

# Prevention of Herniation after Laparoscopic Surgery

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**C**omplications in laparoscopic surgery are becoming more prevalent as more open procedures convert to laparoscopic procedures. This article will address incisional herniation of trocar wound sites and management of inferior epigastric bleeds. A trocar wound closure device allows for avoidance and rapid management of both the aforementioned complications.

Clinical reports on the incidence of incisional hernias vary widely. However, the largest current clinical study (Kadar, Reich, Liu, et al.)<sup>1</sup> regarding the incidence at .17% (3.1% in 12-mm extraumbilical sites and 0.23% at 10-mm extraumbilical sites). Some physicians feel that closure of the fascia is adequate for reducing the chance of incisional hernias. However, of the hernias reported in the Kadar study, one-half of the hernias occurred despite attempts to close the fascia. Another clinical paper reports two of the three hernias present occurred in the preperitoneal space.<sup>2</sup> In the past, if the fascia could easily be closed using conventional techniques, it was done; but if obesity made it difficult, only the skin was closed. This can no longer be considered good surgical technique.

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Physician reports are even more varied. Some hernias have been diagnosed up to eight years after the original procedure.<sup>3</sup> One of the reasons for these conflicting figures is that hernias are not being reported as a complication of the surgery. Furthermore, there are more cases of incidents having been reported

with 5-mm trocar sites, with one multicenter review reporting one-half of the hernias occurring in 5-mm trocar sites.<sup>4,5</sup> A survey of laparoscopists reports that 71.3% of incisional hernias require a subsequent surgical procedure, often laparotomy with bowel resection, to reduce the hernia.<sup>6</sup>

One fact remains clear in this argument: these potentially deadly complications can be easily avoided by routine mass closure of the fascia and the peritoneum. Physicians who routinely do so for trocar ports 10 mm and above have observed no incisional hernias.<sup>7,8</sup> If closure of the fascia and the peritoneum has

been shown to be effective in avoiding this postoperative complication, this technique should quickly become the gold standard.

A practical device for trocar wound closure has been developed: a double-needled device that allows for quick, effective mass closure of the fascia and peritoneum in the trocar wound site (Ligature Device, Tahoe Surgical Instruments). This device has twin 15-gauge needles that are placed simultaneously on both sides of the wound. One of the cannulas is hollow, allowing for suture to be passed, and the other has a shape memory alloy loop for suture



Figure 1. Re-establishing the pneumoperitoneum.

retrieval. The device's design allows for its use with the trocar in place or after the trocar's removal and requires no additional instrumentation.

#### TECHNIQUE WITH TROCAR REMOVED

The following is the recommended method. The device is loaded by placing the suture of the surgeon's choice through the hollow cannula and retracting within 10 mm inside the distal tip. The manufacturer recommends using an 0 or 2-0 absorbable monofilament suture. The trocar is removed to allow the wound defect to relax and provide better access to the fascia. The wound is spread and the longer cannula is placed subcutaneously into the fat on the far side of the wound. The device is then rocked away from the surgeon and the shorter cannula is placed on the near side of the wound.

Once this is accomplished, the surgeon will place his index finger between the two cannulas allowing pneumoperitoneum to be established (Fig. 1). Once pneumoperitoneum has been established, the laparoscope is positioned to visualize the trocar port being closed. The cannulas are spread using the middle finger to secure the fascia and advanced through the fascia and peritoneum as one proceeds. The device is controlled by using thumb and middle fingers to act as a brake for the device while allowing maximum control of the needle's advancement. Visualization of the needles reaching the peritoneal wall is accomplished observing the tenting of the peritoneum. Once the position has been established, the longer needle is inserted through the

peritoneum approximately 10 to 15 mm. The device is then rotated away from the surgeon's body to allow accurate placement of the opposite needle on the contraperitoneal side of the wound.

Once both needles have passed through the peritoneum (Fig. 2), the red locking button is depressed and the handle squeezed until the device locks in place with the suture retrieval loop extended across the opposing needle. Suture is then advanced approximately 2 to 3 inches through the retrieval loop. The surgeon then presses the red locking button again and releases the handle to retrieve the suture to the opposite needle and locks the suture to the opposing needle (Fig. 3).

