

Thyroid Retractor

UW Madison Department of Biomedical
Engineering-BME 301



WISCONSIN
UNIVERSITY OF WISCONSIN-MADISON



Team

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BME
Design

A black horizontal line with a white ECG (heart rate) waveform pattern that starts under the 'D' and ends under the 'n' of 'Design'.



Presentation Overview

- Problem Statement
- Background Research
- Product Design Specifications
- Preliminary Designs
- Design Matrix
- Proposed Final Design + Future Work
- References/Bibliography



Problem Statement

- Device to aid in thyroid retraction
- Access to below thyroid
- Avoid difficult dissections
 - Single point of contact
- Accomodating for multiple sizes and shapes

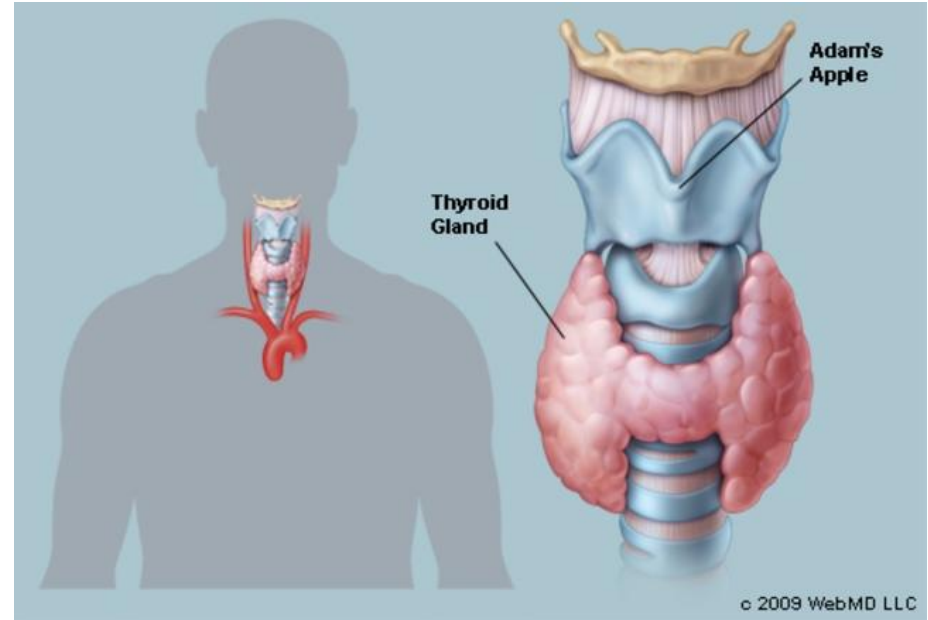


Figure 1: Anatomical Image of the thyroid gland [1]



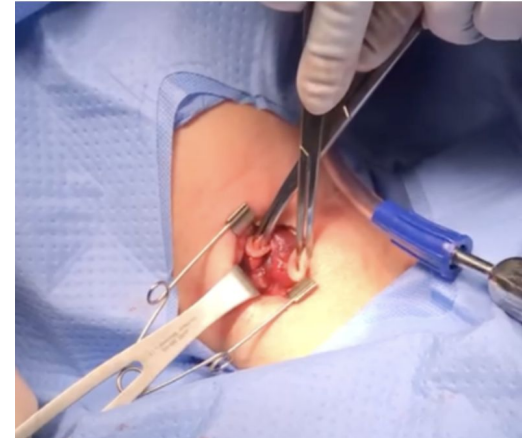
Background - Procedures

- Relevant, tedious procedure [3]
 - 130,000+ thyroidectomies annually [4]
- Pean clamp & ball of gauze
 - 'Peanut'

Figure 2:
Image of Peanut
Forceps [2]



Figure 3:
Image during a thyroid
retraction surgery by Dr.
Doubleday





Background - Thyroid

- Thyroid Dimensions
 - 4-4.8 x 1 to 1.8 x 0.8-1.6 cm [5]
 - 10-20 grams [5]
- Important in hormone production
- Parathyroid regulates calcium
- Single point of contact difficulties
 - Traction
 - Folding over

