BME Design-Fall 2023 - Ellie Steger
Complete Notebook

PDF Version generated by

EMILY WHEAT

on

Dec 13, 2023 @08:09 PM CST

Table of Contents

Team contact Information

ERIN SCHLEGEL - Oct 11, 2023, 8:36 PM CDT

Last Name	First Name	Role	E-mail	Phone	Office Room/Building
Puccinelli	Tracy	Advisor	tracy.puccinelli@wisc.edu		
Lubner	Meghan	Client	mlubner@uwhealth.org		
Steger	Ellie	Leader	esteger@wisc.edu	8479976051	
Schlegel	Erin	Communicator	ekschlegel@wisc.edu	571-499-1162	
Skutnik	Aleksandra	BSAC	askutnik@wisc.edu	8477498466	
Wheat	Emily	BWIG	wheat2@wisc.edu	6307460492	
Jaekle	Olivia	BPAG	jaekle@wisc.edu	4843197231	

Project description

EMILY WHEAT - Oct 11, 2023, 8:41 PM CDT

Course Number: 400

Project Name: Radiologic pathologic correlation in renal cell carcinoma

Short Name: RCC Blade

Project description/problem statement: The goal of this project is to develop a blade for a tumor resection coring device. The blade should be able to effectively resect a tissue sample from an ex-vivo tumor without causing tissue damage to the overall tumor. Currently, the resection device used is too blunt and thick to effectively extract samples without causing surrounding tissues to be damaged and un-imageable on CT. By creating a new blade design, the pathologist can preserve the tumor sample during the coring process. In maintaining the integrity of the tumor tissue, the pathologist will be able to accurately correlate CT image markings with their location in the patient sample.

About the client: Dr. Meghan Lubner works in the University of Wisconsin-Madison Department of Radiology.

2023/09/26 Team Contract Meeting

EMILY WHEAT - Oct 11, 2023, 8:00 PM CDT

Title: Team Contract Meeting

Date: 9/26/2023

Content by: Emily

Present: Emily, Erin, Aleks, Ellie, Olivia

Goals: To discuss each members individual contract prep and complete the team contract as a group

Content:

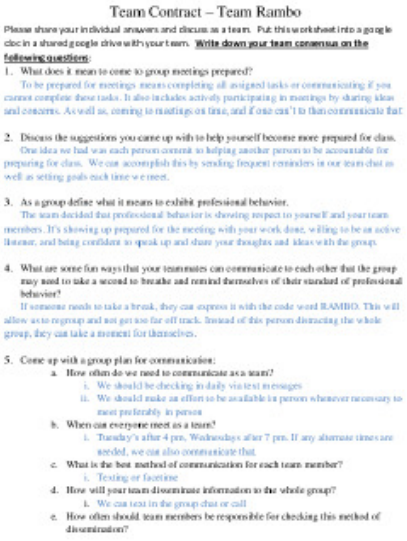
- The team met at engineering hall after the first new client meeting
- Each group member went through their individual contract answers
- each member had similar answers:
  - how to be prepared for meetings
  - defining professional behavior
  - defining conflict and ways to resolve it

- the group went through each of their 5 strengths and there were many overlaps:
  - multiple members had:
    - empathizer
    - coach
    - deliverer

- the team talked about how we will resolve conflict within our team
- the team came up with two different safe words:
  - "rambo" to indicate the team should take a break on get back on track with professional behavior
  - "snow" for when a topic has touched a personal topic for one of the team members
- the team talked about how each strength can help the group as a whole and another member took notes when each person was sharing

Conclusions/action items: At the end of the meeting, each member will individually email Dr. Puccinelli their individual team contracts. Erin will also email the team contract. The team will meet soon to complete the design matrix.

EMILY WHEAT - Oct 11, 2023, 8:03 PM CDT



Team Contract – Team Rambo

Please share your individual answers and discuss as a team. Put this worksheet into a google doc in a shared google drive with your team. **Write down your team consensus on the following questions:**

1. What does it mean to come to group meetings prepared?
   To be prepared for meetings means completing all assigned tasks or communicating if you cannot complete these tasks. It also includes actively participating in meetings by sharing ideas and concerns. As well as, coming to meetings on time, and if one can't to then communicate that.

2. Discuss the suggestions you came up with to help yourself become more prepared for class.
   One idea we had was each person commit to helping another person to be accountable for preparing for class. We can accomplish this by sending frequent reminders in our team chat as well as setting goals each time we meet.

3. As a group define what it means to exhibit professional behavior.
   The team decided that professional behavior is showing respect to yourself and your team members. It's showing up prepared for the meeting with your work done, willing to be an active listener, and being confident to speak up and share your thoughts and ideas with the group.

4. What are some fun ways that your teammates can communicate to each other that the group may need to take a second to breathe and remind themselves of their standard of professional behavior?
   If someone needs to take a break, they can express it with the code word RAMBO. This will allow us to regroup and not get too far off track. Instead of this person distracting the whole group, they can take a moment for themselves.

5. Come up with a group plan for communication:
   a. How often do we need to communicate as a team?
      i. We should be checking in daily via text messages
      ii. We should make an effort to be available in person whenever necessary to meet preferably in person
   b. When can everyone meet as a team?
      i. Tuesday's after 4 pm, Wednesdays after 7 pm. If any alternate times are needed, we can also communicate that.
   c. What is the best method of communication for each team member?
      i. Texting or facetime
   d. How will your team disseminate information to the whole group?
      i. We can text in the group chat or call
   e. How often should team members be responsible for checking this method of dissemination?

Download

Team_Contract.pdf (244 kB)

2023/09/26 New PDS Team Meeting

EMILY WHEAT - Oct 11, 2023, 8:33 PM CDT

Title: Team Meeting to Complete the PDS for the New Project

Date: 09/26/2023

Content by: Emily

Present: Emily, Aleks, Erin, Olivia, Ellie

Goals: To complete the PDS for the new project and submit it

Content:

- the team met at Engineering Hall to complete the PDS
- the PDS sections were split up the same as the first PDS for the old project
    - each member had to do the same sections as before
- since the team already met with the client, many questions were answered and the team could complete many unknown sections of the report
- the old teams prototype gave the team a better idea on the dimensions, materials, and ergonomics of the project
- the entire team reviewed the PDS before submission
- a few grammatical errors were corrected and overall flow of the report

The full PDS can be found under "Project Files" titled "PDS"

Conclusions/action items: Emily will submit the PDS on canvas and will upload in on the website. Erin will email the PDS to our advisor. Moving forward, each team member will come up with 2-3 individual design ideas. The team will meet and share all ideas then complete the design matrix with the final 3 ideas.

2023/10/01 Design Matrix Meeting

EMILY WHEAT - Oct 11, 2023, 8:34 PM CDT

Title: Design Matrix Meeting

Date: 10/01/2023

Content by: Emily

Present: Emily, Erin, Ellie, Aleks, Olivia

Goals: To share individual design ideas, decide on the 3 final designs, and complete the design matrix

Content:

- The team met on facetime to finalize the design matrix
- each member had already shared their personal design ideas during the weekly Friday advisor meetings
- the final 3 designs were chosen
- erin and olivia worked on the SolidWorks images for the designs
- the team made the categories they were grading each design on and the weights of each category
- after weighing each design, the "skin biopsy design" won
- shorts explanations were written about how the team defined and scored each category
- a paragraph was written explaining the winning design

The full design matrix can be found under the "Design Process" folder titled "Design Matrix"

Conclusions/action items: The team successfully completed the design matrix and picked a winning design. The team will continue to research how to fabricate the winning design and the possible materials and methods needed. In the near future, the team will divide up sections of the preliminary report and presentation and complete both.

2023/10/04 Preliminary Presentation Review

ERIN SCHLEGEL - Dec 13, 2023, 4:34 PM CST

Title: Preliminary Presentation Practice

Date: 10/04/23

Content by: Erin Schlegel

Goals: To practice our preliminary presentation and edit any errors.

Content:

- changed the name to the recorder blade

- Describing the Punch Biopsy Slide:

  - Emphasizing the difference between this and previous group's design
  - based on the punch biopsy design

- Evaluation Criteria:

  - Make sure to explain the criteria in a separate slide, then do a design matrix slide itself
  - use design ideas for pictures on this slide

Conclusions/action items: Continue practicing your slide and be within the time limit for your section.

2023/10/11 Preliminary Report Meeting

EMILY WHEAT - Oct 11, 2023, 7:40 PM CDT

Title: Preliminary Report Team Meeting

Date: 10/11/2023

Content by: Emily

Present: Emily, Aleks, Olivia, Erin, Ellie

Goals: To edit, finalize, and submit the preliminary report as a team

Content:

- The team meet at Union South at 6pm

- Ellie facilitated the meeting

- Emily took notes

- Erin helped edit the references

- Aleks and Olivia went through and fixed all grammatical comments on the side of the document

- the entire team read through the entire report and discussed edits

- the team wrote the abstract last

- the team decided on purchasing a sheet of stainless steel and fabricating it into a blade in the TeamLab

- the team finalized what 3 tests to run in the future

Conclusions/action items: After the meeting, Emily will upload both the report and notebook on Canvas and will upload the report on the website. The team will complete the peer and self evaluations tomorrow and meet with our advisor on Friday. On Friday, the team will discuss what to do for our outreach project.

2023/10/20 Recap of Client Meeting

Olivia Jaekle - Nov 09, 2023, 1:44 PM CST

Title: Client Meeting Recap

Date: 10/20/2023

Content by: Ellie

Present: Emily, Aleks, Olivia, Erin, Ellie

Goals: To edit, finalize, and submit the preliminary report as a team

Content:

- Erin is looking to order materials this week
    - Write an email for funding specifics
        - § Metal tubing and pig kidney (not yet but figure out how)
            - □ Preliminary testing will be done on chicken breast
- Have a blade fabricated by 10/31
- Is the tube still delrin?
    - FormLabs printed f
    - Wants slits to be illuminated on MR imaging
- Make a design matrix for how to get the sample out of the device
    - Has to be printed for each design
    - Team will bring designs to next Friday
    - Ellie do research on how to make
- How will blade be detatch?
    - Press to fit- move forward with for first prototype
    - Thread- harder to fabricate
    - Clip
- Reach out for outreach and testing logistics
    - Emily, Aleks Olivia
        - § Deliverable show Friday
- Meet with Sylvana- see what she has been working on
    - Shooting for next Wenesday
- 10/31 Demo for imaging-
    - Erin

- Ellie
- Olivia

Acquire chicken breast from Dr. Lubner

Conclusions/action items: This week Erin will work on blade fabrication, Ellie will research tube designs, and Emily, Olivia, and Aleks will reach out to schools for outreach and write testing procedures. The team will create a design matrix for tube designs on Friday. Erin, Ellie and Olivia will go to watch the procedure

2023/10/24 Outreach Ideas Meeting

Olivia Jaekle - Nov 09, 2023, 1:52 PM CST

Title: Outreach Ideas

Date: 2023/10/24

Content by: Olivia Jaekle

Present: Olivia, Aleks, and Emily

Goals: To figure out ideas for outreach

Content:

- https://www.instructables.com/Pyramid-Catapult/
  - Catapult with candy corn pumpkins (spoon and rubber bands)
  - Teaches them about projectile motion
- https://hessunacademy.com/toothpick-bridges/
  - Strongest toothpick bridge design→ teaches them about statics trusse and frames
- https://www.science-sparks.com/how-to-make-a-potato-battery/#:~:text=Potato%20Battery%20Instructions&text=Place%20a%20copper%20coin%20and,be%20enough%20to%20light%20it.
  - Potato battery → teaches them about bioinstrumentation
- https://www.scientificamerican.com/article/generate-electricity-with-a-lemon-battery/
  - Lemon battery
- Could do a paper airplane one
  - Give the students 3 different paper airplane designs and make them pick which one they think will work best - have each student make the design they picked - test all airplane distances with a tape measure
  - Could weigh down the planes with popsicle sticks or something
  - The Ultimate List of 14 Science Experiments for Elementary School (scienceandliteracy.org)
- Make lava lamps :
  - Instructions:

1. Fill the water bottle 1/3 with water
2. Fill the rest with oil
3. Add the food coloring
4. Break the Alka Seltzer tablet into pieces and add to the mixture
5. Watch the lava lamp come to life

- The Ultimate List of 14 Science Experiments for Elementary School (scienceandliteracy.org)

- Building skyscrapers:
  - Materials needed:
    - Mini marshmallows + toothpicks
  - Idea:
    - Kids literally just build skyscrapers with marshmallows as the joints and toothpicks as structural segments
    - This one doesn't really have a competitive aspect to it

- Sturdiest Pirate ship activity

    - Kids get x amount of materials and have to build a pirate ship that can hold the most amount of candy (could do Hershey kisses or gold coins or even pennies so that candy doesn't get wet)
    - Kids will work in teams
    - Everyone gets candy at the end for participating

- Pumpkin Picker
    - Kids/teams build a “device” that can pick up pumpkin candies from their board
    - sticks, tape, etc.
    - 

Conclusions/action items: This area the ideas that we cam up with, with the potato battery being our lead choice. We will meet with Dr.P to see what advice she has with moving forwards with this idea.

2023/11/01 Hospital Engineer Meeting

ERIN SCHLEGEL - Dec 13, 2023, 4:33 PM CST

Title: Meeting with Sylvana Garcia, the hospital's engineer

Date: 11/01/23

Content by: Erin Schlegel

Present: Erin Schlegel, Emily Wheat, Aleks Skutnik, Olivia Jaekle

Goals: The goal of this meeting is to understand what methods and materials Sylvana has used in the past to successfully 3D print the coring device.

Content:

Background:

-works with a lab named radius within the department of radiology, they offer different services in the hospital for advanced image processing

- ex. measuring tumors and taking patient data to identify

- in charge of 3D printing and fortiflow MRi

- they do clinical applications and medical educations, building models for uterus, phantom organs

In terms of working on the Radiologic Pathologic Correlation in Renal Cell Carcinoma:

- Mold that has lid to put kidney in and close

- Top of the box– thin hole to introduce the blade onto the specimen

- Wanted to correlated with pathology and in vivo scans

- Align the longitudinal axis of the blade with slicing of the MRI

- Cuts the tissue through the kidney

- Collecting tube opens to be able to grab the samples

- worked on aligning the longitudinal of the blade with the slicing of the MRI

- Was working with a bigger blade

  - Current tube we have was a last minute idea
  - She was only really working with the box, not much on the coring device or blade

- form labs use sla, pool of liquid resin that solidifies with UV laser, at the bottom of the pool a laser shoots upward and it cures the layer of liquid and the platform molds ipdwar

- the form labs sla is much more accurate

Advice for printing:

- makerspace has fuse which is good for hollow things, , ultimaker is FDM- good for hollow things , Formlabs

- Resolution of printer 50 microns (0.5)

- Could do (0.1) so that its faster

Conclusions/action items:

The team should continue towards fabrication plans of the blade and refer to the dimensions of the coring tube that Sylvana is to provide the team with. Furthermore, the team should plan on fabricating the blade to be a press-fit design into the coring tube. The team will consult with Sylvana in the future if advice on printing or fabrication is needed.

2023/11/28 Final Deliverables Team Meeting

ALEKSANDRA SKUTNIK - Dec 12, 2023, 8:32 PM CST

Title: Final Deliverables Team Meeting

Date: 2023/11/28

Content by: Aleks Skutnik

Present: All

Goals: To divide sections of the final report and poster.

Content:

- The team met at Engineering Hall to discuss logistics of the final deliverables
- The team split up sections of the final report
    - These were based off of previous knowledge and semester focuses
- The team also split up section of the final poster presentation
- The team began working out details of the poster including format, where different aspects of the design should go, etc.
- Testing team began finalizing results to include in the report and on the poster

Conclusions/action items:

The team should work on individual sections throughout the upcoming week to be prepared for poster presentations and to print the poster on time. The team should also begin to work on the final report in conjunction to the poster presentation.

2023/12/07 Final Poster Presentation Meeting

EMILY WHEAT - Dec 12, 2023, 9:05 PM CST

Title: Final Poster Presentation Meeting

Date: 12/07/2023

Content by: Emily

Present: Emily, Aleks, Olivia, Ellie, Erin

Goals: To make final edits and changes to the poster presentation

Content:

- the team meet at ehall
- each team member had already completed their designated sections of the poster
- each member read through the entire poster to check grammar
- all headings and figure labels were edited to be the same font and size
- the format of the poster and slightly changed to break up all the text
- all text was changed to be the same font and size
- all corrections were made after meeting with Dr. Puccinelli earlier in the week to look over the draft of the poster

Conclusions/action items: The team will meet later tonight to practice the presentation as a group. Ellie will print the poster and College Library and Emily will upload it to Canvas and the website.

2023/12/07 Final Poster Presentation Practice

EMILY WHEAT - Dec 12, 2023, 9:14 PM CST

Title: Final Poster Presentation Practice

Date: 12/07/2023

Content by: Emily

Present: Emily, Aleks, Olivia, Ellie, Erin

Goals: To practice the poster presentation as a group

Content:

- the team met at the business school
- each team member said their individual sections out loud for the group to hear
- constructive criticism was given for each member to hone their sections
- the team ran through the presentation start to finish
    - the first practice was 14 minutes long
    - the team knew they had to shorten the time they spoke
- more corrections were made to make the presentation more concise
- the team practiced again and the second time was down to 12 minutes
- the team continued to practice a few more times and the presentation was consistently around 10 minutes long

Conclusions/action items: The team will meet at ECB tomorrow at 11am to set up the poster and the props. Ellie will pick up the poster at College Library. The team will practice a few more times before noon when the symposium starts.

2023/12/12 Final Deliverables Corrections

EMILY WHEAT - Dec 12, 2023, 9:33 PM CST

Title: Final Deliverables Corrections

Date: 12/12/23

Content by: Emily

Present: Emily, Aleks, Olivia, Ellie, Erin

Goals: To read through and make final edits to the final report and final notebook

Content:

- each team member had completed their assigned sections
- the team met at ehall to read through the report together
- corrections were made to the final draft based on the preliminary report feedback
- labels were added to specific pictures
- many appendixes were added
  - including MatLab code
  - including all of the protocols
- some grammar changes were made
- the PDS was updated based on the coring tube
- the PDS was updated based on the feedback after initial grading
- each member is going to read through the report one more time tomorrow
- each member fixed the notebook to make sure all titles were in the same format
- each member will clean up their individual notebook sections

Conclusions/action items: After one more final run though, the team will be complete with the final deliverables. Emily will upload the notebook and final report to Canvas and the website. The team will upload the Outreach Activity Guide as well.

2023/09/20/ Initial Client Meeting

ERIN SCHLEGEL - Oct 11, 2023, 8:07 PM CDT

Title: Initial Client Meeting

Date: 9/20/23

Content by: Emily

Present: Emily, Erin, Aleks, Olivia, Dr. Karla

Goals: To ask initial questions and get clarification from the client on many aspects of the project.

Content:

Clients overall explanation:

- with ultrasound guided procedures its very hard to see exactly where the breast tissue was taken from

- tissue can be damaged - bleeding which it can make it hard to see

- guesswork of trying to see where we took the tissue from

- "battleship style" for MRI? guided procedures because there is a grid and the breast is placed against it

- vacuum-assisted device - NOT what we are doing

- core assisted device - WHAT WE ARE DOING

- one device for the initial pass and sample and then a second device for the final pass and the clip deployment

- currently uses Monobdy? (name brand name)

- bard marque 14 guage biopsy needle was used in a procedure yesterday

- different clip shapes - to track which biopsy location correlates to what sample

- for our device, she thinks we will only need one clip type/shape

  - most common - ribbon and wing/wind

  - standard 1mm in size

- PROBES ARE NOT REUSABLE

- clip should be deployed within 1mm of the tissue sample taken

- patient comfort - need to make the device as quiet as possible because the spring-loaded release has a loud snap that causes patients to flinch a lot

- shelf life = once taken out of the package and placed on the sterile field - it is thrown away

- doesn't know how long it actually can stay on the shelf

- doesn't need to be MRI compatible

- reasons : to minimize tissue trama by

- budget = she currently has no means for a budget - would need to talk to an attending to make a grand proposal

Conclusions/action items: Follow up with Dr.Puccinelli about budget issue as well as make client aware that product existed on market.

2023/09/26 Initial New Client Meeting

EMILY WHEAT - Oct 11, 2023, 8:13 PM CDT

Title: Initial meeting with new clients

Date: 09/26/2023

Content by: Emily

Present: Emily, Erin, Aleks, Olivia, Ellie

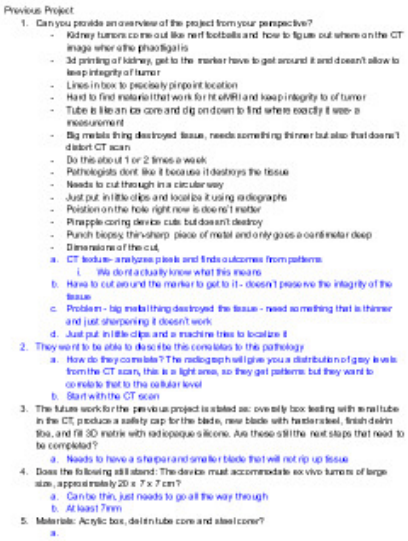
Goals: To meet with the new clients and develop a better understanding of the project and what is expected of us

Content:

- The team met with the clients at 4pm
- two of the members were able to meet in person with the two clients
- three of the team members met on zoom because they had class until 3:45
- Dr. Meghan Lubner was not able to meet since she was traveling
- two of Dr. Lubners colleagues were able to meet with the team
- the team was given a prototype of the 3D printed box used for the kidney
- the team was given the last teams corer prototype
- the team had a shared doc where every member added a few questions to ask the clients ahead of time
- meeting notes were taken on google docs and will be attached here
- every member was able to ask questions and take notes

Conclusions/action items: The team will meet later tonight to complete the new PDS. Once completed, Emily will upload the PDS on the website and submit it on canvas. In the near future, the team will complete the design matrix and split up sections for the preliminary report.

EMILY WHEAT - Oct 11, 2023, 8:14 PM CDT



Previous Project

1. Can you provide an overview of the project from your perspective?
   - Kidney tumors come out like nerf footballs and how to figure out where on the CT image wher e the phaotigal is
   - 3d printing of kidney, get to the marker have to get around it and doesn't allow to keep integrity of tumor
   - Lines in box to precisely pinpoint location
   - Hard to find materia l that work for ht eMRI and keep integrity to of tumor
   - Tube is like an ice core and dig on down to find where exactly it was- a measurement
   - Big metals thing destroyed tissue, needs something thinner but also that doesn't distort CT scan
   - Do this about 1 or 2 times a week
   - Pathologists dont like it because it destroys the tissue
   - Needs to cut through in a circular way
   - Just put in little clips and localize it using radiographs
   - Position on the hole right now is doe no t matter
   - Pineapple coring device cuts but doesn't destroy
   - Punch biopsy, thin-sharp piece of metal and only goes a centimeter deep
   - Dimensions of the cut,
   a. CT texture- analyzes pixels and finds outcomes from patterns
      i. We do nt a ctually know what this means
   b. Have to cut aro und the marker to get to it - doesn't preserve the integrity of the tissue
   c. Problem - big metal thing destroyed the tissue - need something that is thinner and just sharpening it doesn't work
   d. Just put in little clips and a machine tries to localize it
2. They want to be able to describe this correlates to this pathology
   a. How do they correlate? The radiograph will give you a distribution of grey levels from the CT scan, this is a light area, so they get patterns but they want to correlate that to the cellular level
   b. Start with the CT scan
3. The futures work for the previous project is stated as: overally box testing with small tube in the CT, produce a safety cap for the blade, new blade with harder steel, finish delrin tho, and fill 3D matrix with radiopaque silicone. Are these still the next steps that need to be completed?
   a. Needs to have a sharper and smaller blade that will not rip up tissue
4. Does the following still stand: The device must accommodate ex vivo tumors of large size, approximately 20 x 7 x 7 cm?
   a. Can be thin, just needs to go all the way through
   b. At least 7mm
5. Materials: Acrylic box, delrin tube core and steel corer?
   a.

Download

Renal_Cell_-_Initial_Client_Questions.pdf (48 kB)

2023/10/19 Client Meeting # 2

Title: Client Meeting #2

Date: 10/19/23

Content by: Erin Schlegel

Present: Erin Schlegel, Emily Wheat, Aleks Skutnik, Olivia Jaekle, and Dr. Meghan Lubner

Goals: The goal of this meeting is to discuss how to proceed with payment of fabrication materials and

Content:

Initial Questions:

- Does the corer go all the way through? How do you take out the corer so it doesn't make an artifact on the CT image
    - Yes, that is a problem
    - Make a hole all the way through the mold that will allow for the blade to be attached
        - Messy
- We understand that precision is the main goal of this project but what are other current problems with this procedure that can be improved? Timing? Ease of use?
    - A material for the box that will show up on both CT and MRI
        - Ganellinium, wells with water
    - Markers
    - Tube reusable?
        - Just clean with soad and water- not autoclavinle
        - Just 3D print the tube every time
- Are there any other areas we can improve? -we can offer 2 prototypes one .25mm thick and one .5mm thick
    - What about a blade cap
    - Improving the coring device durability? So it doesn't come apart
    - Creating an ergonomic handle
        - No its okay, just hold on the back and twist
    - Are there any blade properties that you want to see as we continue this project?/Are you comfortable with our current design (cylindrical blade like a skin biop
    - Are there any blade features that could improve the procedure? (hydralics, heat, handle ect)
- What does the future work past the blade look like for this project?
    - Ultrasound during insertion
    - Heterogenous tumors applicable in other ways
        - Publishable- alot of groups would
- Are there any other prototypes you can offer us?
- Are there any procedures coming up that we can watch/are there available videos to see the process in action?
    - Can you make a video?
    - We will def be able to see the CT and MR process- maybe not the OR
        - 10am-ish on Halloween
- What is the best time weekly/biweekly to meet?
    - Best way of communicating? Sending questions in an email?
    - Fridays are most flexible
        - Schedule is tbd weekly

- Clarify/recap project funding?
    - Order throught the hospital
- Does current testing methods look ok?
    - Autoclave testing?
- Can she send us those slides?

Meeting notes:
- Aggressive features and want to see what they look like and find where that exact location is

- Take pre procedure CT, then 3d print mold, best guess and put tissue localization clips to see where we think the tumor location is, new ct, then grid to correlate loc
    - Want something to be able to see more on MR
    - Channels? Paint with gad?
- Specimen radiographs to find the graphs and then mark the graph with a pin, then localize 1 cm around the clips
- extract images and look at ROI
- Want to see the difference between low grade features
- Image it in a plastic bucket is not ideal
- Seeing low grade and high grade tumor right next to each other (not wanted)

- Going over previous project;
    - IRB was worried the alginate would ruin the specimen
    - Need the coring device to not damage the specimen
    - Need blade sharper
    - Material for coring device can be upped in discussion
    - One mold tube per specimen
    - Maybe put multiple splits in the tube
    - CLARIFY, we cut the tube?
    - Maybe be a clamshell device that just opens
        - Clamshell tubing– it opens/falls apart when blade is removed
    - Did testing on chicken for blade angle
    - Can get tumors that are processed clinically **
    - Need someway to remove blade from tube
        - Pressfit, threads, clip
    - Tube and blade has space between creating drag
    - Blade is biggest struggle
    - Student did independent study and took blade to outside place and it still wasn't sharp enough
    - Have to be able to get blade on and off
    - Stainless steels surgical is too soft
    - First tube made of slippery delrin
    - Second one, had thread
    - Need press fit?, the one we have isn't even delrin
    - How can we find a way to best visualize on both MR and CT
    - Group did this with MRI only

- Our project:
    - Looking at 316 stainless steel
    - Overall thinner blade
    - Want to order from her and she orders it for us
        - Send her detailed list of materials
    - Length of tube would change, nothing else
    - Maybe on bottom side of the mold so you go through and through
        - Very messy :(

    - Meet on Halloween: 10 AM?
    -

- Alginate: https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.maxill.com%2Fus%2Fblog%2Fpost%2Falginate&psig=AOvVaw1kWnqAXtZmgAXWh74RoXEH&ust=1697809881190000&source
- She also thought about punch biopsy blade design
    - ⅓ thickness is good
    - She has been pushing too hard and felt like she was damaging too much tissue
    - Want it to be sharp and slippery
        - A little bit of drag is fine it is unavoidable
    - Handle?
        - Current process is okay
        - Tubing need to be long enough–doesnt rlly matter bc they 3d print anyway
        - Sylvana? 3d printing engineer
        - Holds onto back of tube and twists to move it through the tissue
        - Theory: ultrasound while pressing in coring device
        - No handle
            - Don't need anything extra
- Reusable tube?
    - Would have to autoclave if it was still in patient
    - Just better to 3d print tube every time
    - None of it is reusable except maybe blade

- Diameter of TISSUE SAMPLE should be min 1 cm
    - Need to keep tube and blade consistent
- ISSUE WITH TUBE AND BLADE
    - Screwing it in may be risky– physician could cut themselves trying to unscrew blade from tube
        - Blade cap could come into play here
- Porcine kidney would be great to use for modeling
    - Can substitute for ham and chicken and whatnot that she would help us get

Questions:

- So is form labs tube supposed to be reused or not :
    - Up to us, we need to make the length longer, If it is reused it needs to be properly sterilized, needs to be long enough to go all the way through
- - how fo you get the blade off if its in the tumor?
    - Still up for debate as well, they were thinking of making a hole on the other side of the box to push the blade through

- The clips go in after the tumor and kidney was already resected
- Downside - built the material for CT but cant see it on MR
- Sample in a 1cm area around the clips after the clips are placed and reimaged while in the kidney
- Water would be visible on MR but they tried it and it didn’t totally work
- Changed to one mold per specimen so don’t need to steralize
- For testing:
    - If using chickens she can get for us

    - She would need to know ahead of time because they only hold the chickens for so long
- Removable blade:
    - They considered press-fit
    - Threaded - created a lot of drag and damage in the tissue
- “Clamshell” refers to the two pieces of the coring device

- When you take the picture you are averaging all the tumors instead o

Conclusions/action items: Confirm the material to order and send Dr. Lubner the link as well as verify the payment method. We also need to confirm the procedure observation ti printing for the procedure.

2023/12/01- In Person Client Meeting

ERIN SCHLEGEL - Dec 04, 2023, 3:29 PM CST

Title: In Person Client Meeting to Test Blades

Date: 2023/12/01

Content by: Aleks Skutnik

Present: Aleks Skutnik, Olivia Jaekle, Emily Wheat, Erin Schlegel

Goals: To have Dr. Lubner test the blade prototypes on pig kidneys.

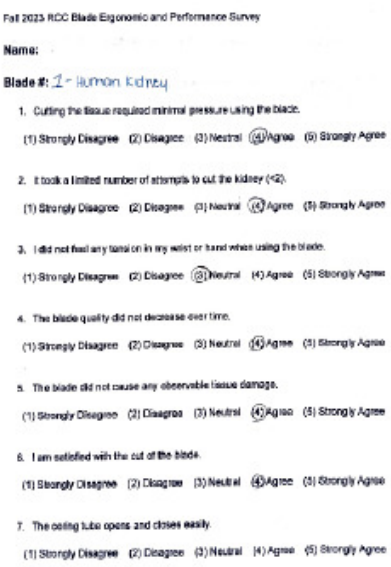
Content:

- The team went to WIMR to meet with Dr. Lubner to conduct testing
- The team was able to watch Dr. Lubner use the blades on an extracted human kidney and pig kidneys
    - The team documented this process with photos and videos for later reference
- Dr. Lubner and Associate Professor Dr. Rong Hu tested four blade prototypes on an extracted human kidney that was no longer clinically needed
    - Stated that blades 1 and 2 worked the best in terms of ease of cutting and minimal tissue damage
    - An issue that arises with human kidneys that is not observed in pig kidneys: connective tissue and fat layer on the human kidney makes it difficult to initially push blade through due to it's slippery yet tough consistency
    - Both Dr.Lubner and Dr.Hu were asked to fill out an ergonomic/performance likert survey on their satisfaction of the blade
- Dr. Lubner then tested the four blade prototypes on four pig kidneys that were sourced from the UW butcher shop
- Following these tests, Dr. Lubner was asked to fill out the same ergonomic/performance survey to rate each blade prototype
    - Copies of the surveys are attached

Conclusions/action items:

Based on the feedback received from Dr. Lubner, the team should continue working on ways to sharpen the blade to minimize the amount of force required to push the blade through tissue samples. Dr. Lubner stated in her surveys that blades 1 and 2 cut the best, so the team should fabricate enhanced prototypes similar to that of blades 1 and 2. Dr.Lubner also suggested making the coring device thinner to minimize tissue drag during the cut.

ERIN SCHLEGEL - Dec 13, 2023, 4:32 PM CST



Fall 2023 RCC Blade Ergonomic and Performance Survey

Name:

Blade #: 1- Human Kidney

1. Cutting the tissue required minimal pressure using the blade.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

2. It took a limited number of attempts to cut the kidney (<2).
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

3. I did not feel any tension in my wrist or hand when using the blade.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

4. The blade quality did not decrease over time.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

5. The blade did not cause any observable tissue damage.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

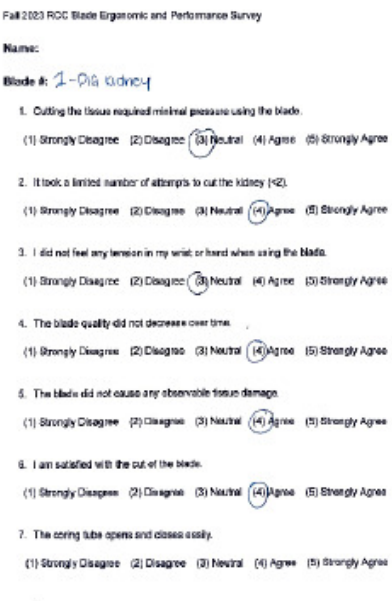
6. I am satisfied with the cut of the blade.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

7. The coring tube opens and closes easily.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

Download

Dr._Meghan_LubnerErgonomicSurveyResultsHumanKidney.pdf (4.65 MB) Attached is Dr. Meghan Lubner's ergonomic/performance survey results for the Human Kidney trials.

ERIN SCHLEGEL - Dec 04, 2023, 3:37 PM CST



Fall 2023 RCC Blade Ergonomic and Performance Survey

Name:

Blade #: 1-Pig Kidney

1. Cutting the tissue required minimal pressure using the blade.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

2. It took a limited number of attempts to cut the kidney (<2).
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

3. I did not feel any tension in my wrist or hand when using the blade.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

4. The blade quality did not decrease over time.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

5. The blade did not cause any observable tissue damage.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

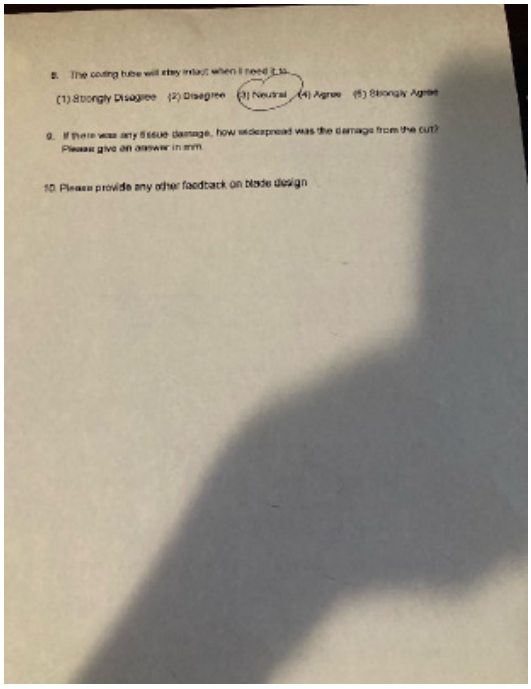
6. I am satisfied with the cut of the blade.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

7. The coring tube opens and closes easily.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

Download

Dr.MeghanLubnerErgonomicSurveyResultsPigKidney.pdf (4.48 MB) Attached is Dr. Meghan Lubner's ergonomic/performance survey results for the Pig Kidney trials.

ERIN SCHLEGEL - Dec 13, 2023, 4:31 PM CST



Download

combinepdf.pdf (2.62 MB) Attached is Dr. Rong Hu's survey results for the human kidney.

2023/9/15 Week 2 Meeting

ALEKSANDRA SKUTNIK - Dec 12, 2023, 8:13 PM CST

Title: Week 2 Advisor Meeting

Date: 2023/09/15

Content by: Emily

Present: Emily, Erin, Aleks, Olivia, Ellie

Goals: To discuss first week research and updates

Content:

- Team will be meeting with the client next Wednesday the 20th
    - team will email the list of questions and clients answers to Dr. Puccinelli
- Team will not be able to meet with Dr. Puccinelli next week
    - office hours 11:30-12:30 at 2158 ECB
    - will stay in touch via email
- went over how to pay for materials
- went over grading - NOT graded on a scale
    - A is a 93%

Conclusions/action items: The team will continue to research and meet to come up with questions to ask during the client meeting. The team will make a rough draft of the prelim presentation to show Dr. Puccinelli at the meeting two weeks from now. If any questions arise, the team will contact our advisor and gain clarity from the upcoming meetings.

2023/09/29 Week 3 Advisor meeting

ALEKSANDRA SKUTNIK - Dec 12, 2023, 8:14 PM CST

Title: Week 3 Advisor Meeting

Date: 2023/09/29

Content by: Olivia Jaekle

Present: Olivia, Erin, Aleks, Ellie, and Emily

Goals:

Content:

- Showed tracy the previous teams prototype

-Not sure if the blade goes through the CT scan or not

-Want to understand why they take out the whole tumor to do the biopsy

-Taking a chunk out of the tumor, not the kidney

-Image first, 3d print mold and box, take out the entire tumor, send it to path

- Pull our original list of questions to ask them

- do have design ideas and will meet with the group after this to have a matrix

- only to work on the blade

-client suggested spinning aspect of blade

- Tracy suggested clip to keep the blade intact

- Tracy will send us PDS and final report from previous group

- all of our Clifton strengths mesh well with each other

- there is a lot of overlap with our top clifton strengths

- 2317 will be where our prelim presentaitons

-office hours will be virtual

- she wants to follow up with cliton strength pilot program after graudation

Conclusions/action items:

The team should continue to work on PDS and begin the preliminary presentation.

2023/10/13 Week 5 Advisor Meeting

ERIN SCHLEGEL - Dec 13, 2023, 4:34 PM CST

Title: Week 5 Advisor Meeting

Date: 10/13/23

Content by: Ellie

Present: Erin Schlegel, Ellie Steger, Aleks Skutnik, Olivia Jaekle, Emily Wheat

Goals: To meet with Dr. Puccinelli and receive feedback on our preliminary presentation.

Content:

- concerned about the capstone depth

-ergonomics of the handle or piston to get a more accurate cut to add more to a blade,

- reach out the client, look at other designs, research other designs to see why certain design aspects.

- schedule regular meetings with meg, talk to her on monday

Action items:

-meet with TEAM lab to fabricate

- look for areas to improve handle and ergonomics

Olivia's idea: patent for a surgical blade that is a piston, skin biopsy that presses the button and applies hydoloic pressure that allowed it to get the right amount of force per tissue

-outreach assignment

Conclusions/action items:

Reach out to our client and set up a meeting as soon as possible. Begin fabrication and meet with TEAM Lab as well as complete our outreach assignment.

2023/10/27 Week 6 Advisor Meeting

Olivia Jaekle - Nov 09, 2023, 1:53 PM CST

Title: Week 6 Advisor Meeting

Date: 2023/10/27

Content by: Olivia

Present: Emily, Olivia, Aleks, Ellie

Goals: Updates about tubing and outreach

Content:

- Showing Dr. P our designs for the tubing; seems like she thinks they are good starting place

- Talked about injection molding but thinks we should do fabrication before

- use ME 419 and ME 418 professors to help with simulation

-Reach out to TEAMLab about fabrication of tubing again

- Dr. Meg wants to do MRI and CT compatibility

-BME 619 professor is good help with imaging and showing flourescense or markers for CT and MRI

- For outreach: needs to be BME based

- The email to outreach needs to be professional and should put BME outreach opportunity in title

- ECG EMG stuff for bioinstrumentation

-Don't reinvent the wheel

- It is all about how you frame it, but need to be BME based and not just engineering

- We really like the lemon or potato circuit, but need to make it more BME based

-if we did bio based, need to do biomaterials and then BME based

- We need little kids to walk out saying they know what BME is so keep it simple and colorful

- Teachiengineering.org

- CRISPR --> have kids cut DNA

Conclusions/action items: Overall, we need to figure out a new outreach idea. We need to start testing within the next two weeks. And we should continue with these tubing designs by creating them in SOLIDWORKS.

2023/11/10 Week 8 Advisor Meeting

ALEKSANDRA SKUTNIK - Dec 12, 2023, 8:12 PM CST

Title:Week 8 Advisor Meeting

Date: 2023/11/10

Content by: Olivia

Present: Aleks, Emily, Olivia, Erin, Ellie, Dr.P

Goals: Update Dr. P on our progress and get insight

Content:

- — Compare the blade testing to the old blade to compare
- — Test with pig kidneys
- — figure out ergonomics
    - survey for qualitative data
- — Could put a hole in the middle
- — Could use a silicone cap
    - — And use a hole to keep pressure from building up
- — Outreach
    - — Remind Dr.P to send activity guide

Conclusions/action items:

The team should continue to work on tube designs and also continue to test the blades. The team may also begin working on the outreach activity guide.

