**Abstract:**

Introduction

Trocar site hernia (TSH) is an uncommon complication after laparoscopic surgery, but may potentially require surgical intervention. The available data have shown the importance of prediction and prevention, and the optimal surgical approach for TSH remains unclear and its long-term outcome is scarcely available. Here, we present a case of a lateral TSH after laparoscopic incisional hernia repair, which was successfully repaired using the onlay technique with a self-gripping mesh.

Case Presentation

A 74-year-old woman presented with an abdominal incisional hernia at the midline after an open cholecystectomy. She underwent laparoscopic surgery for incisional hernia with intraperitoneal onlay mesh repair. Fascial closure was performed for trocar sites. After 12 months, she noticed a painful bulge in the left upper quadrant suggestive of TSH. At the time of diagnosis, her body mass index was 32 kg/m². TSH repair was performed under general anesthesia. A 3 × 3 cm defect was identified, and the hernial content was found to be the omentum. Defect closure was performed using interrupted sutures followed by placement of a self-gripping mesh (11 × 11 cm in size, obtaining a 4 cm overlap for the defect). The operative time was 80 min. The postoperative course
was uneventful except for a spontaneously resolved seroma. CT scan at the 1-year follow-up and physical examination at the 2-year visit showed no recurrence.

**Conclusion**

Our proposed onlay repair using self-gripping mesh may be considered as the treatment of choice for cases of lateral TSH after laparoscopic incisional hernia repair.
TITLE PAGE

The title of the article
Onlay repair using self-gripping mesh for lateral trocar site hernia after laparoscopic incisional hernia repair: A case report with short and mid-term outcome

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A short running headline
Onlay self-gripping mesh repair for trocar site hernia
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Abstract

Introduction

Trocar site hernia (TSH) is an uncommon complication after laparoscopic surgery, but may potentially require surgical intervention. The available data have shown the importance of prediction and prevention, and the optimal surgical approach for TSH remains unclear and its long-term outcome is scarcely available. Here, we present a case of a lateral TSH after laparoscopic incisional hernia repair, which was successfully repaired using the onlay technique with a self-gripping mesh.

Case Presentation
A 74-year-old woman presented with an abdominal incisional hernia at the midline after an open cholecystectomy. She underwent laparoscopic surgery for incisional hernia with intraperitoneal onlay mesh repair. Fascial closure was performed for trocar sites. After 12 months, she noticed a painful bulge in the left upper quadrant suggestive of TSH. At the time of diagnosis, her body mass index was 32 kg/m². TSH repair was performed under general anesthesia. A 3 × 3 cm defect was identified, and the hernial content was found to be the omentum. Defect closure was performed using interrupted sutures followed by placement of a self-gripping mesh (11 × 11 cm in size, obtaining a 4 cm overlap for the defect). The operative time was 80 min. The postoperative course was uneventful except for a spontaneously resolved seroma. CT scan at the 1-year follow-up and physical examination at the 2-year visit showed no recurrence.

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Our proposed onlay repair using self-gripping mesh may be considered as the treatment of choice for cases of lateral TSH after laparoscopic incisional hernia repair.

Key Words

Trocar site hernia; Onlay technique; Self-gripping mesh
Introduction

Trocar site hernia (TSH) is an uncommon complication after laparoscopic surgery but potentially requires emergent surgery because of hernial incarceration through small fascial defects\(^1,2\). The incidence of TSH is generally 0–5.2\(^\%\)\(^1,3-8\), whereas a wide variety of incidences (0.7–22\%) has also been reported in patients who underwent laparoscopic ventral hernia repair\(^3,9,10\). The risk factors of TSH included higher body mass index (BMI), female sex, older age, wound infection, longer operative time, trocar location, larger trocar or mesh size, lack of fascial closure, and stretching of the trocar site during surgery\(^2,4-6,8,9\). Preventive measures against TSH are represented by fascial closure for trocar sites \(\geq 10\) mm\(^3,5,8,10-12\), while some specific devices have been reportedly effective\(^13-15\). Although the available data have shown the importance of prediction and prevention, the optimal surgical approach for TSH remains unclear and its long-term outcome is scarcely available\(^2\).

