Self-gripping mesh in laparoscopic obturator hernia repair: clinical experience in a single institution

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Abstract

**Purpose:** We propose a treatment strategy for obturator hernia repair using a self-fixating mesh. An obturator hernia is a relatively rare type of abdominal hernia with a high mortality rate, with surgery being the only treatment option. Various approaches to repairing obturator hernia using meshes and tackers have been proposed. Nonetheless, postoperative complications such as chronic inguinal pain and hemorrhage have been reported with tacker-fixated mesh approaches.

Although the self-adhesive property of a self-fixating mesh enables tacker-less hernia repair, it is rarely used in inguinal hernia repair. Tacker-less repair reduces the likelihood of chronic pain development; however, the difficulty in handling the mesh in the abdominal cavity must be overcome.

**Methods:** We have been using a self-fixating mesh (PG mesh; ProGrip™ laparoscopic self-fixating mesh) for obturator hernia repair since April 2020. In two cases preceding the introduction of the PG mesh for obturator hernia repair, we experienced difficulty attaching the PG mesh; nevertheless, we successfully performed obturator hernia repair by simplifying the method, using three steps, to attach the PG mesh.

**Results:** Between April 2020 and October 2022, we encountered seven cases of obturator hernia. Of these cases, five were repaired using the PG mesh. Postoperatively, one patient had a small subcutaneous hematoma with no postoperative complications, including chronic pain and hemorrhage. The postoperative recovery time was not prolonged, and there was no recurrence of symptoms during the observation period.

**Conclusion:** PG mesh appears to be suitable for obturator hernia repair.

1 Introduction

Obturator hernia is an acute abdominal condition primarily occurring in older women and presenting with vomiting or sudden femoral pain due to the impaction of hemial contents or bowel obstruction [1]. It is a relatively rare condition with an incidence of 1% [2].

Surgery is the only treatment option for obturator hernia, and various methods of obturator hernia fixation have been used [3–5]. The effectiveness of laparoscopic obturator hernia repair has been reported in a study [6]. In many cases, mesh and tacker have been used for obturator hernia fixation. While the use of tackers and meshes in hernia repair reduces the recurrence rate, this method has been suggested to be associated with postoperative complications, including chronic inguinal pain and hemorrhage, which may impair a patient’s ability to perform activities of daily living [7–10].

The self-adhesive property of PG mesh (ProGrip™ laparoscopic self-fixating mesh, Medtronic plc, Dublin, Ireland) allows for tacker-less surgery. Nonetheless, the difficulty in handling the PG mesh in the abdominal cavity is a major issue in obturator hernia repair. To overcome this, we simplified the procedure of laparoscopic obturator hernia repair with a PG mesh.
2 Materials And Methods

2.1 Study design

Medical records of twelve patients who underwent obturator hernia repair at Iseikai Hospital (Osaka Prefecture, Japan) between April 2020 and October 2022 were reviewed. Standard preoperative data of all patients were collected (Table 1). We examined the perioperative and postoperative data of patients who underwent hernia repair using the PG mesh.

<table>
<thead>
<tr>
<th>Case</th>
<th>Age</th>
<th>Sex</th>
<th>BMI (kg/m²)</th>
<th>Site</th>
<th>Hemia content</th>
<th>Obstruction</th>
<th>Previous abdominal surgery</th>
<th>Time from onset of symptoms to surgery (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>84</td>
<td>F</td>
<td>13.7</td>
<td>Right</td>
<td>Ileum</td>
<td>Yes</td>
<td>Yes</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>80</td>
<td>F</td>
<td>12.7</td>
<td>Right</td>
<td>Ileum</td>
<td>Yes</td>
<td>No</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>76</td>
<td>F</td>
<td>15.6</td>
<td>Right</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>83</td>
<td>F</td>
<td>14.3</td>
<td>Bilateral</td>
<td>Ileum</td>
<td>Yes</td>
<td>Yes*</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>84</td>
<td>F</td>
<td>15.8</td>
<td>Right</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>91</td>
<td>F</td>
<td>16.9</td>
<td>Left</td>
<td>Ileum</td>
<td>Yes</td>
<td>Yes</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>78</td>
<td>F</td>
<td>22.7</td>
<td>Left</td>
<td>Ileum</td>
<td>Yes</td>
<td>No</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>88</td>
<td>F</td>
<td>24.6</td>
<td>Right</td>
<td>Ileum</td>
<td>Yes</td>
<td>Yes*</td>
<td>-</td>
</tr>
</tbody>
</table>

