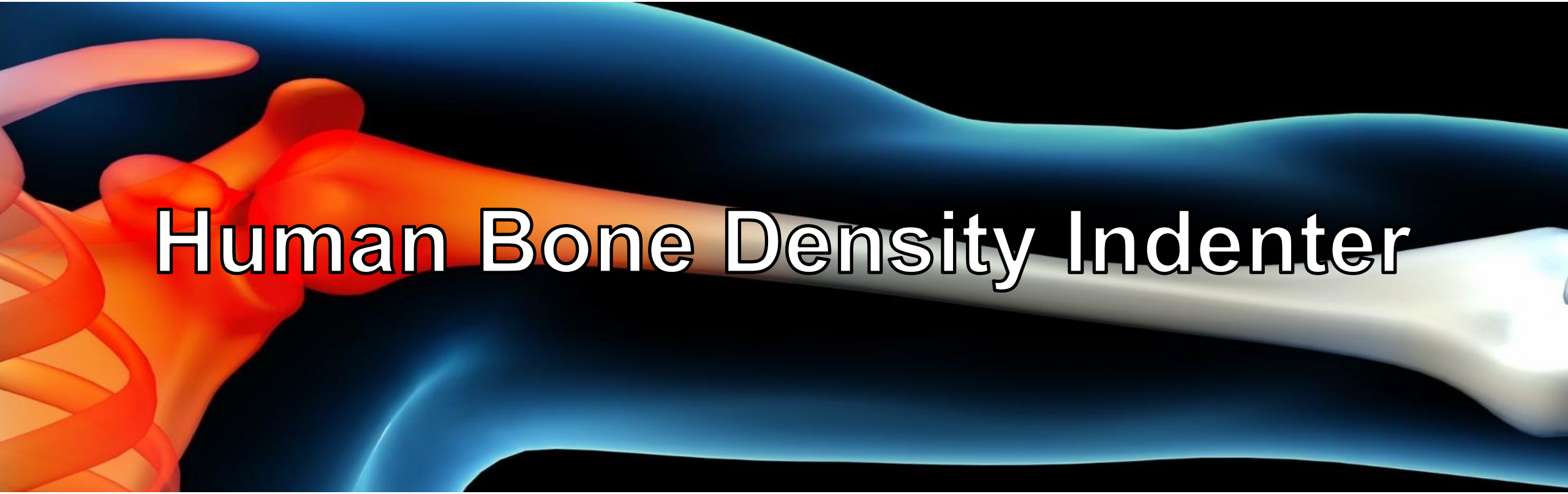
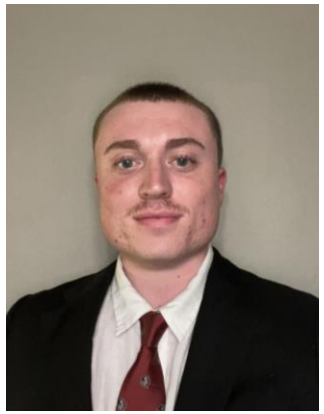
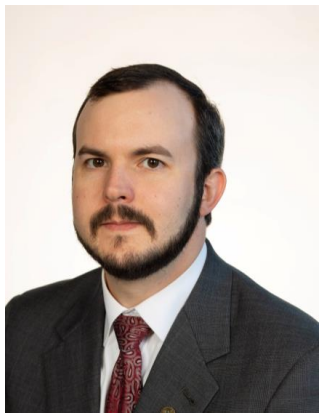

Human Bone Density Indenter

Team Introductions



Grant Giorgi
Orthopedic Bioengineer

Erin Petkus
Biomaterials and Biopolymers Engineer



Timothy Surface
Manufacturing Engineer

Abrea Green
Clinical Engineer

Tessany Schou
Materials Engineer

Nicholas Vastano
Bioinstrumentation Engineer

Sponsor and Advisor

Exactech®
Surgeon focused. Patient driven.™

Project Sponsor
Tom Vanasse
Director of Engineering, Exactech

Academic Advisor
Stephen Arce, Ph.D.
Professor, FAMU-FSU Engineering

Tessany Schou

Objective

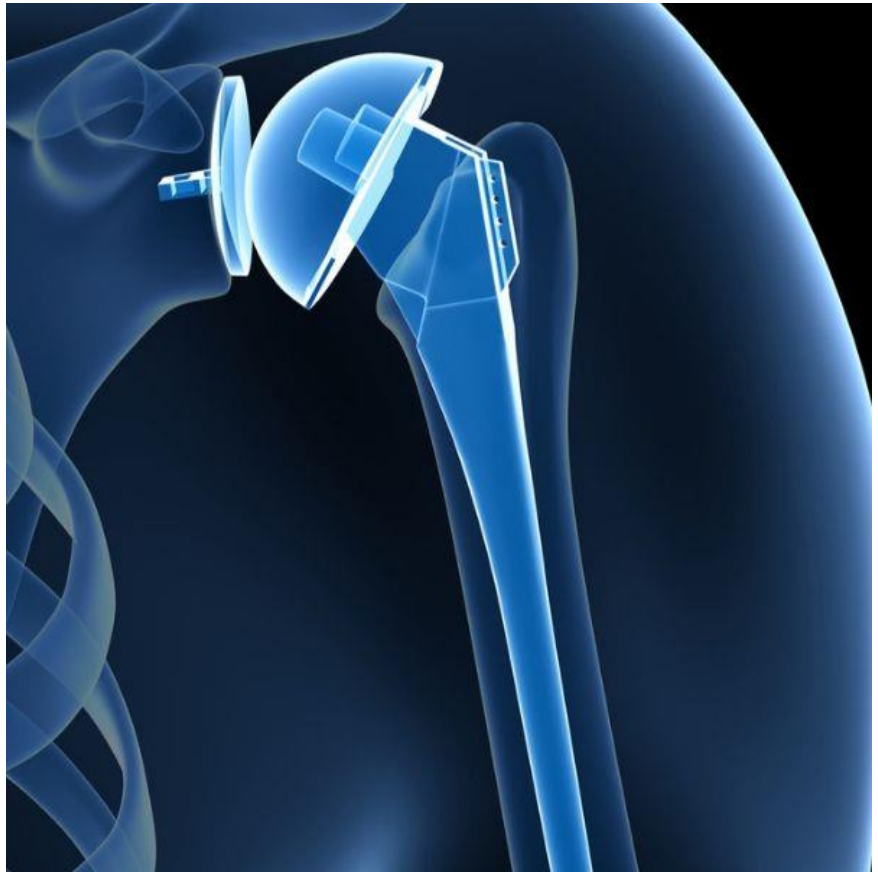
The objective of this project is to create a functional prototype and complete feasibility testing of a device that assists the surgeon’s selection in type of implant used during Total Shoulder Arthroplasty.

