Product Design Specifications for BME 300 Group 24: Right Angled Screwdriver

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Problem Statement:

The aim of this project is to design a right angle screwdriver for use in surgery for facial fractures. The current procedure attaches titanium plates to the mandible by making a small incision on the exterior of the face, which makes it difficult to position the screwdriver effectively and leaves a scar. The right angle screwdriver must be able to fit through a standard incision inside the mouth and provide enough torque to tighten the screws down on to the plate.

1. Design Requirements:

The device must meet all of the client requirements

a. Safety: Mechanical components should not be exposed to tissue during standard procedure. Device should be in line with surgical safety standards including non toxic materials and sanitary parts.
b. Accuracy and Reliability: Device should give constant torque in repeated uses. Structural integrity should not lessen over time. It should be able to apply enough torque to set a screw into human bone without compromising structure.
c. Life in Service: Device should withstand multiple uses during the day for extended periods of time depending on the surgery. Device must be able to screw in 48 screws maximum per surgery.
d. Operating Environment: Device must withstand room temperature while in storage, in use, and idle. Device needs to withstand body temperature and work while surrounded by bodily fluids such as saliva.
e. Ergonomics: Device should be easily operable by a surgeon keeping comfortable handling and approximate 1:1 torque ratio in mind. Device should not cause excessive fatigue to surgeon.
f. Size: Screw head and casing should fit through incision size of 5 cm. Device must be no more than 1.5 cm wide.
g. Materials: Device must be composed of non toxic and corrosion resistant material. Material must also be able to withstand thorough and repeated cleaning.

2. Production Characteristics:

a. Quantity: One reproducible working prototype is necessary.
b. Target Product Cost: Under $300

3. Miscellaneous:

a. Standards and Specifications: Device must pass surgical tool standards
b. Customer: Client emphasizes the benefit of seeing operation and would ideally like to feel the operation but not necessary. Client also stressed the need for an ergonomic handle which could be taken from existing device. Screw head could also be taken from existing device.

c. Patient-related Concerns: Device must not cause any harm while device is being used. Device must be sterilized between surgeries.
d. Competition: Products that already exist include straight angle screwdrivers and ones with mild angles but none that are right angles.