Parastomal Hernias

Leif A. Israelsson, MD, PhD\textsuperscript{a,b,*}

\textsuperscript{a}Department of Surgery and Perioperative Science, Umeå University, Umeå, Sweden
\textsuperscript{b}Kirurgkliniken, Sundsvalls Sjukhus, SE-851 86 Sundsvall, Sweden

Although he never performed the procedure, Littre, in 1710, introduced the concept of a colostomy as a medically useful procedure. In 1793 the first successful colostomy was performed by Duret on an infant who suffered colonic obstruction due to an imperforate anus. Although ostomies have existed since that time, knowledge in this field derives mainly from retrospective clinical reports. Parastomal hernia seems to be a frequent occurrence, to the point where some degree of parastomal herniation has even been considered to be an almost inevitable complication of colostomy formation \cite{1}.

Several surgical techniques have been attempted to prevent parastomal hernia; despite these efforts, herniation remains a major surgical problem \cite{2}. Parastomal hernia is difficult to treat with open or laparoscopic techniques, and high recurrence rates have been reported after repair \cite{2}.

\textbf{Definition of parastomal hernia}

A parastomal hernia is an incisional hernia related to an abdominal wall stoma \cite{3}. Parastomal hernia has been classified into four subtypes: (1) the subcutaneous type with a subcutaneous hernia sac, (2) the interstitial type with a hernia sac within the muscle/aponeurotic layers of the abdomen, (3) the peristomal type with the bowel prolapsing through a circumferential hernia sac enclosing the stoma, and (4) the intrastomal type in ileostomies with a hernia sac between the intestinal wall and the everted intestinal layer \cite{4}. This classification has not been used in clinical studies, as it is difficult to distinguish these types of parastomal hernias during physical examination.

The definition of parastomal hernia used at follow-up is seldom present in clinical reports. In two clinical reports, herniation was defined as a palpable
defect or bulge adjacent to the stoma [5–7]. In one study, herniation was defined as a palpable “cough impulse” at the ostomy site [8]. In another study, adding a CT scan resulted in a radiological definition of any intra-abdominal content protruding along the ostomy [5]. In all other available clinical reports, the definition of parastomal hernia used at follow-up was not given.

In some studies, a distinction has been made between parastomal hernia and stoma prolapse [9–15]. However, neither parastomal hernia nor stoma prolapse was defined in these presentations. In a recent Cochrane report on loop stomas, parastomal hernia was defined as the formation of a hernia beside the stoma; stoma prolapse was defined as eversion of the stoma through the abdominal wall [16]. Guidance on how to differentiate between them at clinical examination and then exclude the presence of a concomitant herniation when prolapse is present was not given. As prolapse is an undesired complication of stoma formation, which is not readily differentiated from herniation, many authors have probably considered both as parastomal hernias.

The lack of a proper definition of parastomal hernia in reported cases makes it difficult to compare rates of parastomal hernia between different series and to estimate the true rate of herniation. Similar to ventral incisional hernia, recurrence rate of parastomal hernias increases with time [17]. It is generally agreed that follow-up should be no less than 12 months after the index operation to detect a ventral incisional hernia [18].

In future studies, the definition of parastomal hernia should be included at a follow-up that is no less than 12 months after the index operation. The present author proposes that parastomal hernia be defined as any palpable defect or bulge adjacent to the stoma detected when the patient is supine with legs elevated or while coughing or straining when the patient is erect [2,19,20]. If a CT scan is added to the clinical examination, parastomal hernia should probably be defined as any intra-abdominal content protruding along the ostomy.

### Incidence of parastomal hernia

The rate of parastomal hernia varies between 5% and 52%. This wide variation is probably due to the different definitions of hernia used at follow-up and its timing [5–8,11–15,17,21–34]. The use of a CT scan may

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<thead>
<tr>
<th>Table 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Suggested strategy at follow up for parastomal hernia</strong></td>
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<tr>
<td>Follow-up</td>
</tr>
<tr>
<td>Clinical examination</td>
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<tr>
<td>CT scan</td>
</tr>
</tbody>
</table>
have contributed to the high hernia rates reported during the last decade as it allows detection of small parastomal hernias [5,8,23–25]. It seems that with a CT scan, more parastomal hernias can be detected than perceived by clinical examination alone [5,8]. Follow-up time varies considerably in clinical reports, and only a few studies have followed patients for at least 1 year or longer and then reported a herniation rate of 11% to 50% [7,12,14,24,25,35]. Experiences from studies on the rate of incisional hernia indicate that the highest hernia rates reported are the most accurate [36]. Considering that no uniform definition of parastomal hernia has been used in these reports and the variability of follow-up time, the true rate of parastomal hernia is very difficult to estimate, but it is probably between 30% and 50% in general surgical practice.

