

Ultrasound Transducer Holder

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Overview

- Background
- Problem Statement
- Design Alternatives
- Final Design
- Future Work

Background

- Ultrasound: High frequency sound
- Acoustics of material change with load
 - Guitar string
- Steep learning curve

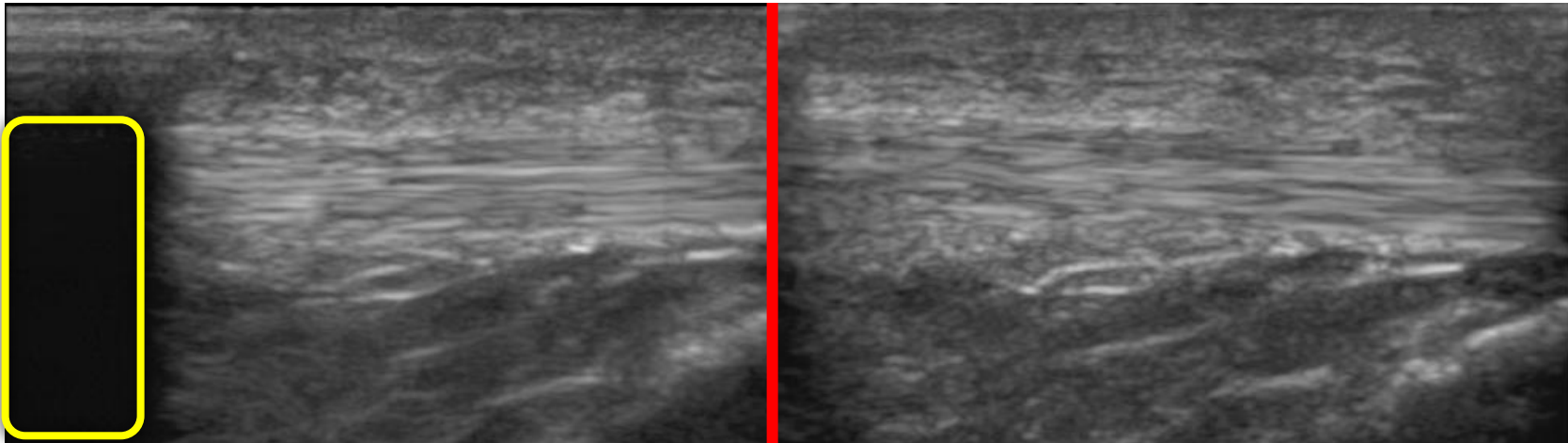


Fig 2: Echometrix software; shadow due to detachment

Background

- Echometrix
 - Ultrasound video software
- Track pixels to develop stiffness/strain relations
 - Healthy tissues vs injured tissues

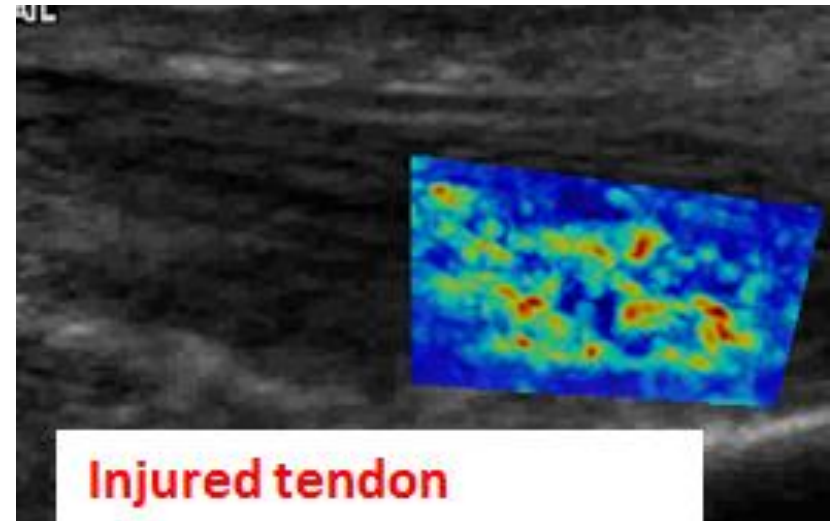
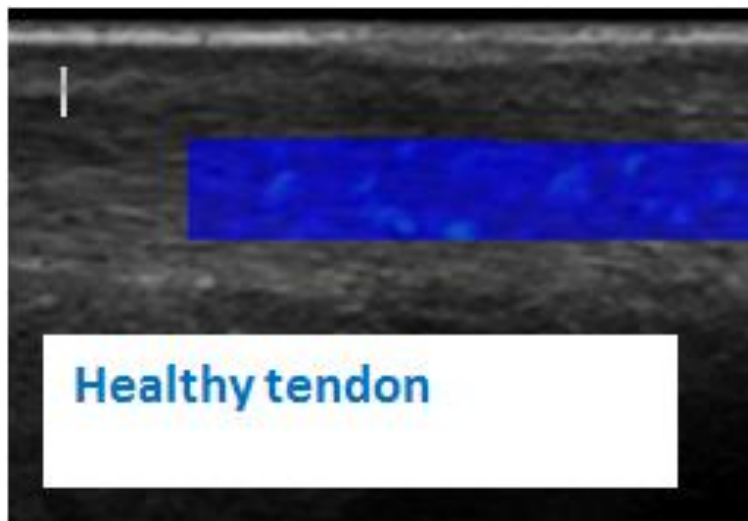


