

Background

The goal of this project is to design a new, more secure connection for Medtronic's LP Strata Valve. This shunt helps to treat hydrocephalus, a condition where there is a buildup of cerebrospinal fluid in the brain cavity. The shunt is implanted in the lumbar region of a patient, and works by creating a pressure drop to induce a flow of cerebrospinal fluid, which is then drained into the abdominal cavity. With the current design, it is difficult to attach the lumbar catheter to the nozzle of the LP Strata valve in a controlled, dry environment, and even more difficult to do so in a slippery surgical environment.

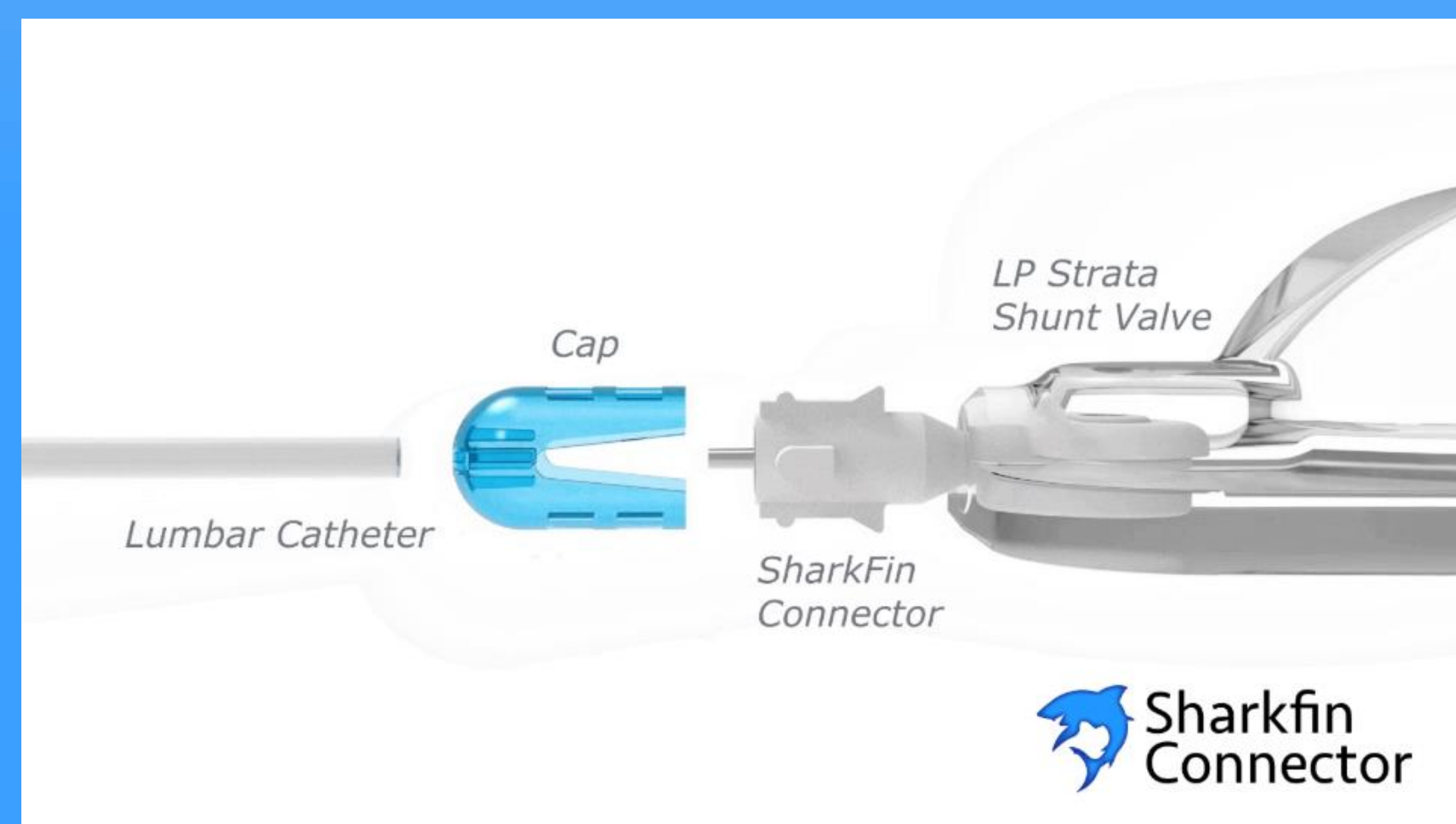
Overview

The new Sharkfin connector has a much simpler assembly process than the current design.