2023/11/16 Advisor Meeting

ERIN SCHLEGEL - Nov 16, 2023, 3:31 PM CST

Title: Advisor meeting week 11/16

Date: 11/16/23

Content by: Ellie, Olivia, Erin, Emily, Aleks

Present:Team + Dr.Puccinelli

Goals: The goal of this meeting is to discuss our further testing plans with our advisor as well as logistics of ordering testing supplies.

Content:

- to order pig kidney, need to call ahead and will tell us the best day to pick us up
  - If they need a letter Dr.Puccinelli will sign it
- Our goal for this semester is to have two working prototypes with the Puzzle piece design and lego design
  - still working out the kinks of 3D printing
- next testing round will be using a pig kidney
- For testing:
  - main goal is to get pig kidneys to do durability testing
  - test with team and additional doctors
  - considering looking into the autoclave testing, going through process to be certified in biochem autoclaves to quanitfy it do a 3D scan and use Image J to see differences in thickness, diameter, etc.
  - Also looking into hardness tests to align with ISO standards
- Need to aqcuire the old acitivity guide for outreach, still deciding school selection, just need to confirm the school
  - if the school statistics are more than 30% under represented students we can get aid for purchasing the materials
- Notes from report:
  - introduce images before inserting them
  - be more detailed in testing protocols
  - spell out acronyms the first time you use them
  - should have an ease of use test- client using a likert scale
  - should specify standard pressure and temp of standard autoclave
  - shelf life- how long it can be ...looking at years, typically sterilization is the limiting factor
  - SI units
  - she would like dimensions in all images
  - for CAD drawings, don't use dimenisons in solid works but just put diameter and length in ourselves

Conclusions/action items: Call to order the pig kidneys from Varsity Meats as well as continue prototyping and looking into hardness tests and autoclave usage.

2023/11/30 Advisor Meeting

EMILY WHEAT - Nov 30, 2023, 12:52 PM CST

Title: Advisor Meeting

Date: 11/30/2023

Content by: Emily

Present: Aleks, Emily, Erin, Ellie, Olivie, Dr. Puccinelli

Goals: To go over the teams' accomplishments this past week and talk about future work for the final two weeks of the semester

Content:

- team divided up sections of the final poster
- team has a functioning sample tube now
  - the final tube is the "Lego Design"
- future work- we need to make one end of the tube a little thinner so it doesn't cause tissue damage
- team did autoclave testing on the blade this week
  - did 3D imaging of the blades at the makerspace
  - were able to get a more accurate thickness
  - did a 'rest run' on one of the blades we aren't using for the ergonomics test in the future
  - Erin is doing "after-imaging" on Friday to confirm the blades are the same thickness as they should be
- the team acquired 4 pig kidneys this week
  - the team will be testing with the client this Friday Dec 1st with the client with the pig kidneys
- talk about EVERYTHING we have accomplished this semester for the final poster
  - even though we wont have completed testing with the new lego design coring device we should still discuss it
  - it will lead into future work
- the team asked a few clarifying questions about the final poster format
- a rough draft of the outreach plans is due by the end of the semester
- the team will set up a meeting next week to review the poster before we print it on Wednesday
- reviewed the ergonomic survey the team created
  - should change the questions to include the Likert 1-5 rating system

ex. while using the device I did not feel any strong tension in my hand. strongly agree would be 5

- should make averages and standard deviations of the results of the ergonomics survey to have some quantitative data

Conclusions/action items: The team will meet with the clients tomorrow at WIMR to test the blades on pig kidneys and complete the ergonomic survey. A meeting will need to be scheduled to go over the final poster before printing. The team will complete the final poster and present it next Friday Dec. 8th.

2023/12/05- Advisor Meeting for Poster

ALEKSANDRA SKUTNIK - Dec 06, 2023, 10:52 AM CST

Title: Advisor Meeting

Date: 2023/12/05

Content by: Aleks Skutnik

Present: All

Goals: To go over and discuss areas of the final poster that need improvement.

Content:

- Update PDS with coring device
- Minimize wording on poster
- Shift around problem statement and background
  - In the background section put motivation and information about the procedure
- Add pictures to final design
  - Issues with final design prints at maker space
  - Add visible labels on solidworks pics
- Keep testing section as is
  - Keep tissue damage test
- Results area
  - Blades weren't made exactly the same with thickness
  - Better way to graph?
  - Scale on y axis (blade thickness)
  - Can increase increment
    - 0-1 mm instead
    - See if it looks better when it's closer together
  - Bolder lines for the graph
- Next semester talk about manufacturing best practice
- Summarize ergonomic survey in testing section and bring full copy to presentations
- Discussion
  - Have results and discussion in one section
  - Gives more room for survey
- Future work
  - Silicone prob not good for blade cover but fine on the other end
  - Add manufacturing capabilities
  - Maybe get rid of some pictures
- Add complete references
- Bullets- first letter capitalized

Conclusions/action items:

The team will make the necessary changes to the poster before poster presentations.

2023/10/11 Blade Design Matrix

EMILY WHEAT - Oct 11, 2023, 7:28 PM CDT

Title: Blade Design Matrix

Date: 2023/9/28

Content by: Olivia Jaekle

Present: Olivia, Erin, Ellie, Emily, and Aleks

Goals: To use design criteria and find a final device

Content:

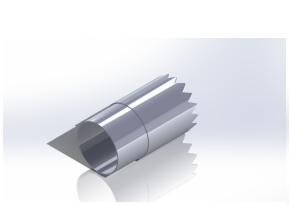
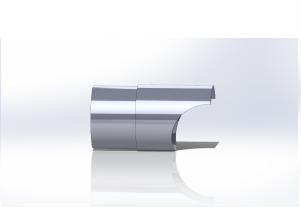
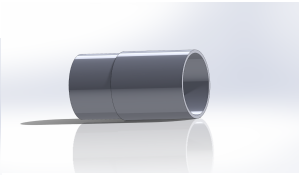
Criteria	Pineapple Corer		Recorder Blade		Punch Biopsy Blade	
						
Precision (30)	2/5	12	4/5	24	5/5	30
Durability (20)	2/5	8	3/5	12	5/5	20
Feasibility (20)	3/5	12	3/5	12	4/5	16
Ease of Use (20)	5/5	20	4/5	16	4/5	16
Cost (10)	3/5	6	4/5	8	4/5	8
Score (100)	58		72		90	

Table 1. Design Matrix for Renal Cell Carcinoma Blade

Scoring Criteria:

Precision (30%)- Precision is a measurement of how much external tissue trauma the blade creates around the sample site. The trauma should not radiate more than 3mm in any direction off the circumference of the sample. Higher scores were assigned to designs that would cause the least amount of damage to surrounding tissue while lower scores indicate more predicted trauma.

Durability (20%)- Durability relates to how long the blade will last over the course of its lifetime. The blade must be able to effectively resect 50 samples, and be able to withstand an autoclave without losing its sharpness. Low scores were given the designs thought to dull quicker.

Feasibility (20%)- Fabrication of prototypes should not be difficult. Ideally, the prototypes should be created with resources easily accessible and not require too much finesse to manufacture. High scores are given to prototypes with more readily available resources and less complex fabrication processes.

Ease of use (20%)- Ease of use correlates to the ergonomics of the design, how easily it can detach from the core, how much pressure/strength the client needs to apply to the device, and a low procedure time (< 5 minutes). Higher scores indicate more of these requirements met than designs with lower scores.

Cost (10%) - The overall cost of fabricating the design holder prototype should be no more than $100. The team was given an overall budget of $500 but do not expect to exceed $100 for one individual prototype. Low scores indicate an expensive fabrication process , while high scores are more cost-effective designs.

Conclusions/action items:

Overall, the design that won was the Skin Biopsy Design as it scored the highest in four out of five categories: precision, durability, feasibility, and cost. This design creates the least amount of external tissue damage due to the simplicity of the blade. The rigged “teeth” on the pineapple corer and the non-uniform circle of the slated blade will cause uneven cuts and can tear the tissue more. The simplicity of the blade allows for it to remain sharper than the other blades. It also is an overall more simplistic design with less detailed components than the competing designs, therefore it won durability and feasibility as well. Since all three designs will most likely be made of stainless steel, all designs scored similar in the cost category. Overall, the pineapple corer design is too rough for human tissue and the slanted blade is a more complex model of the skin biopsy design.

2023/10/27 Corer Design Matrix

ERIN SCHLEGEL - Nov 08, 2023, 9:40 AM CST

Title:

Date:

Content by:

Present:

Goals:

Content:

Conclusions/action items:

Expense Spreadsheet

Olivia Jaekle - Oct 11, 2023, 7:33 PM CDT

Download

Copy_of_BPAG_Expense_Spreadsheet_-_Sheet1_1_.pdf (49.2 kB)

2023/12/12 Updated Expense Sheet

Olivia Jaekle - Dec 12, 2023, 6:09 PM CST

Item	Description	Manufacturer	Part Number	Date	QTY	Cost Each	Total	Link
Component 1								
	Tubing: Welded, 316 Stainless Steel, 5/8 in Outside Dia, 0.585 in Inside Dia, 6 ft Overall Lg	Grainger	3ADN7	10/10/23	1		22.01	link
Component 2								
	3D printed tube	Makerspace		11/01/23	1		5.80	
Component 3								
	Chicken Breast	Animal & Dairy Science Dept		11/05/23	8	2.00	16.00	link
Component 4								
	Lego and Puzzle Piece Tube 3D printing	Makerspace		11/10/23	1		25.87	
Component 5								
	Pig Kidney	Animal & Dairy Science Dept		11/20/23	4	10.59	42.36	link
Component 6								
	Reprint- Lego and Puzzle Piece Tube 3D printing	Makerspace		11/30/23	1		23.06	
Component 7								
TOTAL:								135.1

Download

expense_sheet.png (66.1 kB)

2023/11/02 Jig Saw Model

ERIN SCHLEGEL - Dec 13, 2023, 4:49 PM CST

Title: Jig Saw Model

Date: 11/02/23

Content by: Erin Schlegel

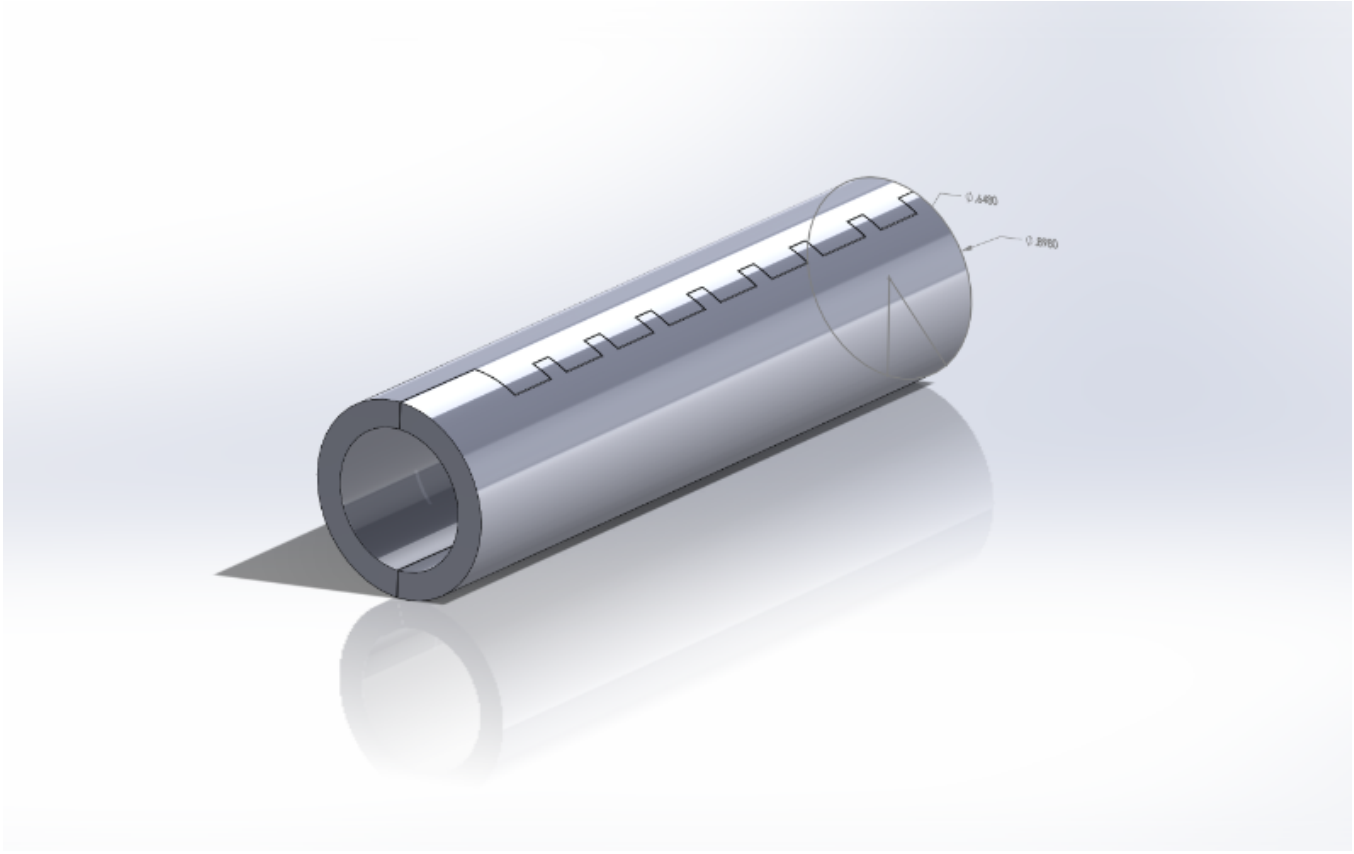
Goals: The problem with the previous team's coring device was that it slipped in the vertical direction. The goal of this new design was to prevent this error by including teeth to grip each half.

Content:

- initial jig saw design SolidWorks seen below

-utilizes a larger wall thickness of .125 inches

-used linear pattern tool to make sketch, then split into two parts using the "split" tool in SolidWorks



Conclusions/action items:

Print this design and see what improvements needs to be made.

2023/11/05 Jig Saw and Lego Re-design

ERIN SCHLEGEL - Dec 12, 2023, 11:56 AM CST

Title: Jig Saw Redesign

Date: 11/05/23

Content by: Erin Schlegel and Ellie Steger

Present: Erin Schlegel and Ellie Steger

Goals: In the "Jig Saw" model the pieces are not fitting together well and coming apart, so we posed the question at show and tell and received two main ideas from other groups to keep the pieces secute. Our goal is to model these two new designs in SolidWorks for 3D printing. The new designs are named the "Lego" design and "Puzzle Piece" design.

Content:

Lego Design:

-Ellie modeled this design in SolidWorks

- has holes and pegs on either side of the thickness profile of the corer

-these holes will have a tight press fit into eachother, similar to a lego

- This tight fit should hold the corer together in the horizontal direction during the vertical procedural motion as the pathologist pushes down into the tumor sample

- Ellie utilized the linear pattern tool in order to create these "holes" and "pegs" along the corer

- all other dimensions including thickness, and inner/outer diameter of the device, and length

Puzzle Piece:

- Erin modeled this design in SolidWorks

- another common idea that was presented at Show and tell was the idea of a snap design to hold the pieces together

- we utilized the components of a snap/puzzle piece where there is extra room in the hole profile to allow for the material to compress to get in and out of the hole

- Erin altered her previous Jig Saw design to include some gaps between the pieces geometry in order to mimic this snap fit

-Erin utilized the linear pattern tool as well as the split tool to create two separate parts in order to better 3D print

- the final print is below:

Conclusions/action items: We will 3D print both of these designs and test the feasibility in order to move forward with the more robust design for blade testing. Make any final adjustments to the design if needed.

ERIN SCHLEGEL - Dec 12, 2023, 11:56 AM CST

Download

IMG_6157__1_.jpg (1.4 MB) Depicted here is the 3D printed "Puzzle Piece" design printed in Form Labs BioMed Clear. As you can see in the pictures there are still some design flaws such as the teeth not fitting together well and being off centered from the center line.

ERIN SCHLEGEL - Dec 12, 2023, 11:56 AM CST

Download

IMG_6159_2.jpg (1.44 MB) Depicted here is the 3D printed "Puzzle Piece" design printed in Form Labs BioMed Clear. As you can see in the pictures there are still some design flaws such as the teeth not fitting together well and being off centered from the center line.

ERIN SCHLEGEL - Dec 12, 2023, 11:56 AM CST

Download

IMG_6286.jpg (1.35 MB) Depicted here is the "Lego Design" which is also printed in Form Labs BioMed Clear. This design utilizes a simple snap fit similar to a lego, and maintains a .3mm tolerance gap to create a good fit. This design has a much slimmer and easier design, therefore making it the winning design.

ERIN SCHLEGEL - Dec 12, 2023, 11:56 AM CST

Download

IMG_6292.jpg (1.32 MB) Depicted here is the "Lego Design" which is also printed in Form Labs BioMed Clear. This design utilizes a simple snap fit similar to a lego, and maintains a .3mm tolerance gap to create a good fit. This design has a much slimmer and easier design, therefore making it the winning design.

2023/11/10 Lego Design Reprint

Ellie Steger - Dec 13, 2023, 4:35 PM CST

Title: Lego Design Print

Date: 2023/11/10

Content by: Ellie

Present: Ellie

Goals: Correct the tolerances on the female portion of the Lego design SolidWorks

Content:

The female and male halves of the team's lego design did not fit together initially because the tolerances between the holes and pegs were not big enough.

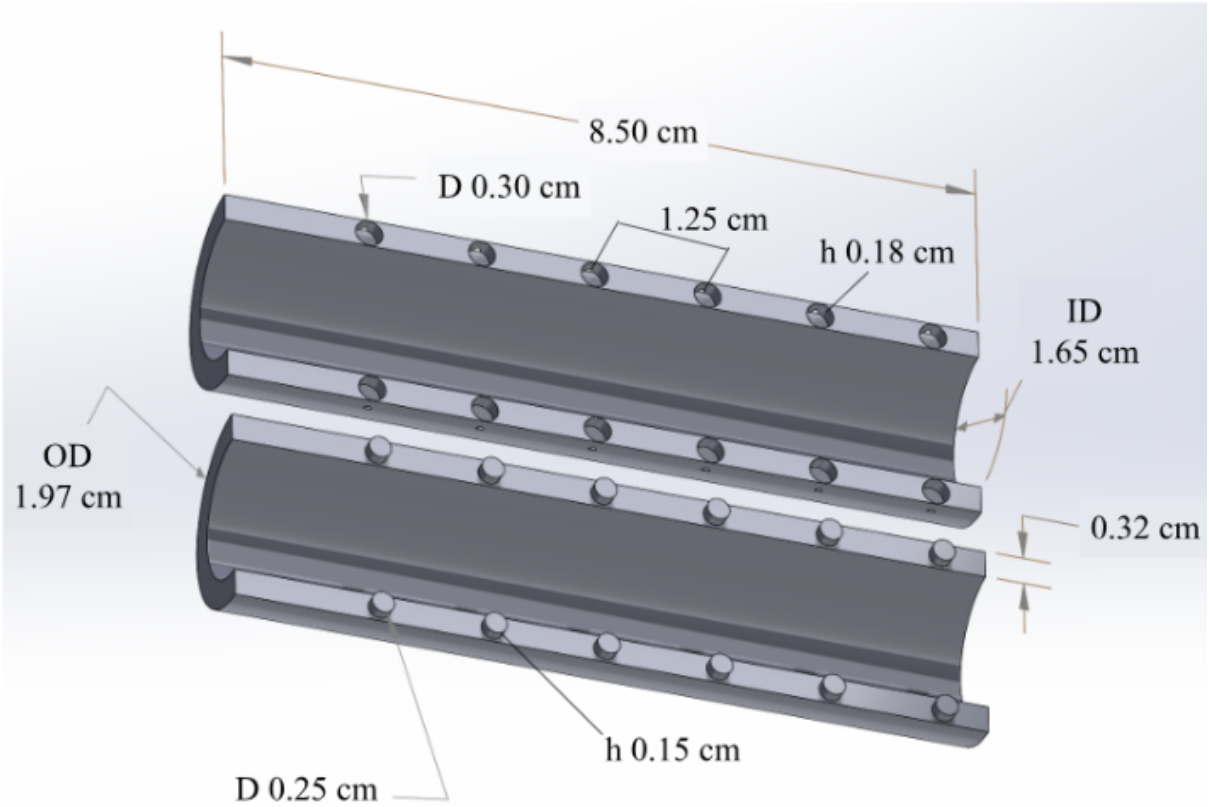
We altered the female half by making the diameter of the holes .1 mm bigger and making the hole 0.03 mm deeper. This allows for a secure attachment between the halves without interferance.

The tube will still be printed in formlabs biomed clear resin

Conclusions/action items:

This design proved to be successful and we will move forward with this design.

Ellie Steger - Dec 13, 2023, 4:36 PM CST



Ellie Steger - Dec 13, 2023, 4:39 PM CST

2023/11/29 JigSaw Rework #3

ERIN SCHLEGEL - Dec 13, 2023, 7:22 PM CST

Title: Jig Saw SolidWorks Design Rework

Date: 11/29/23

Content by: Erin Schlegel

Goals: The goal is to center the teeth on the design and create a better snapping mechanism on the "Jig Saw" design in order to be able to better determine if it is a feasible design.

Content:

- after printing the initial jig saw design(depicted below) I realized I needed a larger gap for the pieces to fit together. Currently, the gap is too small so the pieces don't fit as well as the teeth are not on the center line of the tube. This is causing the teeth to be located on a greater curvature than intended, which also makes the pieces hard to meld together.

Original jig saw design:

Rework process in SolidWorks and Calculations:

-firstly, because the snap fit Is a fairly common modeled design, so I researched how to make a snap fit

From this website https://www.hubs.com/knowledge-base/how-design-snap-fit-joints-3d-printing/ , I did research on cantilever joints:

citation:

[1] “How do you design snap-fit joints for 3D printing?,” Hubs, https://www.hubs.com/knowledge-base/how-design-snap-fit-joints-3d-printing/ (accessed Nov. 29, 2023).

- some common issues with snap fit is a lack of adequate gaps to account for tolerances

-stress can cause brittle parts to snap

-use .3mm tolerance for SLA printing

- looking further into designing new teeth for the jig saw design, I have to take into account the material I will be printing in

-found on the UW-Makerspace website, I utilized the spec sheet (2001432-TDS-ENUS-0.pdf (formlabs.com)) for the form labs resin material we will be 3D printing in

- then found information from Bayer on snap fit joints https://fab.cba.mit.edu/classes/S62.12/people/vernelle.noel/Plastic_Snap_fit_design.pdf

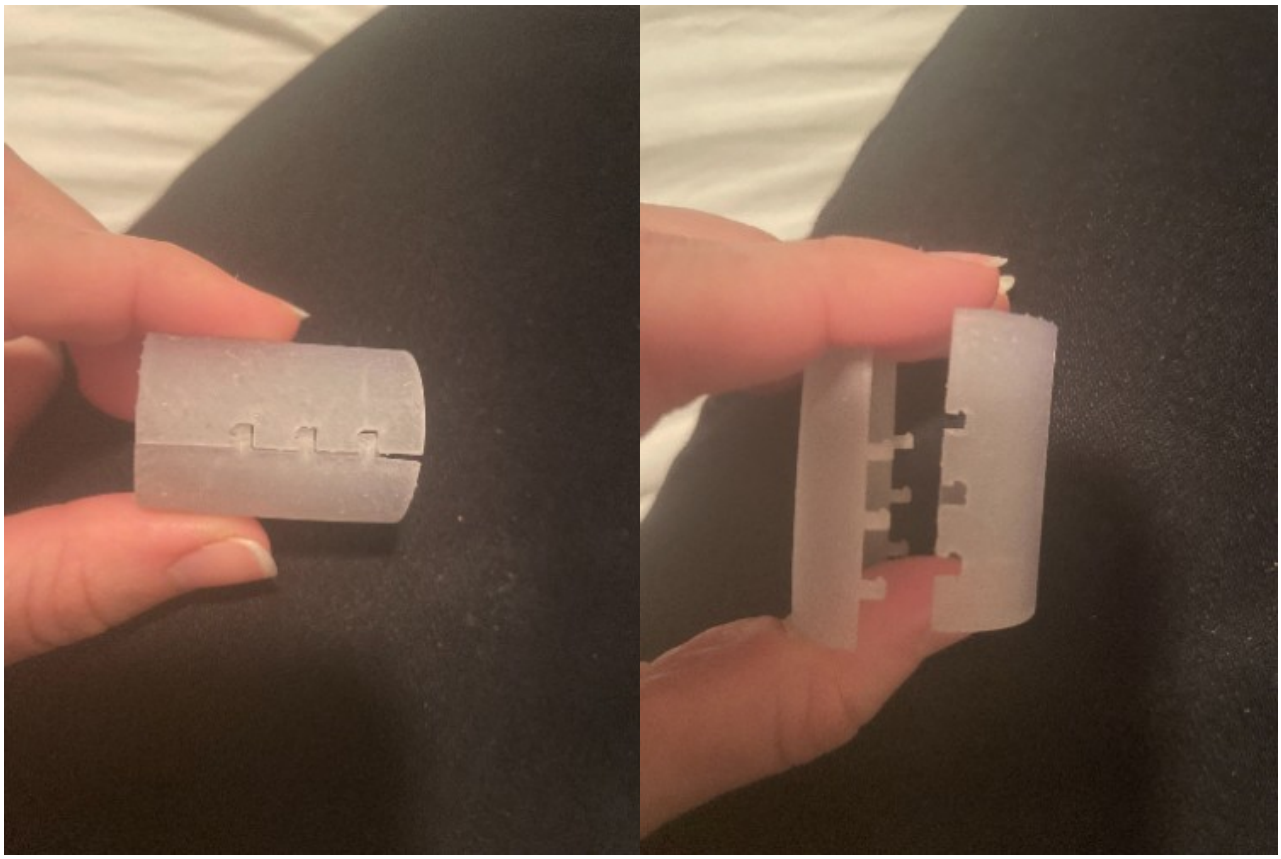
citation:

[1] “Snap-fit book final 11-05 - Massachusetts Institute of Technology,” Snap Fit Joints for Plastics, https://fab.cba.mit.edu/classes/S62.12/people/vernelle.noel/Plastic_Snap_fit_design.pdf (accessed Nov. 29, 2023).

- I was able to use this information along with notes from Mechanics of Materials at UW-Madison to calculate the maximum strain, permissible deflection, and length to width ratio of a type 1 cantalever joint, my work is below in the attachments.

-after this I was able to update the SolidWorks file and reprint a proof of concept part that was shorter in order to conserve funds if this design did not prove feasible.

The updated jig saw printed design is below:



Conclusions/action items:

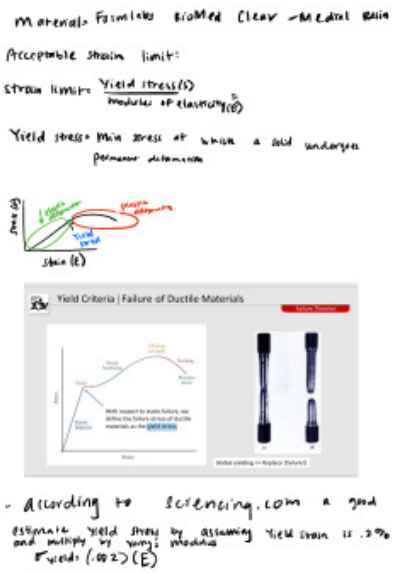
Now we need to compare the feasibilities of both this design and the lego design in a design matrix to decide which we will move forward with.

ERIN SCHLEGEL - Dec 13, 2023, 7:25 PM CST

Download

2001432-TDS-ENUS-0.pdf (152 kB) Here is the specification sheet for the FormLabs BioMed Clear Resin used to 3D print our "Puzzle Piece" design at UW-Makerspace.

ERIN SCHLEGEL - Dec 13, 2023, 7:26 PM CST



Download

Snap_fit_calculations.pdf (3.46 MB) Here are my calculations for finding the correct length and width ratios for the given resin material for a cantalever joint.

2023/12/02 Final Prototype Print

Ellie Steger - Dec 13, 2023, 5:12 PM CST

Title: Final Prototype Print

Date: 2023/12/02

Content by: Ellie and Erin

Present: Ellie and Erin

Goals: Create a lip and press to fit aspect of the tube to connect to the blade

Content:

In order to create a press-fit connection with the blade the team created a .05 mm lip within the blade to stop the blade from slipping through.

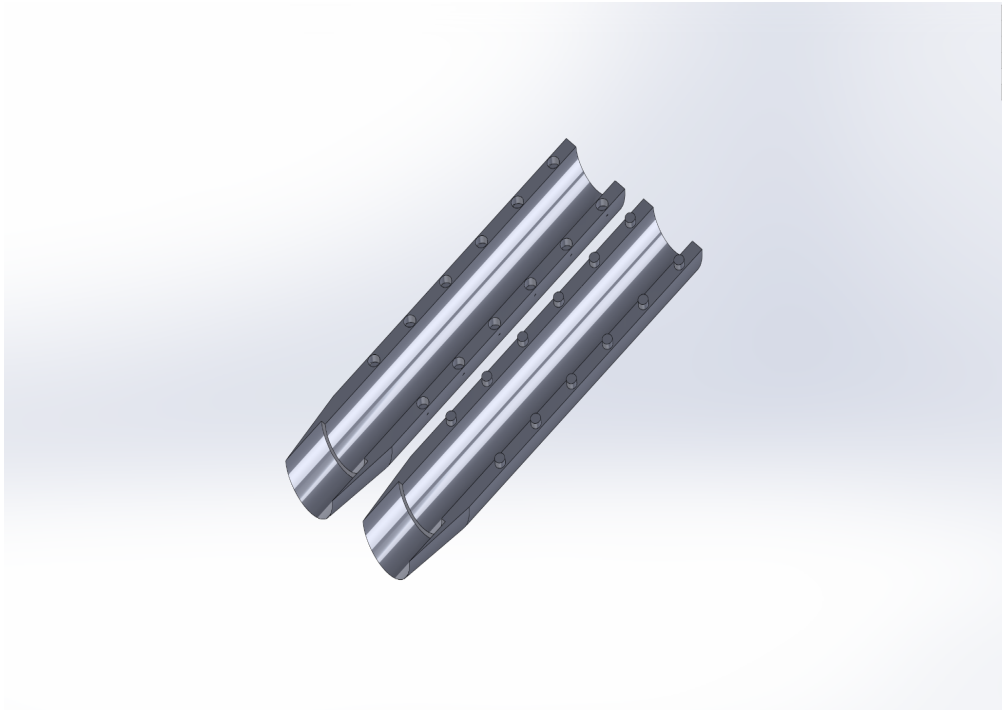
The tube also must have a chamfer to a point so that it is flush with the blade so that the device could be pushed through the tumor without causing any issue trauma.

The team completed the attached Solidworks design

Conclusions/action items:

This design will need to be altered and the print orientation has to be experimented with. The chamfer at the end of the tube failed multiple times because it was too thin.

Ellie Steger - Dec 13, 2023, 4:54 PM CST



2023/12/07 Final Prototype Reprint

Ellie Steger - Dec 13, 2023, 5:18 PM CST

Title: Final Prototype Reprint

Date: 2023/12/07

Content by: Ellie

Present: Ellie

Goals: Edit the SolidWorks so that the final sampling tube can be printed

Content:

Our previous SolidWorks Design failed because the edge came to a point that was smaller than the layer size of the Biomed clear resin.

We updated the edge of the chamfer from 0mm to .01mm, the same depth as the layer size so that the print could be successful.

Conclusions/action items:

Although the print was successful, we will have to continue to workshop the chamfered end so that bowing does not occur and the print succeeds 100% of the time.

2023/10/16 Design Consultation #1 - Copy

Title: Design Consultation #1

Date: 10/16/23

Content by: Erin Schlegel

Present: Erin Schlegel, Jeff Rappe (TEAM Lab), Jesse Darley (TEAM Lab)

Goals: To meet with the TEAM lab experts and propose our initial design and fabrication methods.

Content:

Initial Questions:

- What is the difference between steel 304 and 316?

-What is the best way to cut the tubing, drop saw?

- What is the best method for fitting into the corer, a press fitting?

-The previous group lathed their stainless steel tubing, but I know the material is very thick so will it be possible to lathe this as well?

Specs of Previous Device:

-diameter needs to be 7-10mm for samples

-blade made of 304 stainless steel that had a 15.875mm outer diameter (as seen from their final poster), 12.573 mm inner diameter, thickness is 1.651 mm and length of the blade using the steel tube found here: https://www.grainger.com/product/GRAINGER-APPROVED-Tubing-Welded-3ADG4?partial-content=1

-Previous fabrication method:

The blade was crafted by cutting a 10 cm section on the drop saw. The two ends were lathed at varying angles (15, 20, 25, or 30 degrees) and faced. They were threaded 0.635 cm - thread (1 cm in length) and then cut so the total length of the blade was 2 cm. Four blades were created. See appendix for full instructions.

Meeting Notes:

- want to use a softened state to design because it is easier on the lathe

    - current blade is a softened stainless steel

    - material becomes "hardened" when heat treated

-examples of soft materials are alumnimum, while hardened state would be carbide

- we want want the outer diameter of the blade to be a little bigger than the inner diameter of the Delrin tube because we can saw it down to get an exact press fit together

- could create an aluminum adapter or bushing with a set screw to hold the blade in place to the Delrin tube

    - a screw sticking out would ultimately cause tissue trauma during the procedure so veto that idea

-could get a taper on the blade by using a circular belt sander

    - this would be a little less precise than the lathe but a much easier process

- look into if Mcmaster is an ok vendor for BME 400

-might need to redesign delrin tube because the tissue entering the tube in the blade needs to be the same diameter as when it goes through the rest of the tube so it doesn't squish

- use this website to see the different applications of 304 stainless steel vs 316 stainless steel in healthcare :https://www.essentracomponents.com/en-us/news/industries/medical-equipment/what-is-surgical-steel-the-role-of-stainless-in-healthcare#:~:text=Surgical%20stainless%20steels%20are%20used,fretting%20debris%20into%20the%20body.

Dimensions:

Current Delrin Tube:

***make sure when measuring the ID and OD of the tube that you measure from the side that attaches to the blade, because there are varying dimensions depending on what side you measure

.649/.650" ID of tube (blade grasping end)

3.314" in length

Current Blade:

.619" OD threaded part of blade-- part that inserts in the Delrin tube

.498" ID of the blade

.765" OD non threaded end of blade

.468" height

Fabrication:

- cut sections of the steel tubing using a drop saw in sections longer than the final product so we can hold the piece easily against the sander

  - cut it in 3 to 4 " length sections

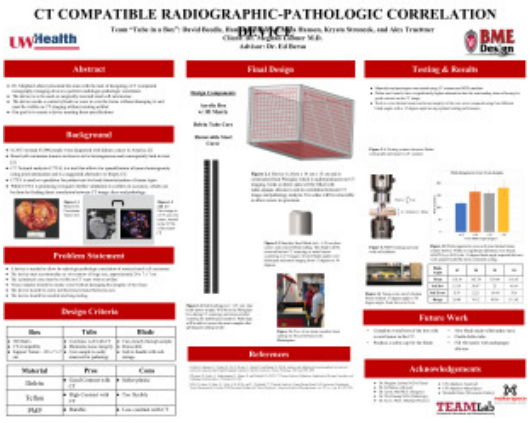
- use circular saw to get taper?

- tubing should have an OD of .625" and thickness of .02" (.5mm), this will allow a .01" gap on either side

  -Tubing: Welded, 316 Stainless Steel, 5/8 in Outside Dia, 0.585 in Inside Dia, 6 ft Overall Lg : https://www.grainger.com/product/GRAINGER-APPROVED-Tubing-Welded-3ADN7?opr=ILOF

Conclusions/action items: Get in contact with the client to understand how to pay for material and do research on 316 stainless steel versus 304 stainless steel.

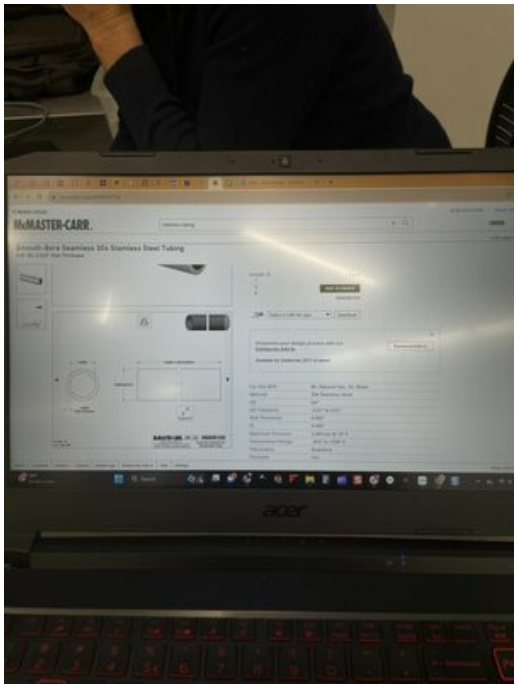
ERIN SCHLEGEL - Oct 24, 2023, 11:53 AM CDT



Download

Final_Final_Poster_Format_1_1_.pdf (1.55 MB)

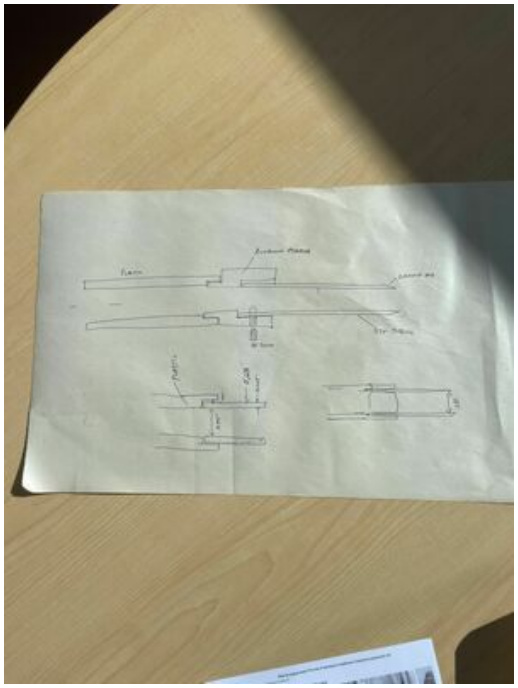
ERIN SCHLEGEL - Oct 24, 2023, 11:53 AM CDT



Download

IMG_5349.jpg (1.25 MB)

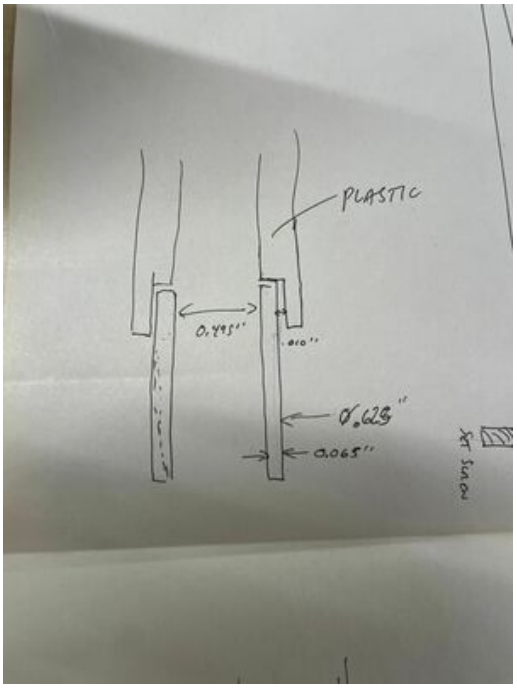
ERIN SCHLEGEL - Oct 24, 2023, 11:53 AM CDT



Download

IMG_5352.jpg (1.24 MB)

ERIN SCHLEGEL - Oct 24, 2023, 11:53 AM CDT



Download

IMG_5356.jpg (1.36 MB)

2023/10/30 Blade Fabrication #1

Olivia Jaekle - Nov 09, 2023, 1:39 PM CST

Title: Blade Fabrication at TeamLAB

Date: 2023/10/30

Content by: Olivia Jaekle

Present: Olivia, Erin, and Ellie

Goals: Make blade for testing

Content:

- Started out by cutting tube out of plastic wrap

- used sharpie to mark cut depths, every 4 inches make cut so that the piece was long enough to hold against the saw

- use clamp that has blade and go around mark with clamp

- move clamp in circular motion to cute tube until one side breaks apart

-line up the mark wit the two rollers to get precise measurement

- use the part that was cut as the side that will be tapered out

- 2nd step, use sander, JET

-put slight angle on the sander and press ligthly

-turn the cut tubing in circular movement perpendicular to the sander to create friction

-get a small cup of water to dip the metal tubing in because it gets very hot

- continue this process until blade is to desired taper and thickness that we want.

Conclusions/action items: Continue this process to replicate multiple blades for testing purposes. The team will create a total of 5 blades.

ERIN SCHLEGEL - Nov 08, 2023, 9:27 AM CST

Download

IMG_5653__1_.jpg (1.21 MB)

ERIN SCHLEGEL - Nov 08, 2023, 9:27 AM CST

Download

IMG_5655.jpg (1.19 MB)

ERIN SCHLEGEL - Nov 08, 2023, 9:27 AM CST

Download

72038423128__F4F1C4C3-ED3C-477E-8E96-ED4DC1476765.jpg (941 kB)

ERIN SCHLEGEL - Nov 08, 2023, 9:27 AM CST

Download

72038421692__46E9D96A-8AA1-4E33-95CC-90ED24026BF9.jpg (841 kB)

2023/11/02 Blade Fabrication #2

Ellie Steger - Nov 03, 2023, 2:51 PM CDT

Title: Blade Fabrication at TeamLAB

Date: 2023/11/02

Content by: Ellie Steger

Present: Ellie

Goals: Sharpen blade so that it is sufficient for testing.