Tessany Schou

Total Shoulder Arthroplasty

Purpose

- Eliminate source of pain and dysfunction by replacing shoulder joint with artificial components



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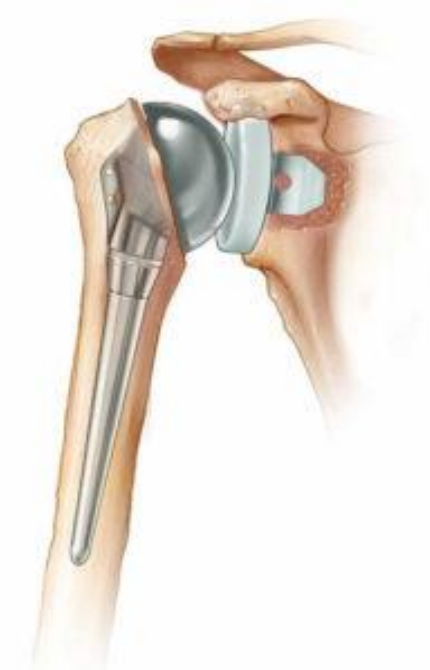
Types of Implants

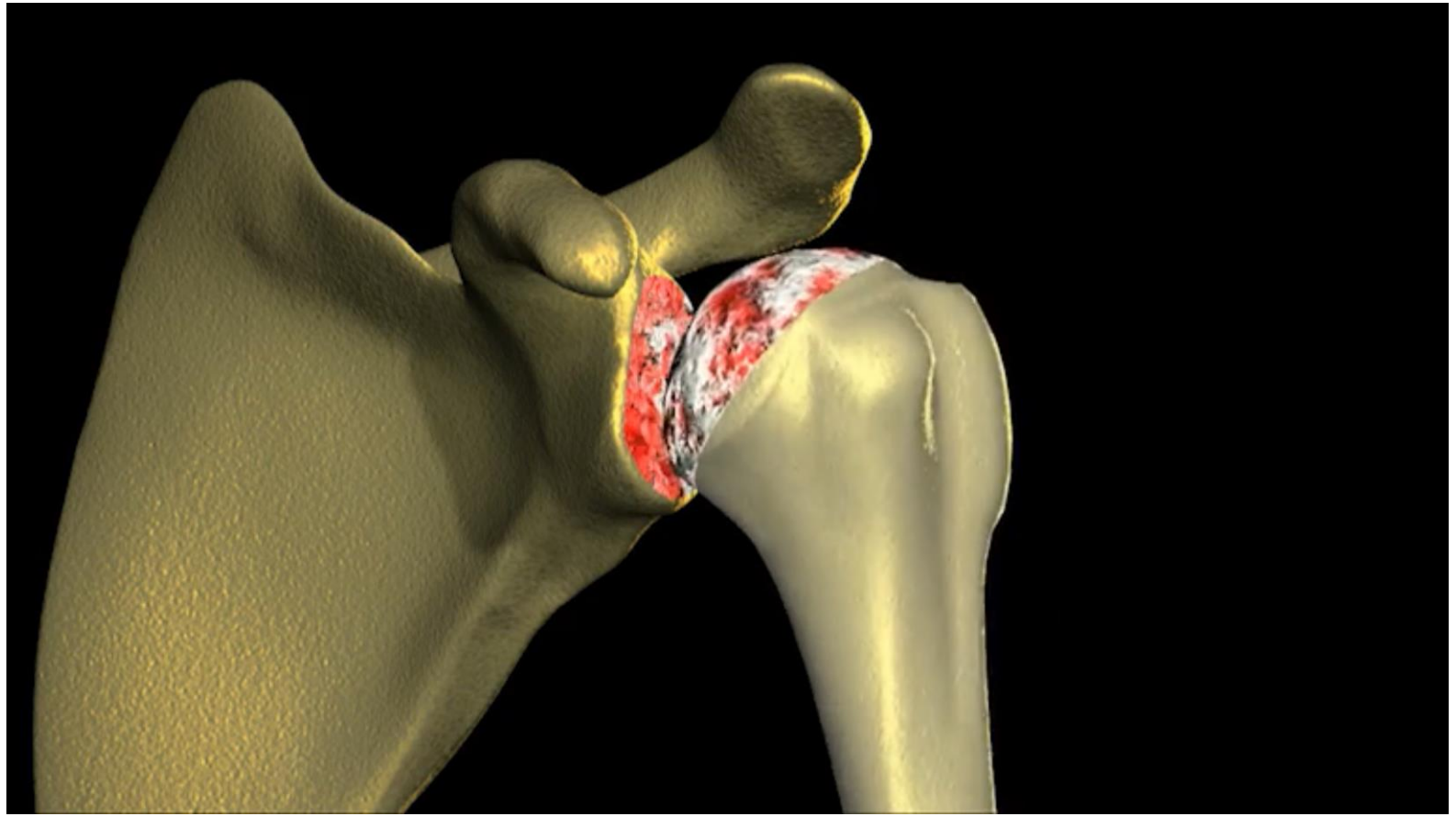
Stemmed Implant



Stemless Implant

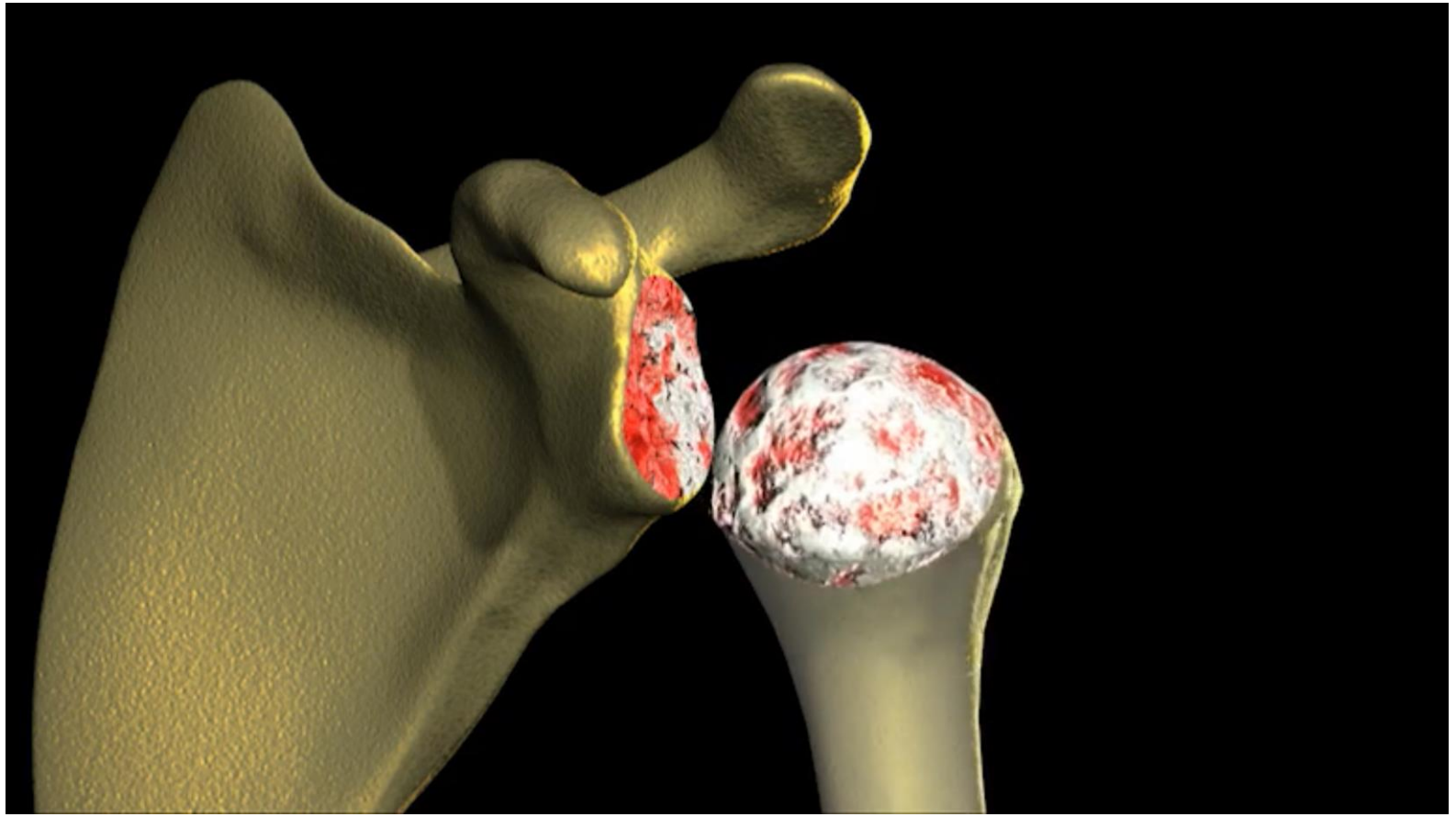
Tessany Schou

The “Thumb Test”



Tessany Schou

The “Thumb Test”



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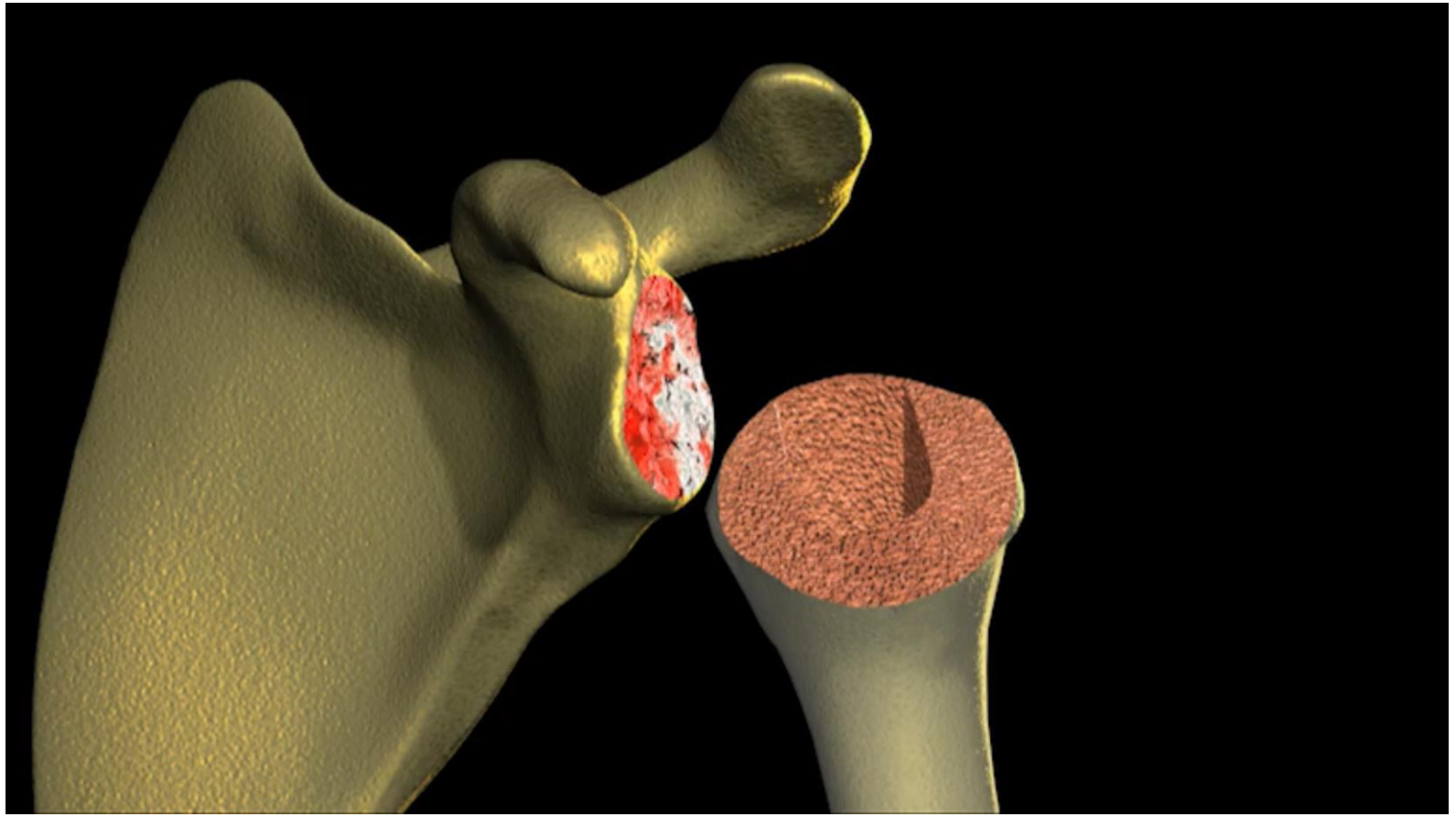
The “Thumb Test”