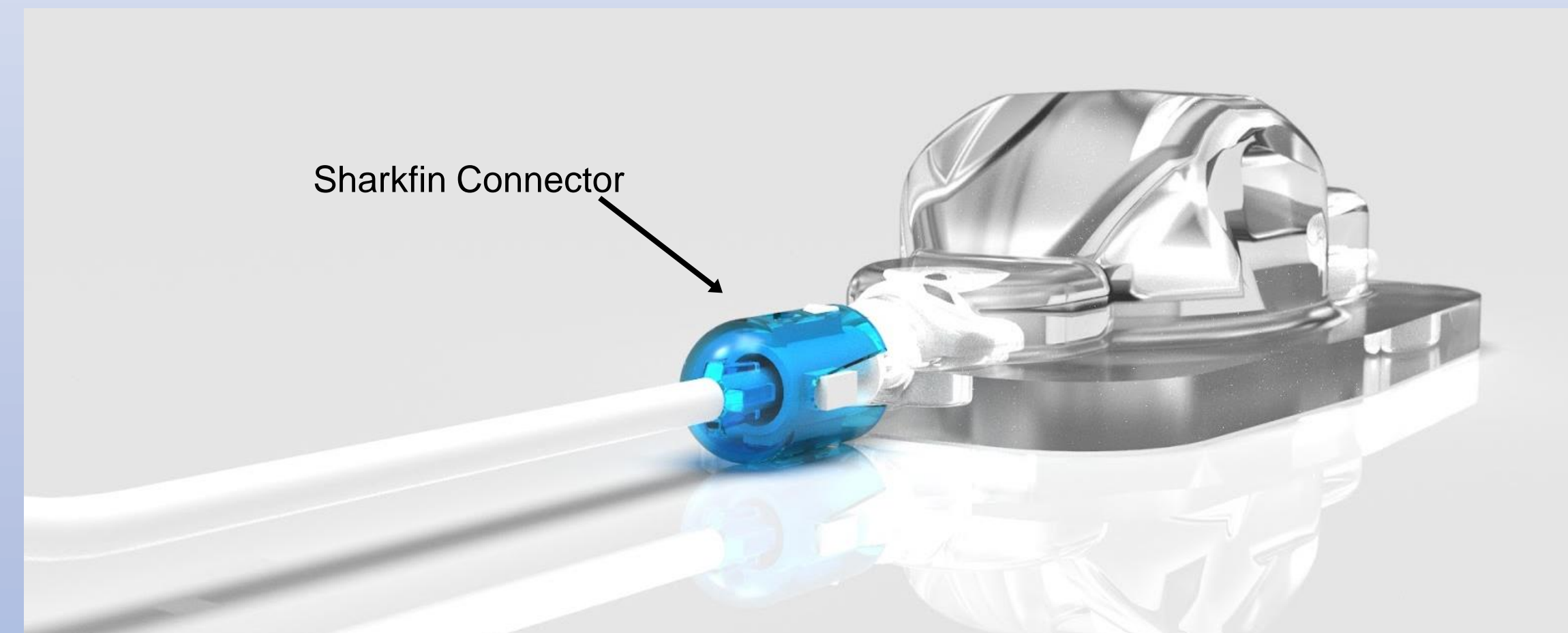
- No suture is required
- Easy to slip catheter over the metal stylet because the outer diameter of the stylet is equivalent to the inner diameter of the catheter.
- Fewer steps to assemble the connection.

These improvements will greatly decrease the connection time, as well as greatly lower the risk of tearing to the catheter.

