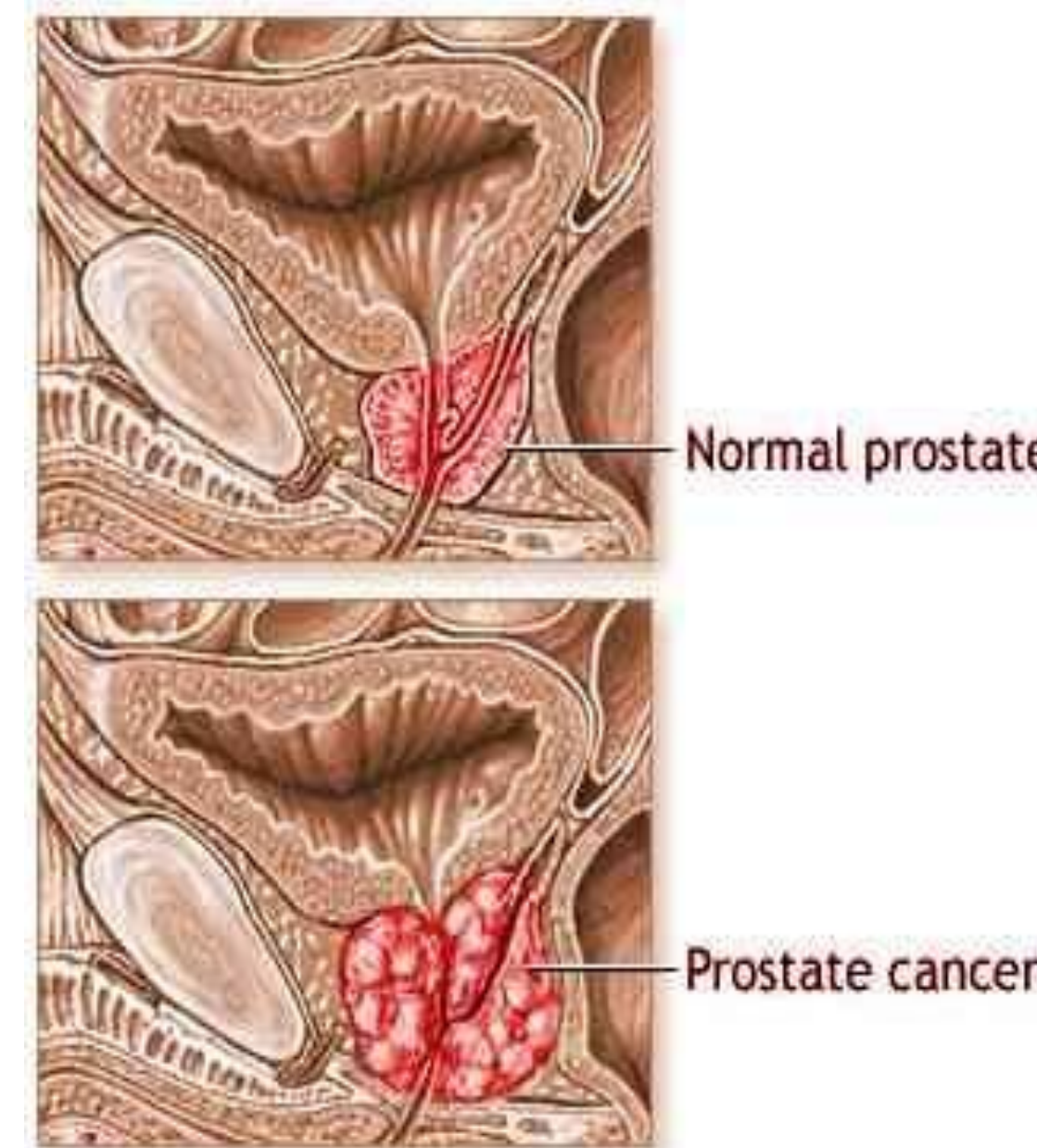


## Abstract

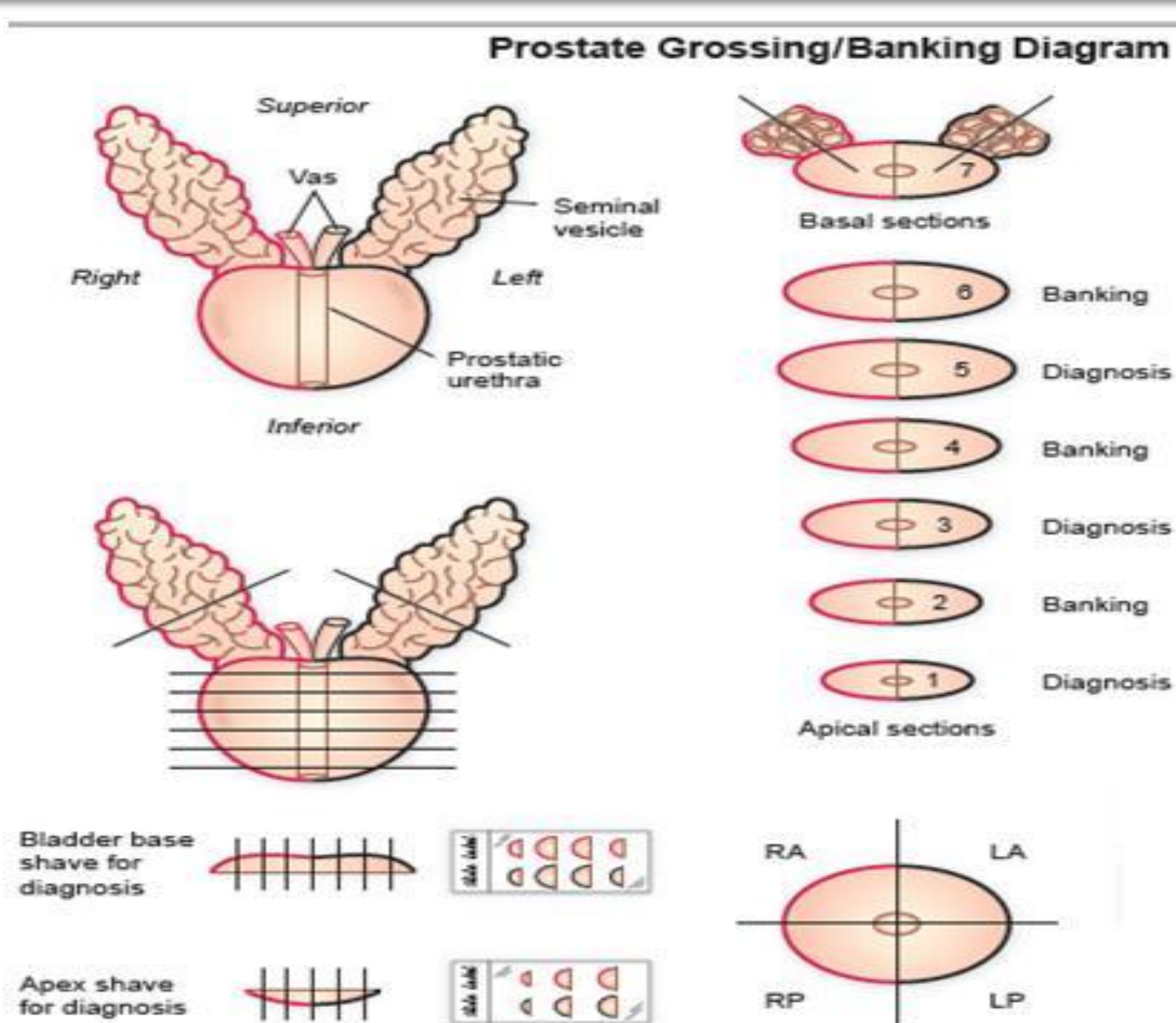
Prostate cancer is a prominent problem among older males. Our client Dr. Wei Huang works as a pathologist at the UW hospital and diagnoses biopsied prostate samples. To expedite and improve the process of extracting slices from the biopsied prostate, Dr. Huang would like us to design a prostate cutting apparatus that secures the tissue during cutting, and allows for 3 mm slices to be easily extracted. After many modifications, our team has constructed a prostate cutting device that can secure the prostate while it is being accurately cut into 3mm slices.