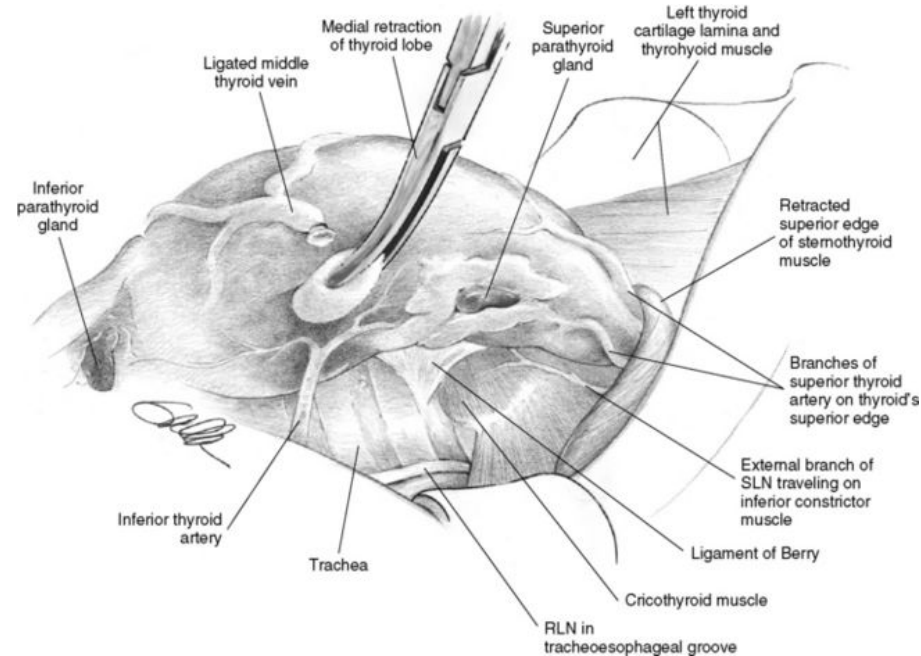


Figure 4:
Diagram of a medial thyroid retraction using a peanut

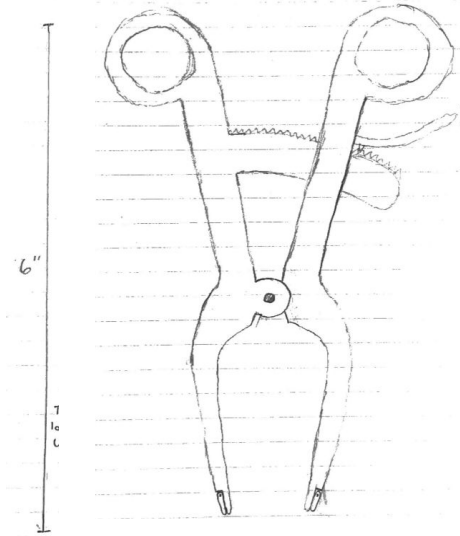


Product Design Specifications

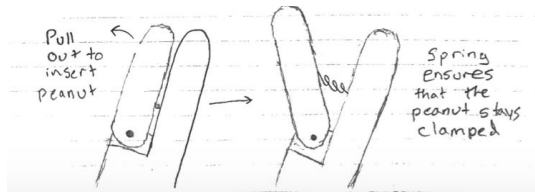
- Two pronged
- Adjustable between prongs & tips of forceps
- No atypical protrusions
- Typical surgical instrument specifications
 - Stainless steel
 - Mirror finish
 - Length: ~ 8 in. [6]
 - Weight: ~ .09 lbs. [7]



Design 1: Adapted Weitlaner

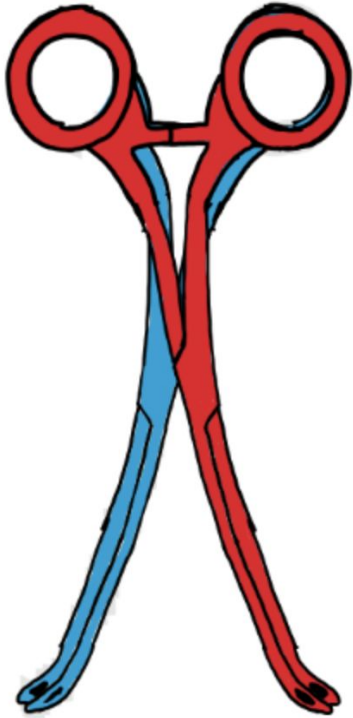


- Based on the designs of the following:
 - Weitlaner Retractor
 - Peanut Sponge Forceps
- Weitlaner: Self-retaining lock to adjust width
- Peanut: One inserted at each end





