

Criteria	Pineapple Corer		Slanted Blade		Skin Biopsy	
Precision (30)	2/5	12	4/5	24	5/5	30
Durability (20)	2/5	8	3/5	12	5/5	20
Feasibility (20)	3/5	12	3/5	12	4/5	16
Ease of Use (20)	5/5	20	4/5	16	4/5	16
Cost (10)	3/5	6	4/5	8	4/5	8
Score (100)	58		72		90	

**Table 1. Design Matrix for Renal Cell Carcinoma Blade**

*Precision-* Precision is a measurement of how much external tissue trauma the blade creates around the sample site. The trauma should not radiate more than 3mm in any direction off the circumference of the sample. Higher scores were assigned to designs that would cause the least amount of damage to surrounding tissue while lower scores indicate more predicted trauma.

*Durability-* Durability relates to how long the blade will last over the course of its lifetime. The blade must be able to effectively resect 50 samples, and be able to withstand an autoclave without losing its sharpness. Low scores were given the designs thought to dull quicker.

*Feasibility-* Fabrication of prototypes should not be difficult. Ideally, the prototypes should be created with resources easily accessible and not require too much finesse to manufacture. High scores are given to prototypes with more readily available resources and less complex fabrication processes.

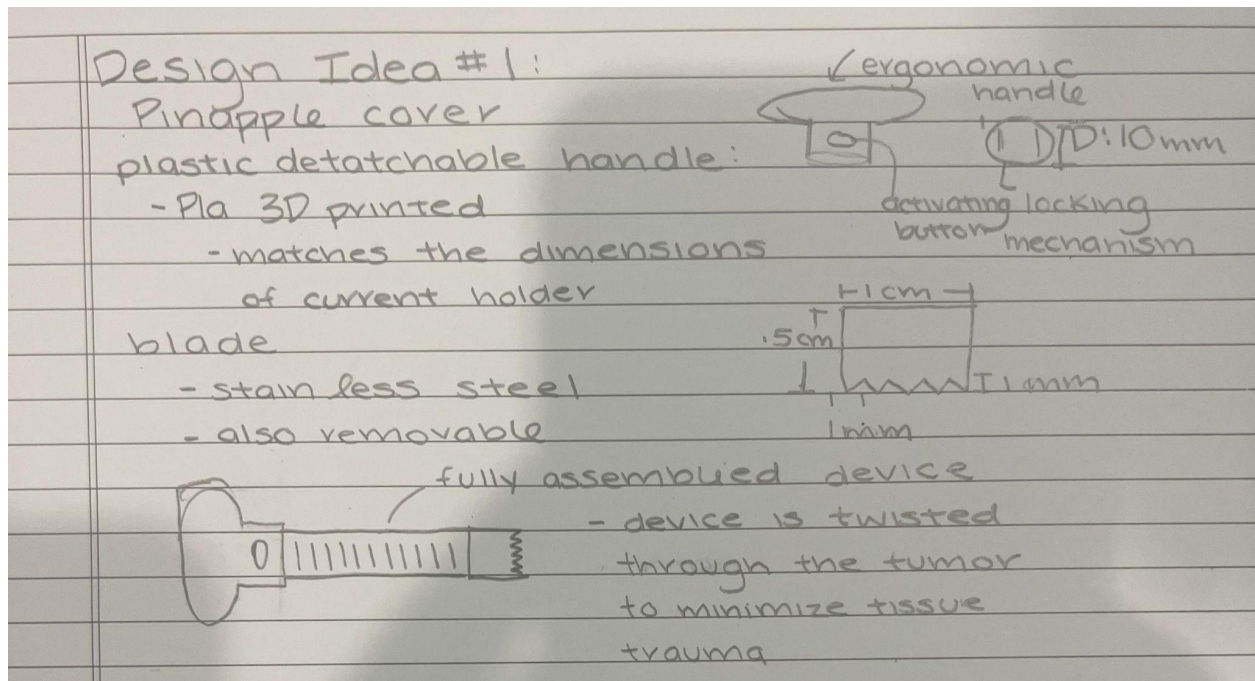
*Ease of use:* Ease of use correlates to the ergonomics of the design, how easily it can detach from the core, how much pressure/strength the client needs to apply to the device, and a low procedure time (< 5 minutes). Higher scores indicate more of these requirements met than designs with lower scores.

*Cost-* The overall cost of fabricating the design holder prototype should be no more than \$100. The team was given an overall budget of \$500 but do not expect to exceed \$100 for one

individual prototype. Low scores indicate an expensive fabrication process, while high scores are more cost-effective designs.

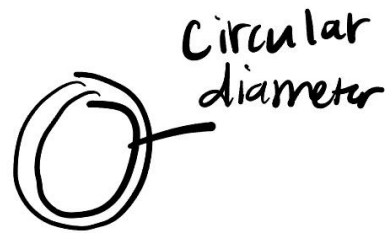
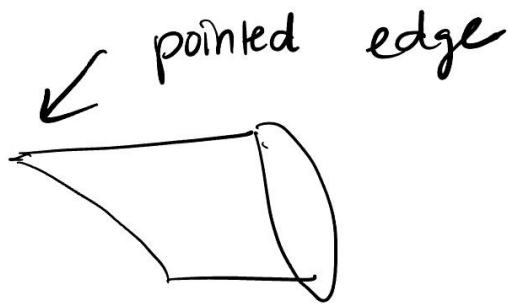
Overall, the design that won was the Skin Biopsy Design as it scored the highest in four out of five categories: precision, durability, feasibility, and cost. This design creates the least amount of external tissue damage due to the simplicity of the blade. The rigged “teeth” on the pineapple corer and the non-uniform circle of the slanted blade will cause uneven cuts and can tear the tissue more. The simplicity of the blade allows for it to remain sharper than the other blades. It also is an overall more simplistic design with less detailed components than the competing designs, therefore it won durability and feasibility as well. Since all three designs will most likely be made of stainless steel, all designs scored similar in the cost category. The only downside to the Overall, the pineapple corer design is too rough for human tissue and the slanted blade is a more complex model of the skin biopsy design.

### Design 1:



Design 2:

### Design 3:



Design 3:

'punch biopsy'  
↳ based off skin biopsy design

A hand-drawn sketch of a punch biopsy instrument. It consists of a long, cylindrical handle with a circular blade at one end. The handle has several vertical slits along its length. A bracket on the right side of the handle is labeled with two points: "\* no button" and "\* just push + twist to get a clean cut".

- \* circular blade  
or  
\* coring handle they already use
- \* trephine  
↳ already a surgical instrument
- ↳ can be several dimensions or designs
- ↳ has been used to cut holes in bones (e.g. skull)