*Elective second surgery

2.2 Patient data

All patients underwent preoperative evaluation, including blood tests and computed tomography imaging. The data were retrospectively collected.

2.3 Materials used

The PG mesh from Medtronic (Dublin, Ireland) is a self-gripping composite mesh. The monofilament polyethylene terephthalate mesh is encased by a resorbable layer of micro-grips [11].

2.4 Treatment algorithm

The treatment algorithm for obturator hernia in our hospital is presented in Fig. 1. Cases of obturator hernia generally require emergency surgery. Under laparoscopic guidance, the abdomen was examined, and the incarcerated obturator hernia was manually reduced. Hernia repair was performed using the PG
mesh in patients with no intestinal necrosis or considerable intestinal obstruction. In patients with intestinal necrosis, the necrotic intestine was resected, followed by reversal and ligation of the hernial sac. In some cases, further surgical intervention was performed 2–3 months after the first surgery to repair the obturator hernia using the PG mesh.

2.5 Surgical method

Our surgical procedure was similar to the transabdominal pre-peritoneal method used for groin hernia repair. The port placement and the position of the surgeon and scopist are shown in Fig. 2. These are the same as those for transabdominal pre-peritoneal repair performed in patients with inguinal hernias at our institution. First, we inserted a 12-mm or 5-mm port in the umbilical fossa. Subsequently, we inserted one port on each side of the first port: a 12-mm port on the hernia side and a 5-mm port on the other end. We inserted both ports outside of the inferior epigastric artery and vein and displaced the 12-mm port toward the patient's head. It was necessary to exfoliate the area around the obturator foramen as widely as possible; however, there are no special procedures to treat abrasions of the pre-peritoneal space.

The method used for attaching the PG mesh is shown in Fig. 3. The edge of the PG mesh was trimmed to make it oval-shaped. The mesh was 15 × 10 cm in size and was soaked in saline before being folded along the minor axis to divide it into three equal portions. The surgery involved the following three steps: (1) The sides of the PG mesh were grasped using forceps, and the mesh was inserted into the abdominal cavity through the 12-mm port of the laparoscope; the position of the folded PG mesh is shown in Fig. 4A; (2) The folded PG mesh was positioned in front of the Cooper's ligament, displacing the inner portion of the mesh toward the dorsal side of the patient; (3) The mesh was unfolded in the pre-peritoneal space (Fig. 4B). The peritoneum was closed with a continuous suture using an absorbable thread. Finally, the incision was closed.

At 1–2 weeks after being discharged, the patients were interviewed and physically examined. We performed follow-up examinations 2 and 6 months after discharge to screen for the presence of chronic inguinal pain and hernia recurrence. After that, we contacted them by telephone as appropriate or examined them at the regular outpatient visit of other departments.

2.6 Ethics

This study was approved by the ethics committee of Iseikai Hospital (approval number: 2022-9). The ethics committee of Iseikai Hospital obtained approval from each patient to manage individual data for appropriate use. The authors also removed identifying information to protect the privacy of the patients.

3 Results

The preoperative clinical details of the five patients who underwent hernia repair using the PG mesh are summarized in Table 1. Except case 7 and 8, patients were thin (BMI, 12.7–16.9) and all patients were older women, and their general preoperative condition were relatively poor. All patients underwent emergency surgery.
The surgical details are summarized in Table 2. We used a 7.5 × 10-cm PG mesh in one patient (case 2, Table 2). This patient had strong adhesions in the pre-peritoneal space. We experienced difficulty in covering the myopectineal orifice and could only perform the repair around the obturator foramen. In case 6, the mesh was trimmed slightly in consideration of the peeling range of preperitoneal space.

