

Probe Holder Design Team Mid-Semester Presentation

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Client: Dr. James Stein

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Problem Statement

- Design a holder to position and stabilize an ultrasound probe to be used in vascular reactivity studies.

Ultrasonography

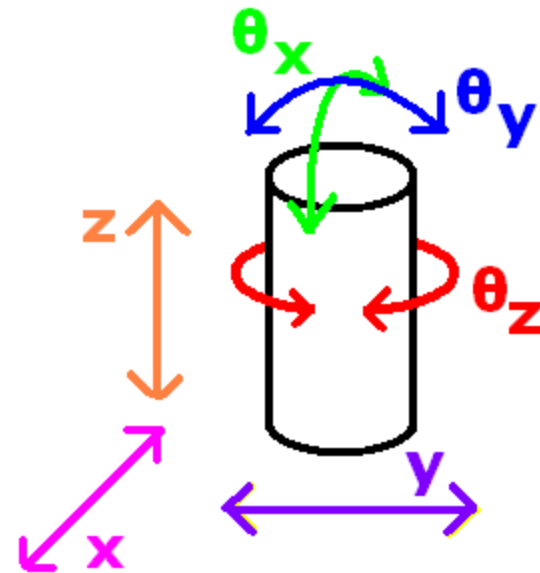
- Transducer measures sound wave reflections off of tissues in the body to measure anatomy and physiology without invasiveness
- Our Client: Use Ultrasound to image brachial arteries
 - Vasculature response to pressure and resistivity
 - Client uses for research of Atherosclerosis
 - Technique widely used in clinical settings as well

Why the need for a probe holder?

- Practical
 - Stabilization increases image quality
 - Get “before and after” of same location in artery
 - Free up sonographer for other tasks/monitoring
- Ergonomic
 - Studies are very stressful on sonographers
 - Wrist in deviation in one position for 5+ min.
 - Many clinics limit studies to 1/hour due to strain

Specifications

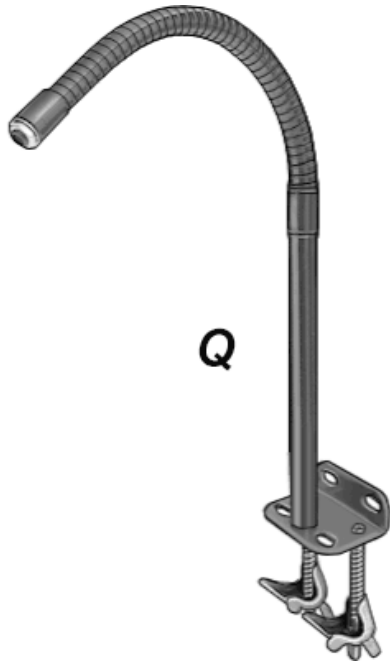
- Device to hold variety of probes
- Position probe with 6 degrees of freedom
 - 3 Directional
 - 3 Rotational
- Stabilize patient arm
- Sensitive to fine tuned adjustments



Rating Criteria

Ease of Use (40%)
Reliability (30%)
Durability (15%)
Cost (5%)
Complexity (10%)

Design #1: Snake



- Many ball and socket joints in a row
- Excellent flexibility
- Poor durability

Ease of Use (40%)	9
Reliability (30%)	5
Durability (15%)	4
Cost (5%)	10
Complexity (10%)	10
Total	7.2

Design #2: Dial Indicator



- Several degrees of freedom
- Secure
- Difficult to quickly change position

Ease of Use (40%)	5
Reliability (30%)	10
Durability (15%)	9
Cost (5%)	7
Complexity (10%)	7
Total	7.4

Design #3: Arm Design

- Pros
 - 5 DOFs
 - Easily controlled with one knob
 - Fine tuning available at the end
 - Holds position and pressure accurately

	Arm Design
Ease of Use (40%)	7
Reliability (30%)	10
Durability (15%)	9
Cost (5%)	6
Complexity (10%)	6
Total	8.05



Arm Design

- Cons
 - Undetermined clamping system for probe
 - Toggle clamp
 - Sandwich probe between two metal sheets with filler
 - About \$100
 - Does not translate
 - Sliding platform available

	Arm Design
Ease of Use (40%)	7
Reliability (30%)	10
Durability (15%)	9
Cost (5%)	6
Complexity (10%)	6
Total	8.05

Design Matrix

	Snake Design	Dial Indicator	Arm Design
Ease of Use (40%)	9	5	7
Reliability (30%)	5	10	10
Durability (15%)	4	9	9
Cost (5%)	10	7	6
Complexity (10%)	10	7	6
Total	7.2	7.4	8.05

Future Work

- Determine best clamping system to hold probe
- Order parts and begin construction
- Design arm rest and table
- Test maneuverability of device

Competition

- Despite significant applicability, no commercialized devices exist
- Several other research labs have constructed similar devices for their own use
- Currently no patents listed

References

Acknowledgements

- Dr. James H. Stein
- Prof. John G. Webster
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Questions?