

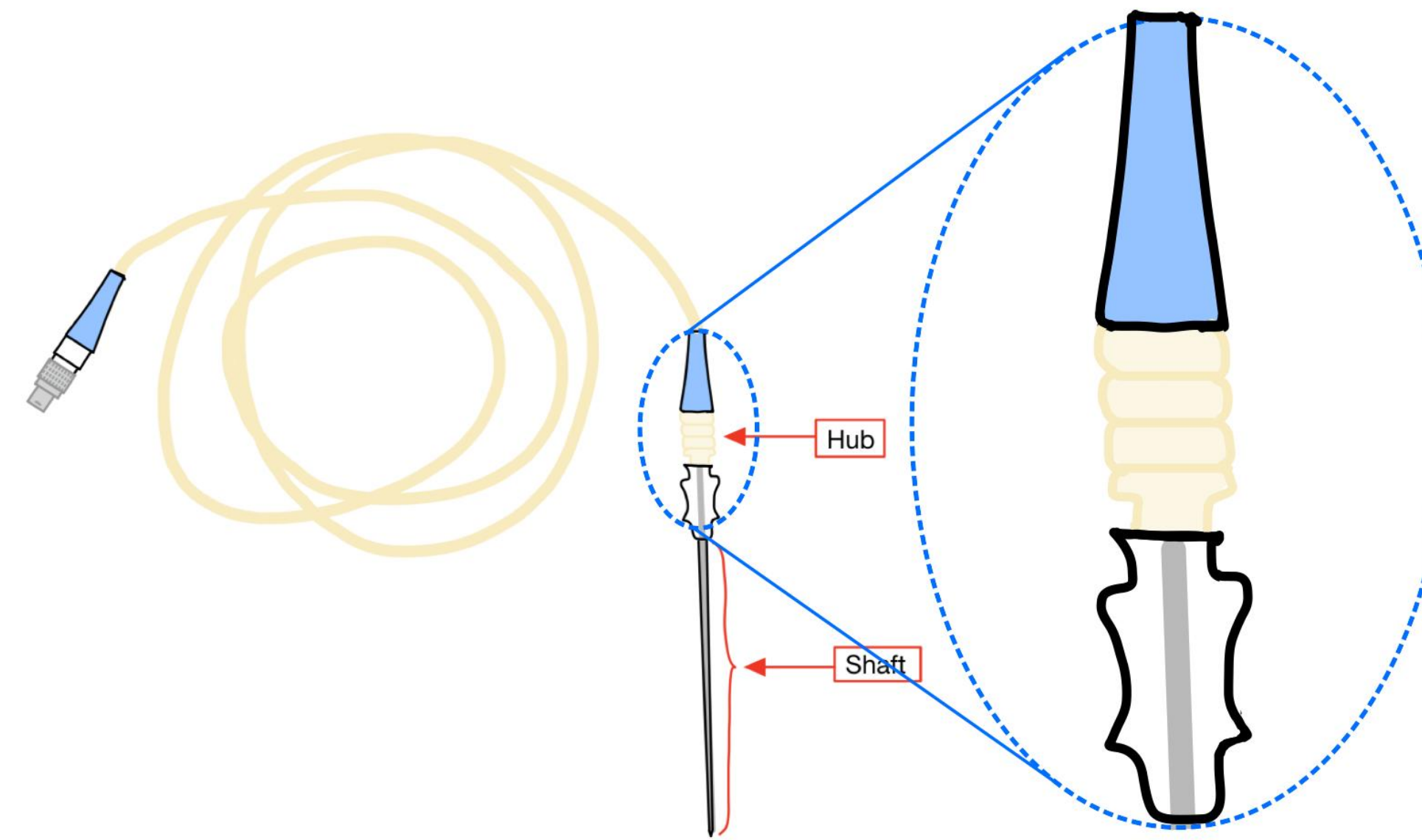
Background

Radiofrequency (RF) ablation is a common therapy used for alleviating chronic pain.

- Imaging modality is used to make sure needle (cannula) is in correct position.
- RF generator sends an electrical current through the probe which heats up the nerve tissue.
- Thermocouple reads temperature at tissue site.
- Heating burns the nerve and prevents it from sending pain signals.
- Therapeutic results can last up to 6-12 months and sometimes even years.

Abbott's current reusable RF electrode can withstand about 50 uses before degradation of materials.

Objective: increase the reusability of the electrode to upwards of 100 uses while also maintaining an affordable unit cost, roughly \$200



Final Concept

For our final concept, we elected to go with a 304 stainless steel material for the shaft, and a PPSU polymer for the hub.