With ileostomies after a Bricker diversion, parastomal herniation seems to occur with similar frequency as with other ostomies (5%–65%) [35, 37–42]. The rate of parastomal hernia has been suggested to be lower after an ileostomy than after a colostomy, but this is rather doubtful as it has not been the case in a number of studies [8,14,38]. The rate of herniation is probably similar with loop ileostomies as with loop colostomies [16,43,44]. Hernia rates are difficult to compare between end stomas and loop stomas, as with the latter, bowel continuity is often restored and follow-up time is therefore different for the two groups [2].

Surgical considerations in stoma formation

Several retrospective reports have illustrated the results of various surgical techniques used in the construction of a stoma. There seems to be great variation among surgeons on how to bring out a stoma [3]. An enterostoma should never be brought out through the laparotomy wound as this has produced disastrous results in terms of infection, wound dehiscence, and herniation [1,45–47]. In two retrospective studies, an extraperitoneal construction of the stoma has been associated with a lower rate of parastomal herniation than an intraperitoneal route [1,24]. This technique has therefore been advocated by some surgeons but has also been challenged by others [48,49].

With stomas brought through the rectus abdominis muscle, a lower rate of parastomal hernia will be encountered than if brought out lateral to the muscle; in a retrospective study of 130 patients, the hernia rate was lower with enterostomas formed through the rectus muscle (3%) than lateral to the muscle (22%) [30]. In another study, of 93 patients, the rates were similar at 1% and 19%, respectively [22]. Four other retrospective studies did not confirm these findings, and there are no randomized studies available in this field [8,23,24,50]. It is nonetheless probably wise to bring out enterostomas through the rectus abdominis muscle as this is not associated with any disadvantages [49].

It has been recommended that the enterostomal opening in the abdominal wall should not be too large, as larger openings may be associated with
an increased risk of parastomal herniation [1,12,29,47,49,51]. However, no evidence exists as to what is “too large” of an opening. It has been suggested that the opening should be made large enough to allow the bowel to pass and that the diameter of the opening should be around 2.5 cm [2,49]. There is no need to fixate the mesentery or suture the bowel to the aponeurosis as this has not reduced the rate of herniation [2,14,24,25].

Some surgeons have advocated laparoscopic surgery for the construction of stomas for fecal diversion [52]. In 263 patients with stomas created laparoscopically, the rate of parastomal hernia was reported to be between 0% and 12%, but follow-up time was less than 12 months [53]. Trephine devices have been tried for the formation of stomas, and in one clinical series no complication was discovered in 18 patients within 24 months [54]. In another study, two prolapses and two parastomal hernias were found in 17 patients within 2 to 48 months [55]. Other nontechnical risk factors for parastomal hernia formation that should be taken into consideration include obesity, wound infection, old age, corticosteroid use, chronic respiratory disorders, and malnutrition [1,4,50,56,57].

**Surgical treatment of parastomal hernia**

Surgical repair is indicated in 11% to 70% of patients with a parastomal hernia [8,12,15,30,35]. Local aponeurotic repair is not an acceptable mode of treatment because it results in an unacceptable recurrence rate within the range of 50% to 76% [1,4,49,57–61].

Relocation of the stoma into another quadrant of the abdominal wall is another way of addressing a parastomal hernia. This usually requires a formal celiotomy, but lesser means have been tried in small numbers of patients [62–65]. After relocation, the risk of a recurrent parastomal hernia at the new site is at least as high as after the primary enterostomy, and recurrence rates of 24% to 86% are reported [4,57,58,60,62,66]. If the stoma is relocated a second time, recurrence rates are further increased [57]. The stoma should not be relocated into a quadrant on the same side of the abdominal wall as this seems to be associated with an increased risk of recurrence [60].

