

Laryng-EZ-scope: Intuitive Intubation

Madeleine Anderson, Alan Hodge, Daylin Russo

Department of Biomedical Engineering

College of Engineering

Carnegie Mellon University, Pittsburgh, PA

Relevance & Need

Intubation Medical Costs and Damages^{2,18}

- 2009 study -- 170 teeth injured in 130 intubations
- 40 Million Intubations are done year, ~50% are in emergency situations
- 35% of emergency intubations are done improperly, anesthesiologists are not always available or nearby
- \$12.8 Billion spent on medical damages
- Both medical professionals and patients are affected by the negative impact of unsuccessful intubations

Shortcomings & Current Solutions

Endotracheal Intubation (Figure 1)

- Procedure to create a clear path to pass a tube into the airway
- Axial pull lifts the epiglottis exposing vocal cords and trachea
- Tube is inserted through the vocal cords, into the trachea
- Anesthesiologist controls oxygen levels, airflow, breathing

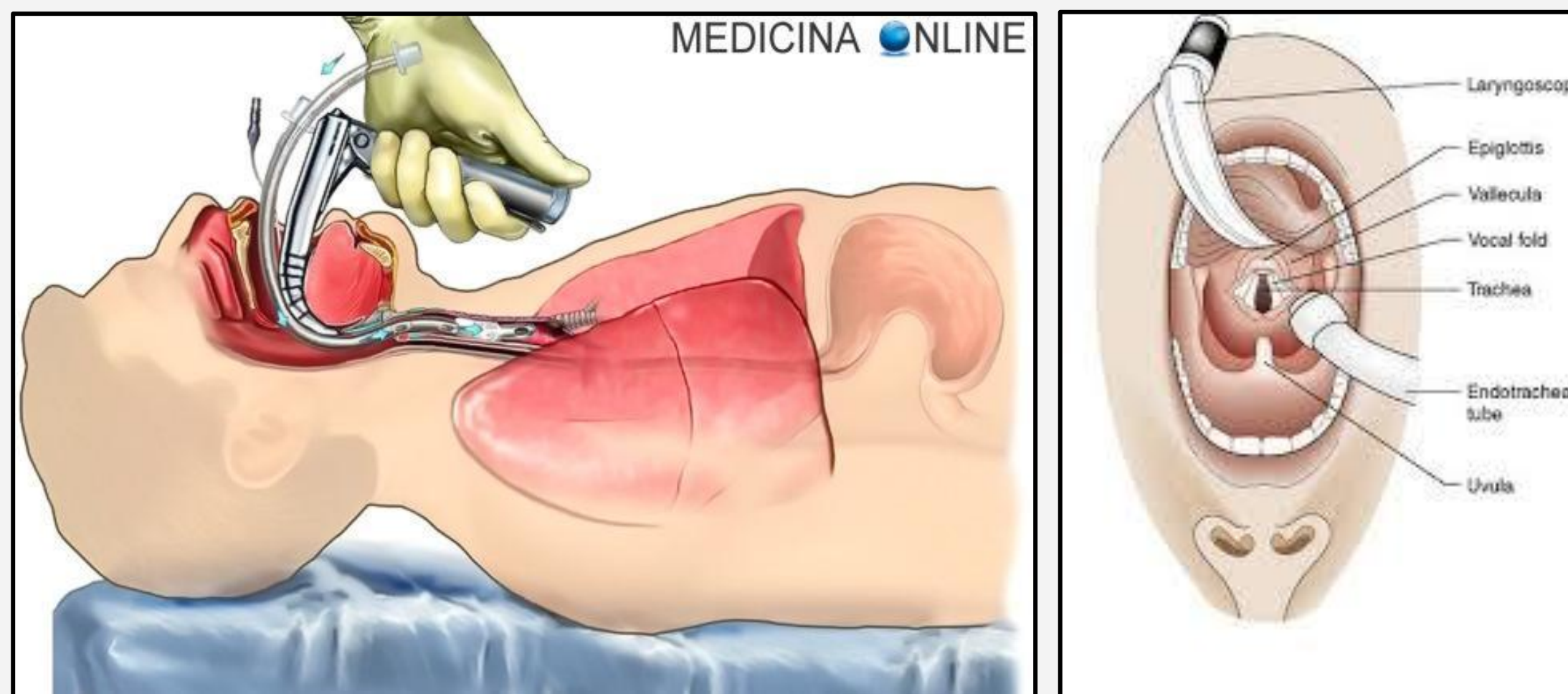


Figure 1: Cross Section and in-throat views of endotracheal intubation procedure.^{3,4}

