

Veterinary bone marrow aspirate models

Date: 10/24/2024

Client: Dr. McLean Gunderson

Advisor: Prof. Randy Bartels

Team:

- Avery Schuda - Co-Leader - aschuda@wisc.edu
- Helene Schroeder - Co-Leader, BSAC - hschroeder4@wisc.edu
- Anya Bergman - Communicator - ambergman2@wisc.edu
- Ella Cain - BWIG - elcain2@wisc.edu
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Problem Statement

Veterinary professionals commonly collect bone marrow aspirates from three main sites in dogs and cats: the iliac crest, the trochanteric fossa, and, mostly commonly, the proximal humerus. Currently no veterinary bone aspiration models exist for students to practice on, requiring the use of cadaver dogs. Cadavers can only be used for about 5-10 insertions of the Illinois bone marrow biopsy needle per site, but does not contain live bone marrow that can be collected. This project aims to create a low-cost 3D anatomically correct model of the humerus with relevant soft tissue structures, mimics the consistency and structure of the bones, and allows for insertion of "bone marrow" for collection, allowing veterinary students to practice the skill of bone marrow aspiration.

Brief Status Update

After 3D scanning the bones provided by Dr. Gunderson, we worked on preparing these files for 3D printing. The team also brushed up on their CAD skills and downloaded appropriate software to prepare to work on the design of the replaceable component.

Difficulties / advice requests

None for now!

Prelim Report						X										
Final Poster																
Final Report/Notebook																
Meetings																
Client		X		X												
Advisor	X	X	X			X										
Website																
Update	X	X	X	X	X	X	X	X								

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

Current design

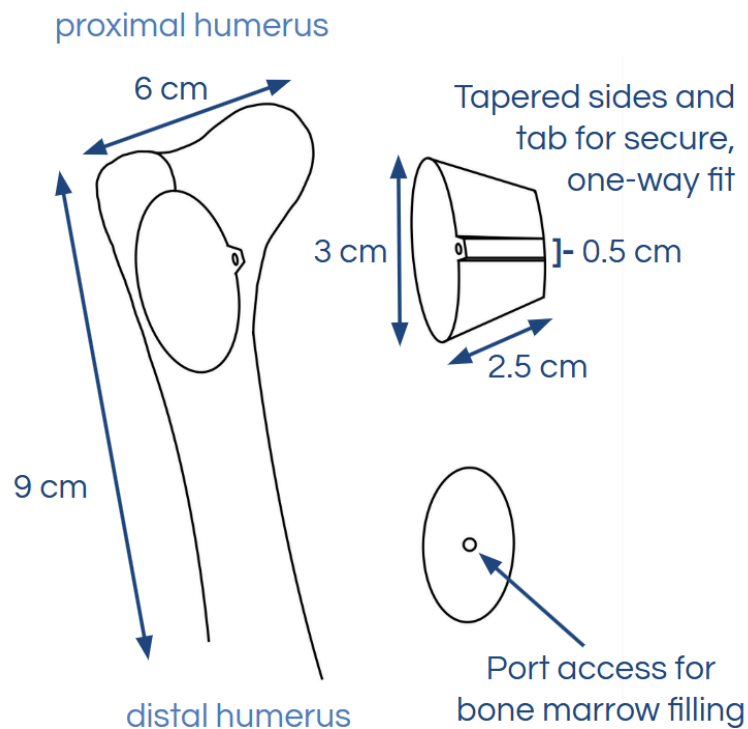


Figure 1: Drawing of the Slide Method of attachment

The proposed final design features the Slide Method of attachment for the design of the replaceable component. The oval section will be hollow to allow the client to fill the simulated bone marrow fluid into the port in the base of the design. The tab allows the user to easily orient the removable section correctly and slide it into place. Both the replaceable component and the rest of the bony structures (scapula, humerus, and fixed elbow) will be 3D printed using PLA. Surrounding the bones will be relevant musculature made from soft silicone which will further help the replaceable component remain in place when the needle enters and exits. The

simulated skin, fabricated by the client out of neoprene and pourable silicone, will be affixed over top and will help to hold the musculature and bones in an anatomical position.

Previous week's goals and accomplishments

- Team
 - Began working on the CAD model of entire bone structure
 - Began working on the CAD model for the replaceable component
 - Finalized fabrication plans and order any outside materials needed
- Avery
 - Finished any post processing needed on the 3D scans in Blender
 - Helped teammates get SolidWorks set up and provide examples/tutorials for practicing skills
 - Continued research/brainstorming to finalize the materials needed for the muscles and shoulder socket
- Helene
 - Worked on post processing the 3D scans.
 - Brainstormed ideas on what to present at the Show and Tell meeting in November.
- Anya
 - Got Solidworks for computer and help to edit the STL files from 3D scanner
 - Brainstormed materials for the final model, specifically look at potential shoulder joints
- Ella
 - Set up SolidWorks and become familiar with the program
 - Continued looking at materials for the muscles
 - Continued brainstorming ideas for the final model
- Ellie
 - Setup Solid works and familiarized myself with the system
 - Continued researching muscle and ways to attach the skin

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)

Avery Schuda	10/23/24	-Downloaded SolidWorks and Blender -Started working on post-processing the 3D scans of bone structure to prepare CAD model -Provided team with SW tutorials and examples to help them build their CAD skills	4	4	41
Ellie Kothbauer		-Download solid works to prepare for design model group work -Researched materials	3	3	29
Anya Bergman		-Downloaded solid works to prepare for editing the stl file. -Researched materials for the shoulder joint and for the muscles.	2	2	25
Helene Schroeder	10/23/24	- Downloaded SW to prepare to work on the 3D scans.	2	2	27
Ella Cain		-Researched potential pseudo-muscle silicone materials for the model -Downloaded SolidWorks and looked at tutorials	4	4	31

Materials and expenses

Item	Description	Manufac-turer	Mft Pt#	Vendor	Vendor Cat#	Date	#	Cost Each	Total	Link
Category 1										
Material test swatches	PLA, ABS, and PETG test swatches	UW Makerspace		UW Makerspace		9/26/2024	3	0.17	\$0.51	
									\$0.00	
Category 2										
									\$0.00	
									\$0.00	
								TOTAL:	\$0.51	

