Electrolarynx-Holder to Support Independent Single Switch Operation

Overview
For patients who have undergone a laryngectomy, an electrolarynx is vital to restore the patient’s ability to speak. This handheld device is pressed against the neck and is powered by a push button switch on the device itself. This can make an electrolarynx impossible to use for weakened in-patients that recently underwent surgery. An adjustable holder is necessary to re-enable speech in this demographic.

Objectives
The objective was to design a physical prototype holder for a commercially available electrolarynx and demonstrate its use. The design was constrained to not modify the electrolarynx’s electrical internals.

Approach
• We met with subject matter experts to gain familiarity with usage patterns and technical issues.
• The sole commercial electrolarynx holder was researched, found to be proprietary to that company’s line of electrolarynx devices, and lacked adjustability.
• Adjustability became a major design goal to accommodate patients with active stoma sites or a vocal sweet spot not at their neck’s midline.
• A novel design for an electrolarynx holder was inspired by commercial designs for other low cost medical device holders for CPAP masks and endotracheal tubes.
• CAD models were created using Autodesk Inventor.
• The design was iterated to strengthen the failure points and make the design more adjustable.
• The holder was fabricated as four separate components using 3D printing and fastened together using four metal fasteners.
• An adjustable supporting strap was fabricated using Velcro® and Velfoam®.
• An external switch was made with a 3D printed case, a non-latching push button switch, a 9V battery, and a custom battery interrupter circuit to override the device’s own power switch.

Outcomes
• A novel design of an electrolarynx holder with 3 degrees of freedom for adjustment was created.
• The prototype was demonstrated to be feasible.
• The project testifies to the difficulty of creating a holder for an unmodified commercial electrolarynx. New electrolarynx designs should incorporate remote use patterns by implementing radiofrequency or Bluetooth switch connectivity.