Problems^{6,11,19}

- In emergency settings, a first responder has little time and using multiple devices adds time to successful intubation
- Tooth damage is common during intubation, protection is rarely used
- Current design is not intuitive for an axial pull for successful procedures

Current Solutions: Airtraq & Mouthguard^{7,8}

- Airtraq camera lets user see trachea without having to look past the laryngoscope
- Does not minimize tooth damage during intubation
- Mouthguards rest on the teeth and get knocked off frequently
- Obstruct the user making intubation more challenging

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Verification & Validation

Technical Testing

- Stress/Strain Simulation testing revealed that aluminum or surgical steel will offer the appropriate factor of safety for the blade, while the handle can remain molded plastic.
- User testing showed an interest in shorter more rounded handles and a smooth transition between blade and handle.

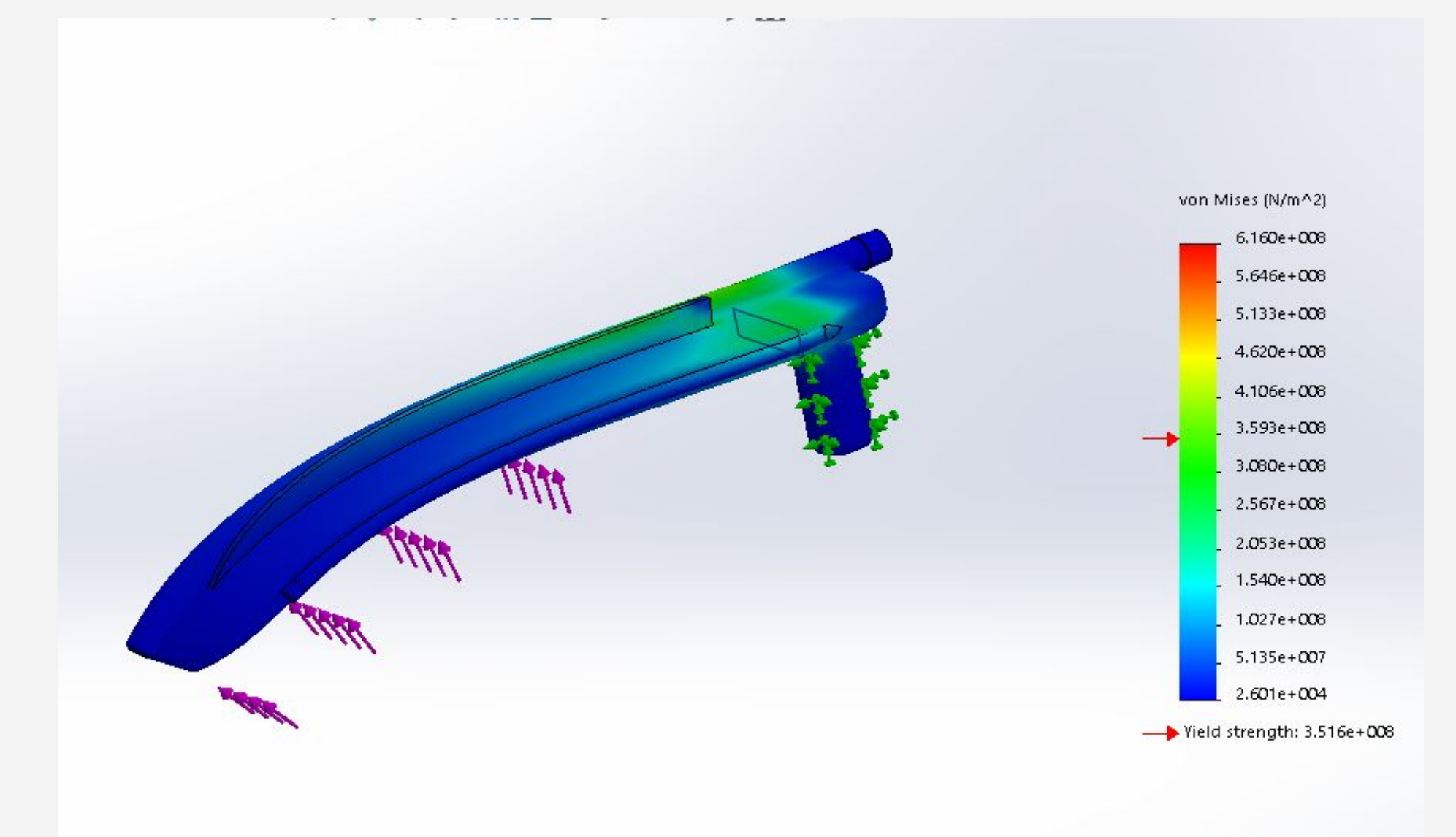


Figure 3: Stress Distribution along the blade

Design Process

Clinical Research

- Anesthesiologists frequently grip the device at the joint between the handle and blade.
- Common problem is leveraging the blade against the teeth when the mouth is difficult to open with just an axial force along the handle.
- Pre Existing devices and handles give direction to the design (Door knob, Gear shift)

Key Design Elements

- Attached tube for suction or O2 in an emergency or trauma setting
- Ergonomic intuitive handle that promotes axial pulling motion to maintain proper intubation form even for new users
- EVA plastic moulded tongue guard that will compress without harming or chipping the teeth.



Figure 2: New Laryngoscope Design

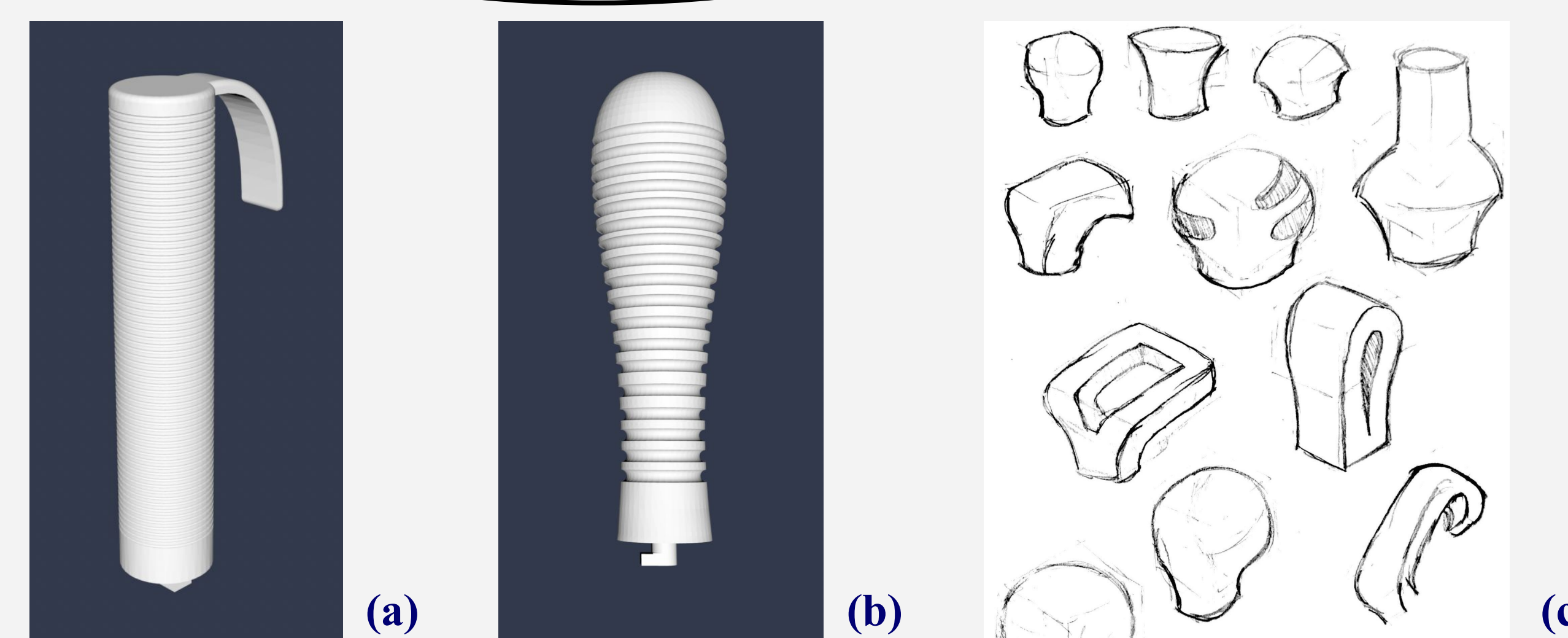


Figure 4: Handle iterations (a) hook handle, (b) door handle, (c) sketches

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