## Prostate Cancer

- Prostate produces and secretes fluid that assists in the male reproduction.
- Prostate Cancer - continual growth of cells and can enlarge normal prostate(20-30g) up to 100g (Prostate Physiology).
- Enlargement can cause problems and complications.
- Potential causes: advancing age, genetics, hormonal influences, and environmental factors such as toxins, chemicals, and industrial products
- Treatments: surgery, radiation therapy, hormonal therapy, cryotherapy, chemotherapy



## Client Requirements



- Secures the prostate
- 3mm segments
- Up to 7-8 slices
- Adjustable
- Intact Prostate Margin

Prostate grossing and banking diagram, every other slice is used for diagnosis purposes. Our device will be able to accommodate making each of these slices.

## Final Design

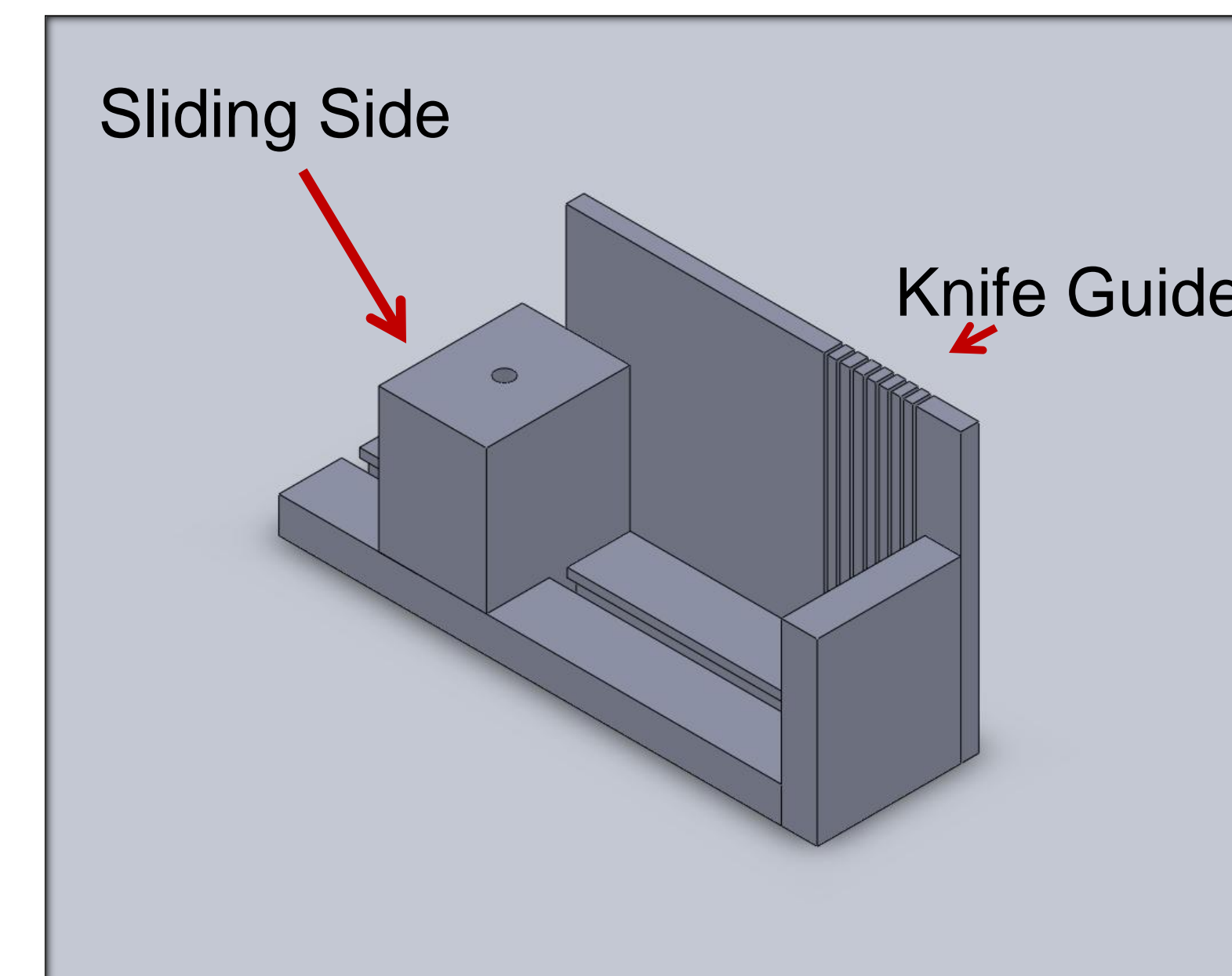
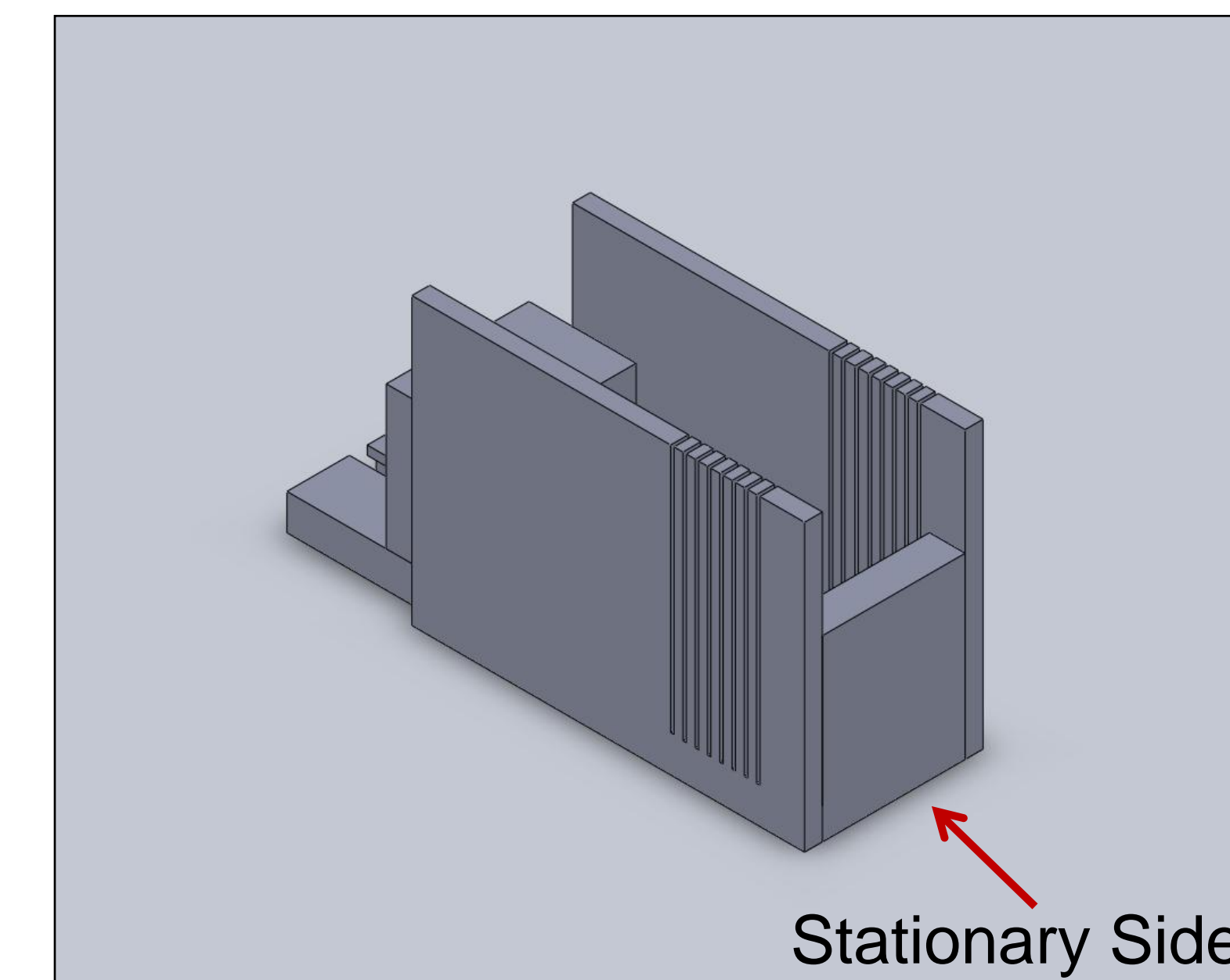
The evolution of the Final Design is shown as a progression running along the bottom of this poster.