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Levels of Bone Density/Quality

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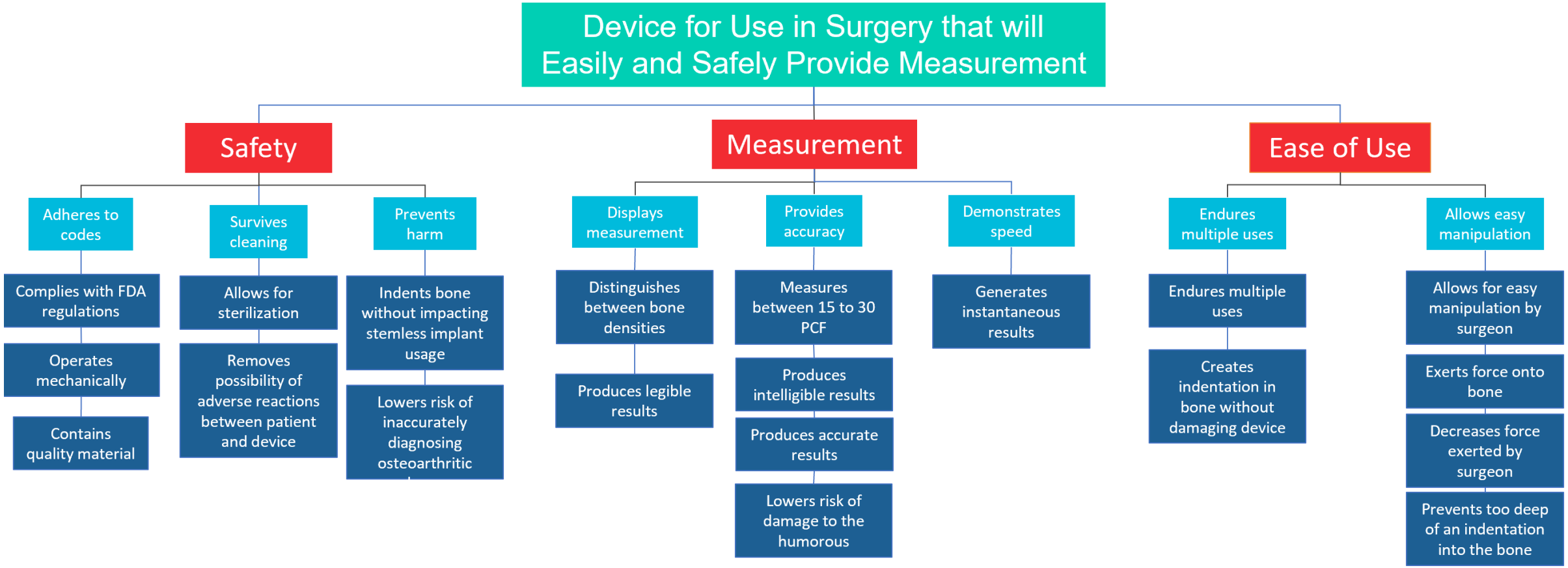
Functional Decomposition



Tessany Schou

Targets

- Compliant with FDA regulations
- Reports results with 95% accuracy
- Measures to an accuracy of .5 PCF
- Width of device is smaller than 6 in.
- Device withstands temperatures up to 140 °C
- Lifespan greater than 50 uses
- Creates indentation less than or equal to 2 cm
- Weighs less than or equal to 5 lbs

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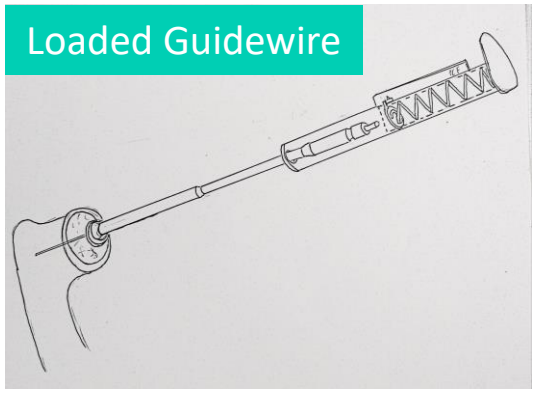
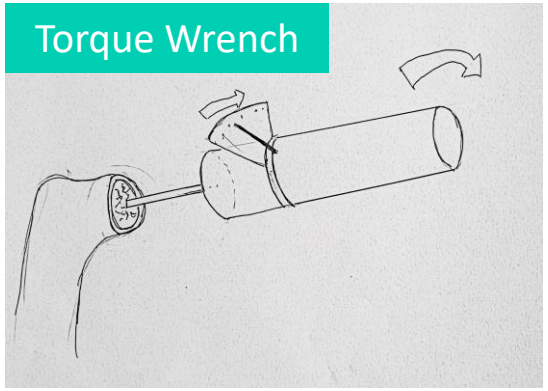
Concepts

