Executive Summary: BME Design Excellence Award

BME 301 Thyroid Retractor

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There are many procedures that require the retraction of the thyroid gland in order to gain access to relevant anatomical structures. According to Kim *et al.* in 2016, over 130,000 thyroidectomies were performed annually in the United States alone. During operations involving moving the thyroid, the endocrine surgeon must retract the thyroid gland medially in order to gain access to the recurrent laryngeal nerve, to dissect the thyroid gland from vascular attachments, and to find parathyroid glands. When retracting the thyroid gland, surgeons often use one or two Rochester-Pean forceps with a piece of gauze at the tip referred to as a "peanut." Working with only one forcep, occasionally there are not enough points of contact on the thyroid which causes the gland to be difficult to retract and hold. Also, if two forceps are used the surgeon will not have both of their hands free to perform the rest of the operation, which could be problematic for hospitals that have limited staffing. The goal that was presented for this design project was to attempt to curb this issue by designing a device that is similar to standard forceps, but has two prongs that are able to retract the thyroid from multiple points of contact.

This semester, the team began with conducting background research and establishing requirements for the device through client meetings. Next, three preliminary designs were evaluated against criteria and based on those results a final design selection was made. The final design to be prototyped is an adaptation of an existing thyroid retractor: the Weitlaner Retractor. The existing device involves a ratcheting system that can adjust for different thyroid sizes, and can be used with one hand. The ends of the Adapted Weitlaner are blunt and slender to allow for surgical rubber caps to be appended. These surgical caps are commonly used in protection of medical instruments, but are also used for necessary friction in surgical procedures.

The body of the Adapted Weitlaner is to be 3D printed out of material similar to that of stainless steel, while the rubber caps will be 3D printed out of Elastic. In order to evaluate the device for proof of concept, there will be a couple testing methods used. The first testing method that will be used will be completed in SolidWorks and will determine if the device will be able to withstand the force applied to it by the surgeon in the operating environment. The second testing method is a qualitative comfort test. Once the device is 3D printed, the client will evaluate the device in regards to how comfortable it is to hold. Additionally, further testing will be completed to ensure that the device is able to effectively retract and pick up items without causing damage.

The device allows the client to not only safely and successfully perform the procedure, but also requires less staff.