Content:

- During the last fabrication session the blade began to overheat and began to flake off.

- TEAMlab members recommended continuing to belt sand the blade while dipping it in a cup of water

- When trying again this solution did not work even when going very slowly to not overheat the blade. The blade continued to flake:

Conclusions: You will need more than just a belt sander to make the blade sharp enough. It is only feasible to make the blade thin enough without it flaking from overheating. We must look into alternate methods to sharpen the blade to ideal sharpness.

2023/ 11/03 Blade Fabrication #3

Olivia Jaekle - Dec 13, 2023, 10:52 AM CST

Title: Blade Fabrication Continued

Date: 11/03/23

Content by: Team

Present: Emily, Olivia, Aleks, Ellie, Erin

Goals: The goal of this meeting was to sharpen the current best blade and to minimize the lip in the tubing.

Content:

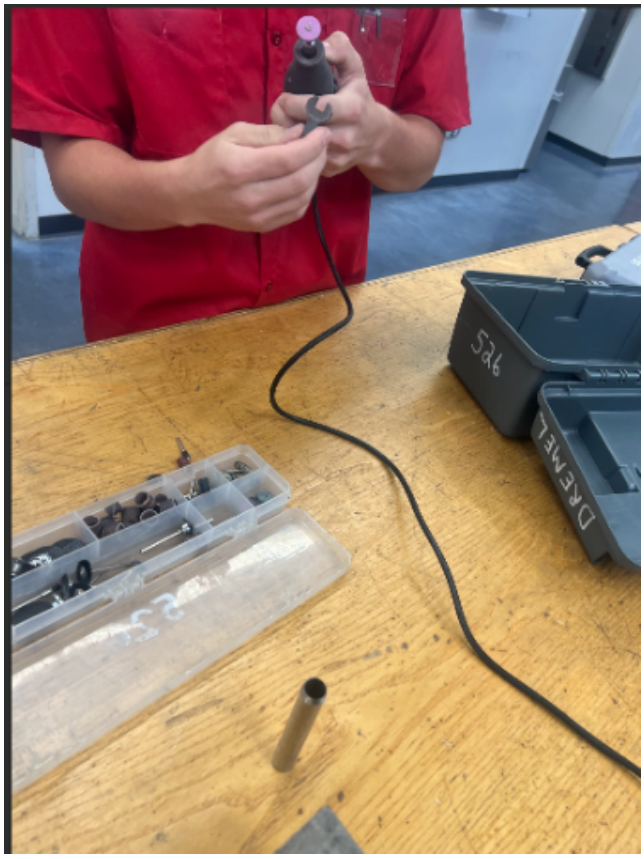


figure 1: meeting with Teamlab to use drummel to minimize lip in tubing

figure 2: lots of blades made using new technique of the drummel

Conclusions/action items:

We were successful in thinning out blades by sanding the outside of the tube and then using the drummel to thin out the tube from the inside.

2023/11/06 Blade Fabrication #4

Olivia Jaekle - Nov 09, 2023, 1:44 PM CST

Title: 4 Blades created for testing

Date: 2023/11/06

Content by: Olivia Jaekle

Present: Olivia Jaekle

Goals: Create the blades used for testing

Content:

Attached is the formal blade fabrication plan so that all blades can be made uniformily. These 4 blades will be used in testing that will occur later this week.

This formal blade fabrication plan was created from the numerous time our team has met with TEAMLAB to get the thinnest and sharpest circular blade possible.

Conclusions/action items:

This fabrication plan will be used as a standard for all blades created. Based on testing, this fabrication plan can be updated.

Olivia Jaekle - Dec 13, 2023, 11:23 AM CST

Blade Fabrication Plan 1

Materials:

- 1-316 stainless steel tube
- Mini tube cutter
- Sanding Belt machine
- Dremel
- 1 cup of water

Procedure:

1. Retrieve 316 stainless steel tube
2. Make marks every 15cm with black sharpie
3. Clamp tube to table
4. Align mini tube cutter blade with black mark
5. Tighten the tube cutter just enough that it doesn't fall off the tube
6. Rotate tube cutter in circular motion towards you until tube splits into two
7. Continue steps 4-6 until the tube is cut into the right amount of sections
8. Take each subsection of the tube and put them all together
9. Take one and turn on the sanding belt machine
10. Press the tip of the cut tube into the sanding belt
11. Rotate the tip to evenly sand down the tube
12. After making 2 full revolutions, remove the tube and dip it into a cup of water for 30seconds
13. Repeat 10-12 until the outside of the tube looks even and sanded down
14. Take the same piece of tubing and clamp it to the table
15. Plug in the dremel and find a top piece that fits inside the tube
16. Turn on the dremel and sand the inside the tube by pressing force around the inner surface
17. Stop after two revolutions and place the tube into a cup of water for 30 seconds.
18. Repeat steps 16-17 until thickness of the tip is less than .25 mm
19. Repeat whole process for all cut sub sections of the tube

Download

Blade_Fabrication_Plan.pdf (29.9 kB)

2023/12/09 Blade Integrity Testing Protocol

EMILY WHEAT - Dec 13, 2023, 7:17 PM CST

Title: Blade Integrity Testing Protocol

Date: 12/09/2023

Content by: Emily

Present: Emily

Goals: To create a protocol to test the integrity of each blade

Content:

Materials:

- 8 chicken breasts
- Final prototype of the blades
- Ethanol
- Scissors
- Caliper
- Gloves
- A large, square, polystyrene dish
- Paper towels

Procedure:

1. Prepare the area by layering the polystyrene dish with multiple paper towels
2. Put on gloves
3. Using the scissors, cut open the packages of chicken breasts and drain the liquid
4. Place the chicken breasts in the polystyrene dish, making sure no chicken breasts overlap
5. Measure the thickness of the blade with the caliper and record the measurement in millimeters
6. If more than one person is testing the different blades, ensure that the same person tests the same blade throughout all cuts
7. Cut the chicken breast by holding the blade in your hand with your thumb pointing down and rotating your wrist
    1. You can rotate your wrist multiple times to cut all the way through the chicken breast, but do not take the blade out and put in back in the chicken to make the cut
8. Once the blade is through the entire chicken, lift the blade up and remove the specimen from the inside
9. Repeat this process four more times for a total of five individual cuts
10. After 5 cuts, measure the thickness of the blade using the caliper and record the measurement in millimeters
11. Repeat steps 7-10 seven more times for a total of 40 individual cuts
    1. Ensure you record the blade thickness after every 5 cuts for a total of 9 measurements
12. Repeat steps 5-11 for all blades being tested
13. Bag all of the chicken, packaging, gloves, and paper towels and dispose of in the trash
14. Using ethanol, wipe down the table, polystyrene dish, scissors, calipers, and all blades

15. Put back all materials once dry

Conclusions/action items: Complete the blade integrity tests on all of the blade prototypes

2023/11/10 Tissue Damage Testing Protocol

EMILY WHEAT - Dec 13, 2023, 7:16 PM CST

Title: Tissue Damage Testing Protocol

Date: 12/09/23

Content by: Emily

Present: Emily

Goals: To create a protocol to test for tissue damage

Content:

Materials:

- 8 chicken breasts
- Final prototype of the blades
- Ethanol
- Scissors
- Caliper
- Gloves
- A large, square, polystyrene dish
- Paper towels

Procedure:

1. Prepare the area by layering the polystyrene dish with multiple paper towels
2. Put on gloves
3. Using the scissors, cut open the packages of chicken breasts and drain the liquid
4. Place the chicken breasts in the polystyrene dish, making sure no chicken breasts overlap
5. Cut the chicken breast by holding the blade in your hand with your thumb pointing down and rotating your wrist
    1. You can rotate your wrist multiple times to cut all the way through the chicken breast, but do not resect the blade until the cut is complete
6. Once the blade is through the entire chicken, lift the blade up and remove the specimen from the inside of the hallow blade
7. Use calipers to measure the amount of tissue damage the cut created and record this distance in millimeters
    1. This is the distance from the edge of the circle of the intended to the furthest sign of tissue trauma, either a tear in the chicken or a larger than 10mm diameter circle
    2. If no visual damage is seen, record this observation
8. Repeat steps 5-7 for a total of 40 cuts
9. Bag all of the chicken, packaging, and paper towels and dispose of in the trash
10. Using ethanol, wipe down the table, polystyrene dish, scissors, and all blades
11. Put back all materials once dry

Conclusions/action items: Complete the tissue damage testing.

2023/12/09 Autoclave Testing Protocol

EMILY WHEAT - Dec 13, 2023, 7:19 PM CST

Title: Autoclave Testing Protocol

Date: 12/09/23

Content by: Emily

Present: Emily

Goals: To create a protocol to test the blades in an autoclave

Content:

Materials:

- Final prototype of blades
- Certification in autoclave use

Procedure:

1. Schedule an appointment with the UW Makerspace to 3D scan
2. Go to the scheduled appointment and meet with the worker
3. Have the certified worker 3D scan the blades using their machinery
    1. You are unable to perform this yourself, it has to be done by a worker
4. Export the 3D scan image as a SolidWorks (sldprt) file
5. Get the dimensions of the inner and outer diameter of the blade from a caliper and record these dimensions in millimeters
6. Repeat steps 3-5 for all blades being tested
7. Schedule an appointment to autoclave at the Biochem Building
8. Go to the scheduled appointment
    1. Ensure that you are autoclave certified by completing the online training
9. Place the blade into the autoclave and follow the steps to autoclave
10. Remove the blade from the autoclave
11. Repeat steps 9-10 for all blades being tested
12. Schedule an appointment with the UW Makerspace to 3D scan
13. Go to the scheduled appointment and meet with the worker
14. Have the certified worker 3D scan the post-autoclaved blades using their machinery
15. Export the 3D scan image as a SolidWorks (sldprt) file
16. Get the dimensions of the inner and outer diameter of the blade from a caliper and record these dimensions in millimeters
17. Repeat steps 14-16 for all blades that were autoclaved

Conclusions/action items: Complete autoclave testing on the blades and upload the results

2023/12/09 Performance Survey Testing Protocol

EMILY WHEAT - Dec 13, 2023, 7:22 PM CST

Title: Performance Survey Testing Protocol

Date: 12/09/23

Content by: Emily

Present: Emily

Goals: To develop a protocol to test the performance of each blade

Content:

Materials:

- 16 copies of the performance survey found in Appendix G
- Pencil
- Final prototype of blades
- 4 pig kidneys
- Scissors
- Caliper
- A large, square, polystyrene dish\
- Gloves
- Paper towels
- Ethanol

Procedure:

1. Prepare the area by layering the polystyrene dish with multiple paper towels
2. Put on gloves
3. Using the scissors cut open the packages of pig kidneys and drain any liquid
4. Place the pig kidney in the polystyrene dish
5. Have the client cut into the pig kidney using one blade
6. Once the blade is through the entire pig kidney, lift up the blade and remove the tissue specimen
7. Have the client note the integrity of the tissue specimen and the overall pig kidney
8. Ask the client the questions of the performance survey and write down their answers
9. If there is noticeable tissue damage, use the calipers to measure how much damage there is in millimeters
10. Repeat steps 5-9 with 3 other clients
11. Place all pig kidney waste, paper towels, and gloves in a bag and dispose of in the trash
12. Using the ethanol, wipe down the calipers, scissors, blades, polystyrene dish, and table
13. Put all materials back where they belong

Conclusions/action items: Complete performance testing of each blade with the clients

2023/11/10 Blade Integrity Testing

Olivia Jaekle - Dec 11, 2023, 11:03 PM CST

Title: Blade Integrity Testing

Date: 11/10/23

Content by: Emily, Olivia

Present: Emily, Olivia, Aleks

Goals: To test the blades for the first time using chicken breasts and see how much a blade changes in thickness

Content:

- 8 frozen chicken breasts were bought from Bucky's Varsity Meats at Meat Science and Animal Biologics Discovery

-

	Blade #1	Blade #2	Blade #3	Blade #4	[mm]
Inital	0.18	0.16	0.22	0.04	
5 cuts	0.18	0.16	0.21	0.04	
10 cuts	0.17	0.15	0.21	0.04	
15 cuts	0.17	0.15	0.21	0.04	
20 cuts	0.17	0.14	0.21	0.04	
25 cuts	0.17	0.14	0.21	0.04	
30 cuts	0.17	0.14	0.21	0.03	
35 cuts	0.16	0.14	0.21	0.03	
40 cuts	0.16	0.13	0.21	0.03	
Total Change	0.02	0.03	0.01	0.01	

Figure 1: The results from each blade after 40 cuts, thickness measurements taken every 5 cuts

Figure 2: Image of Chicken breasts after being cut by blades 3 and 4

Conclusions/action items:

The test was deemed successful since the blades thickness changes less than 0.04mm. The team will put this raw data in a graph on matlab so it can be used in the final poster and final report

2023/11/10 Tissue Damage Test

Olivia Jaekle - Dec 13, 2023, 10:49 AM CST

Title: Tissue Damage Test

Date: 11/10/23

Content by:, Olivia

Present: Emily, Olivia, Aleks

Goals: To test the blades for the first time using chicken breasts and see if there is any external damage caused from the blades

Content:

- 8 frozen chicken breasts were bought from Bucky's Varsity Meats at Meat Science and Animal Biologics Discovery

Figur 1: Cut from blade 1

Figure 2: Cut from blade 2

Figure 3: Cut from blade 3

Figure 4: Cut from blade 4

Conclusions/action items:

The test was deemed successful since there was no observable damage.

2023/11/28- 3D Scanning of Blade Prototypes

Olivia Jaekle - Dec 13, 2023, 9:58 AM CST

Title: 3D Scanning of Blade Prototypes

Date: 2023/11/28

Content by: Erin, Aleks

Present: Erin, Aleks, Olivia

Goals: To 3D scan the blade prototypes before and after autoclaving to track any deformations that may occur during the sterilization process.

Content:

The team went to the UW Makerspace to utilize their 3D scanning technology. Images of the 3D scans before and after autoclaving are attached.

*Note that the images attached are poor quality due to the reflective surface of the blades and the thin diameter, making it difficult for a 3D scanner to accurately capture blade images/dimensions

3D scanning set up (done by certified 3D scanning personnel):

1. Lay out a wooden block

2. Calibrate the machine

3. White dots are the positioning targets

4. Hand held 3D gun shoots lasers to read positions

5. Scanner locates all the targets

6. Start the scanning and developing of the 3D image

Dimensions obtained from the 3D scan analysis:

#1Blade:

od: 15.484mm

id: 14.881 mm

#5 blade:

OD: 15.942mm

ID: 14.851 mm

Conclusions/action items:

The team will move forward with autoclave testing since the 3D before scan has been taken. Once the autoclave test is complete, the team will conduct a 3D scan of the blades after to analyze any material deformation to test whether or not the blade material may successfully withstand the conditions of an autoclave.

Olivia Jaekle - Dec 13, 2023, 9:57 AM CST

Download

_4_Pre.stl (0 B)

Olivia Jaekle - Dec 13, 2023, 9:58 AM CST

Download

Pre_Scan_Blade_1_2_3_5_.SLDPRT (265 kB)

2023/11/28 Before-Caliper Measurements

Olivia Jaekle - Dec 13, 2023, 10:09 AM CST

Title: Initial Autoclave Testing

Date: 2023/11/28

Content by: Olivia Jaekle

Present: Olivia Jaekle and Erin Schlegel

Goals: get measurements from caliper before autoclave test

Content:

Prior to autoclaving:

- team 3D scanned all blades to receive 3D images before autoclaving

-Caliper measurements for thickness were found for all for all blades

-dimensions were: (mm)

#1: .15

#2:.13

#3:.20

#4:.03

Conclusions/action items:

Compare these to after doing autoclave on the blades

2023/11/29- Autoclave test

Olivia Jaekle - Dec 13, 2023, 10:08 AM CST

Title:Autoclave test

Date: 2023/11/29

Content by: Olivia Jaekle

Present: Olivia and Erin

Goals: use autoclave

Content:

-Before coming, Erin and Olivia completed autoclave safety training on canvas

- we made a reservation at the biochem building to use one of their autoclaves

-use made sure we were PPE safe by coming with a bin to put the blades in and using gloves to retrieve the hot bin after autoclave finished

Figure 1: these are the specs we used to run the autoclave, they were already pre-populated when we arrived

Figure 2: Erin showing PPE safe by standing away from the door because lots of smoke comes out. She is also wearing gloves so she doesn't get burned touching the bin full of blades

Conclusions/action items:

Since we completed the autoclave test, we will go back to 3D scan and get caliper measurements.

2023/12/30- After Caliper Measurement and 3D scan

Olivia Jaekle - Dec 13, 2023, 10:11 AM CST

Title: Caliper Measurements and 3D scan after autoclave

Date: 2023/12/30

Content by: Olivia

Present: All

Goals: see if autoclave test was successful

Content:

- team 3D scanned all blades to receive 3D images before autoclaving

-Caliper measurements for thickness were found for all for all blades

-dimensions were: (mm)

#1: .15

#2:.13

#3:.19

#4:.03

- no observable changes were found in 3d scans

Conclusions/action items:

We believe the test passed since the images show no observable difference, and when doing a percent change average of all the blades thickness, it is less than %1, so practically negligable. Therefore, this test passed

Olivia Jaekle - Dec 13, 2023, 10:12 AM CST

Download

Postblade3dscan.stl (0 B)

2023/12/01- Ergonomic Survey Template

ALEKSANDRA SKUTNIK - Dec 02, 2023, 8:14 PM CST

Title: Ergonomic Survey Template

Date: 2023/12/01

Content by: Team

Present: All

Goals: To create an ergonomic survey for Dr. Lubner and her team to fill out after using the prototype blades.

Content:

*Below is the Ergonomic and Performance Survey given to the client to semi-quantitatively and qualitatively evaluate the effectiveness of the blade and comfort using the device when performing a tissue biopsy

Name:

Blade #:

1. Cutting the tissue required minimal pressure using the blade.

(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

2. It took a limited number of attempts to cut the kidney (<2).

(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

3. I did not feel any tension in my wrist or hand when using the blade.

(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

4. The blade quality did not decrease over time.

(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

5. The blade did not cause any observable tissue damage.

(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

6. I am satisfied with the cut of the blade.

(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

7. The coring tube opens and closes easily.

(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

8. The coring tube will stay intact when I need it to.

(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

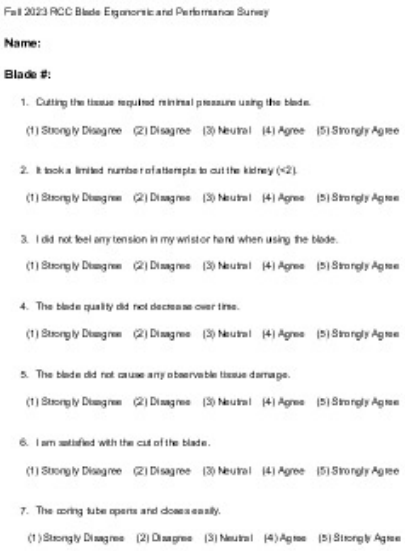
9. If there was any tissue damage, how widespread was the damage from the cut? Please give an answer in mm.

10. Please provide any other feedback on blade design

Conclusions/action items:

The team will present this survey to Dr. Lubner and her team to evaluate the blade during the in-person client meeting. The ratings and feedback will be taken into account and the blade prototypes will be modified accordingly.

ALEKSANDRA SKUTNIK - Dec 02, 2023, 8:14 PM CST



Fall 2023 RCC Blade Ergonomic and Performance Survey

Name:

Blade #:

1. Cutting the tissue required minimal pressure using the blade.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

2. It took a limited number of attempts to cut the kidney (<2).
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

3. I did not feel any tension in my wrist or hand when using the blade.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

4. The blade quality did not decrease over time.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

5. The blade did not cause any observable tissue damage.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

6. I am satisfied with the cut of the blade.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

7. The coring tube opens and closes easily.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

Download

Ergonomic_Survery_1_.pdf (40.7 kB)

2023/12/01- Ergonomic Survey Results

Olivia Jaekle - Dec 13, 2023, 9:57 AM CST

Title: Ergonomic Survey Results

Date: 2023/12/01

Content by: Aleks Skutnik

Present: All

Goals: To review and take into consideration the feedback that the client gave the team on the initial blade prototypes.

Content:

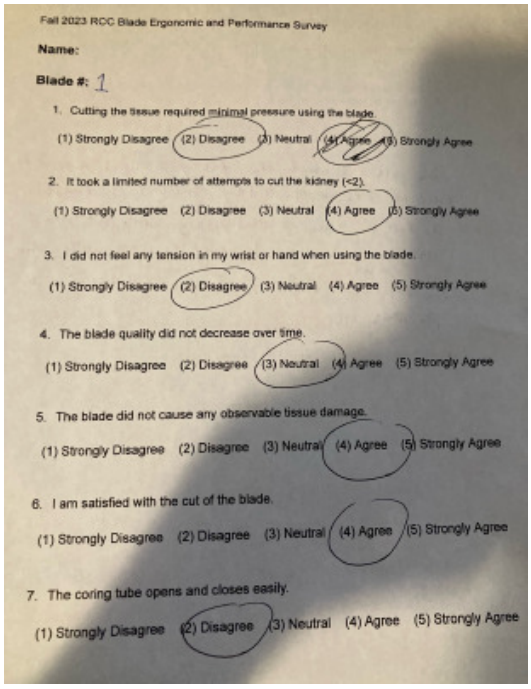
(Full ergonomic survey results attached)

- These results were obtained from the client and her team after performing blade cutting tests on pig kidneys and a human kidney
- Blade 1 appeared to score the best in most categories including minimal pressure necessary to perform the cuts, consistent blade quality, and no observable tissue damage
- 2 images upload staircase damage and external tissue damage, both from blade 3

Conclusions/action items:

The team will continue prototyping blades to improve the blade's abilities and take the client's feedback into consideration moving forward in the fabrication process. The team will also plan to discuss proper manufacturing best practice to improve the fabrication process as a whole.

ALEKSANDRA SKUTNIK - Dec 09, 2023, 3:23 PM CST



Fall 2023 RCC Blade Ergonomic and Performance Survey

Name:

Blade #: 1

1. Cutting the tissue required minimal pressure using the blade.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

2. It took a limited number of attempts to cut the kidney (<2).
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

3. I did not feel any tension in my wrist or hand when using the blade.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

4. The blade quality did not decrease over time.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

5. The blade did not cause any observable tissue damage.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

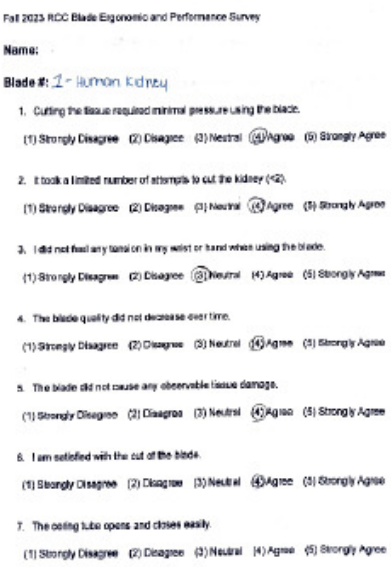
6. I am satisfied with the cut of the blade.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

7. The coring tube opens and closes easily.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

Download

ErgonomicSurveyResultsDr.Rong.pdf (5.58 MB)

ALEKSANDRA SKUTNIK - Dec 06, 2023, 11:02 AM CST



Fall 2023 RCC Blade Ergonomic and Performance Survey

Name:

Blade #: 1- human kidney

1. Cutting the tissue required minimal pressure using the blade.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

2. It took a limited number of attempts to cut the kidney (<2).
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

3. I did not feel any tension in my wrist or hand when using the blade.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

4. The blade quality did not decrease over time.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

5. The blade did not cause any observable tissue damage.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

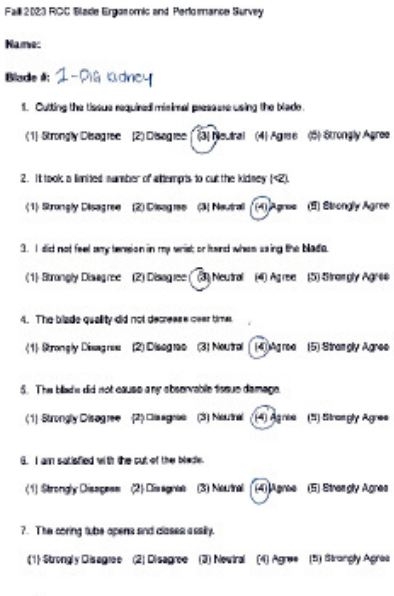
6. I am satisfied with the cut of the blade.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

7. The coring tube opens and closes easily.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

Download

ErgonomicSurveyResultsHumanKidney.pdf (4.65 MB)

ALEKSANDRA SKUTNIK - Dec 06, 2023, 11:02 AM CST



Fall 2023 RCC Blade Ergonomic and Performance Survey

Name:

Blade #: 1-Pig kidney

1. Cutting the tissue required minimal pressure using the blade.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

2. It took a limited number of attempts to cut the kidney (<2).
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

3. I did not feel any tension in my wrist or hand when using the blade.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

4. The blade quality did not decrease over time.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

5. The blade did not cause any observable tissue damage.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

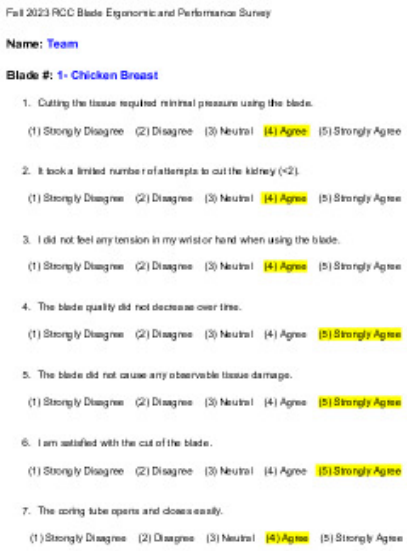
6. I am satisfied with the cut of the blade.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

7. The coring tube opens and closes easily.
(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

Download

ErgonomicSurveyResultsPigKidney.pdf (4.48 MB)

ALEKSANDRA SKUTNIK - Dec 07, 2023, 12:11 PM CST



Fall 2023 RCC Blade Ergonomic and Performance Survey

Name: Team

Blade #: 1- Chicken Breast

1. Cutting the tissue required minimal pressure using the blade.

(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

2. It took a limited number of attempts to cut the kidney (<2).

(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

3. I did not feel any tension in my wrist or hand when using the blade.

(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

4. The blade quality did not decrease over time.

(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

5. The blade did not cause any observable tissue damage.

(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

6. I am satisfied with the cut of the blade.

(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

7. The coring tube opens and closes easily.

(1) Strongly Disagree (2) Disagree (3) Neutral (4) Agree (5) Strongly Agree

Download

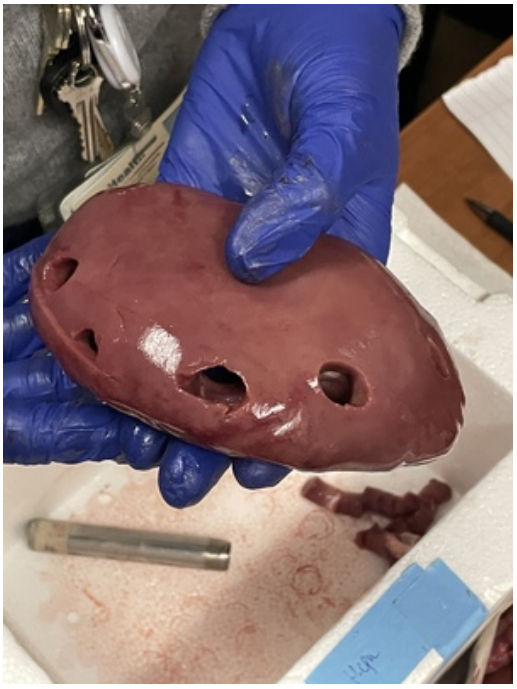
Ergonomic_Survey_Results_Team_Chicken_Breast_Test.pdf (35.9 kB)

Olivia Jaekle - Dec 13, 2023, 9:55 AM CST

Download

IMG_4299.JPEG (2.04 MB)

Olivia Jaekle - Dec 13, 2023, 9:56 AM CST



Download

IMG_4304.JPEG (2.32 MB)

PDS

Olivia Jaekle - Oct 11, 2023, 10:51 AM CDT

DEVICE FOR PRECISE RADIOLOGIC PATHOLOGIC CORRELATION IN RENAL CELL CARCINOMA

PRELIMINARY PRODUCT DESIGN SPECIFICATIONS

BME 400

Team Members:
Ellie Singer, Team Leader
Erin Schlegel, Communicator
Aleksandra Skatnik, BSAC
Olivia Jaekle, BPAG
Emily Wheat, BWIG

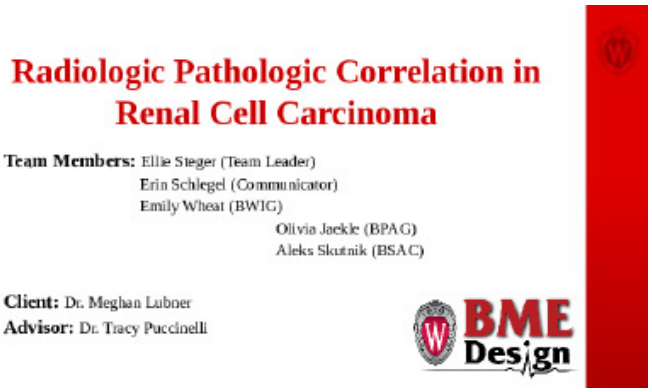
October 1st, 2023

Download

PDS-_Device_for_Renal_Cell_Carcinoma.docx (406 kB)

Prelim Presentation

Olivia Jaekle - Oct 11, 2023, 10:52 AM CDT

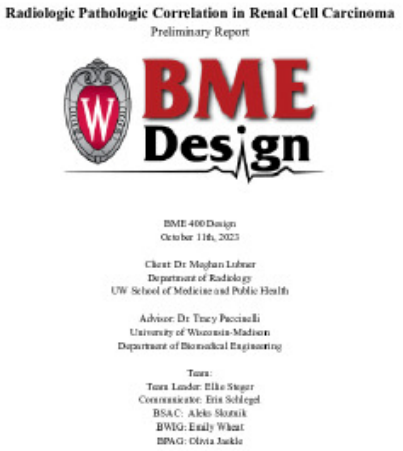


Download

RCC_Biopsy_Prelim_Presentation.pptx (14.1 MB)

Preliminary Report

EMILY WHEAT - Dec 12, 2023, 8:45 PM CST



Radiologic Pathologic Correlation in Renal Cell Carcinoma

Preliminary Report

BME Design

BME 400 Design
October 11th, 2023

Client: Dr. Meghan Lubner
Department of Radiology
UW School of Medicine and Public Health

Advisor: Dr. Tracy Puccinelli
University of Wisconsin-Madison
Department of Biomedical Engineering

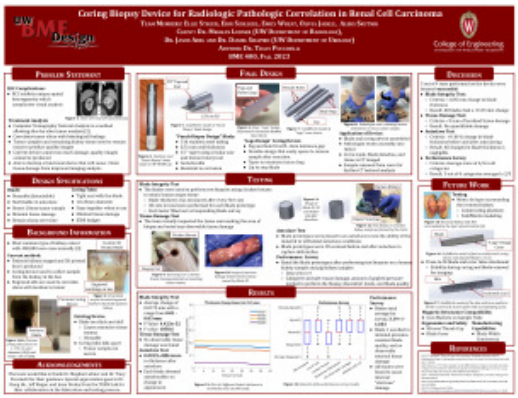
Team:
Team Leader: Elke Singer
Communicator: Erin Schlegel
BSAC: Aleks Slomnik
BWIG: Emily Wheat
BPAG: Olivia Junkle

Download

Team_Rambo-Preliminary_Report.pdf (12.3 MB)

Final Poster Presentation

EMILY WHEAT - Dec 12, 2023, 8:52 PM CST



Download

RCC_Blade_Poster.pptx.pdf (3.09 MB)

2023/11/02 ISO 15189

EMILY WHEAT - Dec 13, 2023, 7:12 PM CST

Title: ISO 15189 standard

Date: 2023/11/02

Content by: Olivia Jaekle

Present: All

Goals: Learn about ISO 15189 standard to have the final design adhere to it

Link: https://www.iso.org/standard/76677.html

Cite: [1] 14:00-17:00, “ISO 15189:2022,” ISO. Accessed: Dec. 12, 2023. [Online]. Available: https://www.iso.org/standard/76677.html

Content:

ISO 15189:2022

Medical laboratories

Requirements for quality and competence

This document outlines the criteria for quality and proficiency in medical laboratories. It is intended for use by medical laboratories to develop their management systems and evaluate their competence. Additionally, it can be employed to verify or acknowledge the proficiency of medical laboratories by users, regulatory bodies, and accreditation entities. The scope of this document extends to point-of-care testing (POCT) as well.

Conclusions/action items:

We are using this standard for our operating environment criteria. it is important that the team works in a clean, steralized place. In conjunction with testing on pig kidney or chicken breast, the team will look at more standards that we must follow

2023/11/02 BS EN ISO 7153

EMILY WHEAT - Dec 13, 2023, 7:09 PM CST

Title: ISO 7153-1:2016

Date: 2023/11/02

Content by: Olivia Jaekle

Present: All

Goals: Learn about ISO 7153-1:2016 for how blades are manufacutred in the medical device

Link: https://www.iso.org/standard/66850.html

Cite:

[1] 14:00-17:00, “ISO 7153-1:2016,” ISO. Accessed: Dec. 12, 2023. [Online]. Available: https://www.iso.org/standard/66850.html

Content:

ISO 7153-1:2016

Surgical instruments

Materials

Part 1: Metals

ISO 7153-1:2016 outlines the metals typically employed in the production of a range of standard surgical instruments, encompassing those utilized in general surgery, orthopaedics, and dentistry, among others.

While ISO 7153-1:2016 is not specifically designed for surgical instruments utilized in specialized applications like implantology and minimally invasive surgery, certain sections of the standard may still be relevant to these instruments.

Conclusions/action items:

We are using this standard for manufacturing blades. This standard gave us insight of how production level blades work and are dispersed. We can also talk to our client more about this when we might want to pursue mass manufacturing

2023/11/05 ISO 13485:2016

EMILY WHEAT - Dec 13, 2023, 7:12 PM CST

Title: ISO 13485:2016

Date: 2023/11/05

Content by: Olivia Jaekle

Present: All

Goals: Learn about ISO 13485:2016, the requirements for quality for medical devices

Link: https://www.iso.org/standard/59752.html

Cite: [1] 14:00-17:00, “ISO 13485:2016,” ISO. Accessed: Dec. 12, 2023. [Online]. Available: https://www.iso.org/standard/59752.html

Content:

ISO 13485:2016

Medical devices

Quality management systems

Requirements for regulatory purposes

ISO 13485:2016 outlines the criteria for a quality management system when an organization aims to demonstrate its capability in consistently delivering medical devices and related services that meet customer and relevant regulatory requirements. These organizations may be involved in various stages of the life cycle, such as design, development, production, storage, distribution, installation, servicing of medical devices, and the provision of associated activities like technical support. Suppliers or external parties offering product and quality management system-related services to such organizations can also use ISO 13485:2016.

The standard's requirements are applicable to organizations of any size and type, except when explicitly stated otherwise. When specified for medical devices, these requirements equally apply to associated services provided by the organization.

Processes mandated by ISO 13485:2016 that are relevant to the organization but not executed by the organization are its responsibility, and they are incorporated into the quality management system through monitoring, maintenance, and control.

If regulatory requirements permit excluding design and development controls, organizations can justify their exclusion from the quality management system. The responsibility lies with the organization to ensure that claims of conformity to ISO 13485:2016 accurately reflect any exclusions of design and development controls.

If a requirement in Clauses 6, 7, or 8 of ISO 13485:2016 is deemed inapplicable due to the organization's activities or the nature of the medical device under consideration, the organization is not obligated to include that requirement in its quality management system. The rationale for such inapplicability is recorded by the organization as described in 4.2.2.

Conclusions/action items:

We are using this standard to align our final design with required quality and regularity affairs. Overall, ISO 13485:2016 sets out standards for managing quality in organizations involved in the production and distribution of medical devices and related services, ensuring compliance with customer requirements and relevant regulations. The document emphasizes the organization's responsibility for all relevant processes, justifications for exclusions, and the recording of any inapplicable requirements.

2023/11/05 ISO 7740:1985

EMILY WHEAT - Dec 13, 2023, 7:12 PM CST

Title: ISO 7740:1985

Date: 2023/11/05

Content by: Olivia Jaekle

Present: All

Goals: Learn about ISO 7740:1985, requirements for detachable blades

Link:https://www.iso.org/standard/14579.html

Cite:[1] 14:00-17:00, “ISO 7740:1985,” ISO. Accessed: Sep. 27, 2023. [Online]. Available: https://www.iso.org/standard/14579.html

Content:

ISO 7740:1985

Instruments for surgery

Scalpels with detachable blades

Fitting dimensions

Specifies the measurements for two sizes of fitting components for detachable scalpel blades and the accompanying handles. This ensures precise fitting and interchangeability of detachable blades for scalpels produced by various manufacturers or in different countries. The transitional phase, facilitating a gradual adjustment to the fitting dimensions outlined in this standard, is anticipated to conclude by the year 1990.

Conclusions/action items:

We are using this standard to align our final design because we want the blade to be detachable from the coring tube. In general this standard is telling us that there are two main fittings used for detachable scalpel blades. WE will look into seeing if our dimensions can fit this criteria so that our blade may be able to used in different situations all around the world.

2023/11/15 CFR Title 21

EMILY WHEAT - Dec 13, 2023, 7:12 PM CST

Title: Code of Federal Regulations Title 21

Date: 2023/11/15

Content by: Olivia Jaekle

Present: All

Goals: To familiarize myself with the code needed to be followed for the blade.

Content:

See attached link:

"CFR - Code of Federal Regulations Title 21," *www.accessdata.fda.gov*. https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/cfrsearch.cfm?fr=864.2240 (accessed Oct. 15, 2021).

The CFR Title 21, Volume 8, contains regulations that govern the design, manufacturing, labeling, and performance of medical devices, including surgical instruments like blades used in medical procedures. Compliance with these regulations is crucial to ensure the safety and efficacy of medical devices, protect the health and well-being of patients, and maintain the integrity of the healthcare system.

Conclusions/action items:

By following the regulations outlined in CFR Title 21, manufacturers of medical blades demonstrate their commitment to quality, safety, and regulatory compliance. This helps in obtaining FDA approval or clearance for the medical devices, and it provides assurance to healthcare professionals and patients that these products meet established standards for performance and safety. Non-compliance with these regulations can result in regulatory actions, including product recalls and legal consequences for the manufacturers.

2023/09/09 Breast Tissue Marker Clip

ERIN SCHLEGEL - Dec 13, 2023, 4:22 PM CST

Title: Breast Tissue Marker Clip

Date : 09/09/23

Content by: **Erin Schlegel**

Citation: Capital & Coast District Health Board , *Breast Tissue Marker Clip*. Capital & Coast District Health Board , 2019

Goals: To learn more about why breast markers are used and their role in the procedure.

Content:

General Info:

- A breast marker is placed in the breast after a lesion is made and sample is taken
- The goal of a breast marker is to find the site of the sample on imaging devices in follow up appointments
    - In order to monitor any new growth of cancerous cells at that site or see if any infection have arose
- The clip is put in the breast by radiologist
- To maintain the comfortableness of the patient, there is a local anesthetic applied to the area of the sample collection
- Insertion of the marker clip happens using a needle which contains the clip and is placed into the patient, then released
- Most clips are ~3mm wide

Why are clips necessary?:

- It can be hard to locate the site of sample collection after the fact, especially if the lesion has been mostly removed
- It serves to check that the correct area was biopsied

Conclusions/action items: I still have found limited information on how clips are actually deployed into the body. I will need to continue to do more research into this process as well as possible downsides to current titanium clips.

2023/09/09 Breast Biopsy Overview

ERIN SCHLEGEL - Dec 13, 2023, 4:22 PM CST

Title: Breast Biopsy Overview

Date: 09/08/23

Content by: **Erin Schlegel**

Citation:

[1] “Breast biopsy,” Mayo Clinic, https://www.mayoclinic.org/tests-procedures/breast-biopsy/about/pac-20384812 (accessed Sep. 8, 2023).

Goals: The goal of this article is to understand the procedure of a breast biopsy and clarify which type we will be focusing on.

Content:

General:

- goal is to remove a sample of tissue from the breast, using some type of incision/extraction tool
- can be used to investigate suspicious mammograms, ultrasounds, or other lumps felt during a breast exam
- biopsy sent off to receive a pathology report
- risks of biopsy include: bleeding/bruising at the site, infection, altered appearance of the breast
- normally there is a numbing injection put in the breast before procedure
- after the sample collection a stainless steel or titanium marker clip is placed in the breast at the biopsy site, for doctors to find later

Types of Breast Biopsies:

1. Fine-needle aspiration biopsy:

- simplest type of biopsy
- doctor directs a thin needle into the lump which is attached to a syringe
    - the syringe collects cells and fluid from the area
- less invasive

2. Core needle biopsy:

- clinician uses a "thin, hollow" needle to extract tissue samples, normally using an ultra sound as a guide
- multiple samples are collected
    - each sample is the size of a grain of rice

3. Stereotactic biopsy:

- uses mammogram to pinpoint location of the suspicious area
- patient lies face down with breast positioned in a hole on the table
- procedure lasts 30min-1 hour
- radiologist makes 1/4" (6mm) long incision and then inserts needle/vacuum powered probe to retain sample

Conclusions/action items: We need to clarify with the client which type of biopsy procedure we will be focusing on. Once we have narrowed the type of procedure down, we can begin to focus on combining the two mechanisms of sampling and deploying the titanium marker.