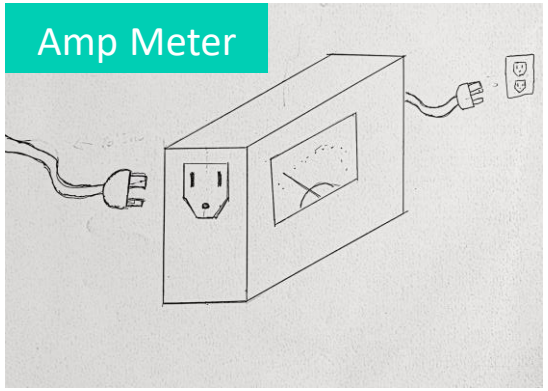
Loaded Guidewire



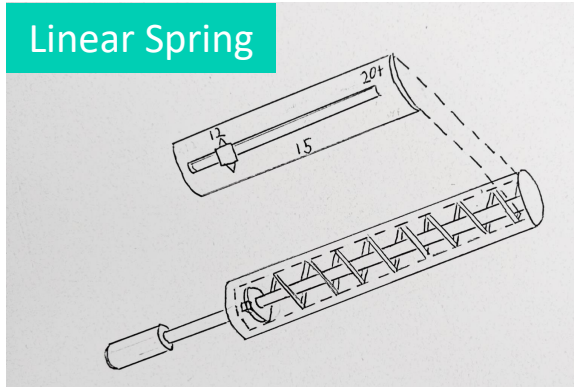
Torque Wrench



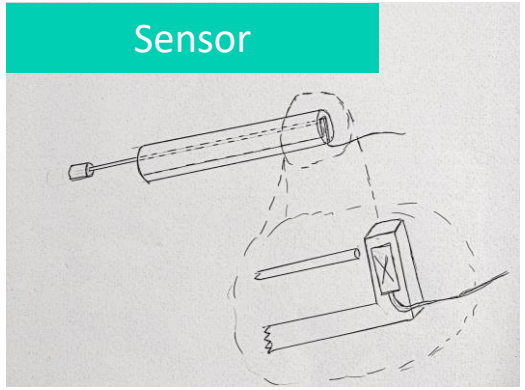
Amp Meter



Linear Spring



Sensor



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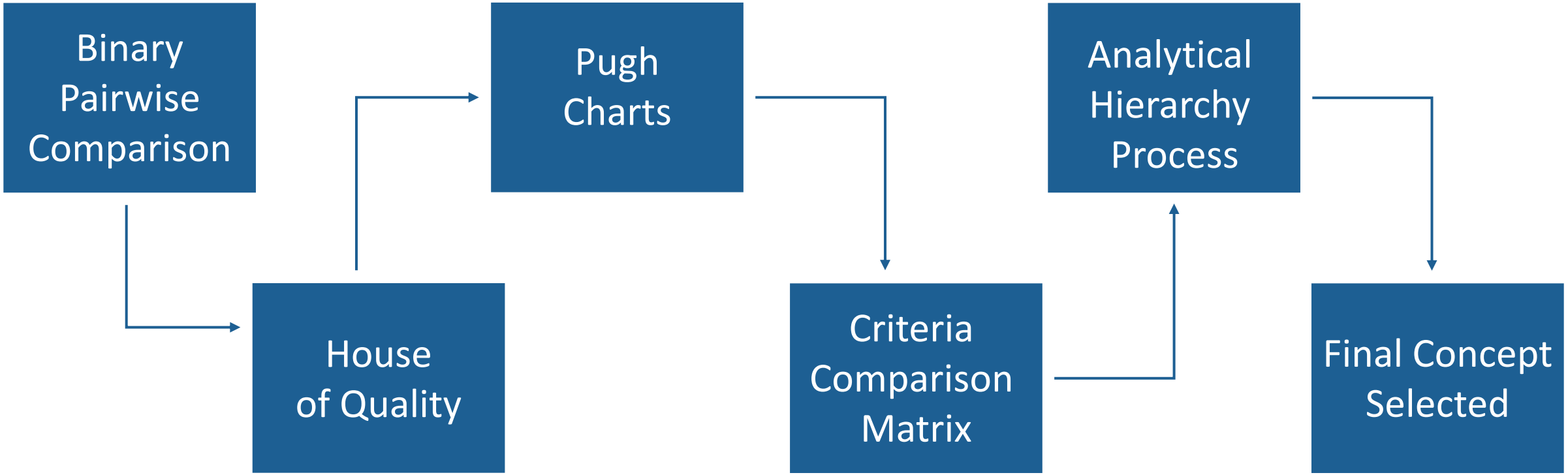
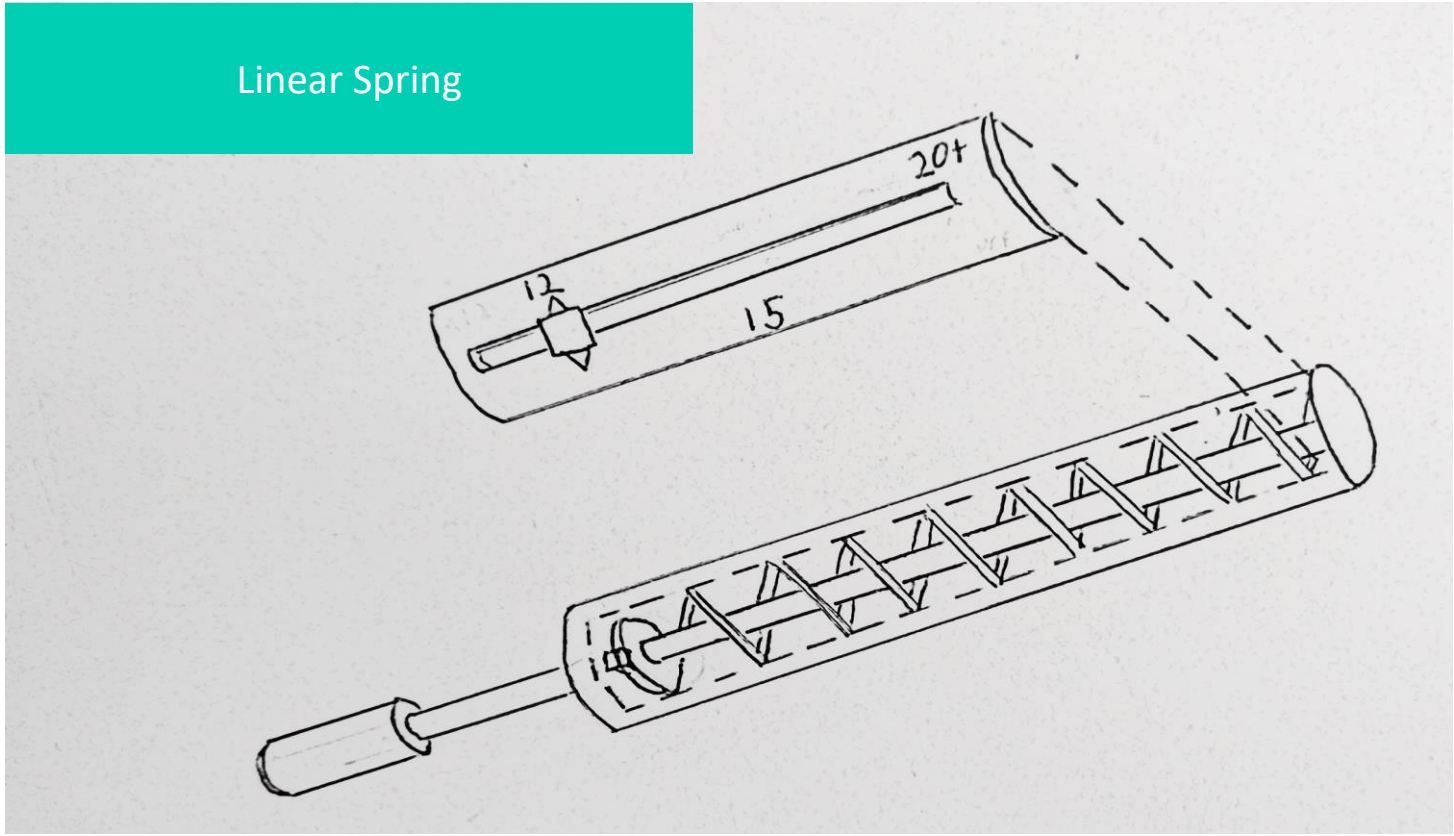
Concept Selection



