Radiologic Pathologic Correlation in Renal Cell Carcinoma

Date: 2024/03/07

Client: Dr. Meghan Lubner
Advisor: Dr. Tracy Puccinelli

Team:
Ellie Steger (Team Leader)

Erin Schlegel (Communicator)

Emily Wheat (BWIG)

Olivia Jaekle (BPAG)

Aleks Skutnik (BSAC)

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 cross-section from an ex-vivo kidney tumor without causing damage to the overall tissue sample. Currently, the resection device used is too blunt and thick to effectively extract tissue without causing surrounding areas to be damaged and un-imageable on CT. By creating a new blade design, the pathologist can preserve the extracted tumor during the coring process. In maintaining the integrity of the tumor, the pathologist will be able to accurately correlate CT image markings and findings with their location in the patient sample.

Brief status update

The team successfully reprinted the coring tube with modifications to the outer diameter as the client specified in order to minimize tissue damage. Slits were added to the coring tube to allow scoring of the collected tissue as the client requested. The team also completed the required 400 outreach activity at Harvest Intermediate School this past week, sharing insights on biomedical engineering to future generations via a prosthetic hand creating activity.

Difficulties / advice requests

The team has had trouble with 3d printing the new solidworks this week. We have completed a successful print, however, we will continue to tweak the solidworks for reproducibility.

Current design

Our current design is our final design from the fall semester, which can be found here: https://bmedesign.engr.wisc.edu/projects/f23/coring_device.

Materials and expenses

Item	Description	Manufacturer	Quantity	Cost
Trephine Blade	AM0570S 100- 10mm d	Miro surgical	1	$92.71
Coring Tube	Biomed clear resin	Makerspace	1	$11.50
Coring Tube	Biomed clear resin	Makerspace	1	$12.75
Coring Tube	Biomed clear resin	Makerspace	1	$8.95
Coring Tube	Biomed clear resin	Makerspace	1	$11.04

Major team goals for the next week

1. Test our finalized coring tube on Pig kidneys
2. Document and analyze testing results
3. Experiment with UV Curing

Next week's individual goals

- Aleks Skutnik
  - Complete tissue damage testing on pig kidneys with the testing team
  - Begin analyzing testing results
- Emily Wheat
  - Complete tissue damage testing on pig kidneys
  - Update website
  - Begin analyzing testing results and adding to final report
- Erin Schlegel
  - Reprinted cording device tube to include a smaller diameter and smaller diameter.
- Olivia Jaekle
  - Complete tissue damage testing on pig kidneys
  - Analyze testing
- Ellie Steger
  - Consult makerspace to see best printing orientation
  - Compare UV cured tube with non-cured

Timeline

Task	Feb				March					April				May	
	2	9	16	23	1	8	15	22	29	5	12	19	26	3	10
Project R&D															
Coring Device Prototyping		X	X	X	X	X									
Blade Prototyping		X													
Packaging Prototyping															
Compatability Testing					X	X									
Final Device Testing															
Testing Analysis															
Deliverables															
Prelim Report				X											
User Manual				X											
Maintenance Instructions				X											
Service Instructions				X											
Safety Precautions															
Final Poster															
Final Report															
Meetings															
Client		X		X	X	X									
Advisor	X	X	X	X	X	X									
Website															
Update	X	X	X	X	X	X									

Filled boxes = projected timeline
X = task was worked on or completed

Previous week's goals and accomplishments

- Week 7 Goals:
    a. Have a finalized print of the coring tubes with slits
        - Done
    b. Test our finalized coring tube on Pig kidneys
        - Will complete testing Friday 3/15
    c. Document and analyze testing results
- Week 6 Goals:
    a. Our goal is to complete testing with Dr. Lubner at UW Health

        - Our testing proved succesful
    b. The team also needs to finalize and standardize our prototype
        - The final iteration of our tube is currently printing
    c. The team will also document all of our results from testing
- Week 5 Goals:
    a. One goal is to verify that the adjustments to the coring tubes's printing setup are effective.
        - Our final iteration is currently printing
    b. Another goal we have is to verify that we will be submitting to Medical Devices: Evidence and Research and format our prelim report accordingly.
        - We have decided to switch our Journal to BMC Medical Research Methodologies
    c. Lastly, our team will complete the preliminary report with user manual, service manual and safety hazard outlines attached.
- Week 4 Goals:
    a. Finalize coring tube design and meet with Sylvana
        - Met with Sylvana and established new printing criteria
    b. Finalize testing protocol documents
    c. Begin compatibility testing between the blade and the coring device
        - The new coring device will be ready for testing for next week
- Week 3 Goals:
    a. Present our preliminary presentation
        - The team presented our presentation to our advisor
    b. Create testing protocols to compare the purchased circular trephine blade to the blade we fabricated last semester
        - After consultation with our advisor the team has shifted our plans to move forward with the trephine blade with comparison testing
    c. Create a final solidworks file for the coring device
- Week 2 Goals:
    1. Meet with advisor to discuss preliminary presentation
    2. Practice and present preliminary presentation
        a. The team will present on 2/9
    3. Set up payment plan and order premade blades
        a. The team ordered the blades
- Week 1 Goals:
    1. Set up the team notebook, meet with client,
        a. The team was able to successfully create a Lab Archives notebook and meet with our client.