The often large defect in the abdominal wall at the parastomal hernia site is in effect an incisional hernia and requires repair as such [67]. When the defect at the original stoma site is sutured, a recurrent hernia is very frequent and was present in 6 of 23 (26%) patients on physical exam and in 11 of 23 (48%) when a CT scan was used for follow-up [5]. In another study of 8 patients, the stoma was relocated to the same side of the abdominal wall and an inlay mesh repair of the abdominal wall defect was performed; no complications were reported within 15 months [68]. This technique violates the principle that relocation should be to the contralateral side of the abdomen. Moreover, the inlay mesh technique has been abandoned for incisional hernia repair owing to unfavorable outcome. As recurrence rates are high with these methods, other ways have been developed for parastomal hernia repair.
The strategy that has been chosen is based on the similarities between incisional hernia and parastomal hernia [69]. Mesh repair is a well-established method for repairing incisional hernias [67,70]. Meshes can be placed in an onlay, an inlay, a sublay, or an intraperitoneal onlay position (IPOM) [51,56,68,69,71–77]. With an onlay technique, the mesh is placed on the anterior aponeurosis. With a sublay technique, it is placed dorsal to the rectus muscle, anterior to the posterior rectus sheath. With the IPOM technique, the mesh is placed intra-abdominally on the peritoneum. These techniques all demand that the mesh be placed with considerable overlap and in all directions extend 5 to 10 cm beyond the edge of the defect. With an inlay technique, the mesh is cut to the size of the abdominal wall defect and sutured to wound edges Fig. 1.

A
Onlay mesh.
Placed anterior to the anterior rectus aponeurosis.

B
Inlay mesh.
Placed in the abdominal wall defect and sutured to wound edges.

C
Sublay mesh.
Placed dorsal to the rectus muscle and anterior to the posterior rectus sheath.

D
Intra peritoneal onlay mesh.
Placed on peritoneum from within the abdominal cavity.

Fig. 1. In parastomal hernia repair the mesh can be placed in an onlay, an inlay, a sublay, or an intraperitoneal onlay (IPOM) position. (A) Onlay mesh—placed anterior to the anterior rectus aponeurosis. (B) Inlay mesh—placed in the abdominal wall defect and sutured to wound edges. (C) Sublay mesh—placed dorsal to the rectus muscle and anterior to the posterior rectus sheath. (D) Intraperitoneal onlay mesh—placed on peritoneum from within the abdominal cavity.
The inlay mesh technique has largely been abandoned in incisional hernia surgery because of the high recurrence rates with this technique. The IPOM technique can be employed with both open and laparoscopic techniques. With prosthetic mesh repair of parastomal hernia, lower recurrence rates have been reported compared with suture repair or relocation of the stoma, but large studies with sufficient length of follow-up or randomized studies are not available [49,57,68,69,78].

There are several types of meshes available. These consist of nonabsorbable, absorbable [69], partly absorbable [69], and acellular collagen matrix [79] meshes, all of which have been used for parastomal hernia repair. Polypropylene meshes and low-weight meshes can be placed in a contaminated environment without major complications [6,80,81]. There are potential dangers associated with the use of meshes though, such as fistula formation, adhesions, septic complications, and seroma formation [10,81,82]. Meshes that induce an inflammatory tissue response cannot be placed in contact with abdominal contents without a high risk of fistula formation, adhesions, and septic complications [83]. A mesh constructed of two layers is therefore usually used with the IPOM technique. The mesh surface facing the abdominal wall is usually of a nonabsorbable material inducing tissue response and allowing for integration of the mesh within the abdominal wall. The mesh surface facing abdominal contents is a nonreactive material causing a low or negligible inflammatory response so that adhesions are not formed. The most common mesh used is expanded polytetrafluoroethylene (ePTFE). A drawback of ePTFE is that the mesh is prone to develop infection in contaminated areas; if an infection occurs, the mesh must be removed.

Incisional hernia repair with a sublay mesh technique produces good results and has been proposed as the most advantageous technique for mesh repair of parastomal hernias [4,69,71–73]. It is theoretically attractive as it allows good anatomical preparation and the intra-abdominal pressure does not displace the mesh easily. With this technique polypropylene meshes are frequently used. Few nonrandomized reports are available on the outcome after sublay mesh repair of parastomal hernia [69,84–86]. They include only between 1 and 10 patients each and in only one study, follow-up time exceeds 12 months. When results from these studies are pooled together, the incidence of recurrence is 2 in 27 repairs (7%).