Timothy Surface

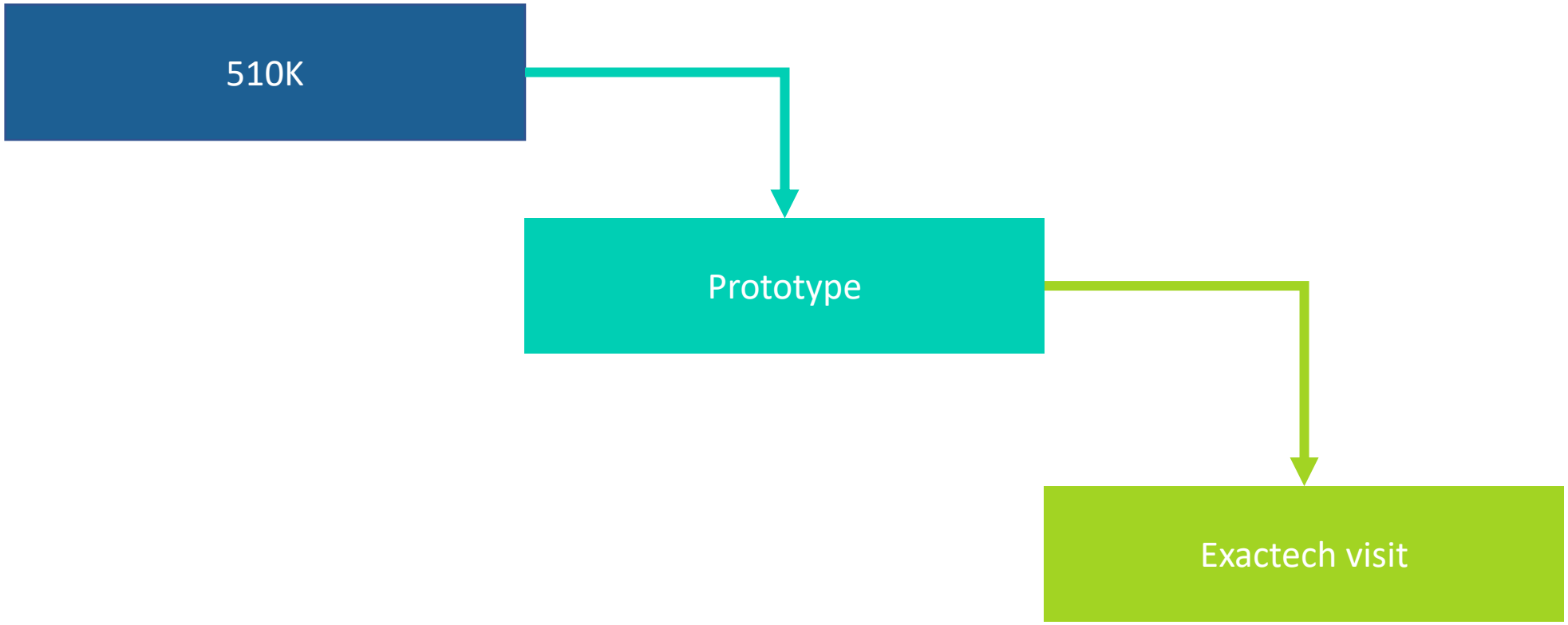
Concept Selection

Linear Spring



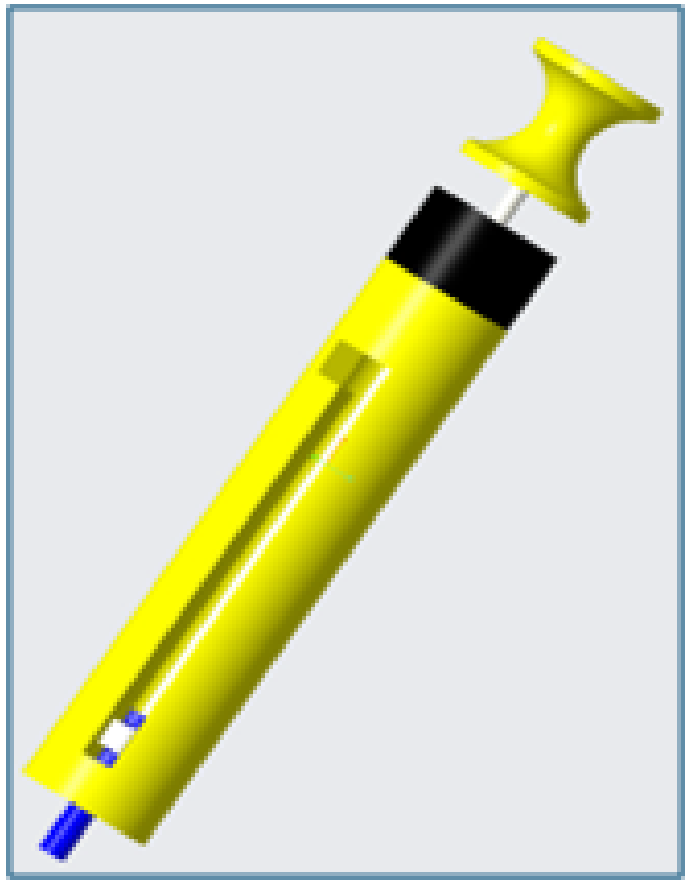
Timothy Surface

VDR2



Timothy Surface

Rework and 3D Model



Timothy Surface

Ongoing Research

- Visit to Exactech
  - Performed a mock shoulder replacement