Fig 3: Echometrix software

Problem Statement

- 3 hands needed for good recording:
 - One hand to hold transducer
 - One hand to take recording
 - One hand to apply stretch
- Holder allows MD to focus on stretch application and recording quality



Fig 1: Echometrix logo

Product Design Specifications

- Securely straps on to surface of most body parts
- Allows translation, rotation
 - 6 Degrees of Freedom
- Requires little to no ultrasound gel
- Holder can be cleaned
 - 70% alcohol
- Allow for needle injection therapy

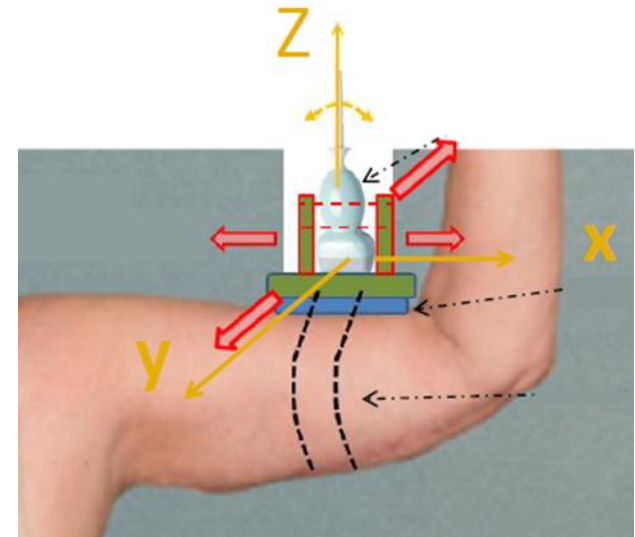


Fig 4: Initial representation of design

Design Alternatives: Rotation

- Rotation of transducer
 - Longitudinal or cross-section
- Needs only one hand
- No movement once set

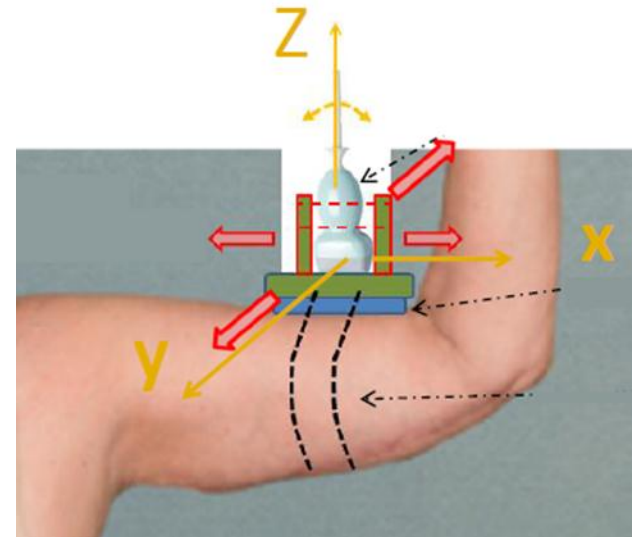


Fig 4: Initial representation of design

Rotating Base

- Pros
 - Simple lock mechanism
 - Mostly prefabricated
- Cons
 - Material strength
 - Positioning
 - Difficult to fasten