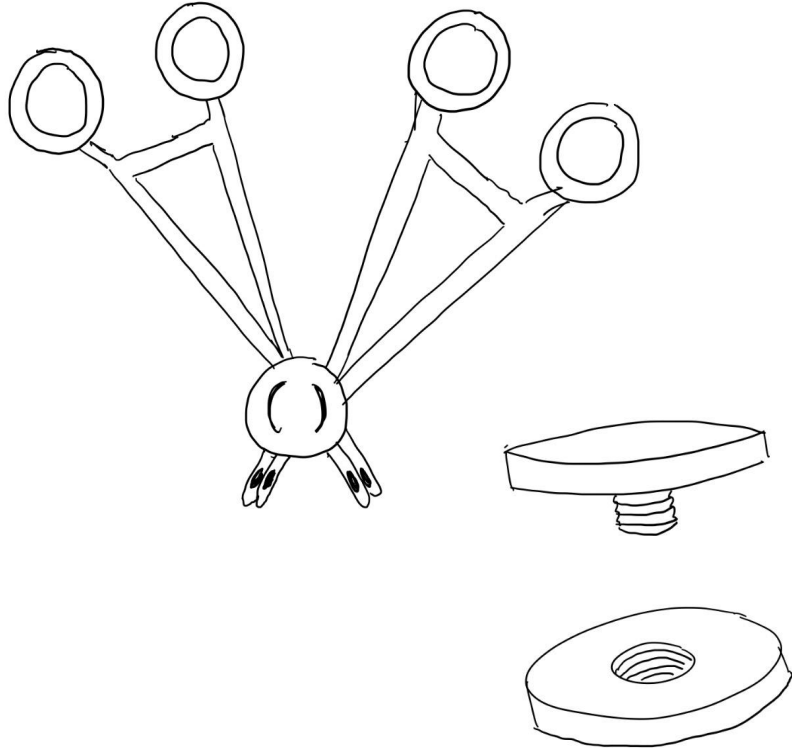
Design 2: Two-Fused



- Two forceps tilted at different angles
- Each prong with ratcheting system
- Finger rings allow for separation