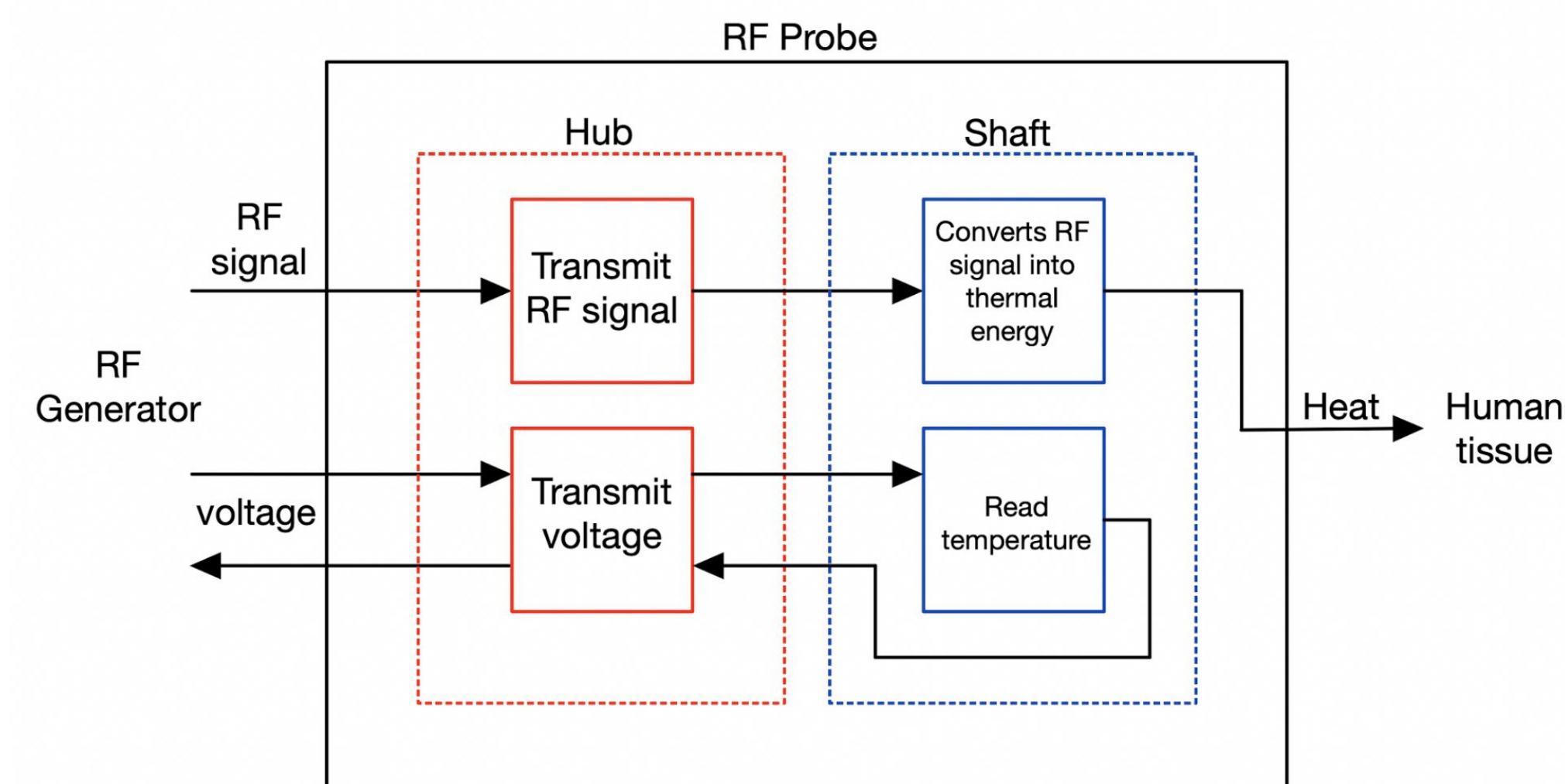
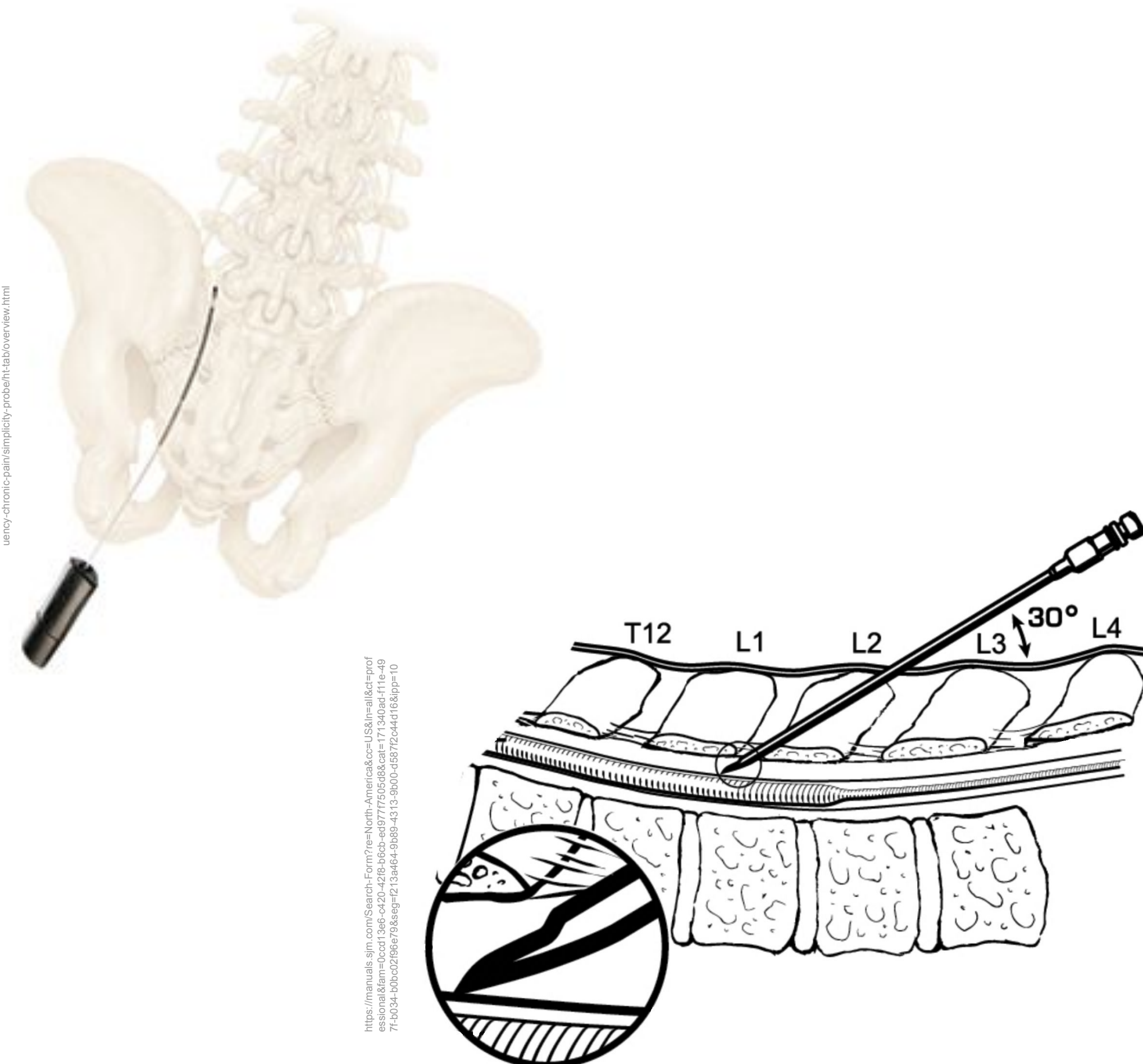
The Hub - PPSU (Polyphenylsulfone)