Parastomal hernia repair with an onlay mesh technique was described in 1981 [87]. Theoretically, the intra-abdominal pressure tends to displace the mesh that therefore must be anchored to the anterior rectus aponeurosis, and this demands extensive flap mobilization. Only a few nonrandomized reports are available on this technique [76,78,79,88–90]. They each report on three to nine patients, and in no more than three studies does follow-up time exceed 12 months. When results from these reports are pooled together, the incidence of recurrence is 2 in 35 repairs (6%). In a number of other reports, a mixture of various mesh techniques has been employed for parastomal hernia repair [10,51,57,58,81,91–97].
Thus, there are retrospective studies available indicating that onlay and sublay mesh repair produces better results than suture repair or relocation of the stoma, but the clinical evidence is not particularly strong as randomized studies are lacking, as is long-term follow-up.

Repairing parastomal hernia with the IPOM technique with an open surgical technique has been presented in two case reports [98,99]. The open IPOM technique was also used in two nonrandomized studies, and when these results are pooled together show 4 recurrences out of 36 repairs (11%) [100,101]. There are a few case reports presenting the laparoscopic IPOM technique [102–104]. The laparoscopic IPOM technique has also been reported in four nonrandomized studies that, when pooled together, resulted in 7 recurrences out of 72 repairs (10%) [105–108]. The laparoscopic technique is not feasible in all patients, and in one study the laparoscopic procedure had to be converted into open surgery in 8 out of 55 patients (15%) [107]. Bowel injury is also a problem in laparoscopic surgery and occurred in 13 of 59 operations (22%) in two studies [105,107]. Infection of an ePTFE mesh requires the mesh to be removed as reported in one study in 4 of 47 (9%) patients undergoing ePTFE laparoscopic mesh repair [107].

Thus, all studies looking at the IPOM technique are retrospective with no long-term follow-up. When performed laparoscopically, the incidences of bowel injury and mesh infection are high. ePTFE mesh, which is used in these cases, is prone to infection and its use should be carefully considered. Consequences of an ePTFE mesh present at subsequent contaminated surgery are not known Table 2.

Prevention

Prosthetic meshes with a large pore size of about 5 mm with a reduced polypropylene content and a high proportion of absorbable material have been available for several years (Vypro, Ultrapro, Ethicon, Norderstedt, Germany). With a low-weight mesh the degree of inflammation in the vicinity of the mesh is diminished [109], which may reduce the risk of the mesh eroding into the bowel [69]. In a prospective randomized study, 27 patients were randomized to a conventional enterostomy through the rectus abdominis muscle and 27 patients to the same procedure with the addition of a low-weight mesh placed in a sublay position. The mesh was not associated with infection or other early complications [6]. At 12-month follow-up, the rate of parastomal hernia was significantly lower with the mesh (5% versus 50%) [6,7]. Long-term follow-up is not yet available from this trial [110]. In a nonrandomized study, a prophylactic mesh in a sublay position was used in 18 patients, and no recurrence was noted within 6 to 28 months [111]. Parastomal hernia occurred within 2 to 26 months in 2 of 24 patients receiving a prophylactic mesh in an onlay position [112].

Placing a large-pore mesh with a reduced polypropylene content and a high proportion of absorbable material in a sublay position at the primary
operation is as yet the only method that has reduced the rate of parastomal hernia in a randomized study [113]. No adverse effects have been detected so far, but adverse late effects cannot be ruled out before long-term follow-up is completed.

The prophylactic mesh technique offers a novel way of treating parastomal hernia. Relocating the stoma into another quadrant with a prophylactic mesh at the new site, in combination with a sublay mesh repair of the abdominal wall defect at the primary stoma site, may have the potential of decreasing recurrence rates [110]. The defect in the abdominal wall is then repaired in a standardized way [20]. The prophylactic mesh has the potential of producing a low risk of herniation at the new site [7]. Only a small non-randomized series of 13 patients with no recurrence detected at 12-month follow-up has been reported so far [110].

**Summary**

Parastomal hernia represents a major surgical problem, and the incidence is probably 30% to 50%. Several surgical techniques have been tried to prevent parastomal hernias from developing. A large-pore mesh with a reduced polypropylene content and a high proportion of absorbable material placed in a sublay position at the primary operation is so far the only method that has reduced the rate of parastomal hernia in a randomized study.
For parastomal hernia repair, several surgical techniques have been attempted and small clinical series reported with short follow-up time. Recurrence rates are high with suture repair and relocation of the stoma; recurrence rates have been lower with mesh repairs. Several mesh repair techniques are used in open and laparoscopic surgery. Randomized trials with long-term follow-up are needed for better evidence.

References