Here, we present a case of lateral TSH after laparoscopic incisional hernia repair, which was successfully repaired using the onlay technique using a self-gripping mesh.

Case Presentation

History of illness
A 74-year-old woman presented with an abdominal incisional hernia at the midline after open cholecystectomy. She underwent laparoscopic incisional hernia repair with 3 three-port setting (12 mm at the Palmer’s point, 12 mm trocar in the left lateral, and 5 mm in the left lower quadrant). A 12 mm trocar was inserted using the open Hassan technique. A 25 × 20 cm multifilament polyester mesh (Symbotex™ composite mesh, Medtronic Plc, Dublin, Ireland) was placed for the defect. Fascial closure with purse-string suture was performed for the 12 mm trocar sites using absorbable material (2-0 Vicryl™, Ethicon Inc., Cincinnati, OH, USA). There were no postoperative complications. After 12 months, she noticed a painful bulge in the left upper quadrant. Physical examination suggested TSH at the Palmer’s point and computed tomography (CT) confirmed the diagnosis (Fig.1a-b). Thus, the location of TSH was categorized as L1 according to the classification of the European Hernia Society. Because of persistent pain and anxiety associated with the risk of incarceration, we decided to perform an elective surgery for TSH repair. At the time of TSH diagnosis, she was 150 cm in height and 72 kg in weight, with a BMI of 32 kg/m².

Surgical technique

Under general anesthesia, surgery was performed in the supine position. A 4 cm transverse skin incision was made at the TSH site, and the subcutaneous tissue was
dissected. A 3 × 3 cm defect was identified, and the hernia sac was circumferentially exposed (Fig. 2a). The hernia sac was opened, and adhesiolysis was performed. The hernial content was found to be the omentum (Fig. 2b). The hernia sac was ligated and the defect was closed by interrupted sutures using non-absorbable suture (1–nylon) with tissue bites of 1 cm and inter-suture spacing of 5 mm (Fig. 2c-d). Subsequently, a self-gripping mesh (Progrip™, Medtronic plc) was trimmed to 11 × 11 cm in size, obtaining a 4 cm overlap for the defect. The mesh was placed over the closed defect and secured to the fascia in four quadrants using absorbable sutures (3-0 Maxon™, Medtronic Plc). (Fig. 2e). The estimated blood loss was 10 mL, and the operative time was 80 minutes.

Postoperative course and follow-up.

The immediate postoperative course was uneventful, and she was discharged on the 4th day after the surgery. She received daily oral analgesics for 2 weeks. There was no wound infection or septic complications. She developed a radiographically confirmed seroma with minimal feeling of bulge, which spontaneously resolved within 3 months. Computed tomography (CT) was performed 1 year after the TSH repair and there was no hernia recurrence, seroma, or hematoma (Fig. 3a-b). At the 2-year visit after TSH repair, no hernia recurrence was found on physical examination.
Discussion

In this report, TSH repair of the lateral side was successfully performed by the onlay technique using a self-gripping mesh, and there was no hernia recurrence at mid-term follow-up. As shown in the literature, this case had multiple risks of TSH at the time of laparoscopic incisional hernia repair, such as higher BMI, female sex, older age, larger trocar, and larger mesh size. The majority of TSH occurs at the umbilical site, while TSH can be found at the lateral side in patients who underwent laparoscopic ventral hernia repair. This patient developed TSH in the left upper quadrant (Palmer’s point), and the trocar size was 12 mm. Although the patient’s characteristics and operative settings were unavoidable at the time of laparoscopic surgery, attempts to prevent TSH may be considered in terms of the following points.