Fig 8: Example of rotating base

Lockable Hinge Joint

- Pros
 - Allows for tilt
 - Strong joint
- Cons
 - Requires two hands
 - Locks every 10°

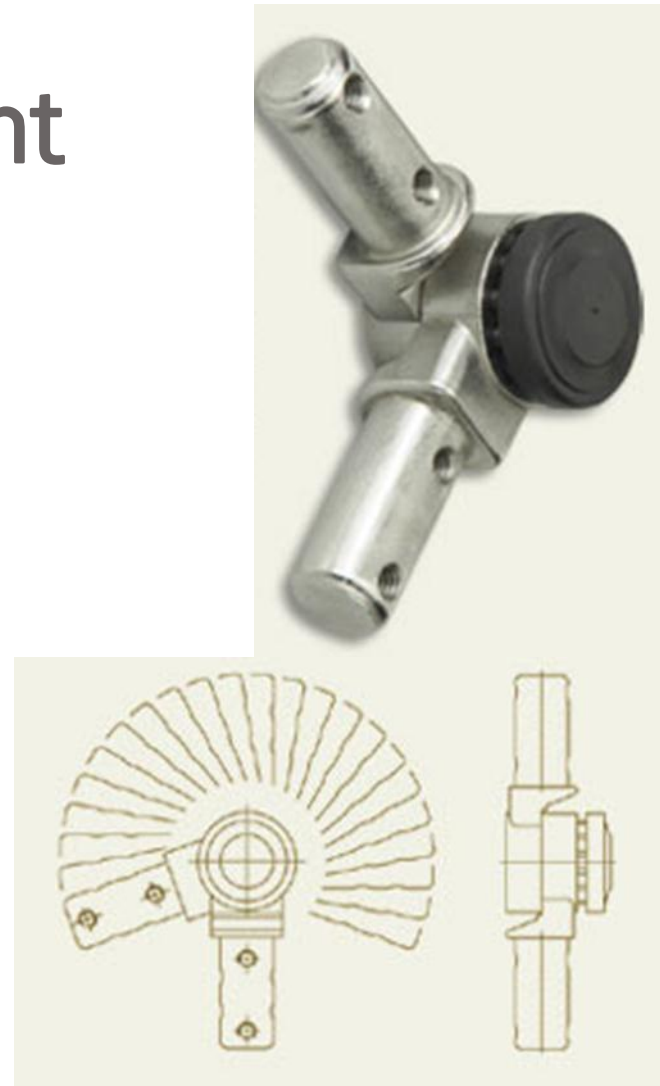


Fig 9: Example of locking hinge joint

Ball and Socket

- Pros
 - User friendly
 - Most freedom
- Cons
 - Friction locking



Fig 10: Ball and socket joint

Design Matrix: Rotation

	Max	Rotating Base	Hinge Joint	Ball and Socket
Ease of Use	40	25	30	35
Adjustability	30	25	15	30
Durability	15	5	15	10
Cost	15	5	15	10
Total	100	60	75	85