2023/09/19 What is Renal Cell Carcinoma?

Title: Chromophobe Renal Cell Carcinoma with Radiologic-Pathologic Correlation

Date: 09/19/23

Content by: **Erin Schlegel**

Citation:

[1] J. Marko, R. Craig, A. Nguyen, A. M. Udager, and D. J. Wolfman, “Chromophobe renal cell carcinoma with radiologic-pathologic correlation,” *RadioGraphics*, vol. 41, no. 5, pp. 1408–1419, 2021. doi:10.1148/rg.2021200206

Goals: The goal of reading this article is to understand the procedure/purpose of renal radiologic-pathologic correlation in cancer cells.

Content:

Background on Renal Cell Carcinoma (RCC):

- RCC is a heterogeneous group of neoplasms from the tubular epithelial cells
- Chromophobe RCC (chRCC) is the third most common type of RCC
- Through pathological analysis it can be seen that chRCC is a solid well-defined mass with lobulated borders
- The most common imaging pattern is a predominantly solid renal mass with circumscribed margins and enhancement less than that of the renal cortex
- RCC can be thought of as a spectrum of diseases that span different areas
- The World Health Organization has determined classifications for the different types of RCC as seen in the table below

Table 1: WHO Classification of Renal Cell Tumors

ccRCC
Multilocular cystic renal neoplasm of low malignant potential
papRCC
Hereditary leiomyomatosis and RCC–associated RCC
chRCC
Collecting duct carcinoma
Renal medullary carcinoma
MiT family translocation RCCs
Succinate dehydrogenase–deficient RCC
Mucinous tubular and spindle cell carcinoma
Tubulocystic RCC
Acquired cystic disease–associated RCC
Clear cell papRCC
RCC, unclassified
Papillary adenoma
Oncocytoma

Source.—Reference 3.
Note.—ccRCC = clear cell RCC, chRCC = chromophobe RCC, papRCC = papillary RCC, RCC = renal cell carcinoma, WHO = World Health Organization.

Imaging Pathology for chRCC:

- chRCC is a well defined solid masses with lobulated surfaces
- They are normally tan/brown colored
- can observe scarring, necrosis,hemorrhage, and califications
- the mean size of a surgical chRCC resection is 4.6-8.0 cm
- Tumor cells are typically supported by a delicate fibrous framework, and the vasculature is not usually prominent

Conclusions/action items: Continue researching previous studies on radiologic-pathologic correlations.

2023/09/19 CTTA Study

Title: Hepatocellular Carcinoma: Texture Analysis of Preoperative Computed Tomography Images Can Provide Markers of Tumor Grade and Disease-Free Survival

Date: 09/19/23

Content by: Erin Schlegel

Citation: [1] J. Oh *et al.*, "Hepatocellular carcinoma: Texture analysis of preoperative computed tomography images can provide markers of tumor grade and disease-free survival," *Korean Journal of Radiology*, vol. 20, no. 4, p. 569, Apr. 2019. doi:10.3348/kjr.2018.0501

Goals: The goal of this article is to investigate the usefulness and procedures of computed tomography (CT) texture analysis (CTTA) in estimating histologic tumor grade and in predicting disease-free survival.

Content:

General Study Info:

- 81 patients with HCC had liver resected from January 2009 to January 2015
- Patient must follow these criteria:
    - 1) Patients with treatment-naïve single HCC
    - 2) patients who underwent R0 resection;
    - 3) preoperative quadriphasic liver CT images (pre-contrast, arterial, portal-venous, and delayed phase) obtained less than 6 weeks before surgery;
    - 4) follow-up of at least 2 years with no recurrence
- tumor grade = how normal or abnormal cancer cells look under a microscope
- various pathologic factors including tumor size; microscopic vascular invasion; satellite nodule; tumor, node, and metastasis stage; and histologic grade have been investigated and established as risk factors of postoperative recurrence for HCC patients
- Until now, no risk model capable of predicting HCC recurrence has been established,
    - partly due to the inability to obtain detailed, quantitative information of this heterogeneous tumor.
- Therefore, identification of more sophisticated and quantitative prognostic markers of HCC is clinically warranted.
- the mean, mean of positive pixels (MPP), entropy, kurtosis, skewness, and standard deviation (SD) of the pixel distribution histogram were found

Issues with Hepatocellular carcinoma (HCC):

- 2nd leading cause of cancer deaths world wide
- for early stages, resection of the entire tumor is preferred, but there is still an 80% chance that the tumor may reappear
- Therefore, these early patients undergo intense surveillance to look for any signs of a recurrence
- But there is no way to establish a model that predicts HCC based on images/patterns

CTTA:

- texture analysis can quantify the pattern of pixel intensities (gray area) on cross sectional imaging to understand patterns of certain areas in the tumor
- can give intel into the aggressiveness of the tumor
- CT images were done on 3mm thick specimens
- used TexRAD software

Results:

- arterial-phase CT images showed significant positive associations with the histologic grade of the tumors ($p < 0.05$) - texture analysis was accurate
- linear regression analysis revealed that SD (standard deviation) and MPP(mean of positive pixels) of medium texture scales on arterial-phase images showed a significant correlation with the histologic grade of HCC
- analysis identified most CT texture parameters across the different filters of fine, medium, and coarse texture scales as significant univariate markers of DFS (disease-free survival) - CTTA was a good indicator of if the patient would survive or not
- it was concluded that CTTA features may be used as predictive markers of DFS that can reflect the heterogeneity of HCC, which is a well-known feature of malignancy in a tumor

Conclusions/action items: This was an encouraging study that shines light on the capabilities of CTTA. We now need to continue researching specifically Renal Cell Carcinoma as well as what current designs are on the market.

2023/09/21 Renal Cell Carcinoma Imaging Features

ERIN SCHLEGEL - Dec 13, 2023, 4:22 PM CST

Title: Renal Cell Carcinoma Imaging

Date: 09/21/23

Content by: **Erin Schlegel**

Citation: [1] M. Deborah A Baumgarten, “Renal cell carcinoma imaging,” Practice Essentials, Radiography, Computed Tomography, https://emedicine.medscape.com/article/380543-overview?form=fpf (accessed Oct. 11, 2023).

Goals: The goal of this article is to understand common patterns in images that are already proven to describe Renal Cell Carcinoma.

Content:

- The preferred method of imagining Renal Cell Carcinoma (RCC) is using computed tomography CT
- In the United States, there are approximately 65,000 new cases and almost 15,000 deaths from RCC each year.
- Stages of RCC as defined by the American Joint Committee on Cancer TNM (Tumor, Node, Metastases) classification:
    - Stage 1: 7cm or smaller, confined to kidney
    - Stage 2: larger than 7cm, but still confined to kidney
    - Stage 3: extend into the renal vein or vena cava, involve the ipsilateral adrenal gland and/or perinephric fat, or have spread to local lymph nodes
    - Stage 4: extend beyond the Gerota fascia, have spread to local or distant nodes, or have distant metastases.

Image: Large renal cell carcinoma. Contrast-enhanced computed tomography (CT) scan.

Conclusions/action items: Understand where the limitations of RCC CT imaging lie and how they correlate to the past group's project. Meet with client to discuss these issues.

2023/09/26 Surgical Blade Design

ERIN SCHLEGEL - Dec 13, 2023, 4:23 PM CST

Title: SURGICAL BLADES: WHICH SCALPELS ARE RIGHT FOR YOUR OPERATING ROOM?

Date: 09/26/23

Content by: Erin Schlegel

Citation:

[1] “Surgical blades: Which scalpels are right for your operating room?,” USA Medical and Surgical Supplies, https://www.usamedicalsurgical.com/blog/surgical-blades-which-scalpel-is-right-for-your-operating-room (accessed Oct. 11, 2023).

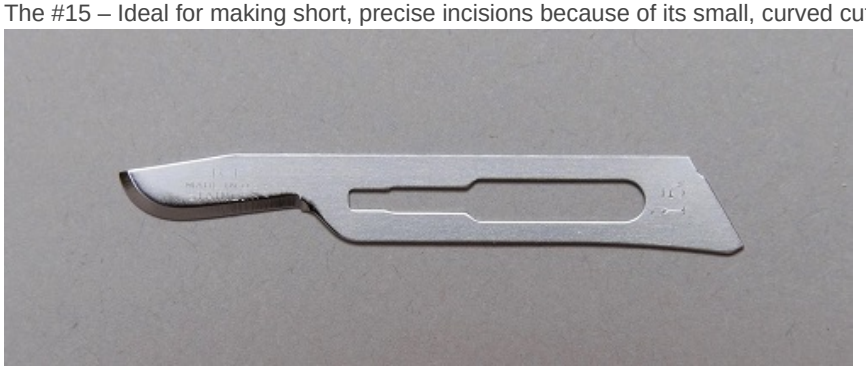
Goals: After talking with the client, it became clear that they wanted our team to focus on improving the blade design so that it does not damage the tissue. The goal is to look at the model of surgical blades to understand why they are good for cutting tissue and to see if I can use any of these aspects in a coring blade design.

Content:

- The #10 surgical blade had a convex side profile which is used for cutting soft tissue with large incisions such as opening the bronchus during thoracic surgery.

- The #11 is a large triangular blade that is typically used for stabbing incisions or short/precise cuts such as opening coronary arteries or the aorta.

- The #15 – Ideal for making short, precise incisions because of its small, curved cutting edge.



Materials:

- today, surgical scalpel blades are usually made from stainless steel, tempered steel or high carbon steel
- stainless steel surgical blade typically resists corrosion much better than a carbon steel surgical blade
- Carbon steel usually has better initial sharpness and durability
- can add various coatings to further strengthen surgical blades. These coatings come in silicone, perylene, or other materials that can help augment the corrosion and wear-resistance of surgical blades.

Conclusions/action items: Start designing and sketching possible blades and present these ideas to the team.

2023/09/09 Current Biopsy Markers

ERIN SCHLEGEL - Dec 13, 2023, 4:23 PM CST

Title: Hologic: Breast Biopsy Site Markers

Date: 09/09/23

Content by: **Erin Schlegel**

Citation:

[1] “Breast biopsy site markers,” Hologic, https://www.hologic.com/hologic-products/breast-health-solutions/breast-biopsy-markers (accessed Sep. 9, 2023).

Goals: The goal of researching this site is to see what current biopsy products are leading the market.

Content:

1. Tumark Biopsy Marker

- designed for longterm visibility
- size varies between 2mm and 7mm
- 91% of markers did not migrate

2. SecurMark Marker

- utilizes bio-absorbable netting to minimize movement
- can mark multiple sites
- absorbs 3-4 weeks post op

Conclusions/action items: In creating a design that combines both a biopsy marker and sample collector, it will be important to keep these current products in mind. Something similar to bioabsorable netting could be key in our design.

2023/09/09 Breast Biopsy Markers Background

ERIN SCHLEGEL - Dec 13, 2023, 4:24 PM CST

Title: Breast Biopsy Markers

Date:09/09/23

Content by: Erin Schlegel

Citation: “Breast Biopsy Markers,” Consulting Radiologists, https://www.consultingradiologists.com/womens-imaging/breast-biopsy-markers/ (accessed Sep. 9, 2023).

Goals: The goal of reading this page was to obtain more general information about the biopsy marker clips and prcedure.

Content:

General Information on site marker:

- Breast markers are typically made of stainless steel or titanium
- About the size of a sesame seed
- Biopsy markers are placed after the incision has been made
- Normally the patient cannot feel the marker
    - does not interfere with any imaging devices
- Allergic reactions to the marker are very rare

Information on Stereotactic Biopsy:

- procedure time ~ 1 hour
- The needle used to biopsy takes about 5-10 samples from the breast
- a gentle mammogram is used after the marker has been placed to confirm the positon of the marker

Conclusions/action items: Continue to research the procedure as well as any expected downfalls from using the titanium marker clip.

2023/09/20 Punch Biopsy Initial

ERIN SCHLEGEL - Dec 13, 2023, 4:24 PM CST

Title: Punch Biopsy of the Skin

Date:09/20/23

Content by: **Erin Schlegel**

Citation:

[1] T. J. Zuber, “Punch biopsy of the skin,” American Family Physician, https://www.aafp.org/pubs/afp/issues/2002/0315/p1155.html (accessed Oct. 11, 2023).

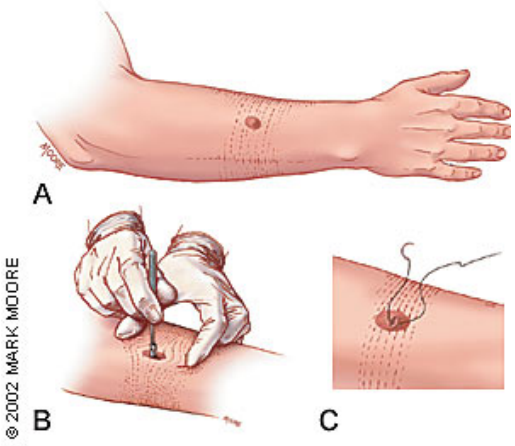
Goals: The goal of reading this article is to understand what devices are similar to the team's design.

Content:

- a punch biopsy is considered the primary technique for obtaining diagnostic-full thickness specimens
- The circular blade is rotated down through the epidermis and dermis into the subcutaneous fat - (penetration of up to 3/8 of an inch ~ 1 cm)
- The circular blade is typically 3-4mm in diameter

Current Downfalls of the device:

- uncomfortable for the patient
- does not go deep enough for what our client desires
- does not procur a wide enough sample for the client



Punch biopsy procedure being carried out.

Conclusions/action items: Follow up with a more recent article of punch biopsies to understand more. Continue researching current designs being used to sample tissues.

2023/09/26 Punch Biopsy Follow- Up

ERIN SCHLEGEL - Dec 13, 2023, 4:24 PM CST

Title: Skin Biopsy

Date: 09/26/23

Content by: Erin Schlegel.

Citation:

[1] S. Rostami. Rostami. and M. L. Ramsey, “Skin biopsy - statpearls - NCBI bookshelf,” Skin Biopsy, https://www.ncbi.nlm.nih.gov/books/NBK470457/ (accessed Oct. 11, 2023).

Goals: The goal of reading this updated article is to verify the information that I read from an earlier article.

Content:

- punch biopsies are typically performed in dermatology
- many factors go into it including location, depth, and breadth of sampling,
- the effort is to provide the pathologist with the most amount of tissue possible
- cylindrical blade is used to obtain a specimen that contains a fuller thickness of the skin
- Punches are available in varying diameters, with the most commonly used sizes ranging from 2 mm to 6 mm.

Conclusions/action items: Now that I understand the variation of punch biopsies, I can continue researching other competing designs.

2023/10/16 304 Stainless Steel vs 316 Stainless Steel

Title: What is surgical steel? The role of stainless in healthcare

Date: 10/16/23

Content by: **Erin Schlegel**

Citation:

[1] Essentra Components, “What is surgical steel? the role of stainless in Healthcare,” Essentra Components US, https://www.essentracomponents.com/en-us/news/industries/medical-equipment/what-is-surgical-steel-the-role-of-stainless-in-healthcare#:~:text=Surgical%20stainless%20steels%20are%20used,fretting%20debris%20into%20the%20body (accessed Oct. 16, 2023).

Goals: The goal of reading this article is to help decide between ordering 316 or 304 stainless steel.

Content:

General

- stainless steel has a low amount of chromium (ateleast 10.5%), therefore creating a stable oxide bond to prevent rust
  - more chromium less oxidation/rust
- the oxide bond is a film that can self restore if damaged - good for medical device longevity (resistant to fissures)
- stainless steel is non-porous and easy to clean
- stainless steel is chemically inactive meaning it is good for sterilization without corrosion

Medical Stainless Steel vs Reg Stainless Steel

- Surgical steel has a high resistance to corrosion with a minimum of 13% chromium,
- surgical steel is also cured and contains .2% carbon
- Stainless steel surgical instruments should be curable and ductile

Looking at Society of Automative Engineers (SAE) specs for surgical grade stainless steels : https://www.sae.org/

304 Stainless Steel:

- does not contain molybdenum
- Still, 304 stainless steel corrosion resistance is high, which is why 304 stainless steel tubing is common in healthcare.
- doesn’t react to sanitation or sterilisation processes
- It’s also safe for contact with body tissue
- Strong and durable, grade 304 stainless steel can take repetitive wear and tear

316 and 316L Stainless Steel

- 316 L stainless steel has a carbon content that can't exceed .03% (L stands for low carbon)
  - very corrosion resistant, has molybdenum
- 316L is a biocompatible stainless steel when produced to ASTM F138 / F139 standards.
- 316 L is non magnetic

Medical metals: common applications for stainless steels

Grade	304	316	316L	420	440B	440C	630 (17- 4)
Orthopedic implant devices	X		X				
Dental implant devices			X				
Surgical and dental instruments		X	X	X	X	X	X
Pharmaceutical equipment: sample & material handling		X					
Stainless steel tubing	X						
Bone fixation	X						
Containers for hazardous materials	X						
Wires	X						
Curettes	X						
Plates and screws	X						
Prostheses	X						

Designation		Chemical Composition (Major elements only) % content is a maximum unless a range is indicated									
SAE	EN	C, ≤	Mn, ≤	P, ≤	S, ≤	Si, ≤	Cr	Ni	Mo	N, ≤	Other Elements ≤, UOS
304	1.4301	0.08	2.00	0.045	0.03	1.00	18.0-20.0	8.0-11.0	–	–	–
316	1.4401	0.08	2.00	0.045	0.030	1.00	16.0-18.0	10.0-14.0	2.00-3.00	–	–
316L	1.4404	0.03	2.00	0.045	0.030	1.00	16.0-18.0	10.0-14.0	2.00-3.00	–	–
420	1.4021	0.15, ≥	1.00	0.04	0.03	1.00	12.0-14.0	–	–	–	–
440B	1.4112	0.75-0.95	1.00	0.04	0.03	1.00	16.0-18.0	–	≤0.75	–	–

Conclusions/action items: Based on this information, we should proceed with ordering a stainless steel 316L tubing.

2023/10/16 ASTM 269 Specification Details

ERIN SCHLEGEL - Dec 13, 2023, 8:05 PM CST

Title: ASTM 269 Spec

Date: 10/16/23

Content by: Erin Schlegel

Citation:

[1] “Standard specification for seamless and welded austenitic stainless steel tubing for General Service,” A269/A269M, https://www.astm.org/a0269_a0269m-22.html (accessed Dec. 13, 2023).

Goals: The goal of reading this page is to understand

Content: https://www.astm.org/a0269_a0269m-22.html

- A269 specification for seamless and welded Austenitic stainless steel tubing for general service.

- This specification covers grades of nominal-wall-thickness, stainless steel tubing for general corrosion-resisting and low- or high-temperature service.

The table below has multiple different materials and their carbon content.

Typical Chemical Properties

	304	304L	316	316L
Carbon, max, %	0.08	0.035*	0.08	0.035*
Manganese, Max, %	2.00	2.00	2.00	2.00
Phosphorous, Max, %	0.045	0.045	0.045	0.045
Sulfur, Max, %	0.03	0.03	0.03	0.03
Silicon, Max, %	1.00	1.00	1.00	1.00
Chromium, %	18.0 – 20.0	18.0 – 20.0	16.0 – 18.0	16.0 – 18.0
Nickel, %	8.0 – 11.0	8.0 – 12.0	10.0 – 14.0	10.0 – 14.0
Molybdenum, %	0	0	2.00 – 3.00	2.00 – 3.00

Typical Mechanical Properties

Typical Mechanical Properties	304	304L	316	316L
Tensile Strength Minimum ksi (MPa)	75 (515)	70 (485)	75 (515)	70 (485)
Yield Strength Minimum ksi (MPa)	30 (205)	25 (170)	30 (205)	25 (170)
Elongation Min	35%	35	35%	35
Rockwell Hardness Number, maximum	B90	B90	B90	B90

Typical Permissible Variations

Size, Outside Diameter, (inch)	Typical Permissible Variations in Outside Diameter	Typical Permissible Variations in Wall Thickness
Up to .500	+/-.005"	+/- 15 %
.501 to 1.499	+/-.005"	+/- 10 %
1.500 to 3.499	+/-.010"	+/- 10 %
3.500 to 5.499	+/-.015"	+/- 10 %
5.500 to 7.999	+/-.030"	+/- 10 %
8.000 to 11.999	+/-.040"	+/- 10 %
12.000 to 14.000	+/-.050"	+/- 10 %

- 316 stainless steel has highest carbon content meaning it is good at resisting corrosion over time, this is a good property to have in a medical device

Conclusions/action items: Utilize 316 stainless steel for our blade due to it's chemical properties.

2023/09/28 Blade Design Sketches

ERIN SCHLEGEL - Oct 10, 2023, 7:45 PM CDT

Title: Design Sketches

Date: 09/29/23

Content by: Erin Schlegel

Goals: The goal of this activity is to sketch multiple variations of design ideas based on the problem statement in order to decide on final possible designs.

Content:

Attached to this entry are my 3 design sketches. A few notable things to mention:

Design #1:

- a funnel design with the intent to exert more force as the diameter gets smaller to easily cut the tissue sample

- a square shape provides very strong edges, over the previous circular design which was not as sturdy

- keeping a very thin thickness of .5mm to not cause a lot of trauma in resecting the sample

Design #2:

-includes small, sharp points to cut the tissue well while the pathologist rotates the device

- has a "push pop" mechanism that pulls the sample up in a syringe style to also aid in the resection of the tissue

-the rotation of the blade into the sample and pull back of the push pop mechanism would happen at the same time

Design #3:

- could have either a concave or convex side profile, taking inspiration from the side profile of a surgical scalpel

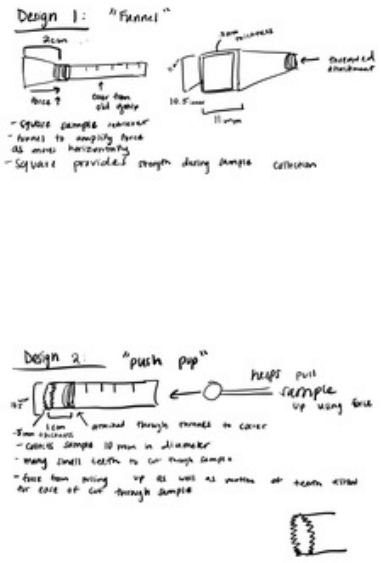
-designed to collect 10mm diameter samples and have a .5mm thickness

-applies maximum pressure at the pointed tip of the blade to allow the blade to easily pierce the tissue

- consider possibly adding a handle for ergonomic purposes

Conclusions/action items: Submit these ideas to the team and decide using a design matrix what the final design will be.

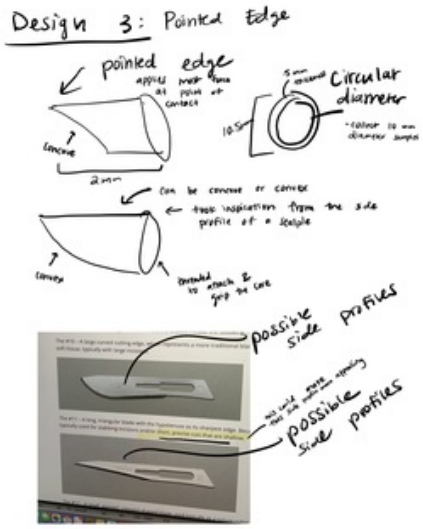
ERIN SCHLEGEL - Oct 10, 2023, 7:30 PM CDT



Download

Page1_5.jpg (292 kB)

ERIN SCHLEGEL - Oct 10, 2023, 7:30 PM CDT



Download

Page2_5.jpg (372 kB)

2023/10/09 Corer Design Sketches

ERIN SCHLEGEL - Nov 08, 2023, 9:42 AM CST

Title:

Date:

Content by:

Present:

Goals:

Content:

Conclusions/action items:

2023/10/03 Pineapple Corer Blade Design

Title: Pineapple Corer Blade SolidWorks Model

Date: 10/03/23

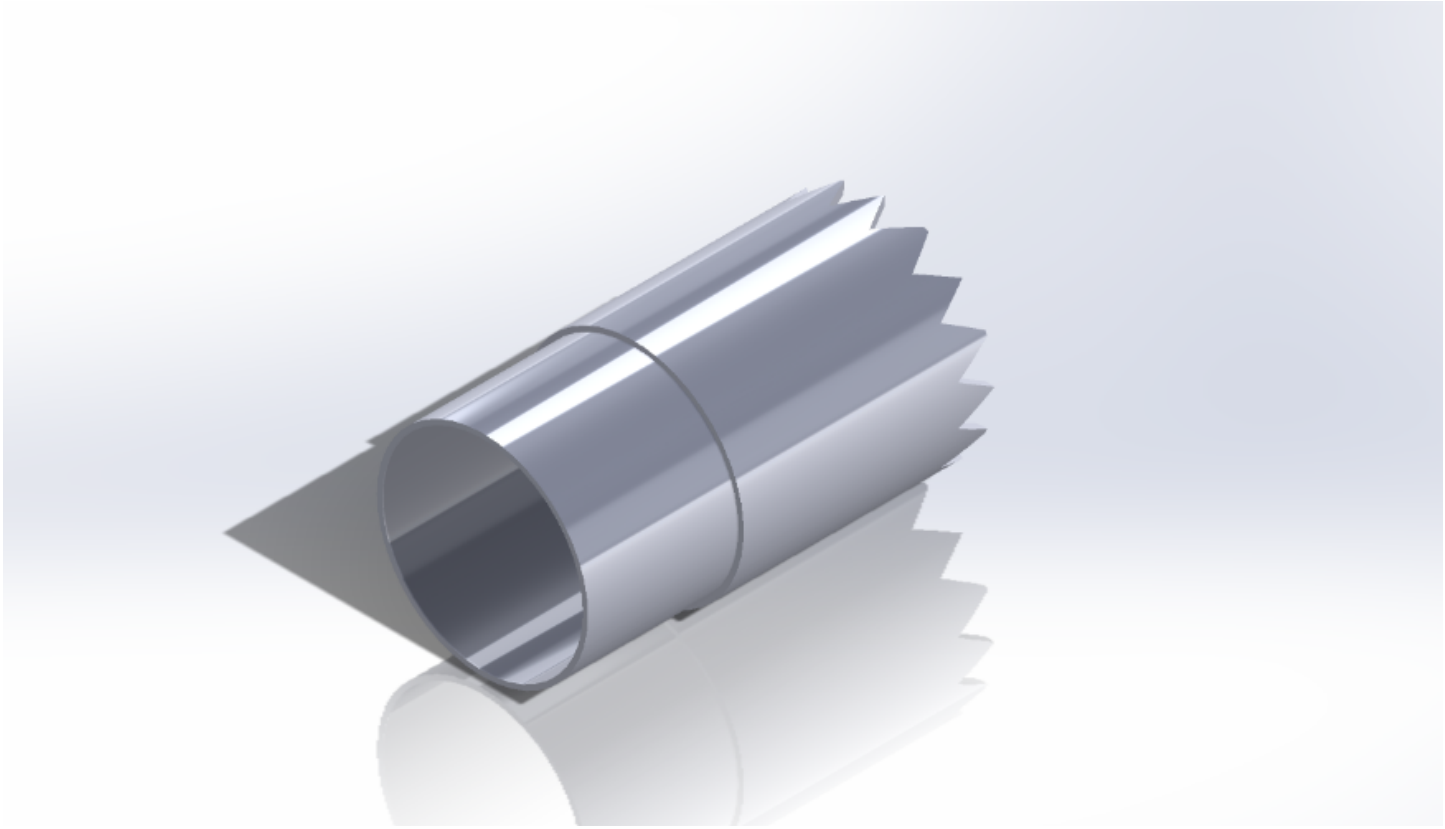
Content by: Erin Schlegel

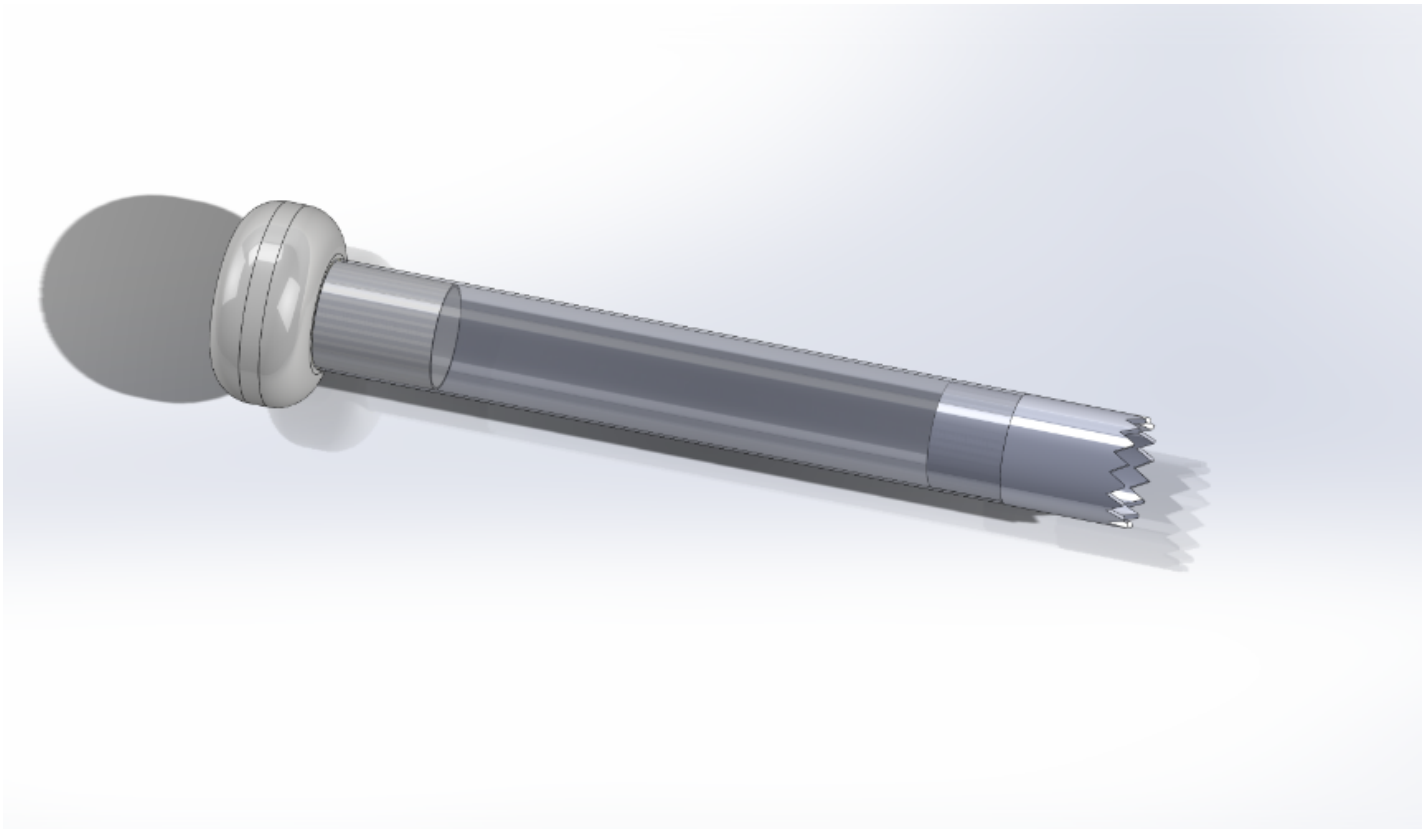
Goals: The goal of using SolidWorks was to model one of our design ideas as well as the assembly.

Content:

Dimensions:

- Outer Diameter: 11mm
- Inner Diameter: 10.5mm
- Includes a lip that has 10.5mm outer diameter and 10mm inner diameter to slip into the corer
- length = 2cm
- Used linear pattern tool to cut small razors at the end of the blade
- Utilizes ergonomic handle at the end to help the pathologist in using the device





Conclusions/action items: Update the dimensions if they change.

2023/10/03 Recorder Blade Design

Title: Recorder Blade SolidWorks Model

Date: 10/03/23

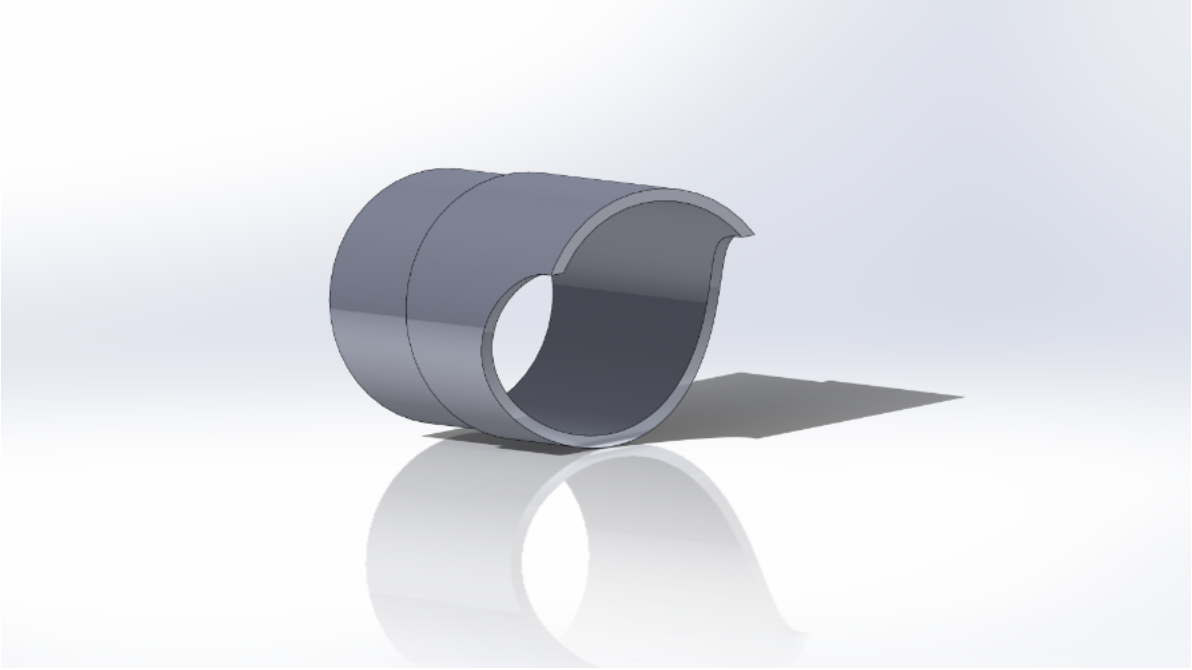
Content by: Erin Schlegel

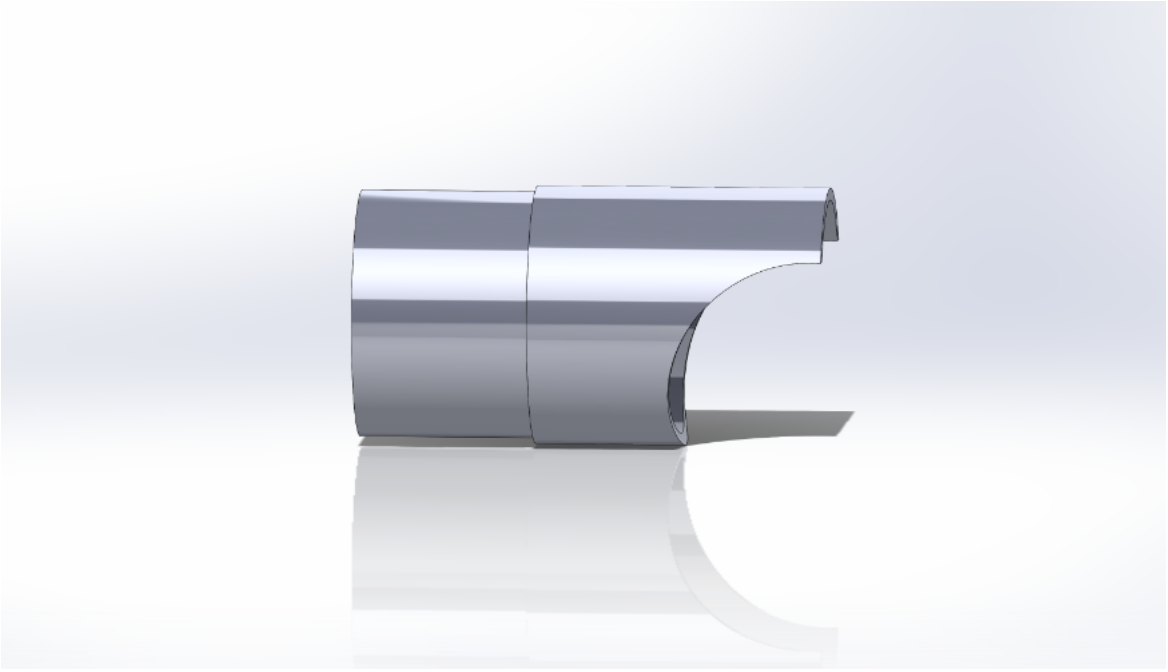
Goals: The goal of using SolidWorks was to model one of our design ideas as well as the assembly.

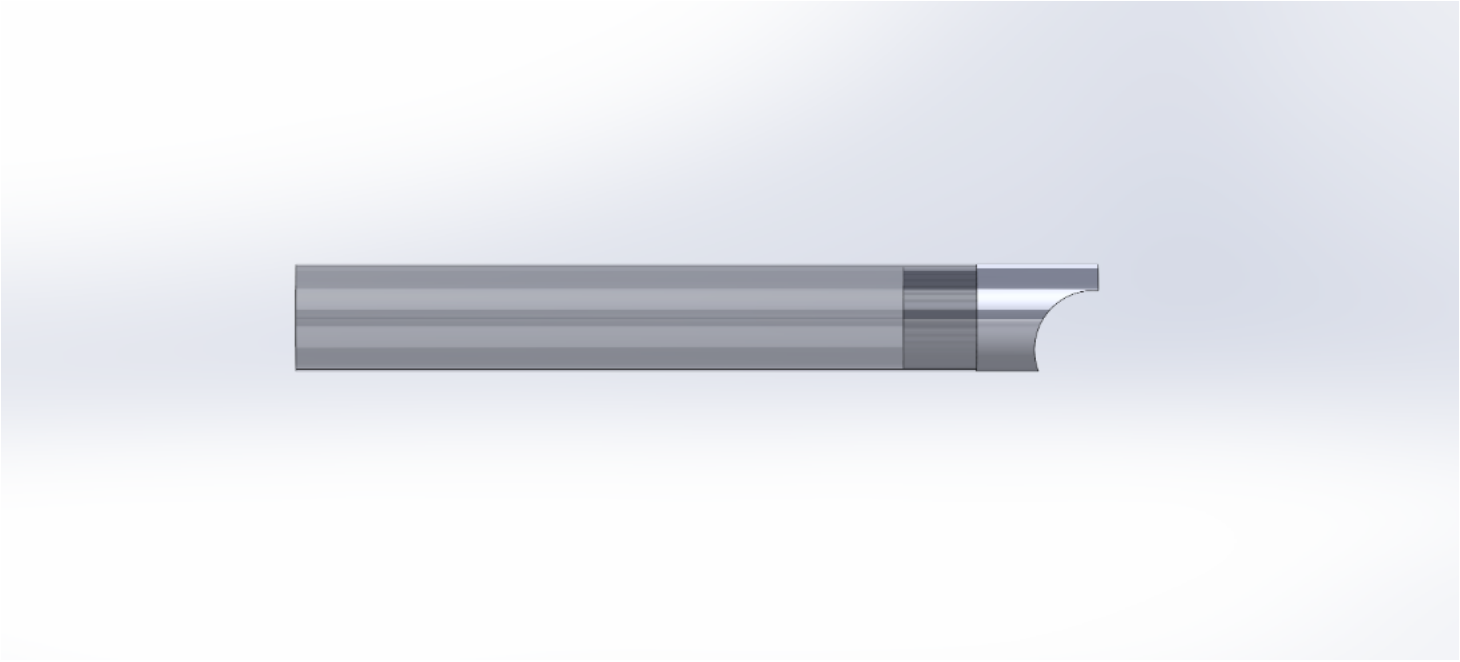
Content:

Dimensions:

- Outer diameter= 11mm
- Inner diameter = 10.5 mm
- length = 2 cm
- Includes a lip that has 10.5mm outer diameter and 10mm inner diameter to slip into the corer
- Used center point arc to create divot in blade
- Assembled using concentric and tangential mates







Conclusions/action items: Make the edges of the blade to be more filleted. Also update the corer part of the assembly to look more realistic. If any dimensions change, update the model as well.

2023/10/03 Punch Biopsy Blade Design

ERIN SCHLEGEL - Oct 09, 2023, 8:39 PM CDT

Title: Punch Biopsy Blade SolidWorks Model

Date: 10/03/23

Content by: Erin Schlegel

Goals: The goal of using SolidWorks was to model one of our design ideas as well as the assembly.