  - Examined tools to look for ideas
- Forces
  - Began work on rough calculations

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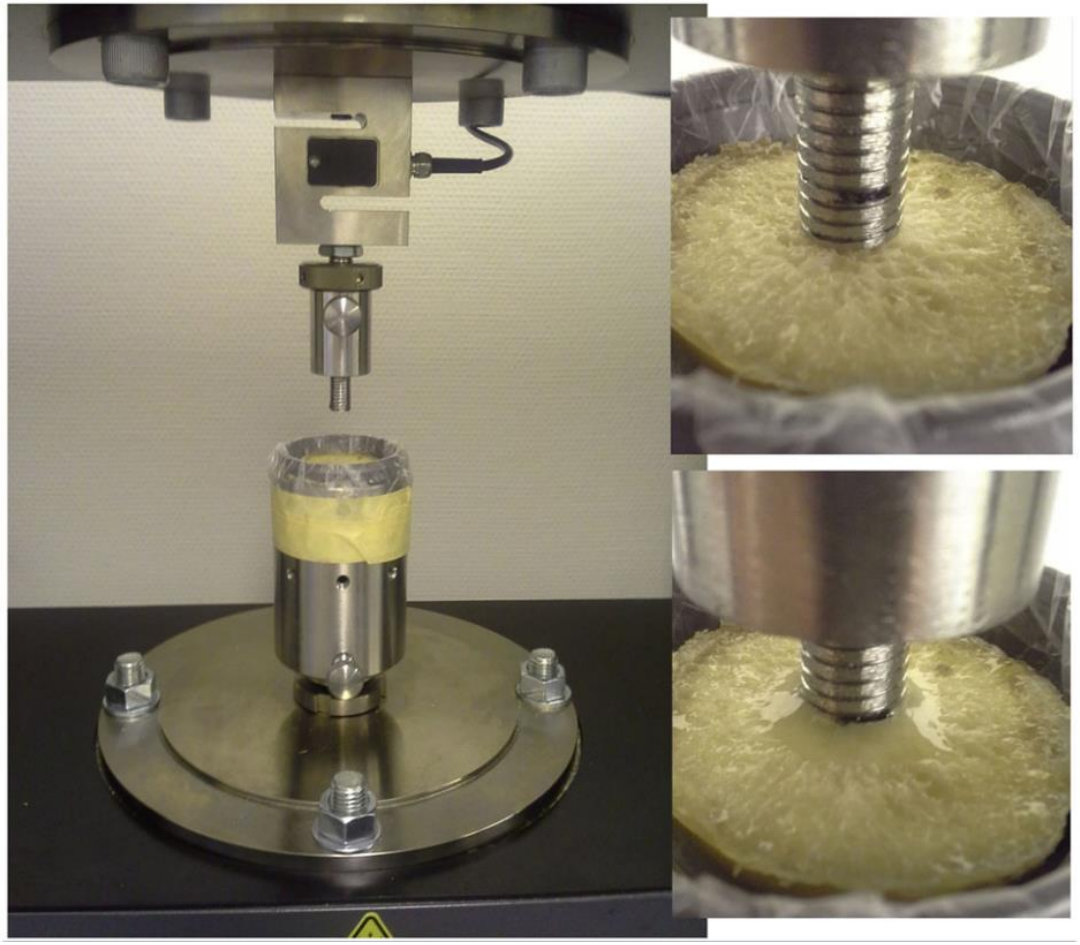
Saw Bone Quantification



- Research
  - Journal articles
- Compression testing
  - Initial meeting this week
- Indentation testing
  - Methodology