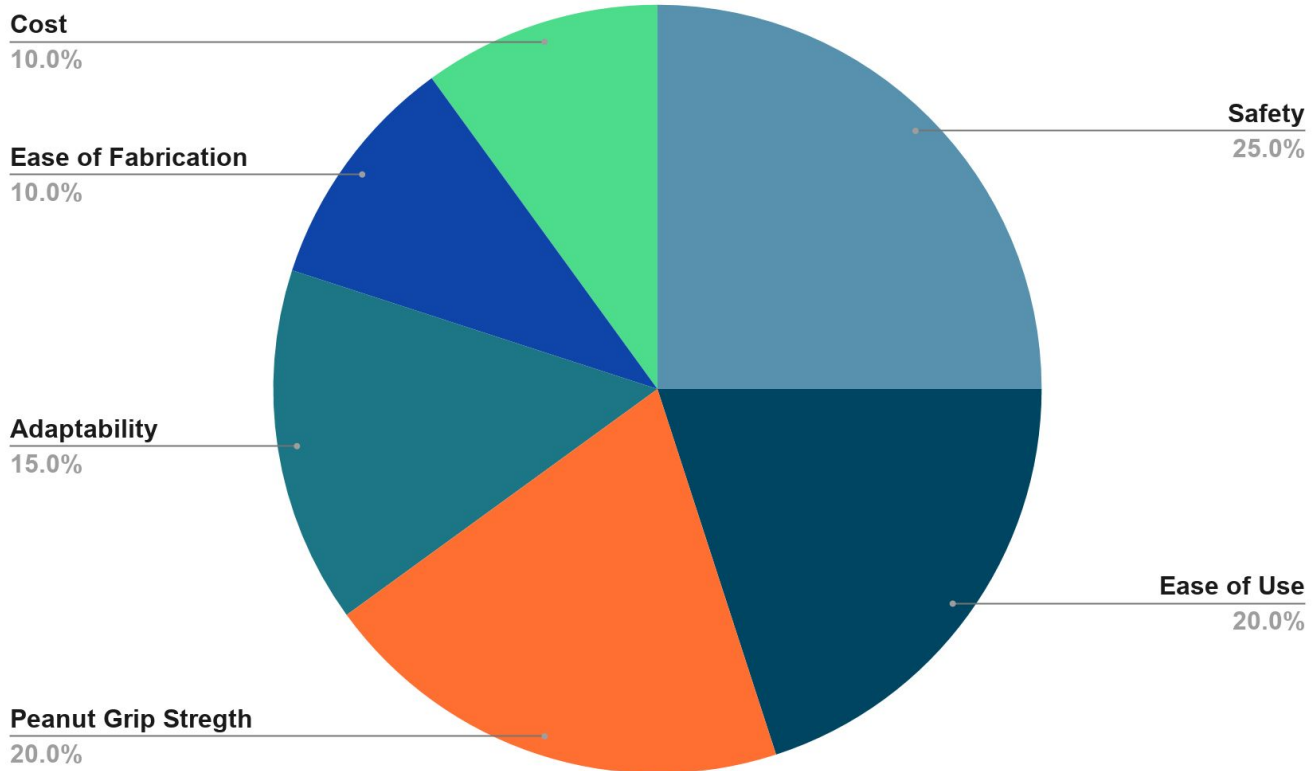
Design 3: Nut and Bolt



- Consists of:
 - 2 Peanut Clamps
 - 1 Nut and 1 Bolt
- Nut and bolt for width adjustment

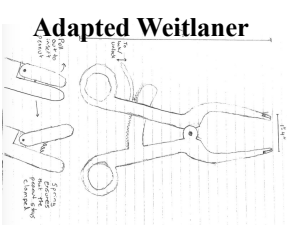
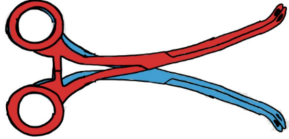
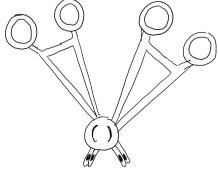


Design Matrix Criteria





Design Matrix

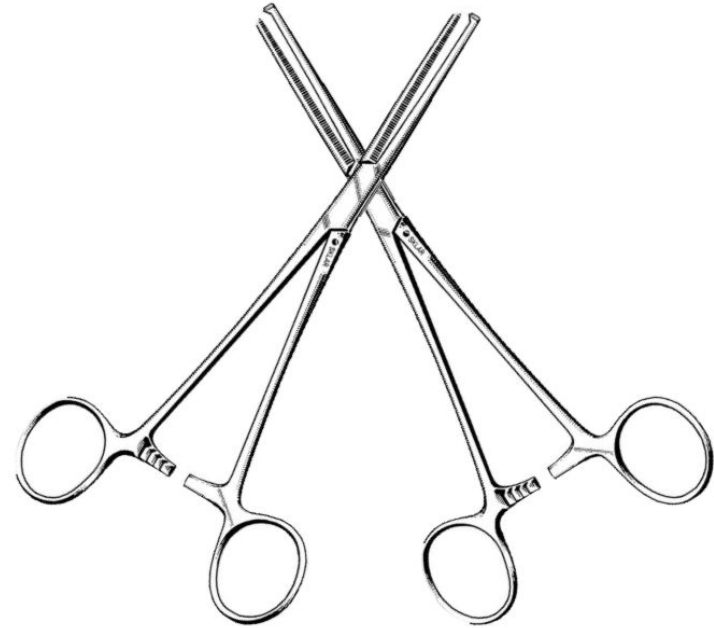
Design		Adapted Weitlaner		Two-Fused		Nut-Bolt	
Criteria	Weight						
Safety	25	5/5	25	5/5	25	5/5	25
Ease of Use	20	3/5	12	5/5	20	4/5	16
Peanut Grip Strength	20	3/5	12	4/5	16	4/5	16
Adaptability	15	5/5	15	3/5	9	4/5	12
Ease of Fabrication	10	3/5	6	4/5	8	5/5	10
Cost	10	3/5	6	4/5	8	5/5	10
Total	100.0	76		86		89	



Proposed Final Design

Nut-Bolt Design

- Two Rochester-Pean style forceps
- Tightening/loosening mechanism
- Adjustable width between peanut sponges
- All-in-one system or detachable forceps?





Future Work

- 1) Finalize a CAD model of the design
- 2) Develop a testing protocol
- 3) Fabrication
- 4) Testing



Acknowledgements

Dr. Amanda Doubleday

Dr. Ed Bersu

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References

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