The device is then removed from the body withdrawing the suture through the fascia, muscle, and peritoneum on the contrafascial side. Once the device is out of the body, the red locking button is pressed and the handle squeezed lightly to unlock the suture from the suture retrieval loop. The suture is then pulled to approximate the peritoneal edges (Figs. 4a-b) and a knot is surgically secured subcutaneously. After practicing this technique a few times, most surgeons should be able to accomplish this process in about 15 to 20 seconds per port closure.

#### TECHNIQUE WITH TROCAR IN PLACE

The device is loaded as in the previous technique. The trocar is rotated 30 to 45 degrees on its lateral axis to allow the needles to be placed. The needles must be placed before the vertical midline of the trocar cannula to ensure

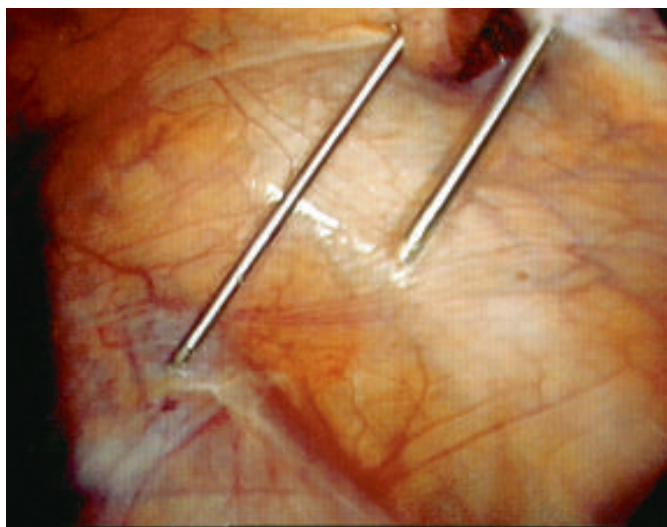


Figure 2. Both needles have passed through the peritoneum, straddling the trocar wound.

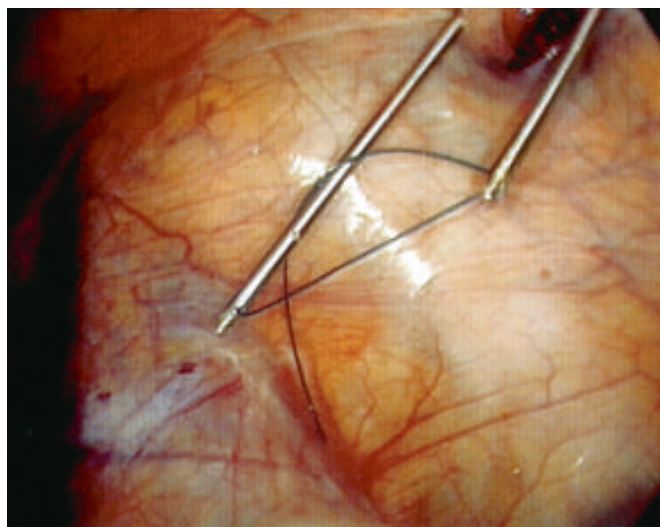


Figure 3. Capturing the end of ligature that will complete the suture circle.



Figure 4a. External knotting of the ligature.

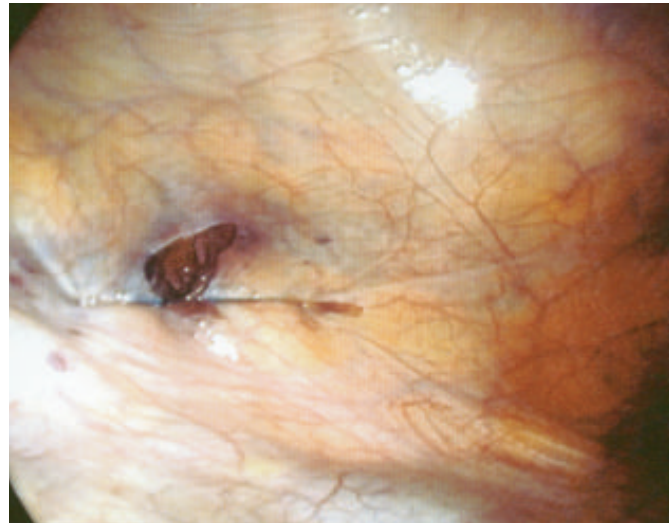


Figure 4b. Laparoscopic view: the peritoneal edges are pulled together.

accurate needle tracking through the wound. Needles are placed through the peritoneum in the same manner as in the previous technique. Once the needles are placed, the device is tilted on its lateral axis allowing the suture retrieval loop to be extended across the opposing needle without interference from the trocar cannula. Withdrawal of the suture and device is the same as in the previous technique.

#### MODIFIED TECHNIQUES

A question that is commonly asked is, "If the device is to be used under direct vision, how is the last port (camera) closed?" This is accomplished by moving the camera to another site to ensure direct vision while placing the suture. Then the suture can be placed with or without the trocar and tagged (not tied). The camera is moved back to its original port. After the other port sites are closed, the camera is removed, followed by the trocar, and a surgical knot is secured at the final port site.

Another question that is commonly asked is, "If a one-puncture technique is used or if there is only one 10-mm port for the camera and no access to a 5-mm scope, how is the wound closed?" This can be accomplished, but requires a modified technique. First, the trocar cannula must be retracted until the distal tip is approximately 2 to 3 mm from the peritoneum. The needles are placed through the fat, fascia, and muscle as in the technique for using the device with trocar in place. Once set, the camera is retracted so

that tenting of the peritoneum can be visualized. Afterward, the camera is extended into the cavity to ensure a space exists between the needles and the underlying bowel. The needles are advanced through the peritoneum until the popping sensation can be felt as the needles pass through the peritoneum. The suture is then placed as in the aforementioned technique.

#### 5-MM PORTS: TO CLOSE OR NOT TO CLOSE?

The mounting evidence is that hernias are occurring in 5-mm trocar port sites. One of the reasons for this may be that the trocar sleeves are thicker than perceived. Upon examination of several trocar sleeves, the authors found the outer diameter (o.d.) of the sleeve to be between 7 to 8 mm. This causes a larger defect and a potential space for herniation to occur. Also, as more instruments are placed and removed from the trocar, the peritoneum has a tendency to be dissected away from the tissue structures above it creating a space for the bowel to herniate into the preperitoneal space. If these ports can be closed, this rare but potentially expensive complication can be avoided. The previously described ligature device can close 5-mm ports by using a slightly different technique. The technique involves crossing the needles before insertion into the wound. This allows the needles to drive away from each other while also closing the wound to maintain pneumoperitoneum. Once the needles have passed through the peritoneum, the handle is released from the hand allowing it to reorient or bias

itself so that the suture retrieval can occur.

#### EFFICIENT MANAGEMENT OF EPIGASTRIC BLEEDERS

Bleeding from inferior epigastric vessels and trocar wounds, while not common, is certainly difficult to manage and can be very frustrating at the beginning of a case. Sometimes this can lead to a conversion to an open procedure, which defeats the benefits of laparoscopy. The traditional method of managing these bleeders involves using a Keith needle which is time-consuming, awkward, and can lead to additional frustration.

Before the procedure begins, the scrub assistant should preload the device with the appropriate suture (0 or 2-0 absorbable monofilament is recommended). After isolating the bleeders relative to the trocar, the device is inserted subcutaneously or percutaneously with both needles straddling the suspected bleeder. The suture is passed in the same manner as described above. After removing the device, a 4x4 gauze roll is placed under the knot prior to tying and the bleeding is tamponaded, allowing completion of the procedure. At the end of the procedure, an evaluation is made regarding the bleeder. In most cases, the bleeding has stopped; however, a decision may be made to keep the suture in for two to nine hours.

#### COST FACTOR

The argument is often made that closure with a disposable device adds

cost. However, the use of such a device shortens operative time when compared with using traditional closure techniques. Closure of all large trocar wounds avoids expensive testing such as CT—the best test for Richter's hernias—when a postoperative patient has vague abdominal symptoms. From a medical legal perspective, hernias occurring after a laparoscopic procedure in which mass closure was not performed would be difficult to defend.

## RESULTS

Our group has performed approximately 200 laparoscopic cases in which we have closed all trocar wounds 10

mm and above and have experienced no hernias to date. As more reports of hernias in 5-mm sites occur, it is recommended that they be closed using the cross-needle technique. Routine mass closure of all trocar sites should become the gold standard in laparoscopy to eliminate this avoidable complication. **STI**

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