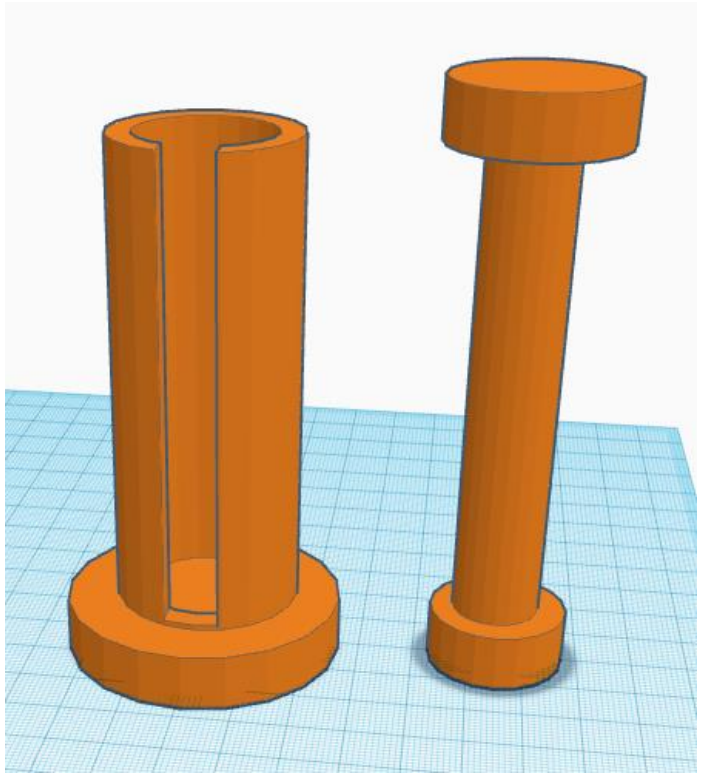
Timothy Surface

Prototyping

- Contact during test
  - Improved grip
- Release mechanism
  - Button
  - Trigger
- Length
- Design for Manufacturing

Timothy Surface

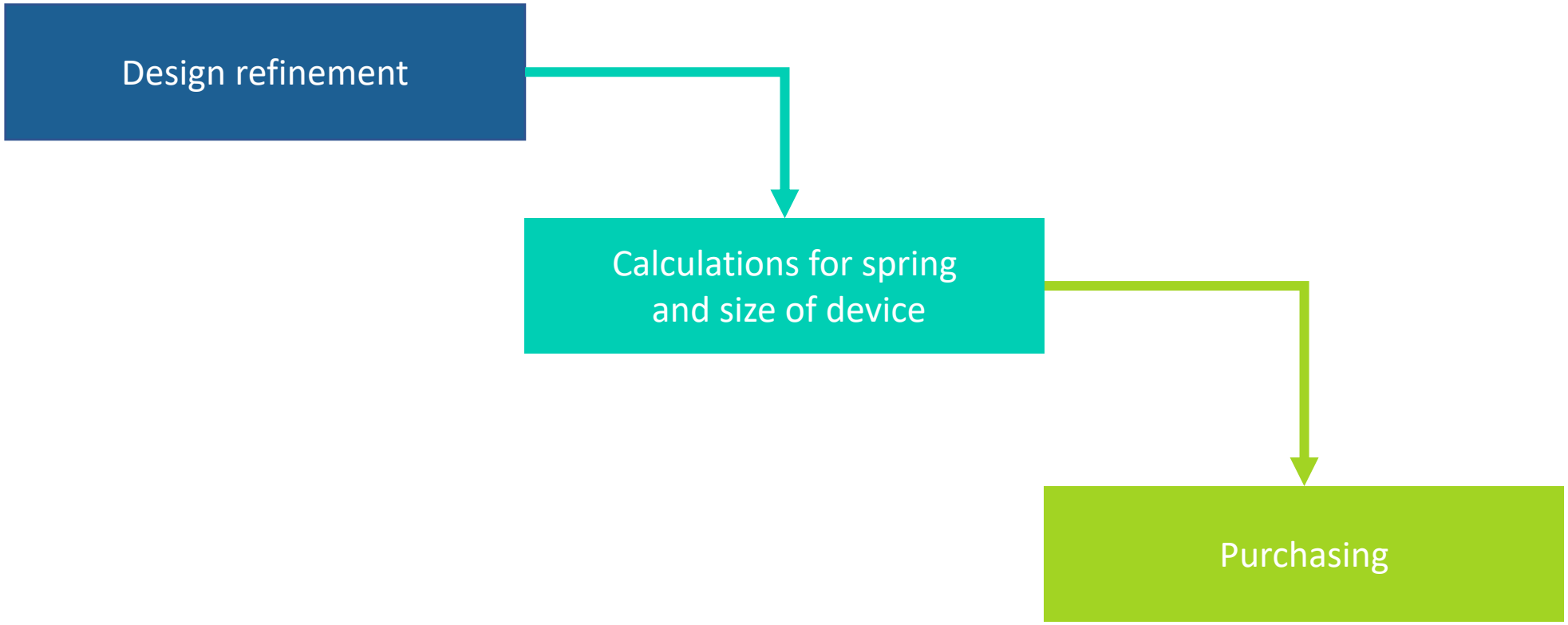
Testing Procedures



- Standards
  - 100 uses
  - Sterilization
- Methodology
  - Springs
  - Indenter
  - Release mechanism

Timothy Surface

Looking Ahead



Timothy Surface

4 Most Important Points

1. Project is to develop a device to measure bone quality.
2. First prototype is completed.
3. Currently researching how to characterize bone quality.
4. Working towards second prototype.

Timothy Surface

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Jordan D. Walters, S. F. B. (n.d.). *Anatomic total shoulder arthroplasty with a stemless humeral component - Jordan D. Walters, Stephen F. Brockmeier, 2021*. SAGE Journals. Retrieved October 15, 2021, from https://journals.sagepub.com/doi/10.1177/2635025421997126.

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Timothy Surface

Contact the Team

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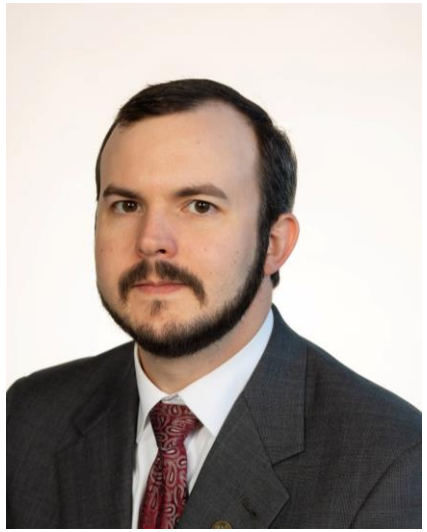

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Timothy Surface