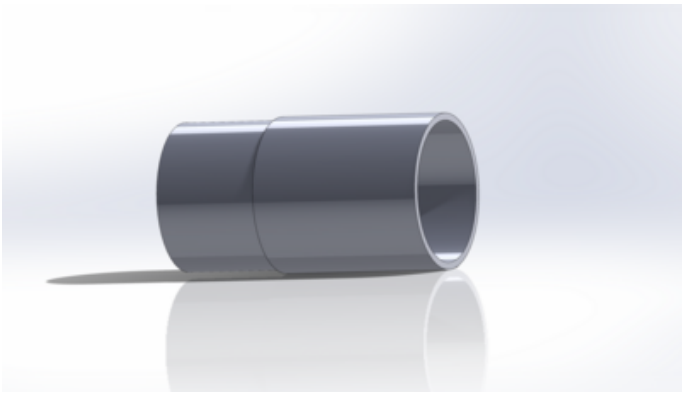
Content:

Dimensions:

- Outer Diamter : 11mm
- Inner Diameter: 10.5mm
- Includes a lip that has 10.5mm outer diameter and 10mm inner diameter to slip into the corer
- length = 2cm

Conclusions/action items: Continue to update the drawings with accurate dimensions and to make the models look more realistic for final presentations.

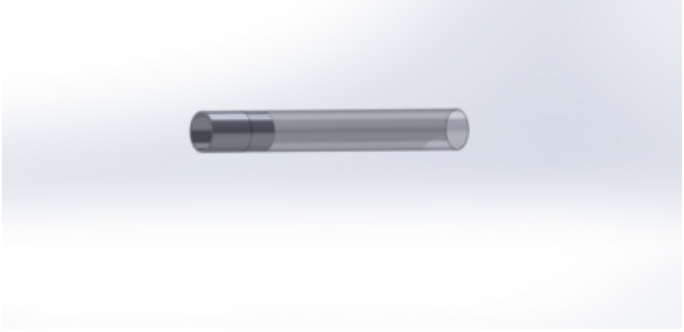
ERIN SCHLEGEL - Oct 09, 2023, 8:35 PM CDT



Download

Punch_Biopsy_Blade_1_.png (426 kB)

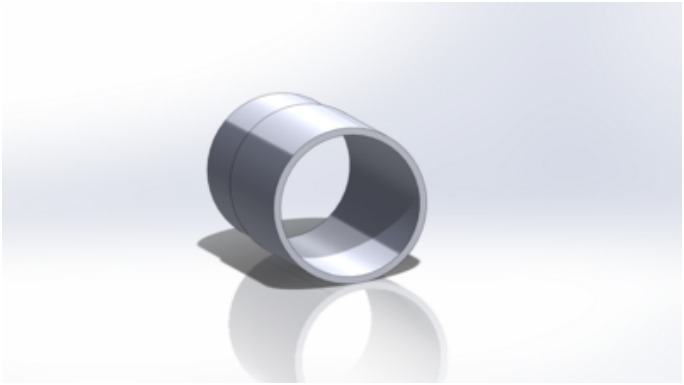
ERIN SCHLEGEL - Oct 09, 2023, 8:35 PM CDT



Download

PunchBiopsyAssembly.png (302 kB)

ERIN SCHLEGEL - Oct 09, 2023, 8:36 PM CDT



Download

Punch_Biopsy_Blade2.png (586 kB)

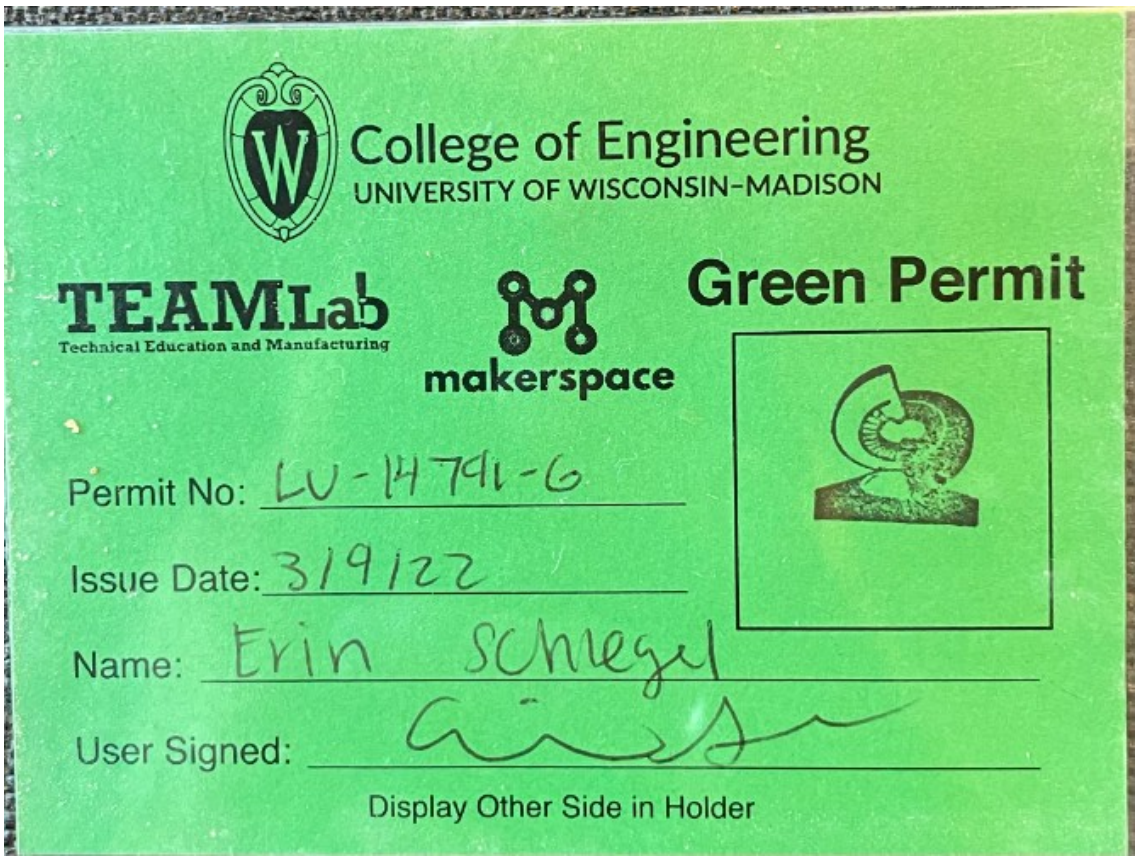
Green Permit Documentation

ERIN SCHLEGEL - Oct 02, 2022, 5:18 PM CDT

Title: Green Permit Documentation

Date Issued: 3/9/22

Content:



Individual Prep For Team Contract

ERIN SCHLEGEL - Oct 11, 2023, 7:42 PM CDT

Title: Individual Prep for Team Contract

Date: 24/09/23

Content by: Erin Schlegel

Present:

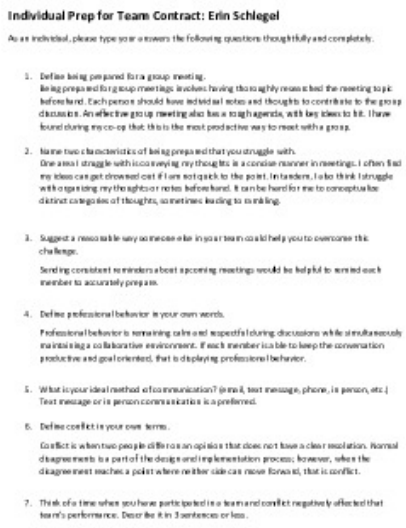
Goals:

Content:

Attached to this notebook.

Conclusions/action items: Meet with the team to discuss our individual traits and work on a team contract.

ERIN SCHLEGEL - Oct 11, 2023, 7:41 PM CDT



Individual Prep for Team Contract: Erin Schlegel

As an individual, please type your answers the following questions thoughtfully and completely.

1. Define being prepared for a group meeting.
   Being prepared for group meetings involves having thoroughly researched the meeting topic beforehand. Each person should have individual notes and thoughts to contribute to the group discussion. An effective group meeting also has a tough agenda, with key ideas to hit. I have found during my co-op that this is the most productive way to meet with a group.
2. Name two characteristics of being prepared that you struggle with.
   One area I struggle with is conveying my thoughts in a concise manner in meetings. I often find my ideas can get drowned out if I am not quick to the point. In tandem, I also think I struggle with organizing my thoughts or notes beforehand. It can be hard for me to conceptualize distinct categories of thoughts, sometimes leading to rambling.
3. Suggest a reasonable way someone else in your team could help you to overcome this challenge.
   Sending consistent reminders about upcoming meetings would be helpful to remind each member to accurately prepare.
4. Define professional behavior in your own words.
   Professional behavior is remaining calm and respectful during discussions while simultaneously maintaining a collaborative environment. If each member is able to keep the conversation productive and goal oriented, that is displaying professional behavior.
5. What is your ideal method of communication? (email, text message, phone, in person, etc.)
   Text message or in person communication is a preference.
6. Define conflict in your own terms.
   Conflict is when two people differ on an opinion that does not have a clear resolution. Normal disagreements is a part of the design and implementation process; however, when the disagreement reaches a point where neither side can move forward, that is conflict.
7. Think of a time when you have participated in a team and conflict negatively affected that team's performance. Describe it in 3 sentences or less.

Download

Individual_Prep_for_Team_Contract_-_Copy_1_.pdf (112 kB)

11/10/23 Tong Lecturer

ERIN SCHLEGEL - Dec 13, 2023, 4:20 PM CST

Title: Tong Lecturer

Date: 11/10/23

Content by: Erin Schlegel

Goals: To hear about the speaker's career path.

Content:

- Speaker is **Dr. Travelle (Franklin-Ford) Ellis**
- Health equity director at Exact Sciences
- was an associate director of minority initiatives at Zimmer Biomet
- received PhD in BME and MD from Uw-madison
- 2023 recipient of college of engineering early career achievement award
- -"the people that come behind me are also a part of me"
- - Find your people, have a diverse range of friends
- - how to find a job: find a network
- - she worked in industry right out of her PhD
- - Do things that scare you:
    - if they are too comfortable they are too easy

Conclusions/action items:

Discuss with her her experiences with Zimmer Biomet and possible job opportunities.

2023/09/13 Breast Biopsy Background Research

Title: Breast Biopsy Background Research

Date: 9/14/23

Content by: Emily

Present: N/A

Goals: To develop a better understanding of the procedure for a breast biopsy

Content:

Breast biopsy - Mayo Clinic

Breast biopsy, https://www.mayoclinic.org/tests-procedures/breast-biopsy/about/pac-20384812 (accessed Oct. 10, 2023).

- There are many different types of breast biopsies that can be done - all depends on the size and location of the suspicious area

- Fine - needle aspiration biopsy

  - most simple type of biopsy

  - the patient lies on a table while the doctor holds the lump in one hand and uses the other hand to insert a very thin needle into the lump

  - the needle is attached to a syringe which collects samples of cells or fluids from the lump

- Core - needle biopsy

  - used to assest a lump that is visible on a mammogram or ultrasound

  - several samples, each about the size of a grain of rice, are collected

  - other imaging techniques may be used to guide the needle

- Stereotactic biopsy

  - uses mammograms to pinpoint the location of the suspicious lump

  - the patient lies down on a padded table with one of the breasts positioned in a hole in the table

  - the radiologist makes a small incision (6 millimeters long) into the breast

  - the radiologist inserts a needle or vacuum-powered probe and removes several samples of tissue

- Ultrasound-guided core-needle biopsy

  - the patient lies on their back or side on a table

  - uses an ultrasound

  - the ultrasound is held against the breast while the radiologist makes a small incision to locate the mass and then takes several samples of tissue

- MRI-guided core-needle biopsy

  - the patient lies face down on a padded scanning table and their breasts fit into a hollowed section of the table

  - the MRI provides the images that show the location of the mass

  - a small incision (6 millimeters long) is made to insert the core needle and several samples of tissue are taken

- Surgical biopsy

  - some or all of the breast mass is removed

  - done in an operating room while the patient is under sedation

Conclusions/action items: This article gave a lot of information on the different techniques used for biopsies. Unfortunately, none of the mentioned a clip or titanium marker being placed in the location of the tissue removal. Further research will need to be done to learn more about clip-deployment.

2023/09/15 Clip Marker Research

EMILY WHEAT - Oct 10, 2023, 8:59 PM CDT

Title: Breast Biopsy with Clip Deployment

Date: 9/15/2023

Content by: Emily

Present: N/A

Goals: To further research how a breast biopsy works when a clip is involved

Content:

Breast Biopsy Markers - Consulting Radiologists

“Breast biopsy markers,” Consulting Radiologists, https://www.consultingradiologists.com/womens-imaging/breast-biopsy-markers/ (accessed Oct. 10, 2023).

- A breast marker is usually titanium or stainless steel
- markers are usually smaller than a sesame seed
- the patient typically cannot feel the marker once it is placed
- the marker doesn't interfere with MRIs or other radiology machines
- the marker won't set off metal detectors
- the marker is designed to not move once it is placed - it still can move, just is unlikely
- allergic reactions are extremely rare
- the marker is placed to identify the biopsy site
    - the marker can be seen on future mammograms for the radiologists to use and identify
    - if surgery of more breast tissue is required, the marker will be removed then

Conclusions/action items: This article gave me some good information as to what materials the markers can be and any reactions the patient might have. However, it did not mention how the markers are placed into the breast after tissue removal. I will need to continue researching further to learn about the procedure in which the markers are placed.

2023/09/15 Titanium Clip Implantation

EMILY WHEAT - Oct 10, 2023, 9:02 PM CDT

Title: Titanium Clip Implantation Research

Date: 9/15/2023

Content by: Emily

Present: N/A

Goals: To learn and understand how titanium markers are implanted into the breast after a biopsy

Content:

Titanium Markers for Breast Biopsy: Uses and Side Effects (healthcentral.com)

D. K. Levey, “Titanium markers for breast biopsy: Uses and side effects - healthcentral,” Health Central, https://www.healthcentral.com/article/the-titanium-marker-should-you-worry (accessed Oct. 11, 2023).

- If a biopsy is positive for cancer, the doctor will refer to where the marker is placed to show where the cancerous tissue came from
    - this will help them determine next steps - where/how much tissue they should surgically remove, or if radiation treatment would be better
- a specialized tool is used to place the marker
    - a two-in-one device that is spring loaded
    - also has a special vacuum to take out the tissue sample
    - the doctor places the marker at the desired location
    - the titanium marker is loaded in the shaft of the device
    - the marker opens up once it is placed, so it cannot move around within the breast
- the incision is then closed with sutures and adhesives

- Reasons for placing the marker:
    - avoid repeating procedures
    - localization for treatment
    - monitoring and follow-up
    - surgical and radiation planning

Conclusions/action items: Titanium markers are used for many reasons after breast biopsies. The information about the reasoning behind it would be great for the preliminary report and presentation background section. The article gave me more in-depth information as to how the markers are placed. This article talks about the use of a two-in-one device, which is what I thought the team would be trying to create - so more information for our client will tell us exactly what problem she would like us to solve and how our device should be different.

2023/09/26 Renal Cell Carcinoma Background Research

EMILY WHEAT - Oct 10, 2023, 9:03 PM CDT

Title: Renal Cell Carcinoma Background Research

Date: 9/26/2023

Content by: Emily

Present: N/A

Goals: To develop a better understanding on what a renal cell carcinoma is and how it affects the human body

Content:

Renal Cell Carcinoma: Symptoms, Treatment & Prognosis (clevelandclinic.org)

C. C. medical professional, “Renal cell carcinoma: Symptoms, treatment & prognosis,” Cleveland Clinic, https://my.clevelandclinic.org/health/diseases/24906-renal-cell-carcinoma (accessed Oct. 10, 2023).

- renal cell carcinoma (RCC)

- the most common type of kidney cancer

- RCCs form in tubules inside the kidneys

- up to 85% of kidney cancers are RCC

- RCC usually are in a single kidney but you can end up having multiple tumors in one or both of the kidneys

- there are approx. 80,000 new cases of RCC each year in the US and 400,000 new cases worldwide

- most common in men aged 60-80

- RCCs develop when abnormal cells multiply out of control inside the kidney tubules

    - there are no specific exact causes but there are several risk factors

There are different types of RCCs:

- there are more than 50 types of RCC but many of them are quite rare

- scientists classify the different types based on different factors, including how they look under a microscope

- clear cell renal cell carcinoma (ccRCC)

    - the most common type of RCC

    - look clear-colored under a microscope

- papillary renal cell carcinoma

    - finger-like projections visible on most tumors

- chromophobe renal cell carcinoma

    - usually light-colored, like ccRCC, but they tend to be larger in size

- unclassified RCC

    - don't fit into any category

Ways to diagnosis RCC:

- ultrasound

- CT scan

- MRI

- biopsies usually don't occur with RCC. Many think a biopsy for a RCC is too risky since it can damage the rest of the kidney

    - instead, tumor cells are removed from the entire tumor and then examined

    - if imaging of these cells show that the cancer has spread, them more tumor cells may be removed from another organ for testing

Conclusions/action items: This article gave me a lot of information about what a renal cell carcinoma actually is, who it affects, how it affects the patient, and the ways healthcare providers diagnose RCCs. Our client said that they do not focus on one type of RCC - but any. I was confused at first when they said biopsies weren't done on RCC, but then I read they study cells taken from the tumor as a whole, and that sounds exactly like what our client described earlier today. I will continue research on the background and biopsies of RCCs.

2023/09/28 Trephine Device Background

EMILY WHEAT - Oct 10, 2023, 9:05 PM CDT

Title: Background research on a trephine biopsy device

Date: 9/28/23

Content by: Emily

Present: N/A

Goals: To develop an understanding of what a trephine device is since it is used in biopsies but I have never heard of one.

Content:

Trephine - Wikipedia

“Trephine,” Wikipedia, https://en.wikipedia.org/wiki/Trephine (accessed Oct. 10, 2023).

- Trephine device heads are sometimes used in "punch devices" for skin biopsies
    - it was this research that brough to my attention "trephine" for the first time
    - seeing as it is used in other biopsies I feel as though it can be used for a RCC biopsy

- trephine is a surgical instrument with a cylindrical blade
- it can be many different dimensions or designs
    - this changes depending on what the device is intended for
- commonly used to obtain a core of bone
    - samples needed to run tests of for bone studies
- commonly used to cut holes in bones
- commonly used to cut out a round piece of the cornea for eye surgery
    - if used for eyes, it has to be very accurate and precise without causing external tissue trauma. I feel this fact here is super important and therefore this device can be used for RCC biopsies
- commonly used as the device to get bone marrow
    - "bone marrow trephine is usually examined in the histopathology department of a hospital under a microscope"
    - this is used because it shows the pattern and cellularity of the bone marrow as it looks in the bone
        - this is important because the RCC biopsies we are working with are used to be looked at under the microscope

Conclusions/action items: I understand that the source is Wikipedia, but that is why I didn't take too much information from it. This was just to get a little background on the device, since I have never heard of it before. Seeing as it is commonly used in other biopsies, especially the fact that it is used on the eye, I feel that this could be a very good option to be used for RCC biopsies. It seems to be very sharp and not cause a lot of external tissue damage.

2023/10/02 Client Research

EMILY WHEAT - Oct 11, 2023, 6:51 PM CDT

Title: Client Background Research

Date: 10/02/2023

Content by: Emily

Present: N/A

Goals: To learn more about the client, Dr. Meghan Lubner

Content:

Profile – Department of Radiology – UW–Madison (wisc.edu)

“Meghan G Lubner,” Department of Radiology, https://radiology.wisc.edu/profile/meghan-lubner-460/ (accessed Oct. 3, 2023).

- Dr. Meghan Lubner works in the department of Radiology
- she works at the University of Wisconsin-Madison
- she works at UW Health
- she is a chief, clinical and research CT
- Dr. Lubner is a professor (CHS) of Radiology
    - specifically, she works in the Abdominal Imaging Section
- She started working at UW in 2009
- she completed an abdominal imaging fellowship at UW-Madison
- she completed her residency training at Mallinckrodt Institute of Radiology at Washington University
- she completed her undergrad and medical degrees from UW-Madison
- she focuses in computed technology

Conclusions/action items: Dr. Meghan Lubner is the new client on our new project. She currently works for UW-Madison and has worked here for about 14 years. She specializes in abdominal imaging and specifically focuses in computed technology. This is very beneficial for the team as the blade we are designing is to be used along side computer tomograph textural analysis (CTTA). This information listed above will be written in the preliminary presentation and report and the final report.

2023/10/11 Background Info

EMILY WHEAT - Oct 11, 2023, 6:43 PM CDT

Title: Renal cell carcinoma background research

Date: 10/11/23

Content by: Emily

Present: N/A

Goals: To get more information on the physiology of renal cell carcinoma and CTTA to complete the background section of the prelim report

Content:

Z. Feng, Q. Shen, Y. Li, and Z. Hu, “CT texture analysis: A potential tool for predicting the Fuhrman grade of clear-cell renal carcinoma - cancer imaging,” BioMed Central,

CT texture analysis: a potential tool for predicting the Fuhrman grade of clear-cell renal carcinoma | Cancer Imaging | Full Text (biomedcentral.com)

- most common type of RCC is ccRCC
- RCC classified in different grades according to size, shape, and staining
- Grade I-II are low
- Grade III-IV are high
- the grade of the tumor is related to the growth rate of tumors and the prognosis of patients
- high grade tumors have higher invasive capacities, higher possibility of metastasis and poor prognosis

- Computer tomography texture analysis (CTTA)
- method used to quantitatively analyze spatial heterogeneity of the tumor
- used with CT images
- filtered by a Laplace of Gaussian operation (? maybe look into this further)
    - filtered to reduce photon noise while showing the changes in the images
- used to identify renal tumors, intraductal papillary mucinous neoplasm classification of the pancreas, and benign mediastinal lymph nodes
- overall used to help predict the pre-operative grading of the tumor
- overall used to improve the prognosis of the patients

Conclusions/action items: The client is not concerned with the team determining the grade of the tumor of the patient. We will not be using CTTA to determine the grade, but it is good information to add in the background section of the preliminary and final report. The team will be aiding the client in using CTTA to determine patient prognosis and more in-depth information about the tumor cell makeup and genetic material.

10/05/2023 Punch Biopsy Research

EMILY WHEAT - Oct 10, 2023, 9:06 PM CDT

Title: Punch device for skin biopsies

Date: 10/05/2023

Content by: Emily

Present: N/A

Goals: To develop a better understanding of the device used for skin biopsies to possibly tailor our design similar to this device

Content:

https://www.aafp.org/pubs/afp/issues/2002/0315/p1155.html

T. J. Zuber, “Punch biopsy of the skin,” American Family Physician, https://www.aafp.org/pubs/afp/issues/2002/0315/p1155.html (accessed Oct. 10, 2023).

- punch biopsies are considered the primary technique for obtaining full-thickness skin specimens
- the device consists of a circular blade
    - the blade is rotated down through the skin
    - the device yields a 3-4mm cylindrical tissue sample
    - the blade could be trephine
    - no matter the material, the blade is attached to a pencil-like handle
- a large part of the biopsy, is that once the sample is obtained, caution must be used to avoid crushing or deforming the sample
- a large punch biopsy requires the site to be closed with a single suture and typically only leaves a minimal scar

Conclusions/action items: This article talks about the process and device used for skin biopsies. There was not too much information about the blade itself, just about the motion used for punch biopsies. Also, much of the article spoke about the aftermath of the biopsy, how the wound might need to be closed up, however our project does not require any suture or wound closing. This is a good start but I need to research further about the different blades to have a more in-depth understanding.

10/05/2023 Pineapple Corer Research

Title: Pineapple Corer Blade Research

Date: 10/05/2023

Content by: Emily

Present: N/A

Goals: To research the blade on a pineapple corer

Content:

The 6 Best Pineapple Corers (thespruceeats.com)

A. Wignall, “Easily cut up a juicy pineapple with one of these handy corers,” The Spruce Eats, https://www.thespruceeats.com/best-pineapple-corers-5272330 (accessed Oct. 10, 2023).

- our clients were the one who mentioned the possibly of having a blade similar to that of

- this article gives the pros and cons of 6 different specific pineapple corers

1. First corer
   - made of stainless steel and is 9.9 ounces
   - 9.35 x 3.92 x 3.31 dimensions
   - has an ergonomic handle
   - says that it could cut though the sides of the pineapple if it is off center
   - this brand has a thicker blade and has reinforced welding points
   - there are sharp serrated blades
   - the handle can pop off with the press of a button

2. Second corer
   - made of stainless steel and is 3.5 ounces
   - 4 x 1 x 7 inches
   - there is an easy-grip handle
   - you can press a lever to dump the core
   - not necessarily for pineapples, mostly used for apples and pears

3. Third corer
   - made of stainless steel
   - 4.75 x 1.75 x 12 inches
   - removable handle
   - textured grip with ergonomic handle

4. Fourth corer

- made of plastic and weighs 4.3 ounces
- 4.5 x 5 x 9 inches
- slicer that comes with a wedger
- creates a pineapple spiral and the wedger then cuts the spiral into triangular chunks
- the wedger is removable

5. Fifth corer

- made of stainless steel and is 7.8 ounches
- 7.8 x 3.1 x 7.8 inches
- easy to clean
- keeps pineapple fruit whole
- not as effective on larger sized pineapples
- can control the thickness of the slices
- has double serrated blades
- cuts fruit away from the sides while simultaneously cutting it from the core

6. Sixth corer

- hand strength required
- meant to store the juice and the fruit at the same time
- has 3 parts: the corer, the wedger, and the container

Conclusions/action items: The point of this article was to see what current pineapple corers on the market are made of. This gave different descriptions of dimensions and the external aspects of the corers. The team is looking into adding a handle to our corer for easy of use but we did not consider to make it detachable like the ones mentioned above. We can look into making the handle or blade or both parts detachable via a button or lever like mentioned above.

2023/11/18 Pig Kidney Research

EMILY WHEAT - Dec 13, 2023, 8:08 PM CST

Title: Pig Kidney Research

Date: 11/18/2023

Content by: Emily

Present: N/A

Goals: To research how similar pig kidneys are to human kidneys

Content:

- the team initially tests the blades on chicken breast

- chicken breast is not very similar to a human kidney, but it will do for initial testing

What are 5 differences between pig and human kidneys? - eNotes.com

[1] “Science,” enotes.com, https://www.enotes.com/topics/science/questions/what-5-differences-pig-human-kidneys-677400 (accessed Nov. 18, 2023).

- the renal size and collecting system of pig kidneys is very similar to that of humans

- pig kidneys are commonly used for human studies

- pig kidneys are even used for human transplants

- there are a few differences:

  - the distribution and size of renal arterial segments

  - the veins on the dorsal surface of the renal pelvis are smaller in pig kidneys

  - the length and thickness of ureters are urethra are not similar

  - pig kidneys produce different hormones and proteins than human kidneys

  - pigs only have 1 renal papilla and humans have many

- pigs have been used for over 30 years in medical fields

- pig bladder tissue has even been used to regrow human leg muscles

Conclusions/action items: It would be a good idea to use pig kidneys to test the blades when they are ready. Since pig kidneys are relatively similar to human kidneys the data would be appropriate. Although there are some differences between the two, the difference don't really apply to what we need to test.

2023/11/26 Ergonomic Survey Research

EMILY WHEAT - Dec 13

Title: Ergonomic Survey

Date: 11/26/2023

Content by: Emily

Present: N/A

Goals: To research what an ergonomic survey typically looks like to make one of our own

Content:

- Dr. Puccinelli suggested we make an ergonomic survey for our client to fill out during testing

- Since using the blade does not have a lot of quantifiable data, we are going to do a qualitative analysis and draw data from that

Free Ergonomic Assessment Checklists | PDF | SafetyCulture

> [1] SafetyCulture Content SpecialistJona TarlengcoJona Tarlengco is a content writer and researcher for SafetyCulture since 2018. She usually writes about safety and quality topics and
> a content writer and researcher for SafetyCulture since 2018. She usually writes about safety and quality topics, “Free ergonomic assessment checklists: PDF,” SafetyCulture,
> https://safetyculture.com/checklists/ergonomic-assessment/#:~:text=An%20ergonomic%20assessment%2C%20also%20called%20ergonomics%20assessment%2C%20is,daily%20operations%20and%20delves%20deeper%20into%
> (accessed Nov. 26, 2023).

Ergonomic Surveys typically include:

- general information

- ergonomic practices

- materials handling

- tools and equipment

- recommendations

Note: many ergonomic surveys are for workplaces and are to see how employees think of the conditions. We will need to tailor our survey and our questions to relate towards the device. Many
can be applied to the use of our device

Conclusions/action items: The team will need to come up with questions to ask for our own ergonomic survey. We will need to format the survey so similar questions are grouped together. T
a few days with the client to ask her these questions.

2023/11/28 Likert Scale Research

EMILY WHEAT - Dec 13, 2023, 3:40 PM CST

Title: Likert Scale Research

Date: 11/28/2023

Content by: Emily

Present: N/A

Goals: To research what the Likert Scale and tailor our ergonomic survey questions to them

Content:

- After meeting with Dr. Puccinelli, she told us our ergonomic survey needs to contain Likert Scale questions

- these questions have numbers applied to them as answers

- this will make the survey easy to quantify

- by doing this we can take averages and make graphs or figures from the data

4 ways to visualize Likert Scales - Daydreaming Numbers

[1] Vidya, “4 ways to visualize Likert Scales,” Daydreaming Numbers, https://daydreamingnumbers.com/blog/4-ways-to-visualize-likert-scales/ (accessed Nov. 28, 2023).

Likert Scale:

- type of rating scale commonly used in surveys

- responders state their level of agreement or disagreement to questions on a symmetric agree-disagree scale

- typically has 5 levels:

- strongly disagree

- disagree

- neither agree or disagree

- agree

- strongly agree

- data can typically be visualized on a bar scale or bar graph

Conclusions/action items: The team needs to change the questions on the ergonomic survey to now look like Likert Scale questions. Only two questions at the end of the survey do not need to be Likert scale questions as they will be hand-written short response. The team needs to quickly change the survey and print out multiple copies as they are meeting with the client this Friday to test.

2023/11/15 Sharpening with a Dremel Research

EMILY WHEAT - Dec 13, 2023, 4:25 PM CST

Title: Sharpening with a Dremel Research

Date: 11/15/2023

Content by: Emily

Present: N/A

Goals: To actually research how to use a Dremel correctly to sharpen something

Content:

- the team had been in the TeamLab previously to figure out how to sharpen the blades

- the team thought of the electric drill type tool that is used at nail salons to file down the nails

- a TeamLab worker said they have a tool like it

- the tool is a Dremel and is commonly used to sharpen things

- the team ended up fabricating with the Dremel and the blades actually turned-out sharper

- since a Dremel will be used for future fabrication it will be good to have some research on it

BME_Outreach_Activity_Rambos.docx - Microsoft Word Online (live.com)

[1] T. Allen, “How to sharpen garden tools with Dremel,” handytooler.com, https://handytooler.com/how-to-sharpen-garden-tools-with-dremel/#:~:text=How%20to%20Sharpen%20Garden%20Tools%20With%20Dremel%201,until%20the%20blade%20is%20sharpened%20to%20your%20liking (accessed Nov. 15, 2023).

Dremel:

- common to sharpen garden tools with a Dremel

- keep at a 45 degree angle

- apply light pressure as you move the tool back and forth

- wipe away shavings with a rag

  - make sure to do this while the Dremel is turned off and away from the rag

- you are able to sharpen the attachments of a Dremel if they start to get too dull too

Conclusions/action items: This is good information to have for future fabrication. None of us had any idea what a Dremel was before the meeting in the TeamLab. Also, it is nice to know Dremels are very commonly used to sharpen tools and even household items such as garden tools.

2023/11/15 Blade Sharpening Strategies

EMILY WHEAT - Dec 13, 2023, 7:36 PM CST

Title: Blade Sharpening Strategies

Date: 11/15/2023

Content by: Emily

Present: N/A

Goals: To look further into blade sharpening strategies

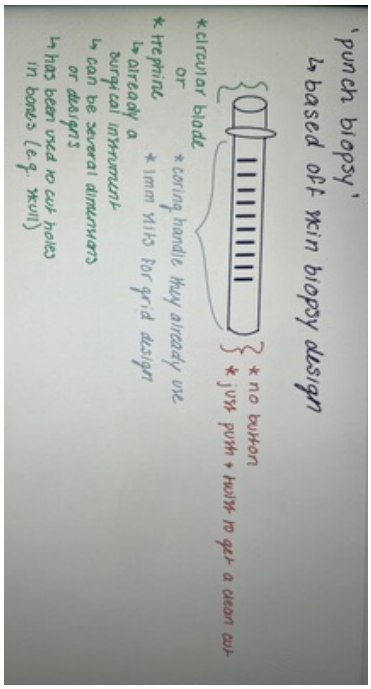
Content:

- while the team was at the TeamLab earlier, some workers suggested other ways to sharpen the blade
- one worker gave us different sandpapers to use to sharpen it by hand
- the sandpaper didn't really seem to be working - it was too difficult to get the sandpaper in the circular tube
- the worker took us to a back room to get a smaller tube that would fit inside our blades
- we found one and cut it in half
    - by balancing the blades in the new tube we were able to sand the blades a little easier
- the sandpaper still was not working very well
- the TeamLab suggested using the circular saw but when we do that too much the blade heats up too much and burns

Conclusions/action items: From this, maybe the team could further research using sandpaper or something of the sort to sharpen the blades. It might've worked well enough if the team did it enough times.

9/28/23 Design Idea 1

EMILY WHEAT - Sep 28, 2023, 12:53 PM CDT

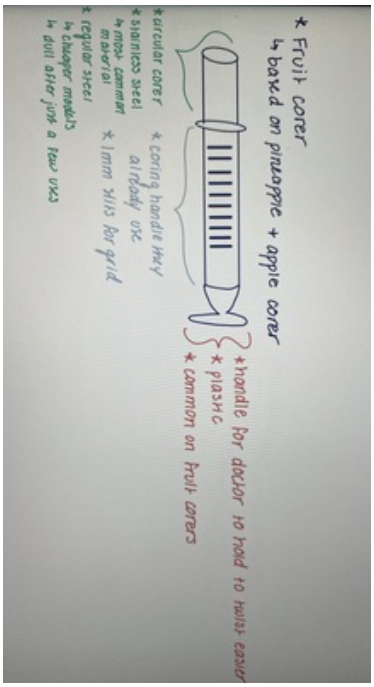


Download

Design1.jpg (2.08 MB)

9/28/23 Design Idea 2

EMILY WHEAT - Sep 28, 2023, 12:53 PM CDT

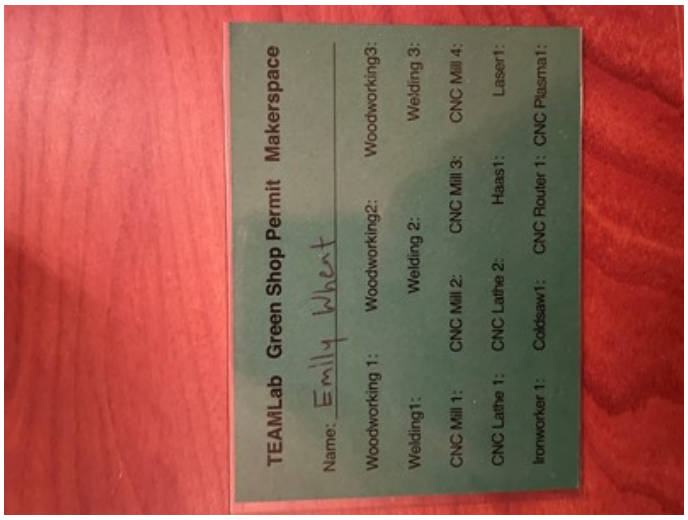


Download

Design2.jpg (2.09 MB)

Green Permit

EMILY WHEAT - Mar 31, 2022, 11:35 AM CDT

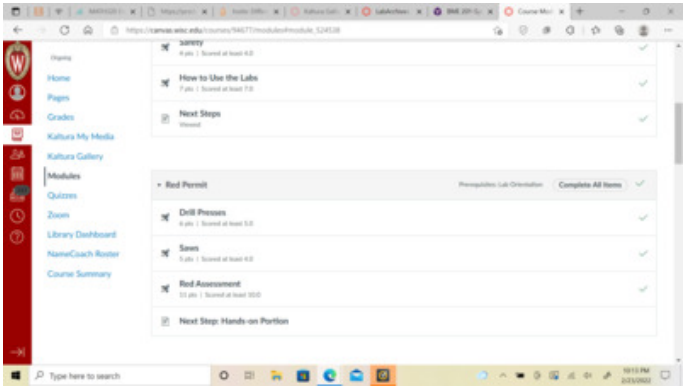


Download

GreenPermit.jpg (3.02 MB)

Red Permit

EMILY WHEAT - Feb 23, 2022, 10:16 PM CST

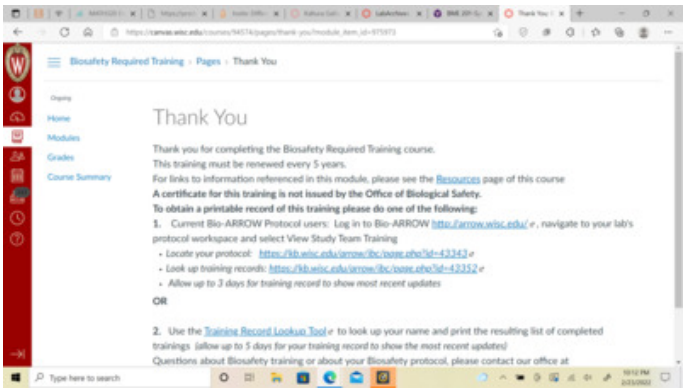


Download

Screenshot_55_.png (268 kB)

Required Biosafety Training

EMILY WHEAT - Feb 23, 2022, 10:16 PM CST

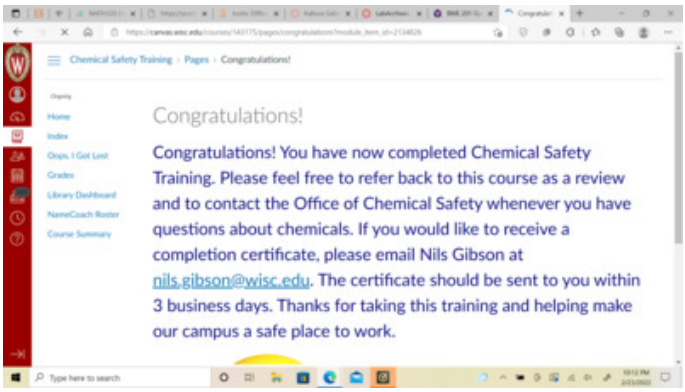


Download

Screenshot_52_.png (397 kB)

Required Chemical Safety Training (OSHA)

EMILY WHEAT - Feb 23, 2022, 10:15 PM CST



Download

Screenshot_53_.png (371 kB)

2023/09/26 Individual Contract

EMILY WHEAT - Oct 11, 2023, 8:04 PM CDT

Individual Prep for Team Contract

As an individual, please type your responses to the following questions thoughtfully and completely.

Emily Wheat

1. Define being prepared for a group meeting.
   Being prepared for a group meeting means showing up on time and ready to talk and actively discuss with your team members. You should have all of your individual work done that will be talked about in the meeting.
2. Name two characteristics of being prepared that you struggle with.
   Depending on the week, sometimes I am running late and will show up right as a meeting starts or just a few minutes after. Also, I feel as though sometimes I ask more clarifying questions than others and that makes me look less prepared.
3. Suggest a reasonable way someone else in your team could help you to overcome this challenge.
   If a group member wants to meet up and walk with me to the meetings, then that could help in ensuring that I am on time.
4. Define professional behavior in your own words.
   Professional behavior is being prepared for meetings and formal communication. Being prepared is defined above and applies here as well. Professional behavior is being respectful towards yourself and others and addressing people in an appropriate fashion. It is also being willing to be an active listener and being able to speak up and add to group conversations.
5. What is your ideal method of communication? (e-mail, text message, phone, in person, etc.)
   My ideal methods of communication are meeting in person and messaging over text message.
6. Define conflict in your own terms.
   Conflict is when a problem, or difference of opinions, arises between two parties that affects one if not both of the parties and even surrounding bystanders.
7. Think of a time when you have participated in a team and conflict negatively affected that team's performance. Describe it in 3 sentences or less.
   On a past ME design team, a team member consistently did not do their work before meetings and therefore could not contribute to the team in an effective manner. In later meetings, that same member would discuss ideas that were already talked about in past meetings, making conversations go in circles and taking more time than needed.
8. Think of a time when conflict allowed a group you were in to think deeper and arrive at a better answer. Describe it in 3 sentences or less.
   On a past ME design project, two members had different opinions on a design idea for the design matrix. Since both members stood strongly behind their ideas, the team collectively

Download

Individual_Prep_for_Team_Contract_-_Emily_Wheat.pdf (111 kB)

2023/09/16 Clip Migration Complication

ALEKSANDRA SKUTNIK - Sep 16, 2023, 1:17 PM CDT

Title: Clip Migration Issues

Date: 09/16/2023

Content by: Aleksandra Skutnik

Present: n/a

Links:

https://pubmed.ncbi.nlm.nih.gov/31076332/

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4139558/

Goals: To understand the issue of clip migration post biopsy.

Content:

- Absence of the post-biopsy marker clip has been reported when patients return for preoperative hook-wire localisation
    - Accurate clip placement was confirmed via post-biopsy MRI mammogram
- Clip migrations have been reported
- Migration rates vary between cases, but most clips migrate about 5 mm to at least 1 cm away from the biopsy site
- Migration seemed to occur more likely in patients with decreased breast density

Conclusions/action items:

The team should evaluate this design flaw in breast biopsy devices. I will continue researching ways on how to minimize migration and look at current publications regarding clip migration and preventative measures to this complication.

2023/09/16 Breast Biopsy Procedure

ALEKSANDRA SKUTNIK - Sep 16, 2023, 1:57 PM CDT

Title: Breast Biopsy

Date: 09/16/2023

Content by: Aleksandra Skutnik

Present: n/a

Goals: To understand the parameters of the breast biopsy procedure.