### Design Dimensions:

- Sliding spacer 1.5" long
- Base 7" long and 1/2" thick
- Sides 5" long and 1/4" thick
- Slots 3/64" wide,
- Approx spacing of 3mm (1/8") between slits
- 1/4" diameter hole in sliding side for hex bolt

### Design Features:

- Sliding side to clamp prostate
  - T-track sliding mechanism
  - Hexagonal bolt locking mechanism
- Two slitted sides to guide knife
  - Open slits at top
  - 8 slits for potential to cut 8 slices



## Cost Analysis

### Fabrication Costs

Item	Cost
Tosa-Tool Design Fabrication	\$520.00
Polycarbonate sheeting	\$6.00
Clamps	\$8.00
<b>Total</b>	<b>\$534.00</b>

## Testing

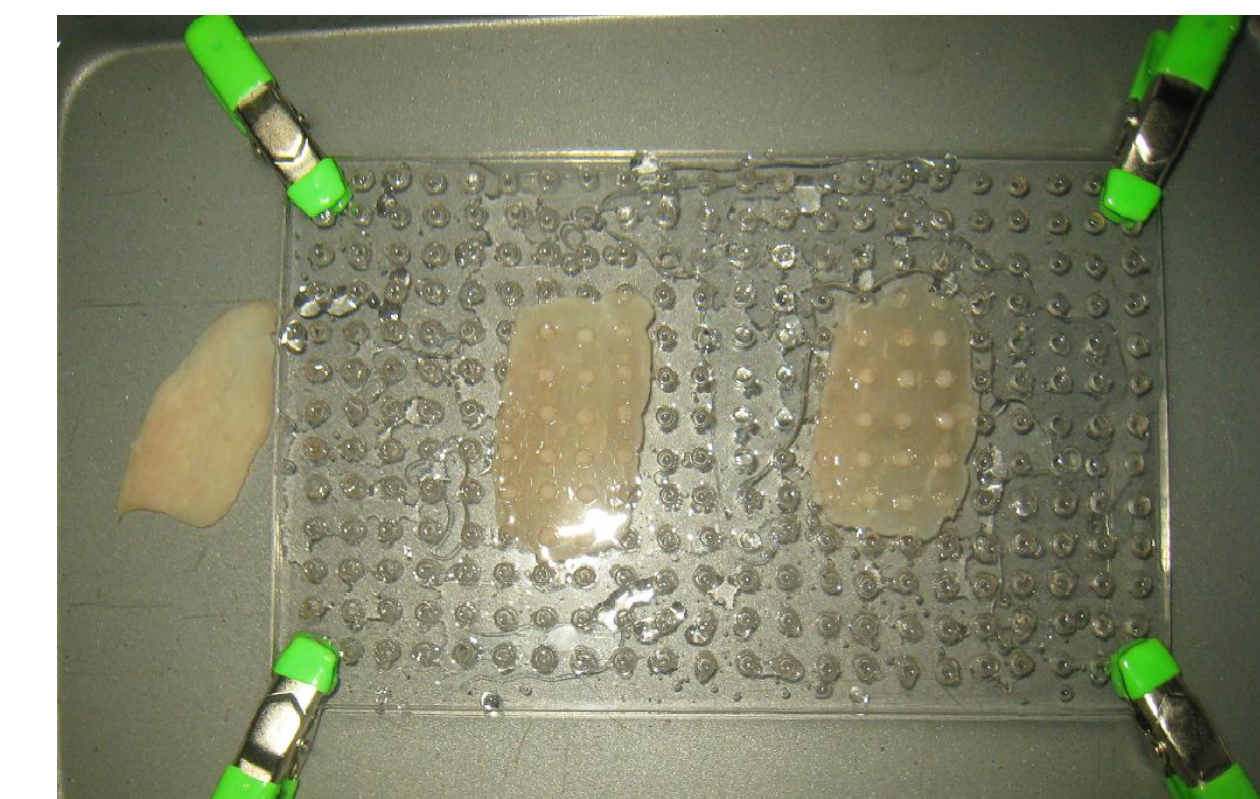
Clamps (right) were fabricated for our client to secure freshly-cut prostate slices while soaking in formalin fixative. To test the efficacy of these clamps, tissue slices (chicken) were soaked in formalin to mimic the prostate fixation process, and 2 variables were assessed:

### Fixation effectiveness:

- 10% buffered formalin solution
- 3 conditions
  - clamp + chicken + formalin
  - chicken + formalin
  - raw chicken (control)
- Results indicated both clamped and unclamped tissues were similarly fixed (compared to control)
- No apparent change in volume was observed

### Clamp Degradation:

- Polycarbonate soaked in formalin to determine degradation over time
- 5 time-points: 15min, 30 min, 1 hr, 2 hr, overnight
- Increased rigidity at 2 hr and overnight time points
- Leaching suspected at long time intervals



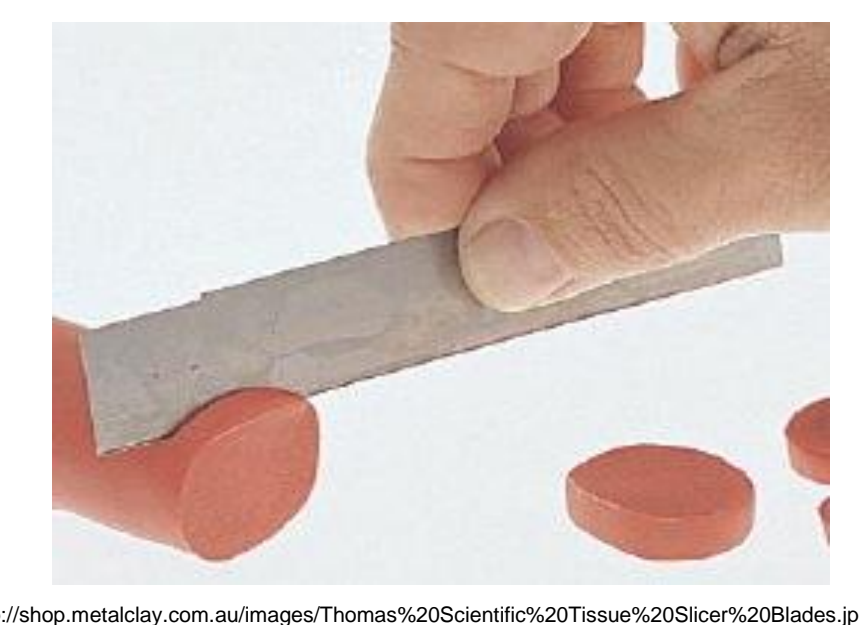
Chicken soaked in 10% neutral buffered formalin solution in accessory clamp, compared to fixation of chicken out side of accessory clamp.



Clamp degradation testing polycarbonate. Increased rigidity after soaking in formalin for 2 hour time period

## Future Work

- Testing – Accuracy of slice thickness using prostate cutter
- Evaluation of device by client and other physicians
- Testing device with biopsied prostate
- Creation of a brief tutorial video on how the prostate cutting device works
- Potential patenting



## References/Acknowledgements

Professor Willis Tompkins – University of Wisconsin – BME Department Advisor  
 Dr. Wei Huang – University of Wisconsin Hospital – Pathology Department  
 Tosa Tool –Prototypes and tooling  
 College of Engineering Shop – Consulting  
 Prostate Physiology (Source)