### Table 2

**Surgical details of the eight patients**

<table>
<thead>
<tr>
<th>Case</th>
<th>Size of hernial orifices (cm)</th>
<th>Operative time (min)</th>
<th>Hemorrhage (g)</th>
<th>Bowel resection</th>
<th>Mesh size (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.5</td>
<td>90</td>
<td>5</td>
<td>No</td>
<td>15 × 10</td>
</tr>
<tr>
<td>2</td>
<td>1.5</td>
<td>143</td>
<td>10</td>
<td>No</td>
<td>7.5 × 10</td>
</tr>
<tr>
<td>3</td>
<td>1.5</td>
<td>73</td>
<td>2</td>
<td>No</td>
<td>15 × 10</td>
</tr>
<tr>
<td>4</td>
<td>2 (right side) 1 (left side)</td>
<td>96*</td>
<td>1</td>
<td>No</td>
<td>15 × 10 (both sides)</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>56</td>
<td>1</td>
<td>No</td>
<td>15 × 10</td>
</tr>
<tr>
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<td>2</td>
<td>76</td>
<td>5</td>
<td>No</td>
<td>13×9</td>
</tr>
<tr>
<td>7</td>
<td>1.5</td>
<td>97</td>
<td>2</td>
<td>No</td>
<td>15×10</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>78</td>
<td>10</td>
<td>No</td>
<td>15×10</td>
</tr>
</tbody>
</table>

*Total operative time

The surgical outcomes are shown in Table 3. Postoperative complications were described using the Clavien–Dindo classification. Postoperative hematoma (grade 1) was detected in case 1. However, postoperative complications such as chronic inguinal pain, hemorrhage, and hernia recurrence were not detected in any of the patients.
Table 3
Surgical outcomes of the five patients

<table>
<thead>
<tr>
<th>Case</th>
<th>Perioperative complications (Clavien–Dindo classification)</th>
<th>Follow-up period (months)</th>
<th>Recurrence</th>
<th>Chronic neuralgia</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Subcutaneous hematoma (grade 1)</td>
<td>30</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>No</td>
<td>2</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>No</td>
<td>10*</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>No</td>
<td>22*</td>
<td>No</td>
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</tr>
<tr>
<td>5</td>
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<tr>
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<td>3</td>
<td>No</td>
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</tr>
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<td>No</td>
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</tr>
<tr>
<td>8</td>
<td>No</td>
<td>1</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

*Death by other disease

4 Discussion

The reported incidence of obturator hernia is 1% (2), commonly occurring in older women with a thin physique and poor physical condition. Surgery is the only radical therapy for the treatment of obturator hernia, and various approaches have been reported [3–5]. Nevertheless, there are limited large-scale clinical data on approaches or methods. Furthermore, in twelve patients, the obturator foramen is relatively small, and strangulation and intestinal ischemia are common. In older patients with dementia, the diagnosis may be unclear owing to difficulties in performing physical examinations and establishing the exact onset of symptoms. Although it is easy to diagnose an obturator hernia based on physical examination and computed tomography findings, detecting intestinal necrosis and perforation in the emergency room remains challenging; therefore, it can be difficult to perform a manual reduction of the hernia and elective surgery in these patients. A transabdominal pre-peritoneal repair allows assessment of the intestinal condition by direct visualization, making it a safe and definitive method for hernia repair.

There is no consensus regarding the use of mesh in obturator hernia repair. Some reports have proposed mesh-free repair methods: opening the hernial sac or closing the hernial orifice using the organs in the abdominal cavity, such as the uterine fundus and greater omentum, and closing the hernial orifice and suture the peritoneum [12–14]. However, in our opinion, the tension-free repair method using a mesh is better. The international guidelines for groin hernia management also recommend the use of tension-free methods for groin hernia repair. The recurrence rate was higher in patients who had undergone non-mesh repair of groin hernia than in those who had undergone tension-free mesh repair [15–16]. Additionally, a previous study showed that the perioperative morbidity rate was significantly improved in cases of
obturator hernia treated using tension-free methods than in cases where a non-mesh repair was performed [17].

