

Executive Summary: Tong BME Design Award

**BME 402 Thyroid Retractor**

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Many procedures require the medial surgical retraction of the thyroid gland to gain access to relevant anatomical structures. A Rochester-Pean forceps with a piece of gauze at the tip, referred to as a “peanut”, is frequently used to retract thyroid glands. This maneuver can be difficult for surgeons that come across large or inflamed thyroid glands due to the single point of contact the peanut provides. Over the duration of the retraction, the thyroid mass may fold over the point of retraction, increasing the difficulty of the operation. In order to combat this problem, two peanut instruments are used requiring both of the surgeon’s hands. This method of retraction using two peanut instruments, while effective, is inefficient. If a surgeon no longer has a free hand to operate due to using both hands for retraction, another surgeon or staff member may have to be present in the operating room to support the surgery.

Two forceps devices exist on the market for use in thyroidectomies. The Allis Tissue Forceps are used during surgery to firmly grasp the thyroid tissue. The Rochester Pean Forceps are used for holding the thyroid tissue out of the way along with a single peanut sponge to distribute the applied force over a larger area, thereby reducing the localized pressure on the tissue and the chance of harm to the gland. However, neither allows for multiple points of contact.

The medical device created is a novel thyroid retractor designed to aid in thyroidectomies by improving access to posterior the thyroid gland and stabilizing the surgical site. This thyroid retractor features a ratcheting lock system that can be adjusted with one hand, and functions in order to adjust the width between the distal legs of the device. Another component of the device is the grooved convex tip geometry located at the distal end of the device, which provides increased traction for an effective retraction.

In order to confirm the device functionality, various quantitative and qualitative tests were performed in order to demonstrate function. All of these tests proved that the device in theory would be able to retract a thyroid without inflicting excess tissue damage or causing ductile tissue failure. The thyroid retractor design addresses the issues outlined by the client. The retractor’s two distal legs adjusted by the ratcheting lock system address the primary difficulty the client wanted help with; ensuring sure this device accommodates thyroids of different sizes. Testing conducted over the span of two semesters indicates the thyroid retractor design is capable of the medial retraction of thyroids of varying sizes effectively without harm to the patient.

According to Kim *et al.* in 2016, over 130,000 thyroidectomies were performed annually in the United States alone. Due to the clinical relevance of the procedure and the thyroid retractor’s ability to address the needs of local clinicians, the device has the ability to benefit the majority of hospitals and clinics across the United States. Of the miscellaneous retractors on the market, the cost ranges between \$40 for very simple retractors, such as the McBurney Retractor, and greater than \$1,000 for complex thyroid retractors, such as the Sklar Mahorner Retractor. Depending on the size of the hospital or clinic, the amount of devices needed may vary. For smaller clinics, around two devices would be necessary. For larger hospitals, 10 or more devices may be needed. Additionally, according to Grand View Research, the global market for surgical devices was estimated to be 12.79 billion USD in 2021. North America alone accounts for 40% of this market. The market is expected to grow by 9.8% between the years of 2021 and 2028. The market space has ample room to accommodate novel devices, particularly designs such as the thyroid retractor that abate current clinical difficulties.