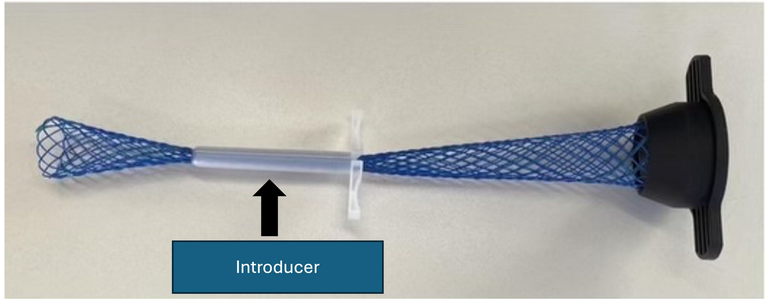
Novel Extraction Device to Enhance Removal of Surgical Specimens

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INTRODUCTION

The current standard for specimen removal during MIS involves placing the resected tissue into a specimen bag and withdrawing it through the largest trocar site. Bunching of the specimen at the bottom of the bag necessitates creating a larger opening than necessary. The risk of trocar site hernia is directly correlated with the size of the trocar and extraction site (1). Consequently, minimizing the size to less than 10 mm could substantially reduce the incidence of port site hernias. We have developed a braided mesh device (*Figure 1*), which grips and compresses the specimen into a long, cylindrical shape, reducing its cross-sectional area and enabling extraction through smaller incisions. This study aims to test the effectiveness of the device compared to conventional extraction bags.



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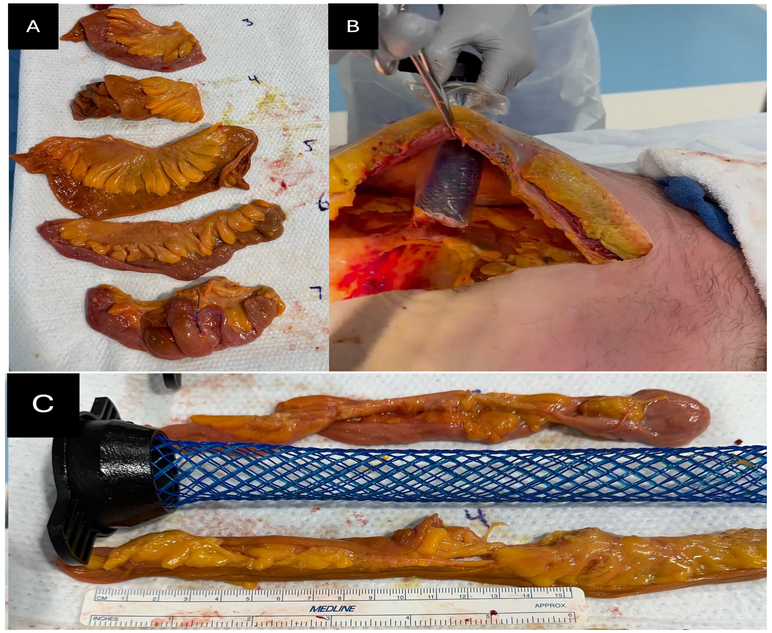
(Figure 1)

METHODS

In a surgical simulation laboratory utilizing a cadaveric model, we prepared six pieces of small intestine cut to approximate the size and volume of a gallbladder *(Figure 2A)*. For each specimen, a new abdominal incision was created using an 8mm trocar. A polyurethane extraction bag was inserted through the port and the specimen placed into it. If the specimen could not be extracted with the bag only, then the braided mesh was used. With the aid of an introducer (figure 1), the braided mesh was inserted into the bag, through the port site, and into abdominal cavity. A laparoscopic grasper was then used to pull the specimen into the braided mesh. Once the entire specimen was contained within the braided mesh, the mesh and bag were pulled out to remove the specimen *(Figure 2B)*. After each experimental attempt, the integrity of the bag was evaluated by filling it with water and observing for signs of leakage. Successful extraction was defined as the complete removal of the tissue specimen from the abdominal cavity without any spillage, bag rupture, or need to enlarge the opening.

(Figure 2)

A: Small bowel specimens before extraction
B: A specimen contained within the mesh and bag as it is extracted
C: The specimens are elongated after the extraction process



RESULTS

None of the specimens were successfully extracted using just the bag. In contrast, all six specimens were successfully extracted using the braided mesh ***(Figure 2C)***. For the leak integrity test, one bag demonstrated a pinhole leak. This results in a p-value of 0.0152 using a Fisher exact test.

CONCLUSIONS

The braided mesh with bag was significantly better at removing specimens than a specimen bag alone. The mesh effectively gripped, compressed, and elongated tissue specimens, allowing extraction through <10mm trocar site incisions while maintaining a minimal risk of port site contamination or incision enlargement. Gallbladder or appendectomy specimen removal could be done through an 8mm port instead of a 12mm port. This could reduce the risk of port site hernias and improve outcomes in minimally invasive procedures.

This device is not FDA approved

1. Pulle et al. Port site hernia in laparoscopic surgery. Current Medicine Research and Practice. 2015