Controversy exists regarding whether the myopectineal orifice, in addition to the obturator, should be covered with a wide mesh and whether covering only the obturator is sufficient. Some cases of coexisting femoral and obturator hernias had been reported [18, 19], and we encountered one such case in our experience (case 4). There are no data on the rate of occurrence of coexisting hernias. The myopectineal orifice in thin older women is often weak, thereby increasing the likelihood of hernia recurrence. Considering the difficulties in reoperating on patients, we consider that it is preferable to cover the obturator foramen and myopectineal orifice with a large mesh covering as much of the area as possible.

A further point of contention concerns the use of a tacker in fixing the mesh. A mesh made of polypropylene or polyethylene and tackers made of metal or absorbable material are often used in the transabdominal pre-peritoneal repair of hernias. Tackers are required for the fixation of the mesh and are thought to be essential for tissue adhesion. However, using tackers may increase the risk of perioperative hemorrhage and postoperative chronic neuralgia [20–22]. There is no reliable evidence to support the safety of using tackers around the obturator foramen and femoral ring. On the other hand, using the PG mesh enabled us to perform tacker-less obturator hernia repair. Compared to tackers, the adhesive property of micro-grips provides more protection to the superficial nerves around the obturator foramen. Hence, tacker-less repair may decrease postoperative chronic neuralgia. None of the patients in this study developed serious postoperative complications, including chronic neuralgia and hernia recurrence. In our study, the repair was safely performed in eight patients.

Conversely, handling the PG mesh in the abdominal cavity is relatively difficult. Therefore, it is important to reduce the number of steps and simplify the procedure in the abdominal cavity as much as possible.

We simplified the mesh fixation method such that it involves only three steps. It is important to perform step 2 carefully; however, the procedures are not too difficult as long as sufficient abrasion has been performed in the pre-peritoneal space. One of the reasons for folding the mesh into three portions is to easily determine the central location of the mesh in the hernial orifice. Moreover, the unfolding procedure is easy.

The present study has certain limitations, particularly the small number of cases and the comparatively short follow-up period. Generally, long-term follow-up of patients with obturator hernia is often difficult because it is a benign disease. Therefore, further investigations with a larger number of cases are required to confirm the effectiveness of this procedure using the PG mesh. Additionally, it is necessary to verify the effectiveness of manual reduction, non-mesh methods, and methods using tackers.

Tracker-less repair using PG mesh may overcome some problems of conventional obturator hernia repair methods and has been shown to be one of the best options for obturator hernia.

Declarations
Ethics Approval and consent to participate and consent for publication

The study was approved by the ethics committee of Iseikai Hospital. The ethics committee of Iseikai Hospital obtained approval from each patient to manage individual data for appropriate use. All patients have signed an informed consent statement. The authors also removed identifying information to protect the privacy of patients.

Availability of data and materials

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

Competing Interests

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Funding

No funding was received for this study.

Authors’ Contributions

TS designed the study. YT, OK, YM, AI, HK, NU, IH, and YH were in charge of treatment in individual cases and cooperated in the collection and analysis of the data. All authors have read and approved the final manuscript.

Acknowledgement

Not applicable

Informed Consent

Informed consent was obtained from all individual participants included in this study.

Author’s information (optional)

Not applicable

References


Figures

Figure 1

Treatment algorithm for obturator hernia.
Figure 2

The port replacement and the position of the surgeon and scopist

Figure 3

Method of attaching the PG mesh

1. Trim the edge of the PG mesh and make an oval shape.
2. Fold the PG mesh into 3 equal portions in the minor axis direction.
3. Retain the side of the PG mesh with a forcep and insert it from the 12-mm port.
(A) Cutting line of the PG mesh and folding of the mesh into three equal portions in the minor axis direction. (B) Photograph showing insertion of the mesh.

Figure 4

Position of the PG mesh detention

(A) Position of the unfolded PG mesh. (B) Photograph showing the PG mesh post-attachment.