- Made by Radel, PPSU is a super-tough, high-heat polymer that has been used in the healthcare industry for over 30 years. [1]
- Passes ISO 10993 Biocompatibility testing.
- Capable of withstanding virtually unlimited steam sterilization.
- Excellent resistance to commonly used hospital disinfectants.

The Shaft - 304 Stainless Steel

- The most cost-effective solution that fulfills our customer's needs.
- Will be used to house the thermocouple, which will read the temperature at the tip of the shaft.
- Will transmit the RF energy to the nerve tissue at the treatment site.

Functions	Targets	Metrics
Transmit RF signal	Signals from 2Hz to 460kHz can be transmitted	Signal is successfully transmitted from the RF generator to the tissue
Transmit Voltage	Voltage ranges between 1.845 V and 7.2 V	Voltage is successfully transmitted from the RF generator to the tissue
Read Temperature	Range of temperature between 50 degrees C and 110 degrees C	Reads in the tissue temperature
Durability of Materials	Reusable for at least 100 times (procedure and sterilization)	Device will successfully work for at least 100 uses
Affordable Cost	The production cost for one probe should stay below \$200	The quote for the prototype (materials and development) will not exceed \$200 per unit
Compatible with Medical Sterilization Techniques	The device will undergo medical sterilization techniques successfully (eg. autoclave)	The device will be able to withstand the sterilization procedure successfully



Future Work

- Going forward we will be developing our initial prototype, based on our selected concept
- Once the prototype is developed, we will begin stress testing the material to determine how feasible our initial design could be in meeting our project targets and metrics

References

- [1] "Radel® PPSU," Solvay. [Online]. Available: <https://www.solvay.com/en/brands/radel-ppsu>. [Accessed: 18-Nov-2021].
- [2] "Radiofrequency Ablation", Cleveland Clinic, 2021. [Online]. Available: <https://my.clevelandclinic.org/health/treatments/17411-radiofrequency-ablation>. [Accessed: 11- Oct- 2021].