Design Alternatives: Z Direction

- 3mm Z movement
- Able to lock in place
- Easy to operate
- Simple fabrication

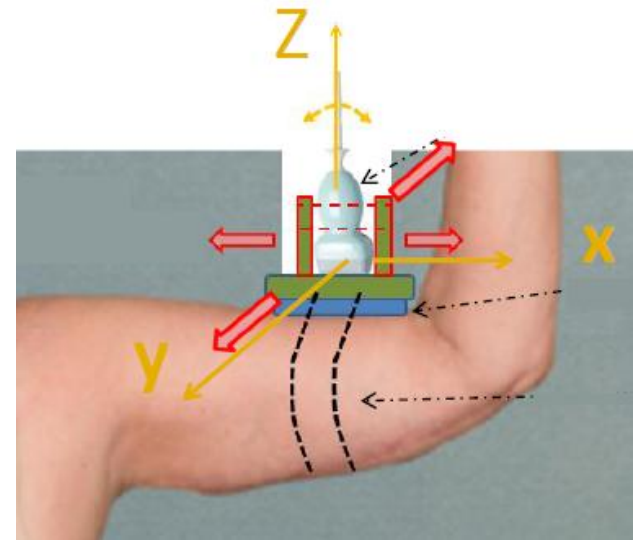


Fig 4: Initial representation of design

Pen

- Pros
 - Simple and easy to use
- Cons
 - Complicated fabrication
 - Weak resistance force



