Introduction:
Current devices obtain an insufficient core sample size of lung tissue during a transbronchial bronchoscopy biopsy. The biopsy is done by inserting the bronchoscope into the patient’s trachea via the mouth. Once inserted, and the target tissue is found, the biopsy device is inserted into the working channel of the bronchoscope. The sample is then obtained, and the biopsy device removed. These devices are constrained by size of the working channel and flexibility of the device. Due to these constraints, extracted lung tissue is either damaged, or too small for proper pathology testing, resulting in the need for multiple biopsies.

Objective:
To deliver a bronchoscopy device that is capable of obtaining a larger volume of tissue, with a single attempt, than current biopsy methods, without requiring removal of the bronchoscope.

Project Deliverables:
- A 10:1 scaled model of the final product capable of obtaining a sample of the gelatin tissue substitute
- A set of instructions for use of the device to demonstrate the correct method of obtaining the sample, from insertion into bronchoscope to removal of the sample from the device
- The experimental results of the tests done on the working prototype compared to the scaled comparative results of the current products provided by Boston Scientific

Prototype Testing and Data
Each iteration of the prototype was tested using low density gelatin based on qualitative descriptions based on clinician and client consultation. The resulting sample sizes were measured along three axis. The measured dimensions were scaled down to match the existing scale of the goal device size, and volume and cross sectional area were calculated assuming the sample was an ellipsoid. Below is a graph showing the comparison of a single sample size to that of our control values.

Finite Element Analysis
Results
A Finite Element Analysis was completed using SolidWorks. The outside sheath was constrained (hidden in the images) and a force of 15N was applied in tension to the rear of the collar indicated by the arrows. The image below shows the resulting stress on the device. The material used is titanium (Ti-6Al-4V). The highest concentration of stress occurs at the rear of the collar, where the forces are applied. Minimal stress concentration occurs at the teeth and is below the yield strength.

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