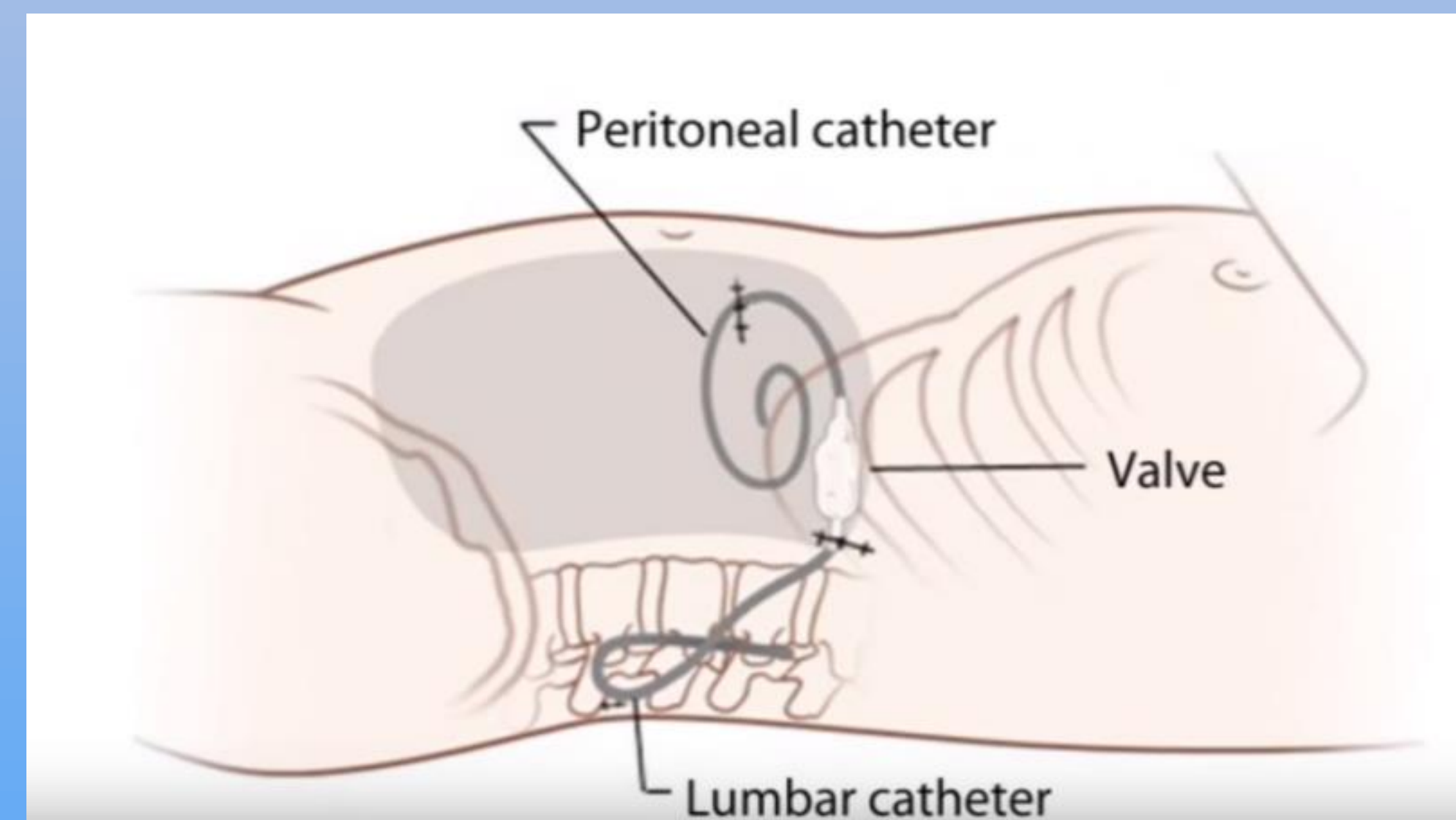
Exploded View



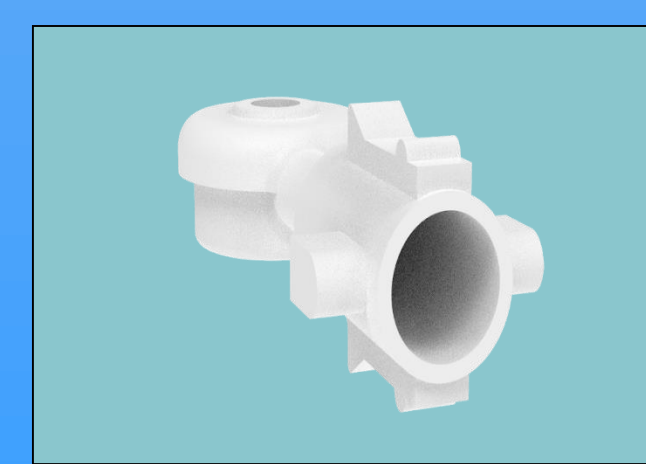
Sharkfin Connector



Shunt Location



Key Components



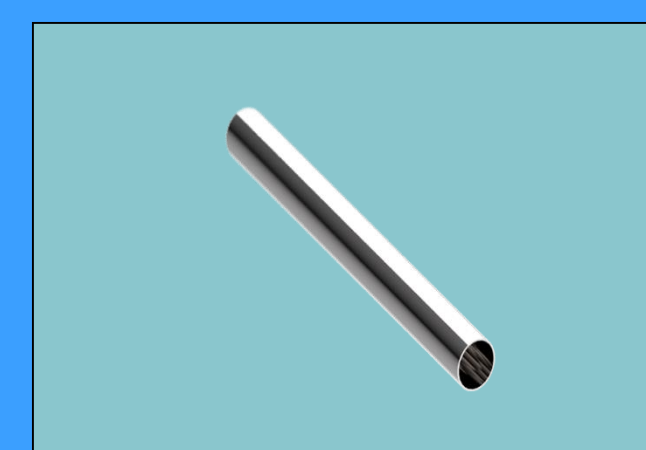
Built in Connector

Redesign of the current valve nozzle for the Sharkfin Connector. Interior features are conserved while exterior features are modified to improve the connection.



Cap

Functions as a strain relief and improves the security of the connection in the Sharkfin connector..



Metal Stylet

The catheter slides over this component to improve the ease of the connection.

Testing

Engineering Characteristic	Minimum Requirement	Testing Results
Tensile Strength	700 psi	Catheter failed before connection
Cyclical Fatigue	100,000 cycles of 10% elongation	Passed
Leakage	No leak at 1 meter depth for 5 min	Passed
Flow Rate	No Change	No Change

Minimum requirements of testing were drawn from ISO 7197 Standard for shunts. All tests were passed and the design is ready for implementation.

Conclusion



The Sharkfin connector notably improves the current connection method in a few key areas.

- Fewer steps to assemble
- Improves security of connection
- Decreases time to connect

Acknowledgements:

This would not have been possible without Medtronic, and support from Jeff Bertrand and Stephen Laguette. A special thanks to Kirk Fields and Elliott Hawkes' Lab team for assistance in the testing process.