Fig 5: Pen click mechanism

Crutch

- Pros
 - Simple
 - Fabrication
- Cons
 - 3mm too small for button
 - Two handed

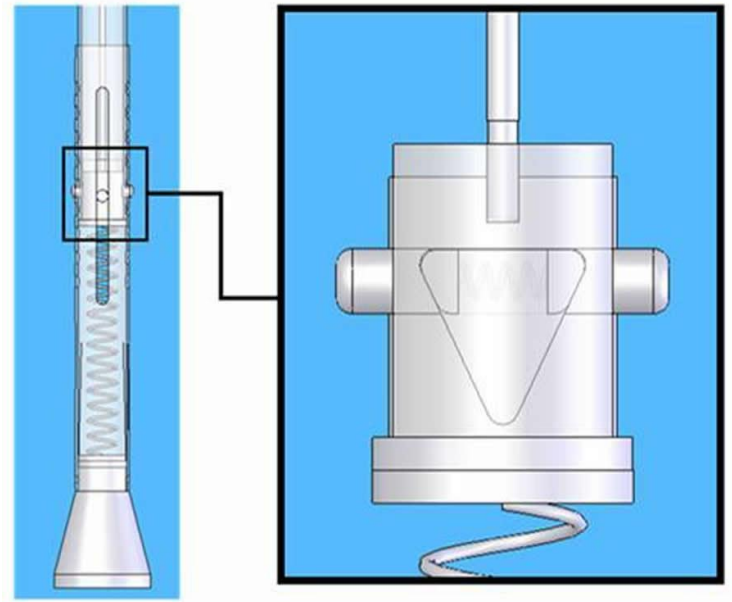


Fig 6: Crutch mechanism

Screw

- Pros
 - One handed operation
 - Adaptable
- Cons
 - Fabrication

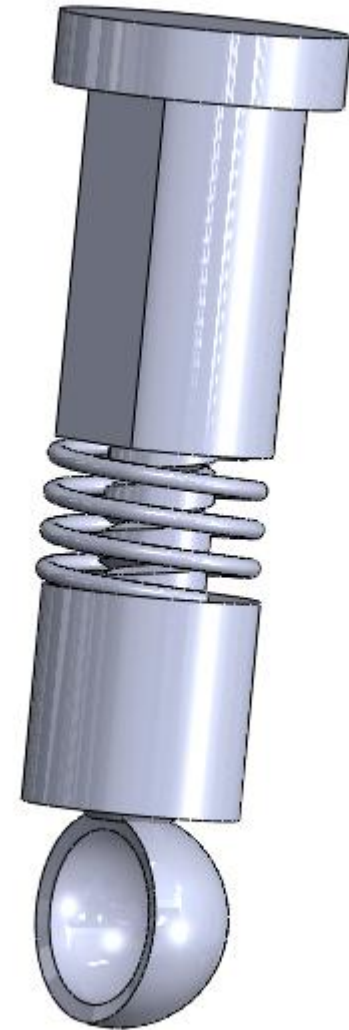
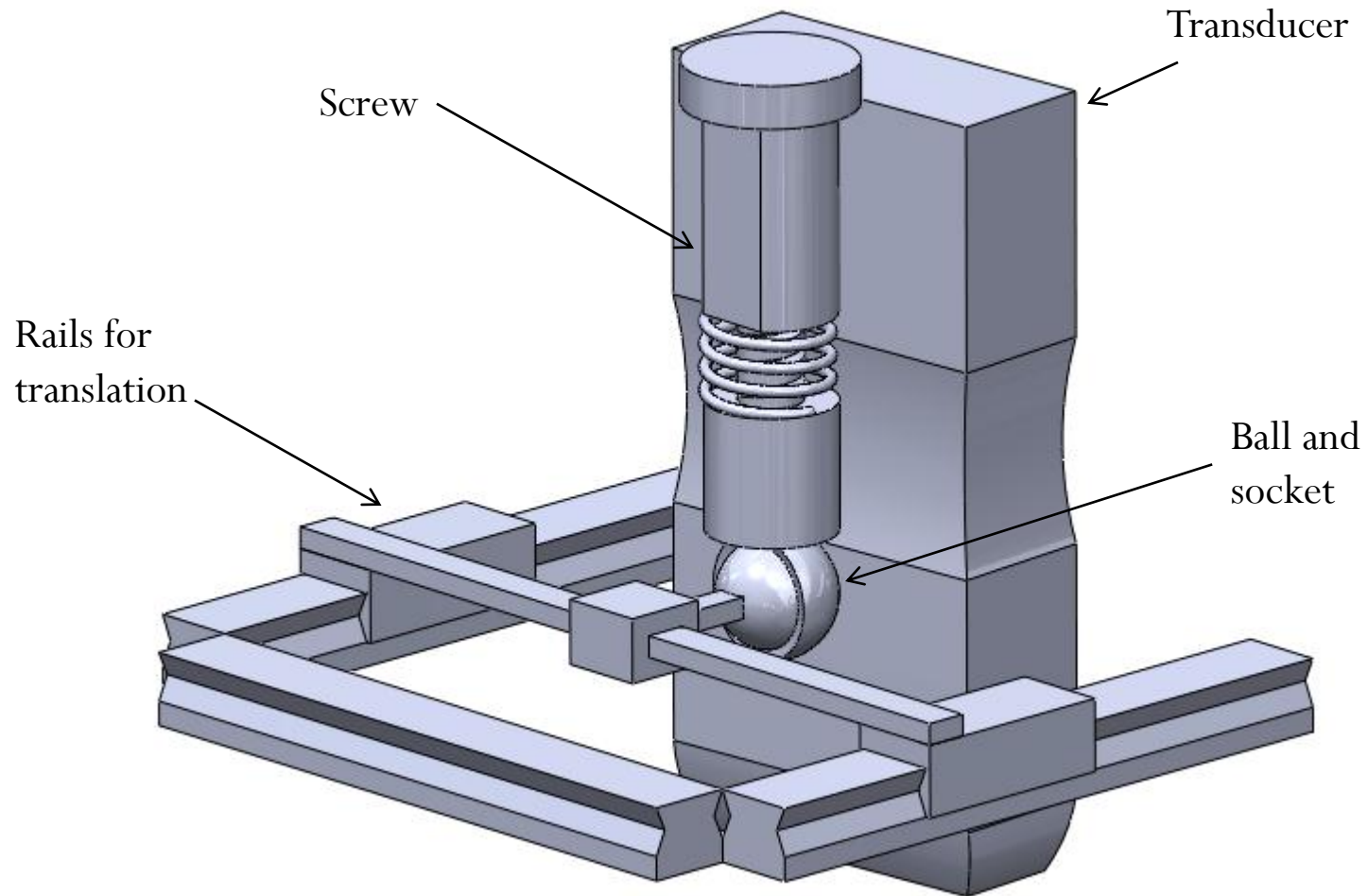


Fig 7: Screw mechanism

Design Matrix: Z Direction

	Maximum	Pen	Crutch	Screw
Ease of Use	40	40	30	35
Adjustability	30	15	15	30
Ease of Fabrication	20	5	5	10
Strength	10	5	10	5
Total	100	65	60	80

Final Design



Future Work

- Fabrication of design
 - Strap
- Testing with ultrasound technicians
- Evaluate and edit design

Acknowledgements

- Dr. Hirohito Kobayashi, Echometrix
- Willis Tompkins, BME
- Sarah Duenwald-Kuehl, Vanderby Lab, BME

References

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Thank you!

Questions?