

Senior Capstone Design

Project: **Arthroscopic Shaver**

Primary Author: **Ethan Overfelt**

Team: **Scalpel Jockeys**

Date: **11/7/19**

Design Validation Plan & Results (DVP&R)

Requirement	Test	Test Subject	Target Date	Result	Recommendation
Maximum pedal effort shall not exceed 40 lbs to stop the vehicle	Measure pedal effort when applying the brake.	Fully functional prototype	3/13/19	Tested 3/10/19 - Measured Pedal effort is 37 lbs	Meets requirements - no further action required.
Maximum weight shall not exceed 20 lbs	Weigh the full system on the scale in GJ 126	Fully functional prototype	3/20/19	Tested 3/18/19 - Measured weight is 24 lbs	1) Remove weight from the bulkhead (~2 lbs). 2) Review status with client to confirm acceptance with 2 lbs overweight.
Autoclavability of motor	Put in autoclave and then see if it is operable afterward	Motor	1/31/20		
Autoclavability of whole device	Put in autoclave and then see if it is operable afterward	Fully functional prototype	3/30/20		
Compatibility of suction with current setup	Place tube in cup of water with bits of cartilaginous tissue and see if it works when hooked up to current	Suction pump and tubing	2/15/20		
Ability for inner shaft to rotate in outer shaft	Hook up motor to inner/outer shaft configuration and run, making sure it runs smoothly without catching	Shafts and motor	3/10/20		
Thickness of shaft and tip should not exceed 4 mm	measure thickness of shaft and head	Shaft and head	2/15/20		
Needs to be comfortable to hold and operate with for Dr. Hiller	Have Dr. Hiller operate on a bovine knee	Fully functional prototype	4/1/20		
Needs to be comfortable to hold for Dr. Hiller	Have Dr. Hiller hold and approve handle	Handle	3/1/20		
Maximum weight shall not exceed 500g with 400g being the handle	Weigh the full system on the scale in GJ 126	Fully functional prototype	3/20/20		
Ability to shave down articular cartilage	run shaver on bovine/porcine knee and measure articular cartilage before and after with a microscope	Fully functional prototype	4/10/20		
Device is not greater than 4 mm in diameter	Measure diameter by inserting shaft into 4 mm straw to ensure fit	Shaft and handle	3/10/20		
Device has two components - attachment and handle that can be taken apart	Manually insert and attach head to handle to make sure ease of fit and locked compatibility by applying	Shaft and handle	3/10/20		
Device is made of two components that can easily slide in and out of each other	Manually measure that there is not friction when sliding inside attachment in and out of handle	Shaft and handle	3/10/20		
Not falling apart or bending	run shaver on bovine/porcine knee, measure deformation and breakage	Fully functional prototype	3/25/20		
Operate for 1.5 hours of continuous use	Use prototype continuously for 1.5 hours with load (shaving of bovine knee cartilage, etc.)	Fully functional prototype	4/10/20		

<-EXAMPLE

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Operate withing temperature range of 25-39 °C	Use prototype at the both 25 °C and 39 °C with load to check functionality	Fully functional prototype	4/10/20		
Input voltage:100-240V AC	Use voltmeter or multimeter to measure the powersouce's voltage	Electrical component	4/11/20		
Input current:6-10A	Use ammeter or multimeter to measure the powersouce's current	Electrical component	4/10/20		
Operation power capability: 400W@200ohms and 200KHz	Use multimeter to measure the output voltage and current, then can get the operate power	Electrical part	4/11/20		
Max speed:12000 RPM	Run at full load, and use Infrared tachometer to measure the speed	Electrical component	4/12/20		
Energy Storage Capacity : Plug in power source (110V-220V)	use plug in electric resource	Electrical component	4/12/20		
Must not break or bend during use when max load is applied	3 point bending test of material	Shaft material	2/15/20		
Meets the IP 68 rating	submerge prototype underwater for a	Fully functional prototype	4/10/20		