

# Ultrasound Probe Holder to Facilitate Peripheral Nerve Block Procedures

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## motivation

Peripheral nerve blocks are a method currently used by anesthesiologists to inhibit sensations of pain in an entire limb during a surgical procedure. Our client performs this procedure on a regular basis with the aid of a portable ultrasound machine and requested that our team design a device able to serve as an additional hand in the pre-/post-operative room.



Figure 1. Brachial plexus nerve block procedure illustrating proper probe angle and placement (New York School of Regional Anesthesia).



Figure 2. ultraStand™ adjustable arm probe positioning system (Wellan Medical Inc.).

## design constraints

- Attach to the articulating arm [ultraStand™] produced by Wellan Medical
- Securely hold probes of varying shapes and sizes made by SonoSite and GE
- Small enough to be easily gripped with one hand
- Produce a force large enough to prevent rotation or movement of the probe in the clamp
- Prevent deformation of the probe itself



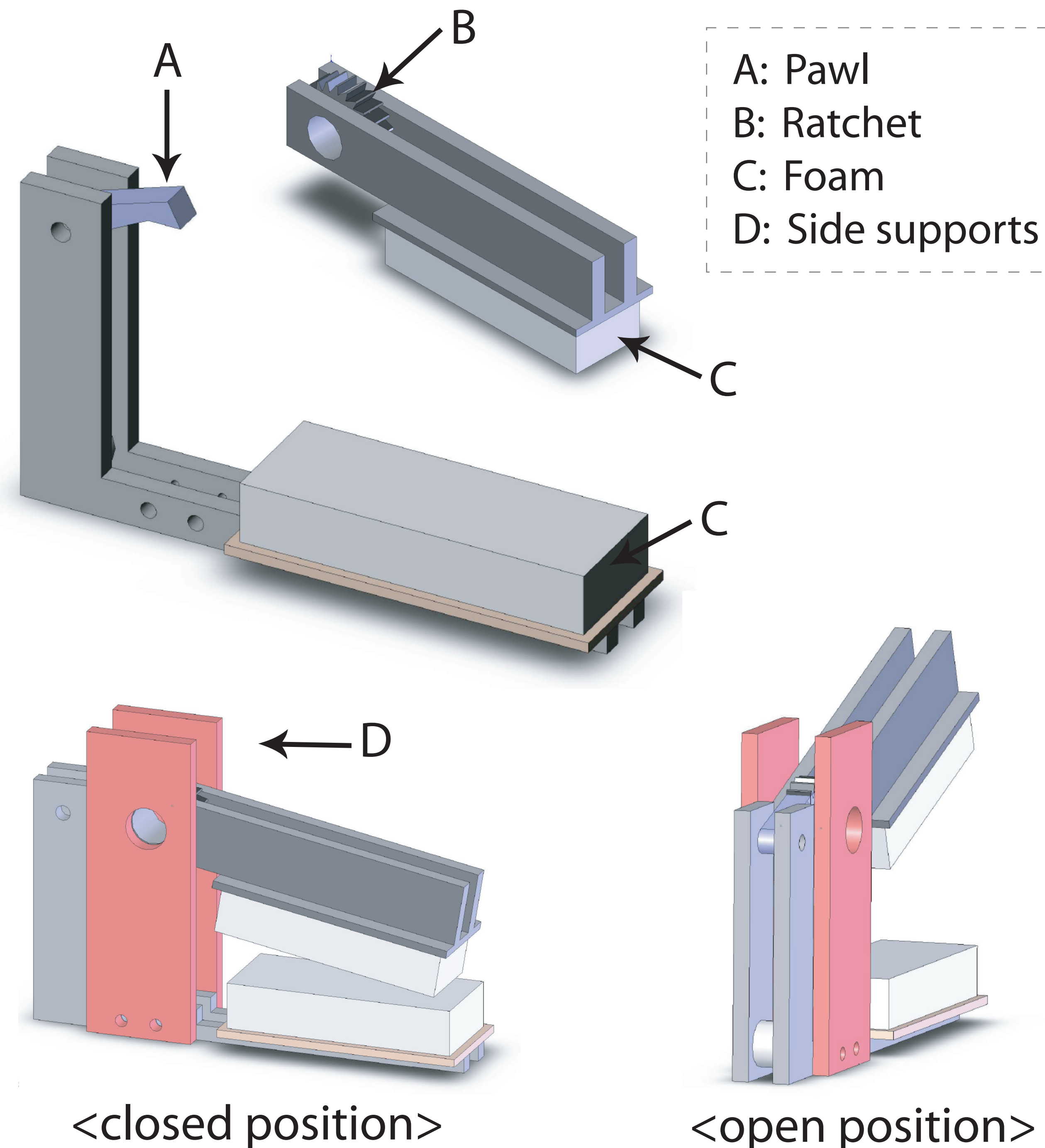
Figure 3. Various styles of SonoSite™ probes (SonoSite Inc.).

## abstract

Our project began with the design of an adjustable arm system meant to facilitate peripheral nerve block procedures. In early March of 2007, a collaboration of engineering alumni from Dartmouth University and physicians at Dartmouth Hitchcock Medical Center went public with a product designed to accomplish the same goal. Following this announcement, our client expressed interest in purchasing this device (known as the "ultraStand™") but desired a redesign of the probe holder. During the second half of the semester, we developed a strong candidate for this design and began construction of an oversized prototype based on a ratchet-and-pawl mechanism. Future work will incorporate client feedback to improve design components and will involve miniaturization of the device.

## current prototype

- Skeleton of oversized prototype made of 1/4" polycarbonate
- Ratchet-and-pawl mechanism (stainless steel) offers stepwise closure and prevents unwanted opening of holder when in use
- Polyethylene foam (3/4") cradles probe



## background

- Ultrasound imaging facilitates anesthesia placement that is safer and more efficient
  - > without ultrasound, procedures are guided by skin surface markings and are only ~ 80% successful
- Simultaneous tasks often required:
  - > placement of probe
  - > insertion of needle
  - > injection of anesthetic
  - > threading of catheter (sustained anesthetic release)

Figure 4. Current oversized ratchet and pawl prototype constructed in April 2007 of primarily polycarbonate and foam



## future work

- Discuss aspects of current prototype with client
  - > satisfaction with mechanism
  - > suggestions for ergonomics
  - > ideal materials
- Ensure compatibility with various probe shapes/sizes
- Pursue professional manufacture of smaller device
- Consult WARF about licensing and patenting issues

## references

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