

Prostate Cutting Device

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Problem Statement:

Prostate cancer affects 1 out of 6 men in the United States. A normal prostate weighs 20-30g, while a diseased prostate can weigh up to 100 grams. In order to properly diagnose this cancer, a biopsy must be performed on a dissected prostate sample. Our client would like us to fabricate a device that secures the prostate while the pathologist slices 3mm segments. This device should contain a measurement grid that allows the pathologist to easily dissect the prostate into the 3mm segments and should be adjustable to accommodate varying prostate sizes. Eventually, our device could be used to cut and examine tissues other than the prostate.

Client requirements:

- Must be able to be sterilized.
- Must be able to cut prostate in 3 mm slices.
- Must provide a guide for cutting prostate.
- Must not damage the margin or capsule of the prostate.
- Must be manually operated, not automatic.
- Must be size adjustable.
- Must be less than \$500-\$1000.

Design requirements:

1. Physical and Operational Characteristics

a. *Performance requirements:* Will be used for 10-15 minutes while cutting prostate. The device will need to be sterilized between uses to prevent cross contamination. May be used multiple times a day.

b. *Safety:* Must provide a guide to cut prostate without harming physician.

c. *Accuracy and Reliability:* Must be able to adjust to differently sized prostates. Normal prostates are 5x4x4cm, but can be larger if diseased. Should accurately and repeatably be able to cut 3mm sections of the prostate.

d. *Life in Service:* Reusable, must be able to be used multiple times a day/week.

e. *Shelf Life*: There are no degradable components to our design. Theoretically the device should have an indefinite shelf life when properly stored.

f. *Operating Environment*: The device will be operated in a hospital. It needs to be sterile to avoid cross-contamination. It should be easy to clean and sterilize.

g. *Ergonomics*: Should be easy to operate by one moderately experienced pathology lab technician.

h. *Size*: There should be guides for cutting 3mm slices precisely. If the device is applied to cut other types of tissue, different sized guides will need to be engineered. The device should easily fit on a narrow lab counter top. The device may be mounted on countertop.

i. *Weight*: The device should be small and easy to lift, not exceeding 10 lbs.

j. *Materials*: The material used should not pit or rust easily. It should also be easy to sterilize. It should not be magnetic in order to avoid any unnecessary interactions with the carbon steel blade or any of the other materials in the pathology lab.

k. *Aesthetics, Appearance, and Finish*: Aesthetically pleasing. Appearance isn't really an issue, it should be free of rough edges and sleek for safety.

2. Production Characteristics

a. *Quantity*: 1 deliverable.

b. *Target Product Cost*: Up to \$500-\$1000.

3. Miscellaneous

a. *Standards and Specifications*: Must be approved for safety and function by the lab technicians utilizing the device.

b. *Customer/Patient related concerns*: Not applicable, device does not come in direct contact with patient.

d. *Competition*: There is currently no product made specifically for prostate cutting. There is a similar product on the market for cutting mouse brains.

