The Statement of Work:
Boston Scientific has identified an opportunity to develop flexible products for use in various areas, visualization, and biopsy within the pleural cavity. The tools would provide an effective alternative to thoracoscopy, with the main distinction and advantage being that the procedure would be conducted with minimal or no lung deflation.

The specific scope of the project would require further determination by the SCOPE team as they evaluate areas for product development. The project will include researching market opportunities, identifying technical challenges, generating ideas, developing preliminary functional prototypes, and conducting authentic testing (possibly in vitro, if appropriate).

Anatomy of Pleural Space:
Inside the body, the lungs are covered by a thin, double-layered membrane called the pleura. The visceral layer lines the inside surface of the lung, while the parietal pleura lines the inside surface of the pleural cavity (the pleural space). The parietal pleura is a more firmly adherent, non-elastic lining, while the visceral pleura is much more compliant.

About 30 ml layers thick, the serous surfaces of the visceral and parietal pleura are usually separated by a thin layer of pleural fluid, which lubricates the lungs. However, the lungs expand without friction during breathing. A procedure called pneumothorax is sometimes performed, which essentially eliminates the friction of the pleura. Adhering the pleura to the chest wall allows for easier breathing and reduces friction. The thoracic cavity then behaves as a single, well-compliant functional lung that can expand and contract.

Current Methods of Diagnosis:
There are a number of different techniques that are used to investigate the underlying cause of a pleural effusion. They vary in invasiveness and effectiveness, and are illustrated below. Briefly, the three types of diagnostic techniques are:

1. Thoracentesis: fluid from the effusion is sampled through a needle procedure that can serve either as diagnostic or therapeutic. Closed Needle Biopsy: this part of the parietal pleura is biopsied using a needle.

Minimally Invasive Procedures:
Minimally invasive procedures are on the cutting edge of surgery. By minimizing the number and size of incisions needed, the amount of anesthesia needed is reduced and hospital stay times are shortened. Furthermore, recovery is greatly decreased. Minimally invasive procedures can also be performed on a wider patient population. Although laparoscopic and endoscopic surgical procedures are much less invasive than open surgery, many improvements can be made, including better control of the size and number of ports needed.

We focused on developing a deformable trocar, which would greatly facilitate single-port surgery, which many see as the next frontier in minimally-invasive surgery.

Meet the Team:

Pleurul Effusions:
A pleural effusion is an accumulation of fluid within the pleural space, or the space between the lung and the chest wall. Normally, there is a small amount of pleural fluid to reduce friction between the lung and the chest wall, but liquids can build up if there is poor drainage or if a fluid is produced. A pleural effusion is generally a symptom of a larger problem. Examples of causes for the two types of effusions are below:

1. Transudative: systemic problem
   - Heart failure
   - Liver failure
2. Exudative: local problem
   - Infection
   - Trauma

Once a pleural effusion is detected, if the cause is not known, there is a variety of procedures of varying levels of invasiveness performed to find its cause.