Link: https://www.mayoclinic.org/tests-procedures/breast-biopsy/about/pac-20384812

Content:

There are several types of biopsy procedures, which are performed based on the evaluation of size, location, and judgement of the physician of the lump or suspicious area.

- Fine needle aspiration biopsy
  - Simplest and least invasive type of biopsy often performed on a lump
  - Very thin needle connected to a syringe that can perform aspirations in order to determine whether a lump is a fluid filled cyst or a solid mass
  - If the mass is solid, a more invasive procedure may need to occur
- Core needle biopsy
  - Used to assess lump
  - Thin, hallow needle used to collect tissue samples
  - Often guided via ultrasound
  - A few samples about the size of a grain of rice is collected and analyzed
- Stereotactic biopsy
  - Uses mammograms to pinpoint the exact locations of suspicion to perform biopsy
  - Patient lies down on a padded platform and places one breast into a hole on this table
    - Breast is compressed by mammogram plates while the imaging takes place
  - Radiologist will make a small (6 mm) incision to insert a needle or vacuum powered probe to collect tissue samples

Conclusions/action items:

Of these several biopsy methods, the team will clarify at the initial client meeting which type/style of biopsy the clip-deploying device will be a part of. This information will determine the dimensions of our device and impact our designs.

2023/09/16 Marker clip information

ALEKSANDRA SKUTNIK - Sep 16, 2023, 2:12 PM CDT

Title: Typical biopsy marker clip information

Date: 09/16/2023

Content by: Aleksandra Skutnik

Present: n/a

Goals: To understand how biopsy marker clips work, look like, and designed.

Content:

- Marker clips are often made of titanium or stainless steel so that they can be seen on a mammogram
- Clips are often about 3 mm in size, so the patient often times will not be able to feel them
- Marker clips are used to be able to mark the sites of biopsies and allow physicians to easily return to areas of concern when performing future mammograms or during operation
- Clips are usually not removed, they are safe to be left in the body
    - However, reports of migration have been noted
- Potential for bio-resorbable markers could be useful

Conclusions/action items:

The team should consider these design factors when brainstorming designs for our device. The marker must be small enough to fit into a thin, hallow needle. The team will still need to clarify device and clip dimensions at the initial client meeting.

2023/09/20 Breast Cancer Statistics

ALEKSANDRA SKUTNIK - Sep 21, 2023, 12:00 AM CDT

Title: Breast Cancer statistics

Date: 09/20/2023

Content by: Aleksandra Skutnik

Present: n/a

Link: https://www.cancer.org/cancer/types/breast-cancer/about/how-does-breast-cancer-form.html

Goals: To better understand the statistics of breast cancer.

Content:

- Women have a 1 in 8 chance of developing breast cancer in their lifetimes
- Breast cancer is the second leading cause of cancer death in women
    - Lung cancer is the first
- Incidence rates have increased by 0.5% every year
- Breast cancer can be easily detected with regular screenings as it can often times go unnoticed
- The 5 year survival rate for women with breast cancer is 91%

Conclusions/action items:

Understanding these statistics is important in gauging the need for this device and the people that are directly affected by the biopsy process. Breast cancer can be detected with regular screenings and biopsies when suspicion arises, so it is important to design biopsy devices that make the process of testing for cancer smoother and easier for the patient to undergo.

2023/09/28 Renal Cell Carcinoma Surgery Approach

ALEKSANDRA SKUTNIK - Sep 28, 2023, 12:52 PM CDT

Title: Surgical Management of Renal Cell Carcinoma

Date: 09/28/2023

Content by: Aleksandra Skutnik

Present: n/a

Link: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3930656/

Goals: To better understand under what cases are tumors on the kidney surgically removed.

Content:

- Renal cell carcinoma is responsible for 90% of kidney cancer cases
- With CT and better imaging options, kidney cancer can be caught much earlier and stage progression can be determined easier
- The only possibility of long term cure and survival of renal cell carcinoma involved surgical intervention and removal of the diseased kidneys (nephrectomy)
- Surgical resection is the standard of care in renal cell carcinoma cases
- Nephron sparing treatments are only used for small, early stage (T1a) tumors

Conclusions/action items:

Part of the device is 3D printed based on measurements of the tumor imaged on CT scans to allow for a sterile container to place the resected tumor into to then conduct biopsies. It is important to understand why the tumor is resected in the first place, while most other biopsies occur without resecting the mass first.

2023/10/11 CT Textural Analysis

ALEKSANDRA SKUTNIK - Oct 11, 2023, 3:14 PM CDT

Title: CT Textural Analysis for RCC

Date: 10/11/2023

Content by: Aleksandra Skutnik

Present: n/a

Link: https://pubs.rsna.org/radiology/doi/10.1148/rg.2017170056#:~:text=Texture%20analysis%20provides%20an%20objective,%2C%20and%20transform%2Dbased%20methods

Goals: To better understand how CT textural analysis works and why it is beneficial to use when imaging RCC.

Content:

- CT textural analysis uses the differing spatial alignment, location, and relationships between pixels of an image to render a 3D depiction of the tumor
- Can give precise lesion characterization and pretreatment tumor assessment
- Can render slice-by-slice images of the tumor without any physiological damage
    - This is especially useful for cancers like RCC because this type of cancer is very heterogenous, meaning there are varieties of cell types disbursed throughout the mass
    - This makes diagnosis and biopsy difficult
    - This also means that taking biopsies has to be very precise to track where certain types of cells are coming from once biopsied

Conclusions/action items:

CT texture analysis may be extremely useful in differentiating between different cell types and tracking where these cells originated from post biopsy. This imaging technique is also useful to predict treatment outcomes and prognosis.

2023/10/11 Renal Cell Carcinoma Heterogeneity

ALEKSANDRA SKUTNIK - Oct 11, 2023, 3:25 PM CDT

Title: Renal Cell Carcinoma Heterogeneity

Date: 10/11/2023

Content by: Aleksandra Skutnik

Present: n/a

Link: https://pubmed.ncbi.nlm.nih.gov/37474942/

Goals: To understand the biological implications of imaging and performing biopsies on renal tumors.

Content:

- RCC tumors are especially difficult to treat due to their heterogeneous nature
- They are immunologically and histologically diverse tumors
    - Which affects cancer progression and treatment options
- By combining CT textural analysis techniques, diagnosis can become clearer or easier to understand
- CT textural analysis allows for slice-by-slice imaging, so cell types may be tracked and identified easier
- Taking biopsies of these tumors is difficult because of the differing cell types
    - Biopsy sites must be tracked
- By identifying the differing cell types, targeted treatment options may be useful and effective depending on the patient specific CT results

Conclusions/action items:

CT texture analysis may be useful in differentiating between cell types. The nature of RCC tumors is heterogeneous and can be difficult for physicians to decide on an appropriate line of treatment or therapy.

2023/09/15 Hologic

ALEKSANDRA SKUTNIK - Sep 15, 2023, 11:44 AM CDT

Title: Hologic

Date: 2023/09/15

Content by: Aleksandra Skutnik

Present: n/a

Goals: To find competing designs that are already on the market in order to be able to compare our future design to current products.

Link: https://www.hologic.com/hologic-products/breast-health-solutions/breast-biopsy-markers

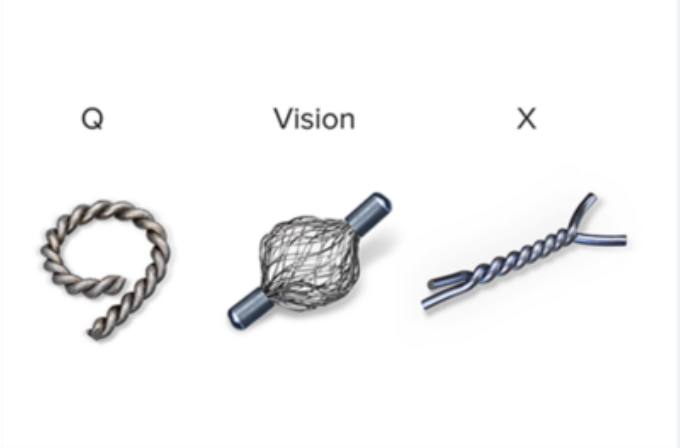
Content:

- Hologic uses 'Q', 'Vision', and 'X' titanium markers
- 91% of markers did not migrate
- 85% marker placements were stated to be visible in ultrasounds upon deployment
- Utilize bio-absorbable suture netting to minimize movement

Conclusions/action items:

The team should discuss current designs at the next team meeting and determine what design is best suitable. The team should discuss the logistics of different types of lesions, differing human anatomy, comfort, and patient safety.

ALEKSANDRA SKUTNIK - Sep 16, 2023, 12:56 PM CDT



Download

Screen_Shot_2023-09-16_at_12.55.59_PM.png (207 kB)

2023/09/20 Mammotome

ALEKSANDRA SKUTNIK - Sep 20, 2023, 11:25 PM CDT

Title: Mammotome

Date: 09/20/2023

Content by: Aleksandra Skutnik

Present: n/a

Link: https://www.mammotome.com/us/en/products/mammotome-revolve-ultrasound

Goals: To find competing designs that are already on the market in order to get inspiration for personal designs.

Content:

- Dual vacuum assisted technology to help minimize the risk for hematomas
- Simple and easy to use design to be user-friendly
- Touch free tissue collection system in the back of the device for sterility purposes
- Single device to minimize tissue trauma collects multiple tissue samples while vacuuming blood
- Allows for easy and precise marker insertion
    - Tissue collection container comes off of the back end of the device
    - Hole for marker needle to be inserted through the guage of the device

Conclusions/action items:

The team should consider this brand and similar brands when designing our product. The single needle concept is important to the client in order to minimize tissue trauma and maximize patient comfort.

2023/10/06 Skin Punch Biospy tool

ALEKSANDRA SKUTNIK - Oct 06, 2023, 10:10 PM CDT

Title: Novel Uses of Skin Biopsy Punches in Dermatosurgery

Date: 10/06/2023

Content by: Aleksandra Skutnik

Present: n/a

Link: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4372910/

Goals: To understand how the skin punch biopsy device works.

Content:

- 0.5-10 mm in diameter metallic tips
- Used for diagnostic, therapeutic, or cosmetic purposes
- Easy to perform procedure, minimal complications, provide full thickness sample

Conclusions/action items:

The idea of the skin punch biopsy can be applied to our design. The circular blade and the concept of the punch biopsy motion is likely the best approach to collect thick, viable samples of the RCC tumor tissue for biopsy.

2023/10/06 Blade Sharpness Patent

ALEKSANDRA SKUTNIK - Oct 06, 2023, 10:36 PM CDT

Title: Scalpel Blade Having High Sharpness and Hardness

Date: 10/06/2023

Content by: Aleksandra Skutnik

Present:n/a

Link: https://patents.google.com/patent/CA2403346C/en

Goals: To understand the patents and standards behind medical grade scalpels.

Content:

- Must have Rockwell C Hardness level between 46 and 53
- Tapered blade of angle 10-25 degrees
- Edge may be atomically sharpened via applying a large negative voltage to the substrate

Conclusions/action items:

The team should keep these standards in mind when fabricating the blade aspect of the device, if the team chooses to fully manufacture the blade in its entirety. These standards will be useful to refer to especially when working with stainless steel.

2023/10/05 Phantom Kidney Testing

ALEKSANDRA SKUTNIK - Oct 05, 2023, 12:29 PM CDT

Title: Utilizing patient specific 3d printed kidney surgical guide with realistic phantom for partial nephrectomy

Date: 10/05/2023

Content by: Aleksandra Skutnik

Present: n/a

Link: https://www.nature.com/articles/s41598-023-42866-9

Goals: To find ways to simulate a kidney to test the durability of our design.

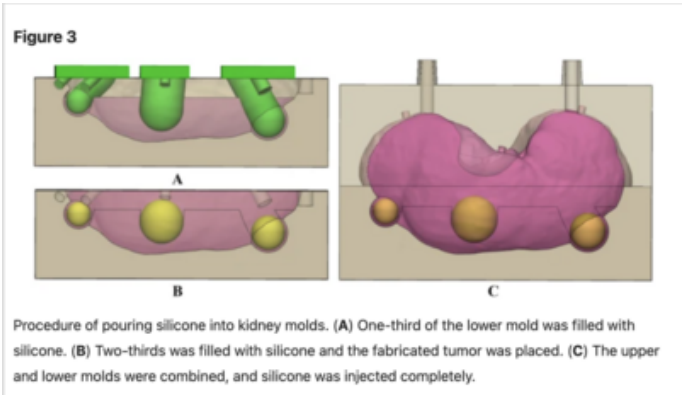
Content:

- Can use the prototype of the 3D printed kidney that the client gave the team to use as a mold for the kidney
- Pour silicone into the molds and let harden to simulate a kidney for testing
- Conduct durability testing-- use blade and corer to harvest biopsy samples ~50 times
- Evaluate the cleanliness of the biopsy cuts over time to track blade dulling

Conclusions/action items:

Create a testing protocol for testing the durability of the blade and conduct testing once the prototype is complete.

ALEKSANDRA SKUTNIK - Oct 05, 2023, 1:26 PM CDT



Download

Screen_Shot_2023-10-05_at_1.26.29_PM.png (591 kB)

2023/11/03- Blade Sharpening Strategies

ALEKSANDRA SKUTNIK - Nov 15, 2023, 4:54 PM CST

Title: Blade Sharpening Strategies

Date: 2023/11/03

Content by: Aleksandra Skutnik

Present: n/a

Goals: To find a way to sharpen the fabricated blades without heating up the material.

Content:

Previous fabrication efforts prove to be difficult to see through as the circular saw in the TEAMLabs causes the material of the blade to heat up.

The team could look into using a dremel tool to sand the inside of the blade to sharpen it from the inside out. This handheld option gives the user more control over where the material is being sanded and can get into the small diameter of the team's blade design. The dremel tip must be smaller than 10 cm. An image of a dremel tool has been attached for reference.

Conclusions/action items:

The team will go down to the TEAMLabs to use a dremel tool to sand down the blades in order to produce a sharper edge for cutting into tissue. If the dremel tool proves to be useful, the team will continue to fabricate blade designs in this manner.

ALEKSANDRA SKUTNIK - Nov 15, 2023, 4:52 PM CST

Download

Screen_Shot_2023-11-15_at_4.52.36_PM.png (145 kB)

2023/11/03- Blade Fabrication Process

ALEKSANDRA SKUTNIK - Dec 13, 2023, 4:31 PM CST

Title: Blade Fabrication Process

Date: 2023/11/03

Content by: Aleks Skutnik

Present: Aleks Skutnik, Olivia Jaekle, Emily Wheat, Erin Schlegel

Goals: To experiment ways to sharpen the blade prototypes.

Content:

- Went to TeamLabs to experiment with blade prototypes
- Used hand held dremel tool to sand down the inside of the blades
    - This minimized and sanded down the lip created after cutting the metal
    - Successfully sharpened the blade

Conclusions/action items:

The team can use a dremel at TeamLabs to sharpen blades. The team should create a detailed protocol on blade sharpening to ensure that the fabrication process is consistent for all blades.

2023/09/28 Design 1: Punch Biopsy

ALEKSANDRA SKUTNIK - Sep 28, 2023, 10:11 PM CDT

Title: Punch Biopsy Design

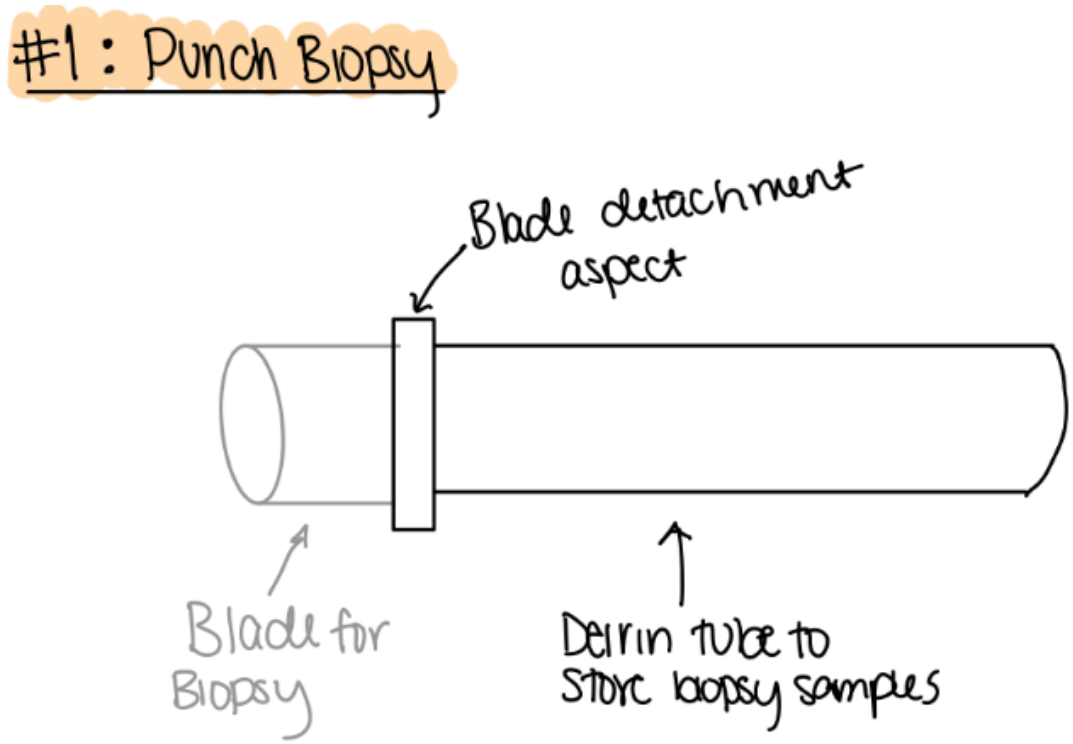
Date: 09/28/2023

Content by: Aleksandra Skutnik

Present: n/a

Goals: To create an initial design to share with the team in order to create a design matrix.

Content:



- This design is inspired by that of a skin punch biopsy device
- It has a sharp, stainless steel blade for precise cuts
- The body of the device can hold the biopsy samples to be transferred to the lab in a sterile manner-- minimizing the handling of the sample prior to testing
- The blade is connected to the body via a detachable segment to make the blade be reusable, if desired

Conclusions/action items:

The team will come up with a design matrix to determine which design/features are most appropriate for the project.

2023/09/28 Design 2: Punch + Plunger

ALEKSANDRA SKUTNIK - Sep 28, 2023, 10:12 PM CDT

Title: Punch + Plunger Design

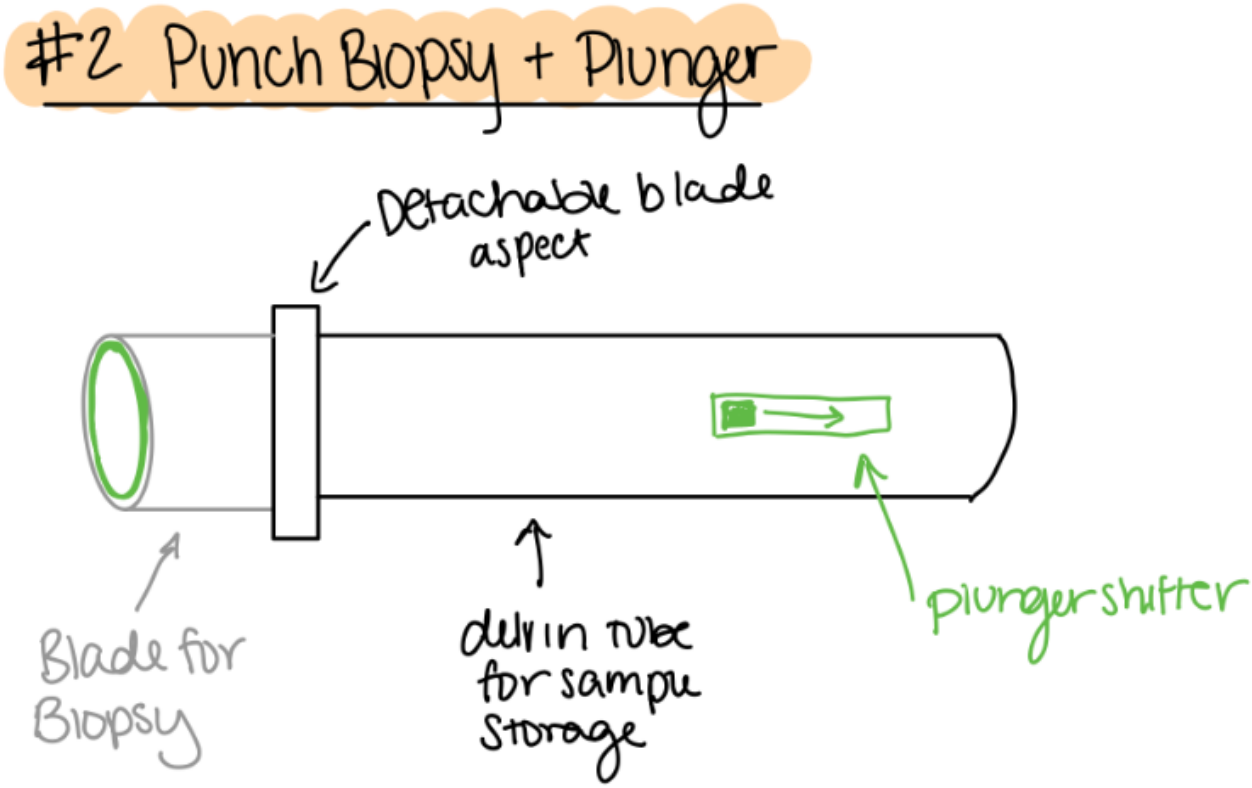
Date: 09/28/2023

Content by: Aleksandra Skutnik

Present: n/a

Goals: To create an initial design to share with the team in order to create a design matrix.

Content:



- This design is similar to design 1
- It has a sharp, stainless steel blade for precise cuts
- The body of the device can hold the biopsy samples to be transferred to the lab in a sterile manner-- minimizing the handling of the sample prior to testing
- The blade is connected to the body via a detachable segment to make the blade be reusable, if desired
- Added feature: plunger aspect
    - The shifter will push the sample back into the tube to better separate samples and minimize any contamination

Conclusions/action items:

The team will come up with a design matrix to determine which design/features are most appropriate for the project.

2023/10/26 Design 1: Vacuum Tube

ALEKSANDRA SKUTNIK - Nov 05, 2023, 9:12 AM CST

Title: Vacuum Tube

Date: 2023/20/26

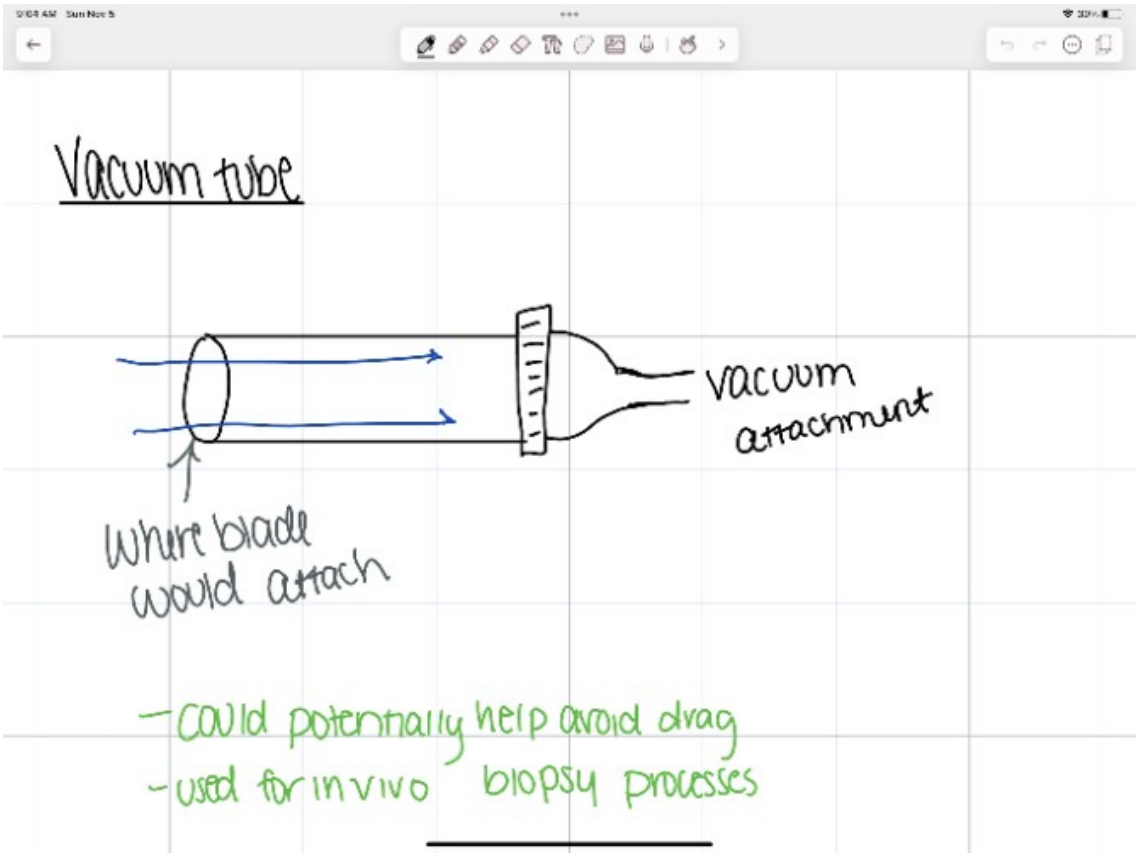
Content by: Aleksandra Skutnik

Present: n/a

Goals: To design a better coring tube that stays in tact throughout the entire biopsy procedure, reduces drag, and minimizes surrounding tissue trauma.

Content:

Vacuum design inspired by in vivo biopsy resection devices. Vacuum attachment at the end of the collection tube to help ease tissue into the tube without causing drag.



Conclusions/action items:

The team will decide on the best design that suits the needs of the client. The team will meet to share design ideas and create a design matrix to determine which tubing design would meet the required criteria the best.

2023/10/26 Design 2: Clip closure

ALEKSANDRA SKUTNIK - Nov 05, 2023, 9:16 AM CST

Title: Clip Closure

Date: 2023/10/26

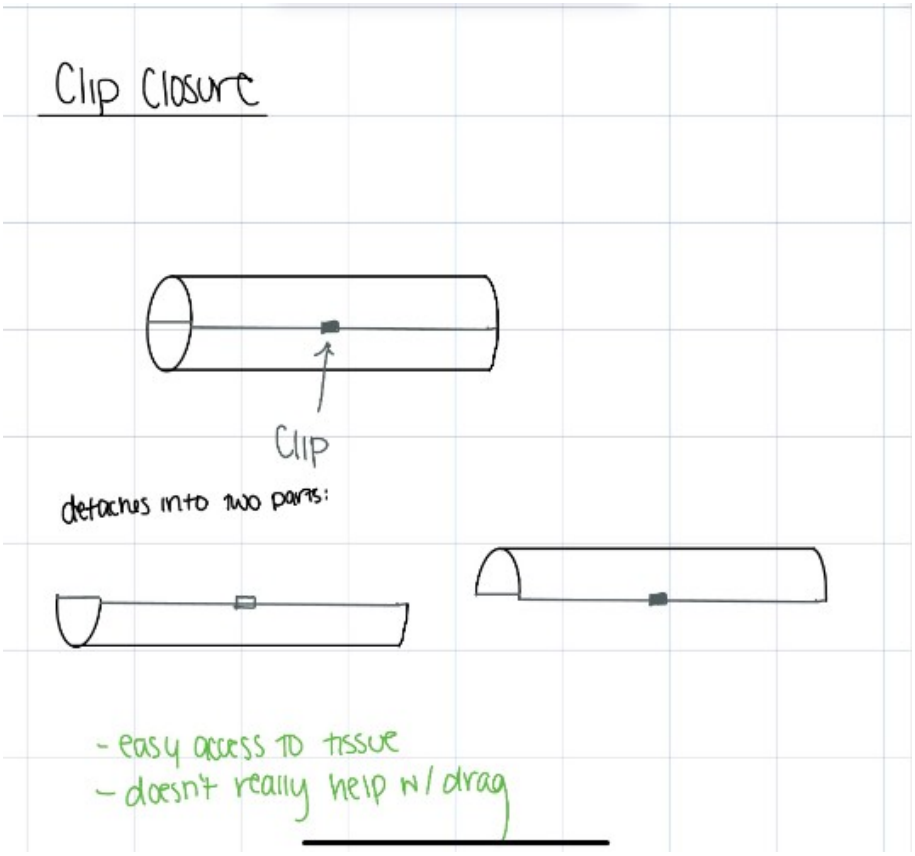
Content by: Aleksandra Skutnik

Present: n/a

Goals: To design a better coring tube that stays in tact throughout the entire biopsy procedure, reduces drag, and minimizes surrounding tissue trauma.

Content:
The clip closure design snaps the two halves of the tubing together via a clip attachment.

Though this design may be effective, there cannot be anything on the exterior surface of the tubing as it may cause surrounding tissue trauma. This design may be modified in the future to include a clip within the thickness of the tubing to minimize excess tissue trauma.

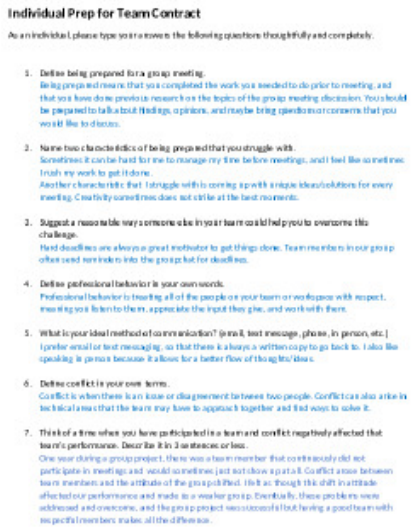


Conclusions/action items:

The team will decide on the best design that suits the needs of the client. The team will meet to share design ideas and create a design matrix to determine which tubing design would meet the required criteria the best.

2023/10/11 Individual Prep for Team Contract

ALEKSANDRA SKUTNIK - Oct 11, 2023, 7:37 PM CDT



Individual Prep for Team Contract

As an individual, please type your answers the following questions thoughtfully and completely.

1. Define being prepared for a group meeting.
   Being prepared means that you completed the work you needed to do prior to meeting, and that you have done previous research on the topics of the group meeting discussion. You should be prepared to talk about findings, opinions, and maybe bring questions or concerns that you would like to discuss.
2. Name two characteristics of being prepared that you struggle with.
   Sometimes it can be hard for me to manage my time before meetings, and I feel like sometimes I rush my work to get it done.
   Another characteristic that I struggle with is coming up with unique ideas/solutions for every meeting. Creativity sometimes does not strike at the best moments.
3. Suggest a reasonable way someone else in your team could help you to overcome this challenge.
   Hard deadlines are always a great motivator to get things done. Team members in our group often send reminders into the group chat for deadlines.
4. Define professional behavior in your own words.
   Professional behavior is treating all of the people on your team or workspace with respect, meaning you listen to them, appreciate the input they give, and work with them.
5. What is your ideal method of communication? (email, text message, phone, in person, etc.)
   I prefer email or text messaging, so that there is always a written copy to go back to. I also like speaking in person because it allows for a better flow of thoughts/ideas.
6. Define conflict in your own terms.
   Conflict is when there is an issue or disagreement between two people. Conflict can also arise in technical areas that the team may have to approach together and find ways to solve it.
7. Think of a time when you have participated in a team and conflict negatively affected that team's performance. Describe it in 3 sentences or less.
   One year during a group project, there was a team member that continuously did not participate in meetings and would sometimes just not show up at all. Conflict arose between team members and the attitude of the group shifted. I felt as though this shift in attitude affected our performance and made us a weaker group. Eventually, these problems were addressed and overcome, and the group project was successful but having a good team with respectful members makes all the difference.

Download

Skutnik_Individual_Prep_for_Team_Contract.docx (17.1 kB)

Biosafety and Chemical Safety Training

ALEKSANDRA SKUTNIK - Feb 16, 2023, 9:05 PM CST

Title: Biosafety and Chemical Safety Training Certification

Content by: Aleksandra Skutnik

Goals: To understand the biosafety and chemical safety standards when working in a laboratory setting.

Content:

Biosafety and chemical safety modules and assessments completed.

ALEKSANDRA SKUTNIK - Feb 16, 2023, 9:04 PM CST

Download

TrainingSkutnik_1_.pdf (254 kB)

Green Permit

ALEKSANDRA SKUTNIK - Feb 17, 2023, 1:27 PM CST

Title: Green Permit training and certification completed

Date: 2023/01/19

Content by: Aleksandra Skutnik

Content:

- Learned how to use lathe and mill machinery in the Team Lab at UW-Madison.

ALEKSANDRA SKUTNIK - Feb 17, 2023, 1:26 PM CST

Download

Screen_Shot_2023-01-26_at_12.23.11_AM.png (307 kB)

2023/9/14- Breast Biopsy

Olivia Jaekle - Sep 14, 2023, 12:40 PM CDT

Title: Breast Biopsy

Date: 2023/9/14

Content by: Olivia Jaekle

Present: Olivia Jaekle

Goals: what is a breast biopsy

Link:https://www.mayoclinic.org/tests-procedures/breast-biopsy/about/pac-20384812

Cite:

[1] “Breast biopsy,” Mayo Clinic, https://www.mayoclinic.org/tests-procedures/breast-biopsy/about/pac-20384812 (accessed Sep. 14, 2023).

Content:

- Used to get a tissue sample that is sent to pathologists to then examine said sample
- Usually is done if there is a lump or any other symptoms of breast cancer
- Results can show is the area in question has cancer
- This is done after ultrasound scan, MRI, and or mammogram aka last resort to see if it is truly cancerous
- Risks to breast biopsy include bruising swelling of breast, infection or bleeding at the biopsy site, breast appearance can change
- There are multiple types of breast biopsies:
    - Fine-needle aspiration biopsy
    - Core needle biopsy
    - Stereotactic biopsy
    - Ultrasound-guided core needle biopsy
    - MRI-guided core needle biopsy
    - Surgical biopsy

Conclusions/action items:

I learned that there are multiple types of breast biopsies. Th team needs to ask our client which types of breast biopsies we need to focus on for our device. I learned what a breast biopsy is and am realizing that the device our client wants us to create will help within this procedure, but I am not sure for what exactly. this is a great starting point to ask questions for our client.

2023/9/14- Breast Tissue Marker Clip

Olivia Jaekle - Sep 14, 2023, 1:10 PM CDT

Title: Breast Tissue Marker Clip

Date: 2023/9/14

Content by: Olivia Jaekle

Present: Olivia Jaekle

Goals: What is a breast tissue marker clip

Link: https://www.ccdhb.org.nz/our-services/a-to-z-of-our-services/radiology/1102218-breast-tissue-marker-clip.pdf

Cite:

[1] "Radiology | CCDHB." https://www.ccdhb.org.nz/our-services/a-to-z-of-our-services/radiology/ (accessed Sep. 14, 2023).

Content:

- A tissue marker is placed in the breast after breast biopsy to locate the site for future reference
- This is done by a breast radiologist
- Can either been done at the time of the needle biopsy or later
- The clips are only 3mm and made of either stainless steel or titanium
    - They show up in the mammogram
- The marker can move around
- These clips will permanently stay in your breast

Conclusions/action items:

I was able to learn what a breast tissue marker clip is. Something interesting I found is that the marker can move, but I don't think that is supposed to happen. I want to ask our client if this is a concern we need to consider within our device

2023/9/14- Breast and/or Lymph Node Clip Placement

Olivia Jaekle - Sep 14, 2023, 1:13 PM CDT

Title: Breast and/or Lymph Node Clip Placement

Date: 2023/9/14

Content by: Olivia Jaekle

Present: Olivia Jaekle

Goals: Learn the procedure of the clip placement insertion

Link:https://myhealth.alberta.ca/Alberta/Pages/Breast-and-or-Lymph-Node-Clip-Placement.aspx

Cite:

[1] "Breast and/or Lymph Node Clip Placement." https://myhealth.alberta.ca/Alberta/Pages/Breast-and-or-Lymph-Node-Clip-Placement.aspx (accessed Sep. 14, 2023).

Content:

1. You will lie on your back on a padded table.
2. You will have an ultrasound of your breast, lymph node, or both to find the area of concern.
3. Your skin will be cleaned with a cool antiseptic solution.
4. Local anesthetic (numbing medicine) will be injected to freeze the area where the clip will be put in. This may sting for 5 to 10 seconds.
5. The clip will be guided into the breast or armpit while the radiologist is doing the ultrasound. You may feel some pressure as the clip is being put in.

Conclusions/action items:

I learned how the clip is placed within the breast. I want to do further research to understand if this procedure is used in all types of breast biopsies or only certain types.

2023/9/20-Fine-needle vs. Core-needle biopsy

Olivia Jaekle - Sep 20, 2023, 12:48 PM CDT

Title: Fine-needle versus core-needle biopsy – which one to choose in preoperative assessment of focal lesions in the breasts?

Date: 2023/9/20

Content by: Olivia Jaekle

Present: Olivia Jaekle

Goals: Understand the difference between the two biopsies

Link: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5769667/

Cite:

[1] E. Łukasiewicz, A. Ziemiecka, W. Jakubowski, J. Vojinovic, M. Bogucevska, and K. Dobruch-Sobczak, “Fine-needle versus core-needle biopsy – which one to choose in preoperative assessment of focal lesions in the breasts? Literature review,” *J Ultrason*, vol. 17, no. 71, pp. 267–274, Dec. 2017, doi: 10.15557/JoU.2017.0039.

Content:

- Fine-needle aspiration has been reduced due to low sensitivity and low specificity
- Fine-needle has a high rate of non-diagnostic, suspicious, and false results
- Fine-needle biopsy is recommended for cystic lesions
- Core-needle biopsy is the basic diagnostic of breast lesions
- Core-needle biopsy delivers more info about the nature of the tumor
- Core-needle biopsy limitations include underestimation of invasion and failure to recognize the components of atypical lesions
- Single find needle is inexpensive

Conclusions/action items:

From this article, I've been able to identify the major differences between the two biopsies for breasts. In conclusion, one really isn't better than another, they both have major downsides.

2023/9/27 - Renal Cell Carcinoma

Olivia Jaekle - Oct 11, 2023, 10:31 AM CDT

Title: Renal-cell carcinoma

Date: 2023/9/27

Content by: Olivia Jaekle

Present: Olivia Jaekle

Goals: Learn about Renal-Cell carcinoma since we got a new client

Link: https://www.cancer.gov/types/kidney/patient/kidney-treatment-pdq

Citation: “Renal Cell Cancer Treatment - NCI,” Feb. 20, 2004. Available: https://www.cancer.gov/types/kidney/patient/kidney-treatment-pdq. [Accessed: Oct. 1, 2023]

Content:

General Information About Renal Cell Cancer:

- Renal cell cancer is a disease in which malignant cells form in the tubules of the kidney.
- Risk factors for renal cell cancer include smoking, the misuse of certain pain medicines, obesity, high blood pressure, family history of the disease, and certain genetic conditions.
- Signs of renal cell cancer may include blood in the urine, a lump in the abdomen, persistent side pain, loss of appetite, unexplained weight loss, and anemia.
- Various tests are used to diagnose renal cell cancer, including physical exams, ultrasound, blood chemistry studies, urinalysis, CT scans, MRIs, and biopsies.
- Prognosis and treatment options are influenced by factors like the stage of the disease, the patient's age and general health.

- - accounts for 2% of all cancers

  - RCC originates in the renal cortex

  - accounts for 80-85% of malignant kidney tumors

  - occurs twice as often in men as in women

  -patients are generally more than 40 at diagnosis

Stages of Renal Cell Cancer:

- Renal cell cancer is staged to determine the extent of the disease.
- Staging involves tests to see if cancer has spread within the kidney or to other parts of the body.
- The stages for renal cell cancer include Stage I (tumor ≤ 7 cm confined to the kidney), Stage II (tumor > 7 cm confined to the kidney), Stage III (cancer has spread beyond the kidney or into nearby lymph nodes or blood vessels), and Stage IV (cancer has spread to other parts of the body).

Renal Cell Cancer Treatment Options:

- Treatment options for renal cell cancer may include surgery, radiation therapy, chemotherapy, immunotherapy, and targeted therapy.
- Surgery can involve partial nephrectomy, simple nephrectomy, or radical nephrectomy.
- Arterial embolization may be used to shrink tumors when surgery is not possible.
- Radiation therapy is used to kill cancer cells with high-energy radiation.
- Chemotherapy involves drugs that stop the growth of cancer cells.
- Immunotherapy uses the patient's immune system to fight cancer, including immune checkpoint inhibitors like CTLA-4 and PD-1 inhibitors.
- Interferon and interleukin-2 are used to affect cancer cell division and boost immune cell activity.
- Targeted therapy involves drugs that identify and attack specific cancer cells, including antiangiogenic agents like VEGF inhibitors and mTOR inhibitors.
- Clinical trials are ongoing to test new treatments.
- Treatment may cause side effects.
- Patients may consider participating in clinical trials to access new treatments.
- Follow-up tests are often needed to monitor the patient's condition and response to treatment.

Conclusions/action items:

This information will be useful to understand what RCC is. Even though we met with our client, I have been finding it hard to really know what our blade and corer box will be used for. This article gave me insight to the main aspects of RCC, the stages of RCC, and what treatments are out there now.