First, the method of trocar insertion and closure can be modified. The trocar was inserted under direct vision and closed by purse-string suture using absorbable material. Sikar et al. showed that trocar insertion with sharp dissection and closure with continuous suture significantly decreased TSH occurrence on the lateral side, compared with blunt dissection and z-shaped closure (18.2% vs. 0.8%). Therefore, continuous suture would be preferable over purse-string sutures. Second, a prophylactic mesh may be used at the time of laparoscopic surgery for high-risk patients. Armananzas et al. showed that the
prophylactic mesh for fascial closure of the umbilical trocar site significantly reduced the incidence of TSH (4.4%) as compared to suture alone (31.9%), up to 1-year follow-up. In that study, high-risk patients were defined as those aged 65 years and older, with diabetes mellitus, chronic pulmonary disease, and obesity (BMI ≥ 30 kg/m²). As the European Hernia Society guideline commented, larger studies are needed to apply this technique with stronger recommendations. Third, the use of new devices may be considered for fascial closure. In general, the fascial defect of trocar sites ≥ 10 mm is closed either manually or using fascial closure (suture passing) devices. Recently, a randomized controlled trial showed that a novel anchor-based system (neoClose® device, Neosurgical, Newton, MA, USA) decreased closure time, pain, and needle depth compared to standard suture passer. In that study, there was no TSH at the 1-year follow-up in either the new device group or the control group. A larger cohort with long-term follow-up is necessary to elucidate its significance in reducing the incidence of TSH.

In this case, we selected the onlay technique for TSH repair. The main reasons for selecting this technique were the obesity of the patient and TSH secondary to laparoscopic incisional hernia repair. Given the higher incidence of TSH after laparoscopic ventral hernia repair, we excluded laparoscopic repair considering the potential risk of TSH at new trocar sites. For the anterior approach, sublay repair would
be optional. Nevertheless, the non-midline location of TSH (L1) made it difficult to decide whether the onlay or sublay approach was suitable in this case. Onlay technique is supposed to be easier and quicker to perform, whereas hernia recurrence and surgical site infection favor the sublay technique\(^{18}\). The sublay technique can be performed for lateral incisional hernia\(^{19}\); however, dissection through several muscle layers may be complex in cases of previous infection and adhesions\(^{18}\).

In addition, we used a commercially available self-gripping mesh along with the onlay technique. Self-gripping mesh allows enhanced tissue adhesion, minimal suture fixation, minimal mesh fixation time, reduced risk of migration, and decreased chronic pain\(^{20}\). Hopson et al.\(^{21}\) demonstrated that onlay repair using self-gripping mesh was a viable treatment for large ventral hernia with no recurrence at 2 years. Moreover, we previously reported the effectiveness of a self-gripping mesh with an anterior component separation technique in a case series\(^{22}\). Therefore, we applied a self-gripping mesh with the onlay technique in this case. The surgical procedure was technically simple and did not cause any major postoperative complications, except for seroma.

However, the long-term outcomes of this technique remain unknown. Kwon et al.\(^{2}\) reported a 29.4% recurrence rate after TSH repair, and the mean duration between TSH repair and hernia recurrence was 32 months (range, 20 – 49 months). In that study,
mesh reinforcement was applied to 58.8% of the patients at TSH repair, suggesting that mesh did not efficiently preclude hernia recurrence. We will continue to follow-up the patient to assess long-term complications, durability of the mesh, and hernia recurrence.

In conclusion, our proposed onlay repair using self-gripping mesh may be considered as the treatment of choice for a case of lateral TSH after laparoscopic incisional hernia repair.

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**Figures legends**

**Figure 1:** Diagnosis of a trocar site hernia on computed tomography. The arrow indicates the defect.

(a) Axial section

(b) Coronal section

**Figure 2:** Surgical technique

(a) Hernia sac

(b) Hernia content (omentum)

(c) Defect closure with interrupted suture using non-absorbable material

(d) Completion of the defect closure

(e) Self-gripping mesh placement over closed defect

**Figure 3:** Findings of computed tomography at postoperative 1-year follow-up

(a) Axial section

(b) Coronal section
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