

Tibial Stent Design Team Progress Report

Client: Dr. Matthew Halanski

Advisor: Dr. Wan-Ju Li

Team: Evan Lange *elange2@wisc.edu (Team Leader)*
Karl Kabarowski *kabarowski@wisc.edu (Communicator)*
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Date: November 29th, 2013 – December 6th, 2013

Problem Statement

Tibia fractures are common in children, and these injuries are currently managed nonoperatively using casts; however, a surgically implanted device would provide more structural stability and aid the healing of the fracture. Adult patients with this injury typically have a rigid intramedullary device implanted into their tibia bone. Unfortunately, these implants cannot be used in pediatric patients due to the presence of growth plates at the implantation site. A previous design team produced a working device that can enter the medullary canal through a hole in the side of the bone and then expand outward to stabilize the fracture, held in place by static friction against the canal wall. This device is flexible enough to fit into the canal, yet rigid enough to maintain fracture reduction, can be secured in place with screws, and can be removed from the canal when desired; however, the device is not fully fixated against the walls of the bone canal, and the friction force of the device is not sufficient to prevent axial rotation within the canal. This rotation can lead to device failure resulting in unnecessary pain for the patient and extra surgery to correct the issue.

The goal of this semester is to improve the existing device by improving its fixation and adding more radial force thereby advancing this project toward clinical use.

Last Week's Goals (14-7 days ago)

- Finish SolidWorks by Friday (11/22/13) and contact fabrication firms
- Order materials and parts by Friday (11/22/13)
- Contact shop about setting up welding seminar
- Create final protocol for testing the device
- When parts arrive begin assembly and testing immediately

This Week's Goals/Individual Goals (7-0 days ago)

- Complete poster and prepare for poster presentation
- Complete SolidWorks simulations
- Begin work on Final Report
- Discuss further optimizations to the design that could be implemented prior to sending the drawings in for fabrication

This Week's Accomplishments

- Completed final poster and prepared for poster presentation
- IDR submitted to WARF
- Completed SolidWorks simulations of centerpiece
- Divided sections for Final Report
- Further optimizations for design
 - COE student shop suggests thickening the walls of the joints of the centerpiece and not cutting a ring into the cap – instead bend the mesh outward and weld it directly onto the flat face of the caps.

Project Difficulties

- No fabrication firms available to make the device this semester
 - Because of this, we plan to extensively define the testing protocol to include in future work, complete the SolidWorks model for all components of the device, conduct simulations on assemblies of components in SolidWorks for preliminary design evaluation, and order the device from a fabrication firm over winter recess

Next Week's Team Goals

- Complete Final Report
- Update Notebooks
- Update website
- Final Advisor Meeting

Summary of Design Accomplishments

- The team is meeting weekly to accelerate the design process
- The team has met with previous semester design team to better understand where the project currently stands
- The team has completed the problem statement and the PDS
- The team has used a design matrix to select the design alternative for the final design that best addresses the needs for the project
- The team has completed the Midsemester Presentation and Midsemester Report
- The team has ordered TechFlex Flexo Braided Stainless Steel sleeves for preliminary testing
- The team met with Dr. Yen (Biomechanics) who consulted on this project previously to discuss options and methods for mechanically testing axial rotation of the device inside of the bone canal
- The team is having regular meetings more frequently to further accelerate the design process
- The team completed SolidWorks models and simulations
- The team completed the final poster

Expenses

- TechFlex Flexo-Braided Stainless Steel from wirecare.com - \$47.15
- Proof-of-Concept Parts - \$9.70

Activities

Person(s)	Task	Time (hrs)	Weekly Total	Semester Total
Evan	<i>Team Role (Leader)</i>		31.0	176.5
	Weekly progress report	1.5		
	Developed next week's team goals	1.0		
	<i>Other</i>			
	SolidWorks Modeling/Simulation	3.0		
	Final Poster & Printing	12.0		
	Invention Report	1.0		
	Thanksgiving Break Debrief Meeting	2.0		
	Team Meeting - Poster	2.0		
	Presentation Preparation Meeting	1.5		
	Proof-of-Concept Fabrication	6.0		
	Individual Presentation Preparation	1.0		
Karl	<i>Team Role (Communicator)</i>		15.0	110.5
	Contacting Dr. Halanski and assistant	1.0		
	<i>Other</i>			
	Invention Report	2.5		
	Thanksgiving Break Debrief Meeting	2.0		
	Proof-of-Concept Fabrication	6.0		
	Team Meeting - Poster	2.0		
	Presentation Preparation Meeting	1.5		
Tyler	<i>Team Role (BSAC)</i>		8.5	75.0
	n/a			
	<i>Other</i>			
	Thanksgiving Break Debrief Meeting	2.0		
	Team Meeting - Poster	2.0		
	Presentation Preparation Meeting	1.5		
	Proof-of-Concept Fabrication	3.0		
Sarah	<i>Team Role (BWIG)</i>		19.0	89.0
	Update Website	0.5		
	<i>Other</i>			
	Thanksgiving Break Debrief Meeting	2.0		
	Team Meeting - Poster	2.0		
	Poster & Printing	13.0		
	Presentation Preparation Meeting	1.5		
Lida	<i>Team Role (BPAG)</i>		5.5	63.0
	n/a			
	<i>Other</i>			
	Poster Image	2.0		
	Thanksgiving Break Debrief Meeting	1.0		
	Team Meeting - Poster	2.0		
	Presentation Preparation	0.5		