2023/10/2 - Kidney Biopsy

Olivia Jaekle - Oct 11, 2023, 10:50 AM CDT

Title: Kidney Biopsy

Date: 2023/10/2

Content by: Olivia Jaekle

Present: Olivia Jaekle

Goals: Learn about how kidney biopsy is performed

Link: https://www.kidney.org/atoz/content/kidney-biopsy

Cite:

“Kidney Biopsy,” National Kidney Foundation, Jan. 07, 2016. Available: https://www.kidney.org/atoz/content/kidney-biopsy. [Accessed: Oct. 2, 2023]

Content:

A kidney biopsy is a medical procedure where one or more small samples of kidney tissue are removed for examination. It's typically performed when a diagnosis of certain kidney conditions cannot be made through other methods like blood and urine tests, imaging, or physical exams. Here's an overview of kidney biopsies:

Types:

1. Percutaneous (through the skin) biopsy: In this method, a needle is inserted through the skin, guided by ultrasound or other imaging techniques, to collect a sample from the kidney.
2. Open biopsy: Open biopsy is a surgical procedure where a sample of the kidney is taken directly from the organ during surgery. It's usually performed when there are certain contraindications to a percutaneous biopsy.

Purpose of a Kidney Biopsy:

- Confirming the diagnosis of specific kidney diseases or disorders.
- Identifying the underlying cause of unexplained blood (hematuria) or protein (proteinuria) in the urine.
- Investigating abnormal blood test results.
- Assessing patients with acute or chronic kidney disease (CKD) when the cause is unclear.
- Diagnosing conditions like nephrotic syndrome and glomerular disease where the filtering units of the kidney are damaged.
- Monitoring the response of the kidneys to treatment.
- Assessing the extent of permanent kidney damage.
- Evaluating kidney transplant patients when the transplanted kidney is not functioning well.
- Determining if a kidney tumor is cancerous.
- Investigating other unusual or rare kidney conditions.
- Checking for medication-related kidney damage.

Risks of a Kidney Biopsy: The risks associated with kidney biopsy are generally low. However, potential complications should be discussed with your healthcare professional. Complications might include:

- Bleeding: Serious bleeding may require a blood transfusion.
- Surgery: Rarely, surgery may be necessary to repair damaged blood vessels.
- Infection: Infections are uncommon, but if they occur, they can be treated with antibiotics.

Before the Procedure:

- Avoid taking over-the-counter pain medicines that can thin the blood (like aspirin, ibuprofen, or naproxen) for two weeks before the procedure.
- Discontinue certain supplements, such as fish oil.
- Undergo blood and urine tests to check for infections and other conditions.
- Adjust your medication regimen as advised by your doctor.
- Typically, you'll be asked not to eat or drink for eight hours before the procedure.

During the Procedure:

- Kidney biopsies are typically performed in a hospital.
- You may be awake with light sedation or under general anesthesia.
- You'll be positioned face-down with a pillow under your ribcage for percutaneous biopsies. For transplanted kidney biopsies, you'll be on your back.

- The kidney is located using ultrasound, x-ray images, or both.
- Local anesthesia is used to numb the area where the biopsy needle will be inserted.
- You'll be asked to take a deep breath and hold it while the doctor inserts the biopsy needle. You might feel pressure or a "pop" when the needle penetrates the skin to the kidney.
- Sometimes, two needles may be used to collect enough tissue for diagnosis.
- After the samples are taken, the needles are removed, and a bandage is applied.

After the Procedure:

- Depending on the hospital's protocol, you might need to rest in bed for 12 to 24 hours.
- Frequent monitoring of blood pressure, pulse, and blood tests are conducted to check for any bleeding or complications.
- You can usually eat and drink after the biopsy if your vital signs are stable.
- If everything is normal, you may be allowed to leave the hospital the following day.
- Follow specific instructions provided by your doctor regarding physical activity and post-biopsy care.

Results:

- The kidney tissue samples are sent to pathologists, who examine them and prepare a report.
- It typically takes a few days to get the full biopsy results, though in some cases, you might receive partial results more quickly.

Conclusions/action items:

This information will be super useful for our preliminary report to give us and our readers more background has to how the corer and the blade will come into effect. This article spoke more about just taking a sample of the kidney rather than the whole kidney, but I think this information is still very valuable to relay steps of a kidney biopsy.

2023/10/2 - Removing Kidney Procedure

Olivia Jaekle - Oct 11, 2023, 12:29 PM CDT

Title: Kidney Biopsy

Date: 2023/10/2

Content by: Olivia Jaekle

Present: Olivia Jaekle

Goals: Learn about how a kidney can be removed

Link:https://www.cancerresearchuk.org/about-cancer/kidney-cancer/treatment/surgery/removing-part

Cite:

Removing part or all of a kidney.” Available: https://www.cancerresearchuk.org/about-cancer/kidney-cancer/treatment/surgery/removing-part-all. [Accessed: Oct. w, 2023]

Content:

1. Partial Nephrectomy: This procedure is used for small kidney cancers that have not spread, typically in stage 1 (less than 7cm across). The surgeon removes only the part of the kidney containing the cancer while leaving some of the healthy kidney tissue. This approach is called nephron-sparing surgery and aims to preserve kidney function.
2. Radical Nephrectomy: In this procedure, the entire affected kidney is removed along with some surrounding tissues. Lymph nodes and even an adrenal gland may also be removed if necessary. This is a major surgery, but if the cancer has not spread, it may be the only treatment needed.
3. Surgery for Symptom Relief: In some cases where cancer is unlikely to be cured, surgery may still be performed to relieve symptoms. This is known as palliative nephrectomy. It can help manage symptoms like pain or blood in the urine. Surgery can also remove cancerous tissue that releases chemicals causing symptoms like drowsiness or sickness.
4. Keyhole Surgery (Laparoscopic Surgery): Keyhole surgery is a minimally invasive approach to kidney removal. It involves making small incisions and using a laparoscope, which is an instrument with a camera and light, to visualize the surgical area. Surgeons use small instruments through these incisions. Keyhole surgery generally leads to faster recovery and less post-operative pain.
5. Robotic Surgery: Some hospitals use robotic systems for laparoscopic kidney surgery. These systems offer the surgeon enhanced precision and control during the operation. Robotic surgery may be used in specialist cancer hospitals and is sometimes referred to as "da Vinci surgery."
6. Benefits and Risks of Keyhole Surgery: Keyhole surgery offers several advantages, including reduced post-operative pain, shorter hospital stays, and faster recovery. However, it can take longer to perform, and there is a possibility that the surgeon may need to switch to open surgery in certain situations, such as when reaching the cancer is challenging or controlling bleeding becomes difficult.

Conclusions/action items:

These are difference ways a kidney can be removed. We will be focusing on Radical nephrectomy in our project. I will reach out to our client to see if we can have some more information about the procedure itself

2023/10/3 Previous Team's Final Report

Olivia Jaekle - Oct 11, 2023, 12:36 PM CDT

Title: Previous Team's Final Report

Date: 2023/10/3

Content by: Olivia

Present: Olivia

Goals: To understand what the previous group did

Link: https://bmedesign.engr.wisc.edu/projects/f18/ct_correlation

Cite: “Precision device for evaluation of radiologic-pathologic features in heterogeneous tumors.” Available: https://bmedesign.engr.wisc.edu/projects/f18/ct_correlation. [Accessed: Oct. 3, 2023]

Content:

Introduction:

- CTTA is a radiographic tool used for analyzing CT images and predicting pathological features, therapy response, and prognosis in various cancers.
- Challenges arise due to tumor heterogeneity and difficulties in reliable tumor biopsies.
- CTTA has potential for whole-tumor, noninvasive analysis and validation through direct correlation with pathology.

Background:

- CT scans provide images of body slices using Hounsfield units to measure tissue density.
- Renal cell carcinoma is the focus of this project.
- Materials selection based on CT compatibility and laser etching ability, including PTFE (Teflon), Delrin, and PMP.

Preliminary Designs:

- Three corer designs: laser etched with holes, laser etched, and slice and dice.
- Material options for the corer: PTFE, Delrin, and PMP.
- Two blade designs: hypodermic needle and razor edge ("Apple Corer").

Proposed Final Design:

- Acrylic box (28x15x14 cm) with a 3D matrix laser etched on three sides.
- Delrin corer with slits for marking every 5 mm and a friction-fit blade attachment.
- Stainless steel blade with 15-degree chamfer for cleaner coring.

Fabrication/Development Process:

- Materials used include acrylic, Delrin, and stainless steel.
- Laser cutting used for the box.
- Changes in corer design to improve functionality.
- Modification of the blade design.

Testing:

- MTS machine testing showed the 15-degree blade required the least work for coring.
- The corer device was tested in a CT scanner for radiographic-pathologic correlation.

Discussion:

- Material issues and errors encountered in the design.
- Proposed modifications for improving the corer and blade design.

Conclusions:

- The device design is capable of coring samples.
- The need for modifications for a more efficient and clean coring process.

The report discusses the development of a device to enhance the validation of CTTA technology in cancer diagnosis, with a focus on renal cell carcinoma. The project includes corer and blade designs, material selection, and testing. Recommendations for design modifications are made to improve the device's functionality and efficiency.

Conclusions/action items:

I went through the whole report and wrote down main aspects of each section. I will bring this to the team when we think about our testing and fabrication processes. Overall, I think they were very successful of coming up with the concept and now it is our job to be able to fine tune the blade that can still be compatitable with the corer design they made.

2023/9/20- Biopsy Marker Standardization

Olivia Jaekle - Sep 20, 2023, 12:36 PM CDT

Title: Biopsy Marker Standardization

Date: 2023/9/20

Content by: Olivia Jaekle

Present: Olivia Jaekle

Link: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7472876/

Cite:

[1] L. H. Portnow, C. M. Thornton, H. S. Milch, V. L. Mango, E. A. Morris, and N. B. Saphier, “Biopsy Marker Standardization: What’s in a Name?,” AJR Am J Roentgenol, vol. 212, no. 6, pp. 1400–1405, Jun. 2019, doi: 10.2214/AJR.18.20577.

Goals: What's on the market for breast tissue marker clips

Content:

- There are 37 different biopsy marker shapes available from six manufacturers
- FDA first approved biopsy markers in soft tissues in 1995

Marker Shape	Brand	Composition	Carrier Material
Anchor	MicroMARK	Stainless steel	NA
Barbell (2 × 4 mm)	BiomarC	Carbon-coated ceramic (nonmetal)	NA
	MammoSTAR	Carbon-coated zirconium oxide (nonmetal)	Beta glucan
Tribell (1.5 mm)	BiomarC	Carbon-coated ceramic (nonmetal)	NA
	MammoSTAR	Carbon-coated zirconium oxide (nonmetal)	Beta glucan
Barrel	HydroMARK	Titanium, stainless steel	PEG-based hydrogel
Butterfly	HydroMARK	Titanium	PEG-based hydrogel
Open coil	HydroMARK	Titanium, stainless steel	PEG-based hydrogel
Bowtie	MammoMARK	Titanium	Bovine collagen
Triple twist	MammoMARK	Titanium	Bovine collagen
U shape	MammoMARK	Titanium	Bovine collagen

Note—NA = not applicable, PEG = polyethylene glycol.

TABLE 1: Breast Biopsy Site Markers Manufactured by Devicor Medical Products (Mammotome)

Marker Shape	Brand	Composition	Carrier Material
Coil	UltraClip	Low-nickel stainless steel alloy[a]	NA
	UltraClip Dual Trigger	Low-nickel stainless steel alloy[a]	PVA polymer
	SenoMark UltraCor	Low-nickel stainless steel alloy[a]	PGA microfiber pad and PVA polymer
	SenoMark Ultra	Low-nickel stainless steel alloy[a]	PGA microfiber pad and PVA polymer
Heart	UltraClip Dual Trigger	Titanium	PVA polymer
	SenoMark UltraCor	Titanium	PGA microfiber pad and PVA polymer
M clip	SenoMark and SenoMark UltraCor MRI	Stainless steel	PGA microfiber pads
O clip	SenoMark	Titanium	PGA microfiber pads
Omega	Gel Mark UltraCor	Stainless steel	PLA-PGA pellets
	Gel Mark Ultra	Stainless steel	PLA-PGA pellets
	SenoMark	Stainless steel	PGA microfiber pads
	StarchMark	Stainless steel	Starch pellets
Ribbon	UltraClip	Titanium	NA
	UltraClip and UltraClip Dual Trigger	Titanium	PVA polymer
	SenoMark UltraCor	Titanium	PGA microfiber pad and PVA polymer
	SenoMark Ultra	Titanium	PGA microfiber pad and PVA polymer
Twirl ring (same as nitinol O twist)[b]	UltraCor Twirl	Nitinol	NA
S clip	Gel Mark UltraCor	Titanium	PLA-PGA pellets
	Gel Mark Ultra	Titanium	PLA-PGA pellets
	SenoMark	Titanium	PGA microfiber pads
Spring	UltraCor	Stainless steel	PEG plugs
V clip	StarchMark UltraCor	Stainless steel	Starch pellets
	StarchMark	Stainless steel	Starch pellets
Venus	UltraClip Dual Trigger	Low-nickel stainless steel alloy[a]	PVA polymer
	SenoMark UltraCor	Low-nickel stainless steel alloy[a]	PGA microfiber pad and PVA polymer
Wing	UltraClip	Nickel-chromium alloy[c]	NA
	UltraClip Dual Trigger	Nickel-chromium alloy[c]	PVA polymer
X clip	SenoMark or UltraCor MRI	Titanium	PGA microfiber pads

Note—NA = not applicable, PVA = polyvinyl alcohol, PGA = polyglycolic acid, PEG = polyethylene glycol.

[a]BioDur 108 (Carpenter Technologies).
[b]Contraindicated in patients with severe nickel allergy.
[c]Inconel 625 (Special Metals Corporation).

TABLE 2:

Breast Biopsy Site Markers Manufactured by BD

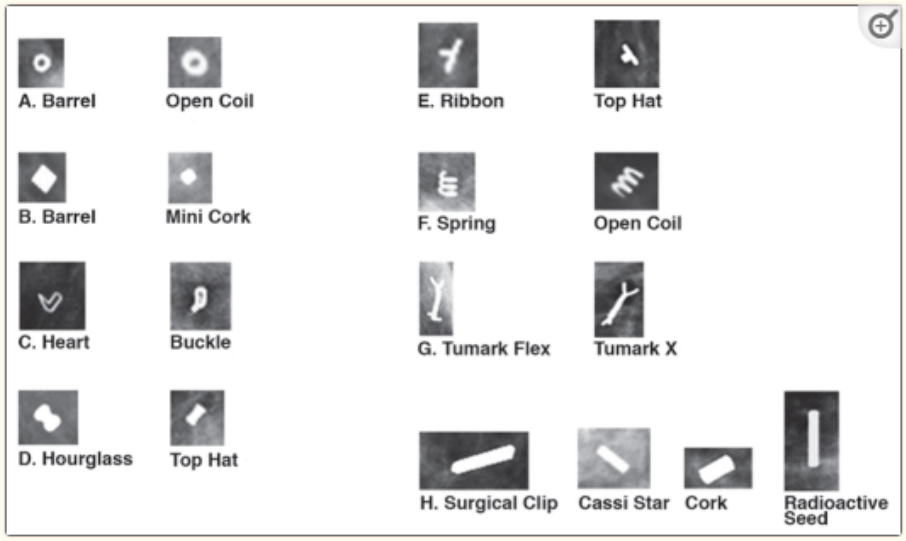


Fig. 1—

Mammograms show biopsy site marker pitfalls and mimics.

A, Barrel mimics open coil.

B, Barrel mimics mini cork.

C, Heart mimics buckle.

D, Hourglass mimics top hat.

E, Ribbon mimics top hat.

F, Spring (opposite endpoints) mimics open coil (parallel endpoints).

G, Tumark Flex mimics Tumark X (both Hologic).

H, Surgical clip, Cassi Star device, and cork mimic radioactive seed.

Conclusions/action items:

After finding there are multiple different types of breast markers, I will ask the client which ones they use or want to use. I will continue to do further research to understand which markers work the best and for what reasons.

2023/10/2 Skin Biopsy Punch Patent

Olivia Jaekle - Oct 11, 2023, 10:26 AM CDT

Title: Sking Biopsy Punch

Date: 2023/10/2

Content by: Olivia Jaekle

Present: Olivia Jaekle

Goals: See what constraints we may have with our designs

References:

B. F. Mcevoy, “Skin biopsy punch,” US3515128A, Jun. 02, 1970 Available: https://patents.google.com/patent/US3515128A/en. [Accessed: Oct. 09, 2023]

Link:https://patents.google.com/patent/US3515128A/en

Content:

- The text describes a disposable knife assembly for a biopsy punch.
- The assembly is designed to hold a skin specimen without damaging it during the biopsy procedure.
- Conventional biopsy procedures involve cutting a skin patch and gently lifting it to expose fatty tissue, but this can damage the specimen.
- This invention aims to overcome this issue by using a biopsy knife assembly that doesn't require separate handling of the specimen.
- The assembly consists of a body with a piston and cylinder, and a knife attached to it.
- The knife has a chamber that can hold the specimen using pressure differential created by the piston's manipulation.
- The knife is constructed as a thin-walled tube with a sharp end and can be disposable.
- The body assembly can be separated for cleaning and sterilization.
- The procedure involves cutting through the skin layers, lifting the specimen without damaging it, and then severing it from the fatty tissue.
- The specimen can be expelled from the knife easily.
- The assembly can be made entirely disposable or only the blade part can be disposable.
- Modifications and variations of this invention are possible within the scope of the claims provided.

Conclusions/action items:

This patent gives us context as to what exactly we are constrianed in our own design. For instance, we can't use a piston to give force to the blade and our blade has to be longer than 3mm. Looking at other patents as well will help use edit our final design so that one day we can patent it.

2023/10/3 Patent- Surgical Access Device

Olivia Jaekle - Oct 13, 2023, 1:32 PM CDT

Title: Surgical Access Device Patent

Date: 2023/10/3

Content by: Olivia Jaekle

Present: Olivia Jaekle

Goals: See what patents are out there that might constrain our designs

Link: https://patents.google.com/patent/US8323185B2/en?oq=US+8%2c323%2c185+B2

Cite: M. J. Perez-Cruet and J. R. Pepper, “Surgical access device assembly,” US8323185B2, Dec. 04, 2012 Available: https://patents.google.com/patent/US8323185B2/en?oq=US+8%2c323%2c185+B2. [Accessed: Oct. 11 2023]

Content:

This text describes a surgical access device assembly for minimally invasive spinal surgery. The assembly includes a base portion with a central bore, a set of retractor blades, and handles for manipulating the retractor blades. Here is a summary of the key components and the steps of the procedure:

Components:

1. Base Portion: This is a central component with a bore and three holes. It is where the other components are mounted.
2. Retractor Blades: These are pivotable blades that have both inner and outer threads. In their closed position, they form a conical shape with a pointed end.
3. First Handle: An elongated handle that attaches to the base portion and is used to thread the retractor blades into the patient.
4. Core Hollow Screw: This screw has external threads and is threaded into the retractor blades to cause them to separate. It is inserted through the base portion's bore.
5. Second Handle: An elongated handle that attaches to the core hollow screw and is used to rotate the screw to separate the retractor blades.
6. Mounting Ring: A ring that is rigidly mounted to the base portion, designed to receive a mounting arm.

Procedure:

1. The surgeon attaches the first handle to the base portion and rotates it to thread the retractor blades into the patient's tissue towards the pathology.
2. Once the retractor blades are in the desired position, the first handle is removed from the base portion.
3. The core hollow screw, with its external threads, is inserted into the central bore of the base portion.
4. The second handle is attached to the core hollow screw.
5. The surgeon rotates the second handle to thread the core hollow screw into the retractor blades, causing them to separate and expose the pathology.

This device aims to provide access to surgical pathology while minimizing damage to surrounding tissue, making it suitable for minimally invasive spinal surgery. The assembly allows for a controlled and safe approach during the surgical procedure.

Conclusions/action items:

Within this patent, the blade had multiple handles, so that would be something we would have to make sure we don't have. Overall, I don't see a lot of overlap with this patent so our main concern is that we don't need two handles or a mounting ring for our blade.

2023/11/02 ISO 15189 standard

Olivia Jaekle - Dec 12, 2023, 10:02 AM CST

Title: ISO 15189 standard

Date: 2023/11/02

Content by: Olivia Jaekle

Present: Olivia Jaekle

Goals: Learn about ISO 15189 standard to have the final design adhere to it

Link: https://www.iso.org/standard/76677.html

Cite: [1] 14:00-17:00, “ISO 15189:2022,” ISO. Accessed: Dec. 12, 2023. [Online]. Available: https://www.iso.org/standard/76677.html

Content:

ISO 15189:2022

Medical laboratories

Requirements for quality and competence

This document outlines the criteria for quality and proficiency in medical laboratories. It is intended for use by medical laboratories to develop their management systems and evaluate their competence. Additionally, it can be employed to verify or acknowledge the proficiency of medical laboratories by users, regulatory bodies, and accreditation entities. The scope of this document extends to point-of-care testing (POCT) as well.

Conclusions/action items:

We are using this standard for our operating environment criteria. it is important that the team works in a clean, steralized place. In conjunction with testing on pig kidney or chicken breast, the team will look at more standards that we must follow

2023/11/02 BS EN ISO 7153 Part 1

Olivia Jaekle - Dec 12, 2023, 10:10 AM CST

Title: ISO 7153-1:2016

Date: 2023/11/02

Content by: Olivia Jaekle

Present: Olivia Jaekle

Goals: Learn about ISO 7153-1:2016 for how blades are manufacutred in the medical device

Link: https://www.iso.org/standard/66850.html

Cite:

[1] 14:00-17:00, “ISO 7153-1:2016,” ISO. Accessed: Dec. 12, 2023. [Online]. Available: https://www.iso.org/standard/66850.html

Content:

ISO 7153-1:2016

Surgical instruments

Materials

Part 1: Metals

ISO 7153-1:2016 outlines the metals typically employed in the production of a range of standard surgical instruments, encompassing those utilized in general surgery, orthopaedics, and dentistry, among others.

While ISO 7153-1:2016 is not specifically designed for surgical instruments utilized in specialized applications like implantology and minimally invasive surgery, certain sections of the standard may still be relevant to these instruments.

Conclusions/action items:

We are using this standard for manufacturing blades. This standard gave us insight of how production level blades work and are dispersed. We can also talk to our client more about this when we might want to pursue mass manufacturing

2023/11/05 ISO 13485:2016

Olivia Jaekle - Dec 12, 2023, 10:20 AM CST

Title: ISO 13485:2016

Date: 2023/11/05

Content by: Olivia Jaekle

Present: Olivia Jaekle

Goals: Learn about ISO 13485:2016, the requirements for quality for medical devices

Link: https://www.iso.org/standard/59752.html

Cite: [1] 14:00-17:00, “ISO 13485:2016,” ISO. Accessed: Dec. 12, 2023. [Online]. Available: https://www.iso.org/standard/59752.html

Content:

ISO 13485:2016

Medical devices

Quality management systems

Requirements for regulatory purposes

ISO 13485:2016 outlines the criteria for a quality management system when an organization aims to demonstrate its capability in consistently delivering medical devices and related services that meet customer and relevant regulatory requirements. These organizations may be involved in various stages of the life cycle, such as design, development, production, storage, distribution, installation, servicing of medical devices, and the provision of associated activities like technical support. Suppliers or external parties offering product and quality management system-related services to such organizations can also use ISO 13485:2016.

The standard's requirements are applicable to organizations of any size and type, except when explicitly stated otherwise. When specified for medical devices, these requirements equally apply to associated services provided by the organization.

Processes mandated by ISO 13485:2016 that are relevant to the organization but not executed by the organization are its responsibility, and they are incorporated into the quality management system through monitoring, maintenance, and control.

If regulatory requirements permit excluding design and development controls, organizations can justify their exclusion from the quality management system. The responsibility lies with the organization to ensure that claims of conformity to ISO 13485:2016 accurately reflect any exclusions of design and development controls.

If a requirement in Clauses 6, 7, or 8 of ISO 13485:2016 is deemed inapplicable due to the organization's activities or the nature of the medical device under consideration, the organization is not obligated to include that requirement in its quality management system. The rationale for such inapplicability is recorded by the organization as described in 4.2.2.

Conclusions/action items:

We are using this standard to align our final design with required quality and regularity affairs. Overall, ISO 13485:2016 sets out standards for managing quality in organizations involved in the production and distribution of medical devices and related services, ensuring compliance with customer requirements and relevant regulations. The document emphasizes the organization's responsibility for all relevant processes, justifications for exclusions, and the recording of any inapplicable requirements.

2023/11/05 ISO 7740:1985

Olivia Jaekle - Dec 12, 2023, 10:32 AM CST

Title: ISO 7740:1985

Date: 2023/11/05

Content by: Olivia Jaekle

Present: Olivia Jaekle

Goals: Learn about ISO 7740:1985, requirements for detachable blades

Link:https://www.iso.org/standard/14579.html

Cite:[1] 14:00-17:00, “ISO 7740:1985,” ISO. Accessed: Sep. 27, 2023. [Online]. Available: https://www.iso.org/standard/14579.html

Content:

ISO 7740:1985

Instruments for surgery

Scalpels with detachable blades

Fitting dimensions

Specifies the measurements for two sizes of fitting components for detachable scalpel blades and the accompanying handles. This ensures precise fitting and interchangeability of detachable blades for scalpels produced by various manufacturers or in different countries. The transitional phase, facilitating a gradual adjustment to the fitting dimensions outlined in this standard, is anticipated to conclude by the year 1990.

Conclusions/action items:

We are using this standard to align our final design because we want the blade to be detachable from the coring tube. In general this standard is telling us that there are two main fittings used for detachable scalpel blades. WE will look into seeing if our dimensions can fit this criteria so that our blade may be able to used in different situations all around the world.

2023/11/15 CFR Title 21

Olivia Jaekle - Dec 12, 2023, 10:35 AM CST

Title: Code of Federal Regulations Title 21

Date: 2023/11/15

Content by: Olivia Jaekle

Present:

Goals: To familiarize myself with the code needed to be followed for the blade.

Content:

See attached link:

"CFR - Code of Federal Regulations Title 21," *www.accessdata.fda.gov*. https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/cfrsearch.cfm?fr=864.2240 (accessed Oct. 15, 2021).

The CFR Title 21, Volume 8, contains regulations that govern the design, manufacturing, labeling, and performance of medical devices, including surgical instruments like blades used in medical procedures. Compliance with these regulations is crucial to ensure the safety and efficacy of medical devices, protect the health and well-being of patients, and maintain the integrity of the healthcare system.

Conclusions/action items:

By following the regulations outlined in CFR Title 21, manufacturers of medical blades demonstrate their commitment to quality, safety, and regulatory compliance. This helps in obtaining FDA approval or clearance for the medical devices, and it provides assurance to healthcare professionals and patients that these products meet established standards for performance and safety. Non-compliance with these regulations can result in regulatory actions, including product recalls and legal consequences for the manufacturers.

2023/10/25 Ergonomics Survey

Olivia Jaekle - Dec 12, 2023, 6:23 PM CST

Title: How to conduct an ergonomics survey

Date: 2023/10/25

Content by: Olivia Jaekle

Present: Olivia Jaekle

Goals: Learn about ergonomics survey

Link: https://us.anteagroup.com/news-events/blog/7-steps-conducting-ergonomic-assessments-lower-risk-facilities

Cite:

[1] "7 Steps for Conducting Ergonomic Assessments in Lower-Risk Facilities," *Antea Group*. Available: https://us.anteagroup.com/news-events/blog/7-steps-conducting-ergonomic-assessments-lower-risk-facilities. [Accessed: Dec. 12, 2023]

Content:

An ergonomic assessment is a detailed study of how employees work to identify risks that can cause musculoskeletal disorders. The process involves:

1. Reviewing Existing Data: Analyzing past incidents and injuries to understand common issues and establish benchmarks.
2. Setting Assessment Methods: Creating a standardized assessment approach and using specific tools for consistent evaluation.
3. Gaining Ground-Level Insight: Visiting the workplace to observe, take notes, and engage with employees for firsthand information.
4. Engaging Employees: Conversing with workers, gathering feedback, and conducting surveys to understand their experiences and needs.
5. Collecting Objective Data: Using insights gathered to create a prioritized list of tasks and departments for evaluation.
6. Assessing and Prioritizing Risks: Analyzing data to identify hazards and mitigation opportunities, prioritizing them based on injury risk and potential severity.
7. Developing a Mitigation Plan: Creating an action plan with a team to address risks, setting timelines, defining success measures, and planning necessary resources and training.

Ultimately, implementing an effective ergonomics program involves a tailored approach that accounts for various workplace factors and engages all stakeholders in ensuring a safer work environment.

Conclusions/action items:

Overall, this can help our team understand how to start approaching an ergonomics survey. Ours would be very different because it would be about how our blades work in a clinical setting,but I think that it is important to think about all aspects of the blade. It is also important to make this survey quantitative (1-5) scale.

2023/10/26 Hardness Test

Olivia Jaekle - Dec 12, 2023, 6:43 PM CST

Title: How to check the hardness of metal: a complete guide

Date: 2023/10/26

Content by:Olivia Jaekle

Present:Olivia Jaekle

Cite:

[1]“7 Steps for Conducting Ergonomic Assessments in Lower-Risk Facilities,” *Antea Group*. Available: https://us.anteagroup.com/news-events/blog/7-steps-conducting-ergonomic-assessments-lower-risk-facilities. [Accessed: Dec. 12, 2023]

link: https://makeitfrommetal.com/how-check-the-hardness-of-metal-a-complete-guide/

Goals: Learn about hardness testing

Content:

Methods for Metal Hardness Testing:

1. Rockwell Testing Machine:
    - Process: Indentation measured by machine, using minor and major loads for accuracy.
    - Pros: Super accurate, common in machine shops, minimal surface prep.
    - Cons: Expensive, challenging for large/non-flat parts, leaves divot, won’t measure thin parts accurately.
2. Minimum Thickness for Rockwell Test: A chart detailing the minimum thicknesses required for accurate Rockwell testing at specific hardness levels.
3. Brinell Hardness Test:
    - Process: Using a ball bearing and hammer to create indents; outdated, inconsistent, and slower than Rockwell.
4. Microhardness Testing (Vickers and Knoop):
    - Vickers: Pyramid-shaped indenter, accurate but slow and requires a well-prepared surface.
    - Knoop: Diamond-shaped indenter, suitable for extremely hard/brittle materials.
5. Scleroscope or Leeb (Rebound Test):
    - Old method: Utilized a hammer's rebound; inaccurate but provided a general idea of hardness.
    - Modern version: More portable, less accurate but useful for quick assessments.
6. File Testing:
    - Concept: Checking if a tool is harder than the material by observing file behavior.
    - Pros: Easy yes/no check for approximate hardness; inexpensive and works effectively.

Author’s Preference: Prefers Rockwell for accuracy and file kits for quick checks, acknowledging the appropriateness of different methods for varied circumstances.

Conclusions/action items:

Out of all these tests, rockwell seems like the most accurate and most applicable to what we need. I will bring this info to the team to see what they think about testing the hardness of our blade, since we talk about it in the PDS. I will also talk to the TEAMlab to see if that have any suggestions on how we could conduct a hardness test.

2023/10/26 Autoclave Test

Olivia Jaekle - Dec 12, 2023, 6:50 PM CST

Title: Autoclave Test

Date: 2023/10/26

Content by:Olivia Jaekle

Present:Olivia Jaekle

Link: https://ehs.ucr.edu/sites/default/files/2019-04/autoclave_testing_packet_20150325.pdf

Cite: “Biosafety Manual,” Environmental Health & Safety. Available: https://ehs.ucr.edu/laboratory/biosafety-manual. [Accessed: Dec. 12, 2023]

Goals: Learn about how to autoclave and how our team can put this into a test for final design

Content:

Autoclave Testing Indicators:

- Physical Indicators: Pressure and temperature recording devices.
- Chemical Indicators: Change color after exposure to specific temperatures (e.g., temperature-sensitive tape).
- Biological Indicators: Bacillus stearothermophilus spores for testing the biological performance.

Introduction:

- Monthly biological spore testing on research autoclaves for biological waste, recorded on a monthly log.
- Obtain biological indicator ampules from Environmental Health and Safety.

Autoclave Testing Process:

- Use at least two spore ampules per cycle, labeled with date, autoclave number, etc.
- Place spore ampoules horizontally in a Biohazardous bag along with materials to be sterilized.
- Select and run an appropriate cycle for the load.
- Allow decompression and cooldown post-cycle.
- Retrieve spore test ampoules from the load.

Incubation Process:

- Incubate spore ampoules from the load and a control ampule in a microbiological incubator.
- Examine the ampoules after 8, 12, 18, and 24 hours for color changes.
- Yellow color indicates a failed test and positive bacterial growth.
- No color change means passing the test and proper sterilization.
- If a fail test is confirmed twice, discontinue use and inform appropriate personnel.
- For a passing test, proceed with regular use and record results in the log.
- Dispose of used Bacillus ampoules by autoclaving before discarding.

Conclusion:

The procedure ensures autoclave efficiency using physical, chemical, and biological indicators. Regular testing, proper documentation, and interpretation of indicator results are crucial for maintaining sterilization effectiveness and ensuring safe disposal of biological waste.

Conclusions/action items:

These steps were helpful, but not all applies to use because we are just steralizing metal. I will see what type of training I need to do to use an autoclave. I am going to reach out to Makerspace to see how they think we should look at a before and after for using an autoclave. AKA, how does one tell if an autoclave worked.

Indiv Design 1: Medtronic Inspired Heat Blade

Olivia Jaekle - Dec 12, 2023, 12:41 PM CST

Title: Medtronic Inspired Heat Blade

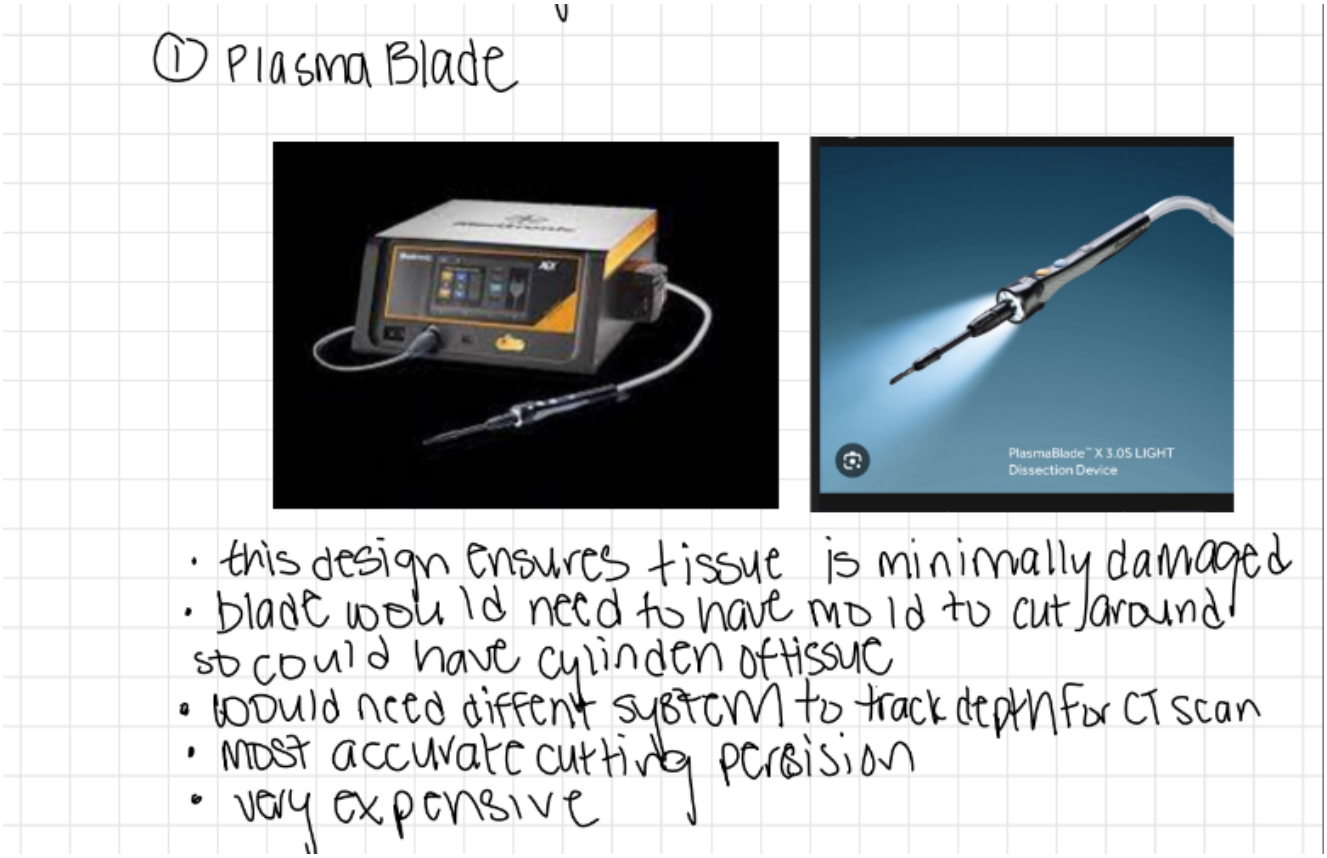
Date: 2023/9/26

Content by: Olivia Jaekle

Present: Olivia Jaekle

Goals: Design 1

Content:



Conclusions/action items:

This design is inspire by the Medtronic head blade. It is able to cut through tissue and becuase of its temp properties, can seal the tissue around the cut so that there is minimal tissue damage. The cons to this design is cost and would be difficult to create a cylinder because the blade is so small for percision. I will show this design to the team and see what they think of it.

Indiv Design 2: Wine Screw Blade

Olivia Jaekle - Dec 12, 2023, 12:39 PM CST

Title: Wine Screw Blade

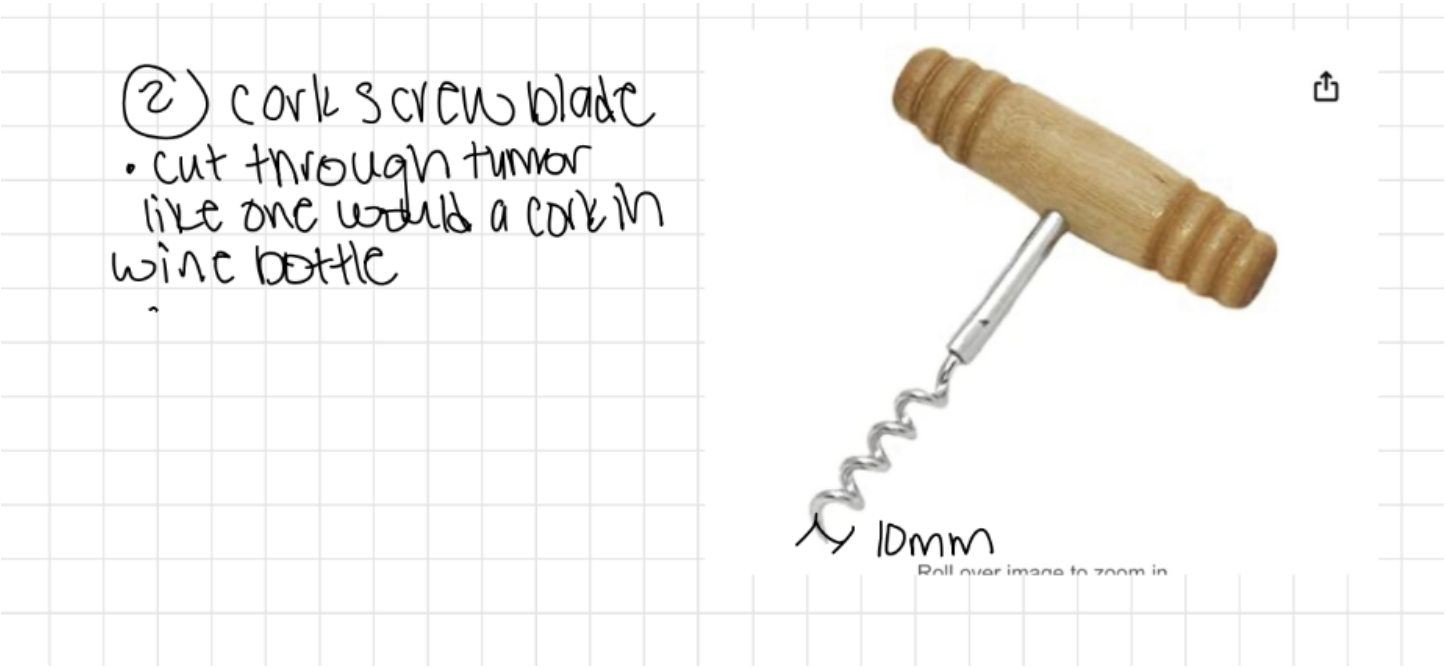
Date: 2023/9/26

Content by: Olivia Jaekle

Present: Olivia Jaekle

Goals: Design 2

Content:



Conclusions/action items:

This design was inspire by a wine screw. This device would be a twist device and the blade itself would be 10mm in diamter to be able to spin into the tissue and collect a cylinder sample within the spiral metal. The cons to this is it might cause a lot of damage on the surrounding tissue and the blade won't be easy to fabricate because of its spiral shape.

Tube Design 1: Teeth clamp

Olivia Jaekle - Dec 12, 2023, 12:50 PM CST

Title: Tube design: Teeth clamp

Date: 23/11/01

Content by: Olivia Jaekle

Present: Olivia Jaekle

Goals: Make new designs for the coring tube

Content:

This design would be have extrusions on one side, and same size cuts on the other side. This would allow both sides to the tube to lock in and create a more secure capsule for the resected tissue.

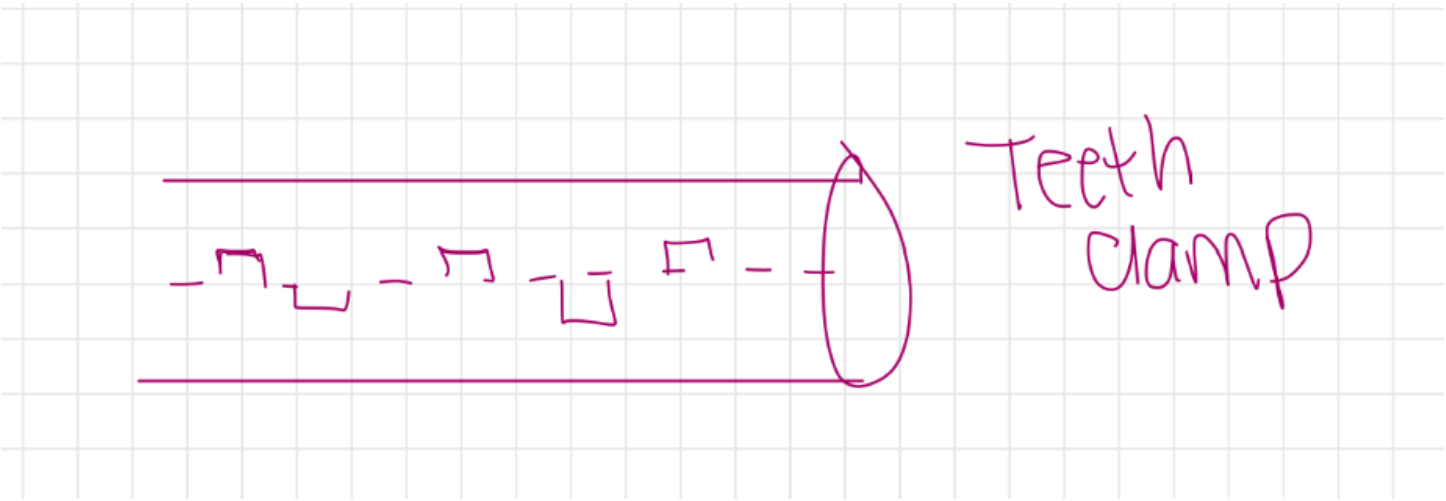


Figure 1: Teeth clamp design for coring tube

Conclusions/action items:

I think this design would be work really well because the teeth would keep the tube together. I also think this would cause minimal external damage because the teeth would be seamless, causing the outside of the tube to be smooth.

Tube Design 2: Graduated Cylinder Design

Olivia Jaekle - Dec 12, 2023, 1:00 PM CST

Title: Tube Design 2: Graduated Cylinder Design

Date: 23/11/05

Content by: Olivia Jaekle

Present: Olivia Jaekle

Goals: Create a tube design that could help with MRI and CT

Content:

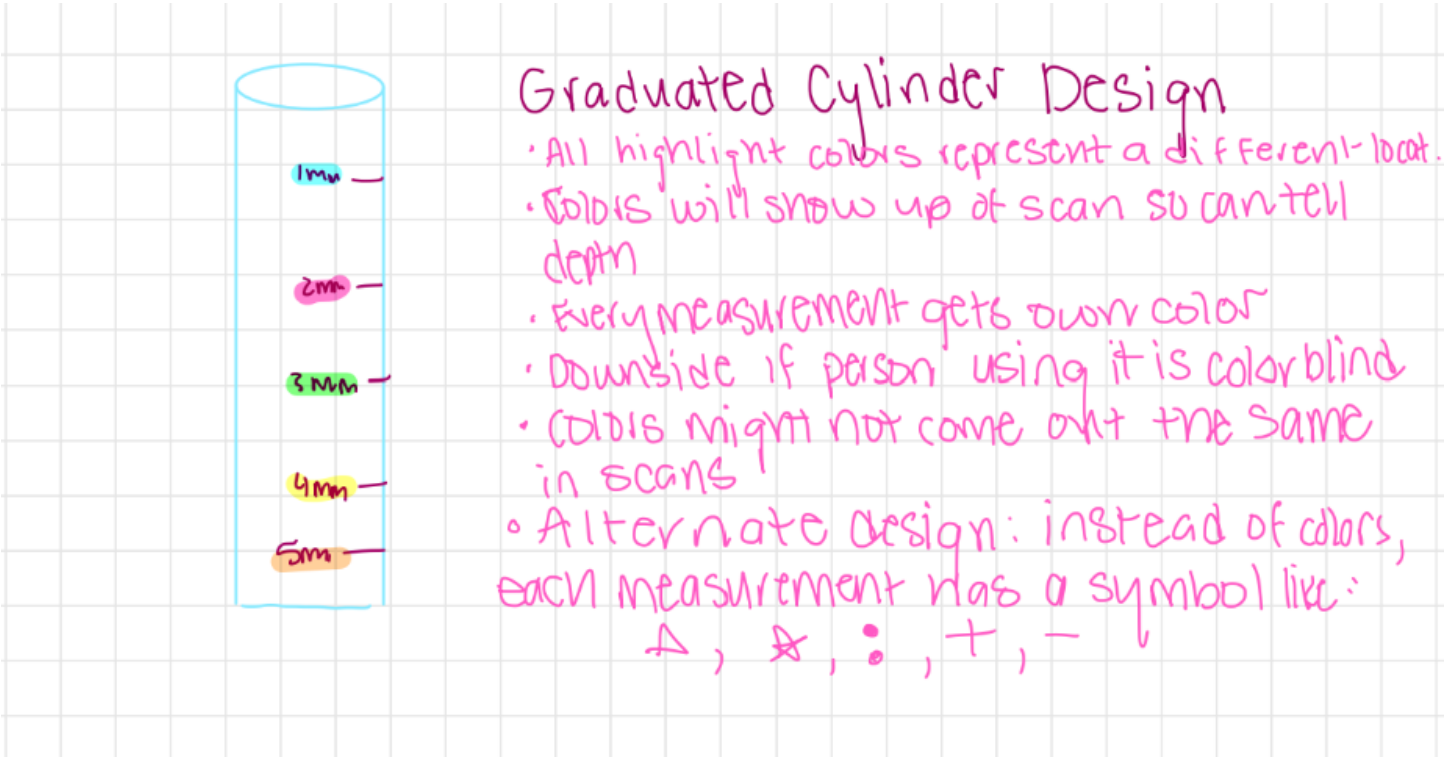


Figure 1: Graduated cylinder design

Conclusions/action items:

Overall, I think that this design would work well and be compatable with both MRI and CT because the symbols would be able to cast a shadow to see within the black and white MRI scans.

2022/2/9 Training Record- Chemical Safety and Biosafety Training

Olivia Jaekle - Feb 09, 2022, 9:39 PM CST

Title: Training Record

Date: 2022/2/9

Content by: Olivia Jaekle

Present: Olivia Jaekle

Goals: Showing that I have completed Biosafety Training and Chemical Saftey Training

Content:

WISCONSIN
UNIVERSITY OF WISCONSIN-MADISON

This certifies that Olivia Jaekle has completed training for the following course(s):

Course	Assignment	Completion	Expiration
Biosafety Required Training	Biosafety Required Training Quiz 2022	1/29/2022	
Chemical Safety: The OSHA Lab Standard	Final Quiz	1/25/2022	

Data Last Imported: 09/02/2022 09:30 PM

Conclusions/action items:

Make sure that these training stay updated and refer back to them when needed.

2022/2/19 Training Record-Green Permit

Olivia Jaekle - Feb 19, 2022, 5:09 PM CST

Title: Training Record- Green Permit

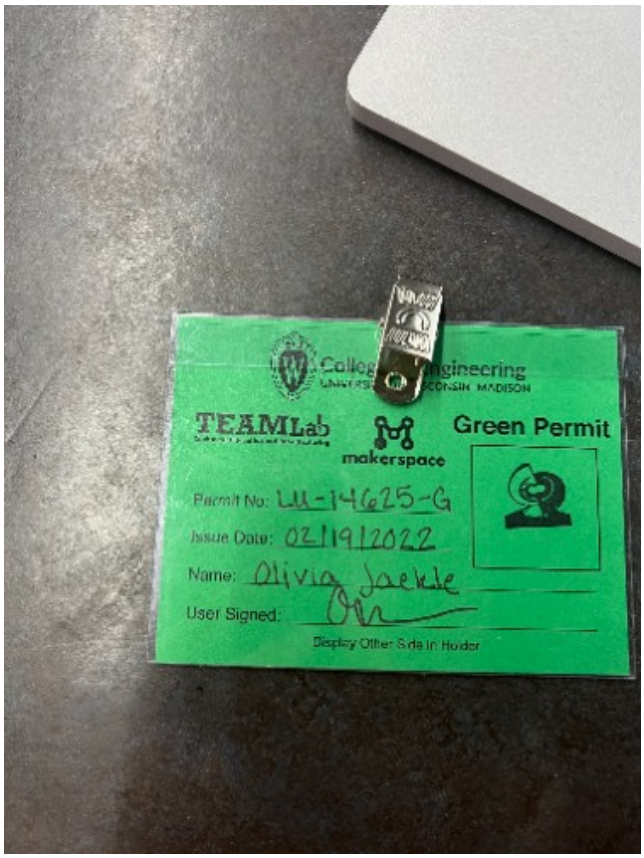
Date: 2022/2/19

Content by: Olivia Jaekle

Present: Olivia Jaekle

Goals: Showing that I have completed the Green Permit

Content:

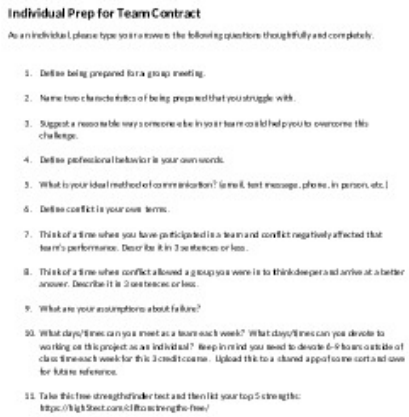


Conclusions/action items:

Make sure that this training stays updated and refer back to it when needed.

Individual Contract

Olivia Jaekle - Oct 11, 2023, 7:35 PM CDT



Individual Prep for Team Contract

As an individual, please type your answers the following questions thoughtfully and completely.

1. Define being prepared for a group meeting.
2. Name two characteristics of being prepared that you struggle with.
3. Suggest a reasonable way someone else in your team could help you to overcome this challenge.
4. Define professional behavior in your own words.
5. What is your ideal method of communication? (e-mail, text message, phone, in person, etc.)
6. Define conflict in your own terms.
7. Think of a time when you have participated in a team and conflict negatively affected that team's performance. Describe it in 3 sentences or less.
8. Think of a time when conflict allowed a group you were in to think deeper and arrive at a better answer. Describe it in 3 sentences or less.
9. What are your assumptions about failure?
10. What days/times can you meet as a team each week? What days/times can you devote to working on this project as an individual? Keep in mind you need to devote 6-9 hours outside of class time each week for this 3 credit course. Upload this to a shared app of some sort and save for future reference.
11. Take this free strengthsfinder test and then list your top 5 strengths: https://high5test.com/clifton-strengths-free/

Download

Individual_Prep_for_Team_Contract_1_.docx (13.9 kB)

2023/11/30 Training Record- Autoclave Safety

Olivia Jaekle - Dec 12, 2023, 6:05 PM CST

Title: Training Record

Date: 2023/11/30

Content by: Olivia Jaekle

Present: Olivia Jaekle

Goals: Showing that I have completed Autoclave Use safety course

Content:

WISCONSIN
UNIVERSITY OF WISCONSIN–MADISON

This certifies that Olivia Jaekle has completed training for the following course(s):

Course	Assignment	Completion	Expiration
Biosafety 106: Autoclave Use	Biosafety 106: Autoclave Use: Safety and Efficacy - Verification Quiz	12/12/2023	No Expiration
Biosafety Required Training	Biosafety Required Training Quiz 2022	1/29/2022	1/29/2027
Chemical Safety: The OSHA Lab Standard	Final Quiz	1/25/2022	

Data Last Imported: 12/12/2023 05:07 PM

Conclusions/action items:

Make sure that these training stay updated and refer back to them when needed.

2023/09/25 Individual Team Contract

Ellie Steger - Oct 11, 2023, 8:01 PM CDT

Title: Individual Team Contract

Date: 9/14/2023

Content by: Ellie Steger

Present: Ellie Steger

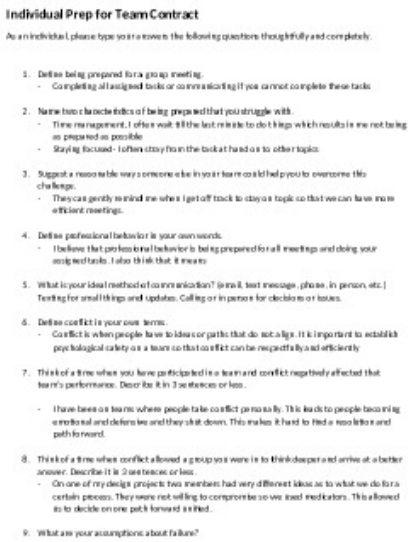
Goals: To evaluate what communication and conflict resolution styles I value in a team.

Content:

Individual Team contract prep is attached.

Conclusions/action items: Meet with the team to create a team contract for the project.

Ellie Steger - Oct 11, 2023, 8:01 PM CDT



Individual Prep for Team Contract

As an individual, please type your answers the following questions thoughtfully and completely.

1. Define being prepared for a group meeting.
   - Completing all assigned tasks or communicating if you cannot complete these tasks
2. Name two characteristics of being prepared that you struggle with.
   - Time management. I often wait till the last minute to do things which results in me not being as prepared as possible
   - Staying focused- I often stray from the task at hand or to other topics
3. Suggest a reasonable way someone else in your team could help you to overcome this challenge.
   - They can gently remind me when I get off track to stay on topic so that we can have more efficient meetings.
4. Define professional behavior in your own words.
   - I believe that professional behavior is being prepared for all meetings and doing your assigned tasks. I also think that it means
5. What is your ideal method of communication? (email, text message, phone, in person, etc.)
   Texting for small things and updates. Calling or in person for decisions or issues.
6. Define conflict in your own terms.
   - Conflict is when people have to ideas or paths that do not align. It is important to establish psychological safety on a team so that conflict can be respectfully and efficiently
7. Think of a time when you have participated in a team and conflict negatively affected that team's performance. Describe it in 3 sentences or less.
   - I have been on teams where people take conflict personally. This leads to people becoming emotional and defensive and they shut down. This makes it hard to find a resolution and path forward.
8. Think of a time when conflict allowed a group you were in to think deeper and arrive at a better answer. Describe it in 3 sentences or less.
   - On one of my design projects two members had very different ideas as to what we do for a certain process. They were not willing to compromise so we used mediators. This allowed us to decide on one path forward as a team.
9. What are your assumptions about failure?

Download

Individual_Prep_for_Team_Contract_AutoRecovered_.docx (17.1 kB)

2023/09/14- Tissue marker migration after MRI-guided breast biopsy: Migration frequency and associated factors

Ellie Steger - Sep 15, 2023, 11:24 AM CDT

Title: Tissue marker migration after MRI-guided breast biopsy: Migration frequency and associated factors

Date: 9/14/2023

Content by: Ellie Steger

Present: Ellie Steger

Goals: To gain a greater understanding of risks associated with the tissue marking clip

Content:

- Tissue marker placement at the time of breast biopsy is recommended, regardless of modality, as it allows for accurate localization in cases requiring surgical excision

- Studies have shown that the clip has a migration of >10 mm in 5%-29% of biopsies which can result in less accurate localization of the biopsy site

- As the breast is released from compression after biopsy, the tissue marker can migrate along the direction of compression alone the needle track as the breast expands to its original shape, known as the accordion effect.

Conclusions/action items:

Must bring this up with the client if we need to consider this when creating a prototype. Look into what materials are least likely to migrate.

Ellie Steger - Sep 15, 2023, 11:40 AM CDT

Funaro, K., Prather, A., Niell, B., & Jared Weinfurtner, R. (2020). Tissue marker migration after MRI-guided breast biopsy: Migration frequency and associated factors. *The Breast Journal*, *26*(3), 440–445. https://doi.org/10.1111/tbj.13486

2023/09/15- A plea for the biopsy marker: how, why and why not clipping after breast biopsy?

Ellie Steger - Oct 11, 2023, 3:19 PM CDT

Title: A plea for the biopsy marker: how, why and why not clipping after breast biopsy?

Date: 9/15/2023

Content by: Ellie Steger

Present: Ellie Steger

Goals:

Content:

1. Intro

- Biopsy clips are essential for marking and locating breast lesions after biopsy procedures.

- They serve various purposes, including correlation across imaging modalities and guiding surgical resection.

2. Types of Markers

- Biopsy clips are categorized into commercial metallic markers, the "Montreal technique" using titanium clips, and markers with embedding materials.

- Clips with embedding materials offer advantages like stability and hemostatic effects.

3. Why Not Clipping?

- Breast clips are generally safe, with minimal reports of allergic reactions.

- Clip migration can occur due to factors like the "accordion effect," hematoma formation, and the time interval between biopsy and post-biopsy mammography.

- Monitoring and documenting clip position is crucial for addressing clip migration.

4. Biopsy Clips and the MRI Environment

- Metallic clips are stable in MRI environments.

- Clips can introduce susceptibility artifacts in imaging, affecting fat suppression and spectroscopy.

- Using materials with lower susceptibility artifacts may improve breast MR spectroscopy.

5. Biopsy Clips and Spectroscopic Analysis

- Metallic clips can introduce inhomogeneities affecting local fat suppression, potentially impacting spectroscopic analysis.

- The type of clip used can vary in terms of its impact on spectroscopy.

6. Stability of Biopsy Clips

- Some cases have reported the formation of metallic fragments near surgical clips, potentially leading to misclassification as suspicious calcifications.

- Collagen-based markers can lead to microcalcifications and should be specified for accurate diagnosis.

7. Biopsy Clips at Histopathological Analysis

- Collagen-plug components of certain markers may resemble local amyloidosis, necessitating clear specification of clip types.

8. Intraoperative Loss of Metallic Clips

- Intraoperative loss of metallic clips is rare but can pose challenges if not documented.

- Lost clips may need further examination or diagnostic mammography.

Conclusions/action items: Biopsy clips play a crucial role in breast diagnostics, surgical planning, and oncological management.

2023/9/26- Renal cell carcinoma: an overview of the epidemiology, diagnosis, and treatment

Ellie Steger - Oct 11, 2023, 11:21 AM CDT

Title: Renal cell carcinoma: an overview of the epidemiology, diagnosis, and treatment

Date: 9/14/2023

Content by: Ellie Steger

Present: Ellie Steger

Goals: To understand background on renal cell carcinoma.

Content:

- Kidney cancer is the cause of 5% of malignancies and is the sixth most common cancer in men

- Renal cell carcinoma (RCC) is the most common type of urogenital cancer

- It has a mortality rate of 30- 40% and is more commonly seen in men than women

- other risk factors of RCC include obesity, hypertension, smoking, and chronic kidney disease

- According to the Global Cancer Statistics in 2020, the incidence and mortality of kidney cancer were 431,288 and 179,368, respectively

- Heterogenous disease that may originate from different cells throughout the nephrons.

- 50% of cases are found accidentally during random detection

- Nephrectomy has been the standard of care for kidney tumors. where the whole kidney is removed

Conclusions/action items: This research backs up the project's significance, the high mortality rate and prominence prove how necessary this device is. It makes sense that the client needs to see the 3D location of the markers because the disease is heterogenous and how being aware of what areas to look could increase detection.

Ellie Steger - Oct 11, 2023, 10:04 AM CDT

S. Bahadoram *et al.*, “Renal cell carcinoma: an overview of the epidemiology, diagnosis, and treatment,” *Giornale Italiano di Nefrologia*, Jun. 2022. doi:35819037

2023/10/6- CT Textural Analysis of Large Primary Renal Cell Carcinomas: Pretreatment Tumor Heterogeneity Correlates With Histologic Findings and Clinical Outcomes

Ellie Steger - Oct 11, 2023, 2:33 PM CDT

Ellie Steger - Oct 11, 2023, 3:03 PM CDT

Title: CT Textural Analysis of Large Primary Renal Cell Carcinomas: Pretreatment Tumor Heterogeneity Correlates With Histologic Findings and Clinical Outcomes

Date: 10/6/2023

Content by: Ellie Steger

Present: Ellie Steger

Goals: To understand the process of CT texture analysis and its applications to primary renal cell carcinomas through a paper written by our client.

Content:

- CT texture analysis was performed on large (> 7 cm; mean size, 9.9 cm) untreated RCCs in 157 patients (52 women and 105 men; mean age, 60.3 years)

- Patients with renal cell carcinoma (RCC) who have large primary tumors are more likely to have metastatic disease at initial presentation and an increased risk of metastases developing after treatment

- Large RCC tumors exhibit genetic and pathologic heterogeneity, leading to sampling errors during biopsy.

- CT and MRI are standard for staging RCC before treatment options are considered.

- Texture analysis, particularly CT texture analysis, is emerging as a valuable tool for characterizing RCC tumors.

- It may aid in determining histologic cell type, nuclear grade, and predicting survival for large RCCs.

- Texture features have shown associations with pathologic subtypes, genetic profiles, and clinical outcomes across various tumor types.

- Texture analysis reveals spatial information in tumor microenvironments, possibly linked to tumor metabolism, hypoxia, and angiogenesis

- Clear cell RCC is associated with specific genetic mutations and angiogenesis. Sarcomatoid features indicate high-grade malignancy and a worse prognosis.

Conclusions/action items: I now understand how the CT textural analysis methods work and why they are effective. This context now makes more sense how the whole procedure is done.

Ellie Steger - Oct 11, 2023, 3:05 PM CDT

M. G. Lubner, N. Stabo, E. J. Abel, A. M. del Rio, and P. J. Pickhardt, “CT textural analysis of large primary renal cell carcinomas: Pretreatment tumor heterogeneity correlates with histologic findings and clinical outcomes,” *American Journal of Roentgenology*, vol. 207, no. 1, pp. 96–105, 2016. doi:10.2214/ajr.15.15451

2023/10/20- MR visible localization device for radiographic-pathologic correlation of surgical specimens

Ellie Steger - Dec 13, 2023, 7:38 PM CST

Title: MR visible localization device for radiographic-pathologic correlation of surgical specimens

Date: 10/20/2023

Content by: Ellie Steger

Present: Ellie Steger

Goals: To understand how to see spacial dimensions in MR images.

Content:

- Abstract and Purpose

  - Challenges exist in detecting small hepatic lesions identified by preoperative imaging.

  - An MRI compatible localization device was developed for ex vivo imaging to improve identification and localization of hepatic lesions.

- Materials and Methods

  - The device includes stationary and removable MR-visible grids lined with silicone gel, forming a 3D matrix.

  - Five swine liver specimens with lesions created by microwave ablation were imaged using this device.

  - Two readers independently evaluated the lesions for size and coordinates, correlating them with MR imaging-guided sectioning.

- Results

  - All lesions were accurately detected and localized.

  - There was a high inter-reader agreement (0.92) for lesion localization.

  - MRI estimations of lesion size closely matched the actual size in cut specimens.

- Conclusion

  - The MR compatible device was feasible for detecting and localizing liver lesions ex vivo.

  - It has the potential to improve the examination of surgical specimens, particularly in cases where pathologic correlation is crucial.

- Introduction

  - Identifying small parenchymal lesions in surgical specimens is difficult due to deformation and orientation changes after resection.

  - Standard pathologic methods may miss lesions, and there is a need for better radiographic-pathologic correlation.

- Materials and Methods

  - Detailed description of the device, including its construction, use of alginate for stabilization, and MR imaging protocol.

  - The device allows for precise 3D localization and measurement of lesions.

  - Lesions in swine liver specimens were analyzed by radiologists and then correlated with pathologic findings.

- Discussion

  - The device allows for more accurate comparison between MR images and pathologic assessments.

  - It could increase the sensitivity of pathologic exams and reduce examination time.

  - Potential applications for other specimen types, like pancreas or kidneys, are noted.

- Conclusions

  - The device successfully demonstrated high accuracy in lesion detection and localization in liver specimens.

  - Its use in clinical settings could significantly improve radiographic-pathologic correlation.

Conclusions/action items:

The successful development and testing of the MRI-compatible localization device demonstrate its potential to significantly improve the detection and precise localization of small hepatic lesions in ex vivo surgical specimens, offering a substantial advancement in radiographic-pathologic correlation. This device should be considered for broader clinical implementation, particularly in cases involving hepatic resections, to enhance the accuracy of pathological examinations and ensure no small lesions are missed. Future research should focus on extending the application of this technology to other organ specimens, such as the pancreas and kidneys, and optimizing MRI scanning parameters for various tissue types and diseases to maximize its clinical utility.

2023/12/06 Perirenal Adipose Tissue

Ellie Steger - Dec 13, 2023, 7:27 PM CST

Title: Perirenal Adipose Tissue—Current Knowledge and Future Opportunities

Date: 12/6/2023

Content by: Ellie Steger

Present: Ellie Steger

Goals: To understand the importance and composition of the perirenal fat surrounding the kidney when it is resected.

Content:

- perirenal adipose tissue (PRAT)

-PRAT is vital for cardiovascular and kidney homeostasis, comprising white and brown adipocytes, predipocytes, nerve endings, vascular structures, and inflammatory cells.

- It plays a significant role in the development of hypertension, obesity, chronic renal diseases, and tumor progression.

- PRAT acts as an endocrine organ, influencing obesity, renal, and cardiovascular diseases.

- Located around the kidney and adrenal gland, PRAT has specific features in terms of vascularization and innervation.

- It produces various adipokines and cytokines, regulating renal function and potentially impacting local tumor invasion.

- PRAT shows a mix of white and brown adipocytes, with gender-dependent morphological differences and potential for 'browning' or activation of brown adipocytes.

- **Impact on Chronic Renal Pathology:** PRAT's size correlates with kidney damage, influencing renal function and potentially contributing to renal pathologies.

- **Role in Metabolic and Cardiovascular Diseases:** Excessive PRAT is linked to increased cardiovascular risk, hypertension, and metabolic disorders like insulin resistance and dyslipidemia.

- PRAT might support tumor growth and progression, particularly in renal and ovarian cancers.

- Current studies focus on the molecular mechanisms of PRAT, its involvement in diseases, and potential therapeutic targets in obesity, renal, cardiovascular, and cancer therapies.

Conclusions/action items: We must take into account the balance between different tissue types when creating a phantom to mimic the perirenal fat. Also we must take into account the thickness of the fat surrounding the kidneys as this is thickened due to tumor formation.

2023/9/26- Punch Biopsy of the Skin

Ellie Steger - Oct 10, 2023, 9:03 PM CDT

T. J. Zubner, “Punch Biopsy of the Skin,” *American Family Physician*, p. 1167, Mar. 2002. doi:1155-1158

Ellie Steger - Oct 10, 2023, 9:32 PM CDT

Title: Punch Biopsy of the Skin

Date: 9/26/2023

Content by: Ellie Steger

Present: Ellie Steger

Goals: To understand how punch biopsies work to apply the concepts for our new designs.

Content:

- Punch biopsies are the primary technique for punch biopsies

- Yeilding a 3 to 4 mm cylindrical core of tissue sample

- Stretching the skin perpendicular to the lines of least skin tension before the incision results in an elliptical-shaped wound

- performed using a circular blade or trephine attached to a pencil-like handle

- rotated down through the epidermis and dermis, and into the subcutaneous fat.

- Punch biopsy is a simple technique to learn and perform

Conclusions/action items:

It seems as though mimicking a punch biopsy that can go deeper would be a viable blade design. This blade would be rotated through the tumor. Some potential downfalls with this device may be the fact that the biopsy will not come out with the blade when removed.

2023/10/11- Fabrication of a silicon micro-scalpel with a nanometer cutting edge

Title: Fabrication of a silicon micro-scalpel with a nanometer cutting edge

Date: 10/11/2023

Content by: Ellie Steger

Present: Ellie Steger

Goals: Scaples are very shard and medical grade. Want to see if there are any relevant fabrication techniques

Content:

Introduction:

- The need for extremely sharp, cost-effective micro-scalpels for less invasive surgical procedures and research on micro-biological entities.

- Current micro-scalpels are made of diamond, which can be expensive and have limited sharpness.

- The article introduces a silicon-based "throw away" micro-scalpel that can be fabricated using CMOS processes and offers precise control over dimensions in the nanometer range.

Device Fabrication:

- A simple single-mask fabrication process is described for batch production of silicon micro-scalpels.

1. It starts with a (100) silicon wafer that is thermally oxidized to 1 micron in thickness.

2. Positive photoresist (AZ1518) is applied to the oxide surface and patterned using lithography to define the scalpel's width, length, and blade orientation relative to silicon crystal planes.

3. Reactive ion etching (RIE) is used to etch the silicon wafer to the oxide interface, using the photoresist pattern as a mask.

4. After removing the photoresist, deep reactive ion etching (DRIE) is performed to define the scalpel's depth and create silicon pillars.

5. The oxide mask is removed, and selective epitaxial silicon is grown, forming the top facets and cutting edge, as well as blade facets and side cutting edges.

- The process results in exceptionally smooth and sharp features, which help prevent the tearing of cells or tissues during cutting.

- Scalpels with various dimensions (widths, lengths, depths) can be fabricated.

Experimental Results:

- Silicon micro-scalpels have been produced with a cutting edge of 100 nm or less and a root-mean-square (RMS) surface roughness of around 1 Å.

- Different pillar geometries have been explored to produce various structures.

- The fabricated scalpels are being tested on nerve and ocular tissue by researchers, demonstrating their potential in medical applications.

Conclusions/action items: Look through resources available at UW Madison for selective silicon epitaxy. This could be a viable option for the fabrication of our blade to make it incredibly sharp.

Ellie Steger - Oct 11, 2023, 3:28 PM CDT

G. W. Neudeck, J. P. Denton and M. E. Stidham, "Fabrication of a silicon micro-scalpel with a nanometer cutting edge," *Proceedings of the 15th Biennial University/Government/ Industry Microelectronics Symposium (Cat. No.03CH37488)*, Boise, ID, USA, 2003, pp. 304-307, doi: 10.1109/UGIM.2003.1225749.

2023/10/11- Materials for Fabrication

Ellie Steger - Oct 11, 2023, 7:08 PM CDT

Title: Material Decision

Date: 10/11/2023

Content by: Ellie Steger

Present: Ellie Steger

Goals: To decide on a material to use for fabrication.

Content:

- We decided on a thickness of .5mm

- We discovered that there are no prefabricated tubes with this thickness

- The best option is from Grainger and is the following 12x12 sheet of stainless steel with 0.022 thickness:

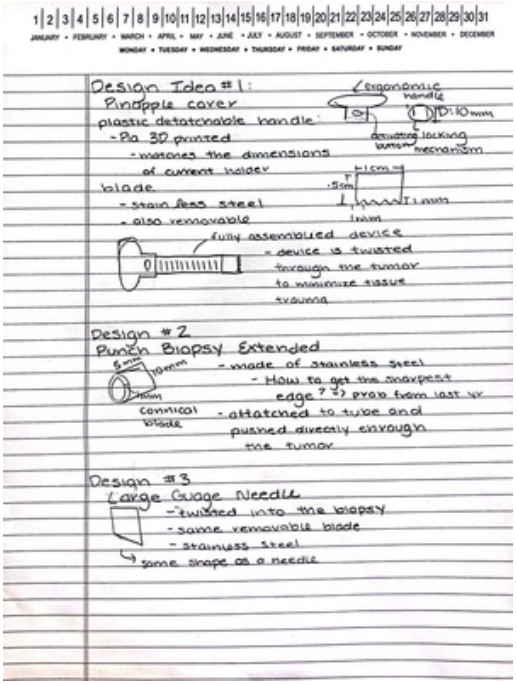
https://www.grainger.com/product/GRAINGER-APPROVED-Stainless-Steel-Sheet-304-796XT3

- We will fabricate this into a circular blade.

Conclusions/action items: Meet with the team lab to see the best fabrication plan.

2023/9/29 Preliminary Design Ideas

Ellie Steger - Oct 10, 2023, 7:48 PM CDT



Download

PrelimDesignIdeas.JPG (774 kB)

Ellie Steger - Oct 10, 2023, 9:12 PM CDT

Title: Preliminary Design Ideas

Date: 9/29/2023

Content by: Ellie Steger

Present: Ellie Steger

Goals: Create design ideas for a blade prototype

Content:

Three design ideas: Large Gauge needle, Punch Biopsy Extended, Pineapple Corer

Conclusions/action items: Going to present the ideas to the team in order to decide on a way forward through creating a design matrix.

2023/11/05 Coring Tube Designs

2023/12/07 Icons for MRI Compatibility

Ellie Steger - Dec 13, 2023, 8:08 PM CST

Title: Icons for MRI Compatibility

Date: 12/6/2023

Content by: Ellie Steger

Present: Ellie Steger

Goals: To create a sampling tube design that is MR-compatible.

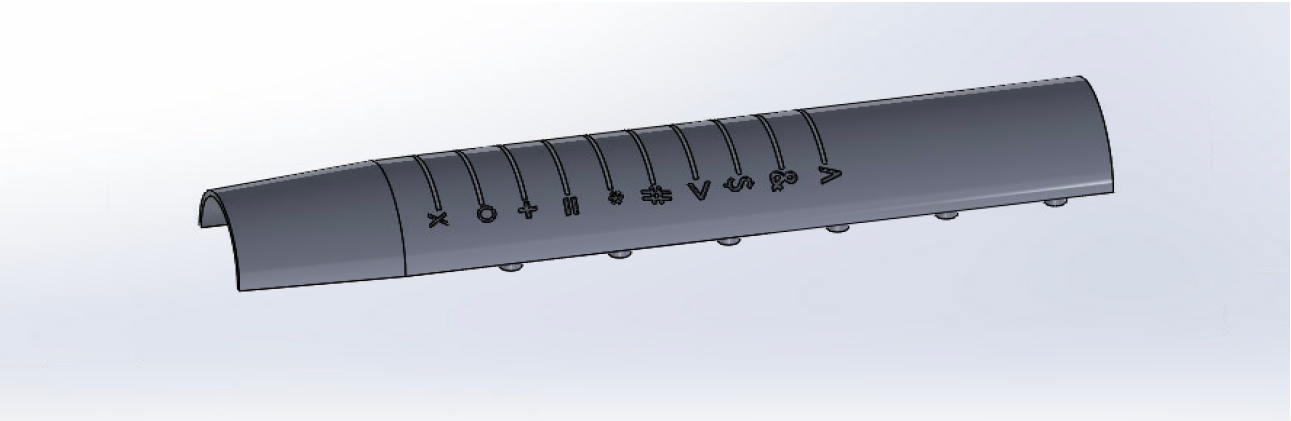
Content:

The client mentioned that markers are inserted into the tumor to cast shadows on the MR images. Taking inspiration from this the team came up with the idea to create embossed icons on our sample tubes that will cast a shadow on the images allowing for location in a 3D space.

I have attached the SolidWorks for the design on solidworks. This design features 10 icons embossed next to each of the slits that are spaced .5 cm apart.

Conclusions/action items: I believe that this is a feasible design to cast shadows and create

Ellie Steger - Dec 13, 2023, 8:09 PM CST



2022/03/11 Green Permit

Ellie Steger - Oct 22, 2023, 5:34 PM CDT

Title: Green Permit Training

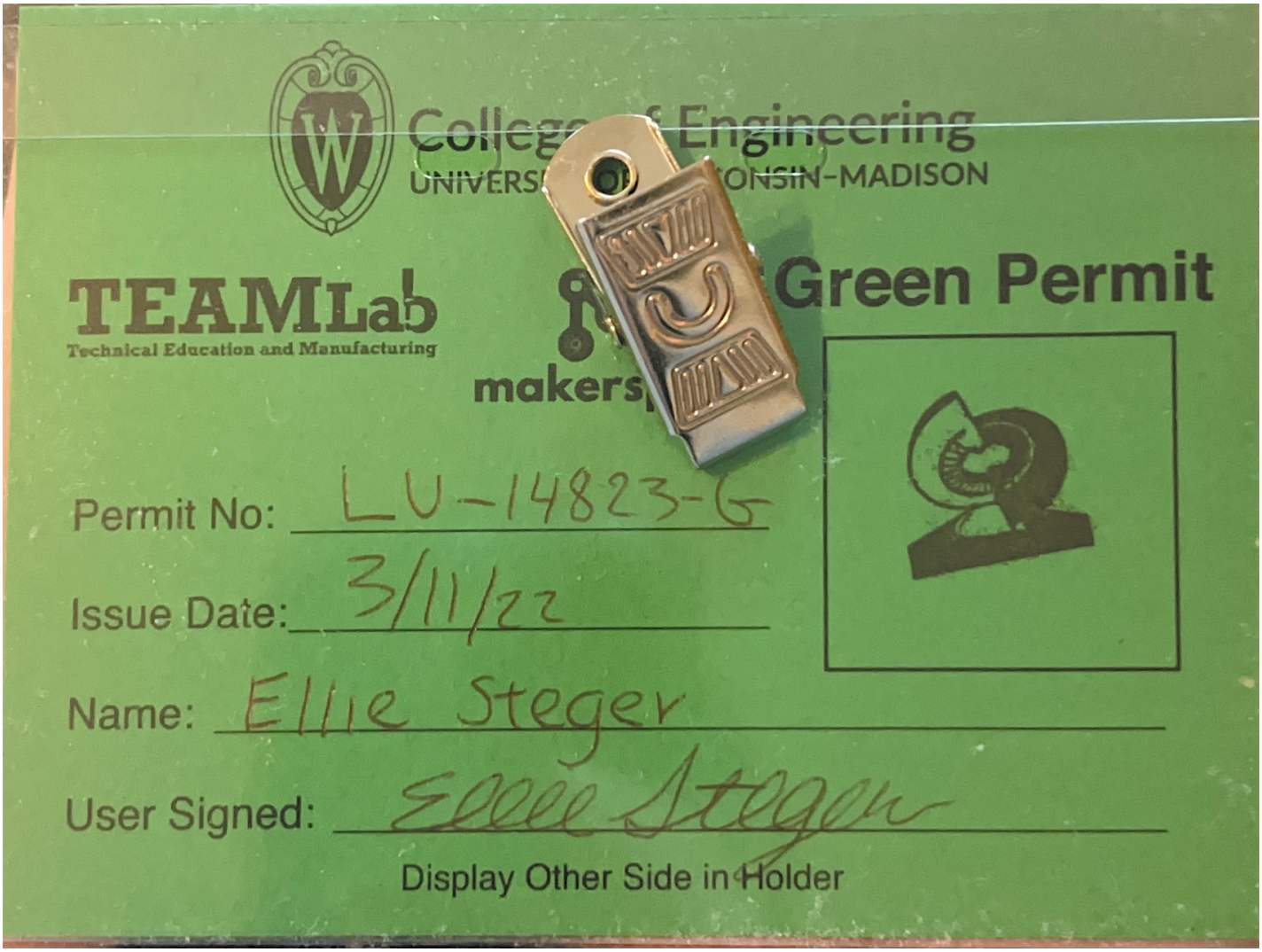
Date: 3/11

Content by: TeamLAB

Present: In-Person

Goals: Obtain Green permit in order to be able to use the mill and lathe to assist the team in the fabrication of the blade.

Content:



Conclusions/action items:

We know can move forward in making the sample holder by using the mill independently.

2022/01/21 Biosafety and Chemical Safety Training

Ellie Steger - Oct 22, 2023, 5:36 PM CDT

Title: Biosafety and Chemical Safety Training

Date: 1/21

Content by: N/A

Present: Canvas

Goals: To have the OSHA lab standard training as well as biosafety training in order to safely work in the lab.

Content:

Training Information Lookup Tool **University of Wisconsin-Madison**

WISCONSIN
UNIVERSITY OF WISCONSIN-MADISON

This certifies that Ellie Steger has completed training for the following course(s):

Course	Assignment	Completion	Expiration
Biosafety Required Training	Biosafety Required Training Quiz 2022	1/21/2022	
Chemical Safety: The OSHA Lab Standard	Final Quiz	1/21/2022	

Data Last Imported: 03/20/2022 01:51 PM

Conclusions/action items:

To create the biomaterial in the tissues lab safely.

Ellie Template

Ellie Steger - Sep 15, 2023, 11:25 AM CDT

Title:

Date: 9/14/2023

Content by: Ellie Steger

Present: Ellie Steger

Goals:

Content:

Conclusions/action items:

2014/11/03-Entry guidelines

John Puccinelli - Sep 05, 2016, 1:18 PM CDT

Use this as a guide for every entry

- Every text entry of your notebook should have the **bold titles** below.
- Every page/entry should be **named starting with the date** of the entry's first creation/activity, subsequent material from future dates can be added later.

You can create a copy of the blank template by first opening the desired folder, clicking on "New", selecting "Copy Existing Page...", and then select "2014/11/03-Template")

Title: Descriptive title (i.e. Client Meeting)

Date: 9/5/2016

Content by: The one person who wrote the content

Present: Names of those present if more than just you (not necessary for individual work)

Goals: Establish clear goals for all text entries (meetings, individual work, etc.).

Content:

Contains clear and organized notes (also includes any references used)

Conclusions/action items:

Recap only the most significant findings and/or action items resulting from the entry.

2014/11/03-Template

EMILY WHEAT - Oct 05, 2023, 9:25 PM CDT

Title:

Date:

Content by:

Present:

Goals:

Content:

Conclusions/action items: