Parastomal hernia treatment with prosthetic mesh repair

There are occasional, historical reports of ostomies occurring after incarcerated and fistulated abdominal wall hernias, and after trauma. The first suggestion of a colostomy as a medically useful procedure was made by Littre in 1710. It was not until 1793 that Duret performed the first successful colostomy on an infant with colonic obstruction due to an imperforate anus.

Parastomal hernia always seem to have been a common occurrence, and Goligher even considered some degree of parastomal herniation as an almost inevitable complication of colostomy formation [1]. Thus, several surgical techniques have been attempted to prevent and to treat parastomal hernias. Despite these efforts, parastomal herniation and recurrence after the repair of parastomal hernia remains a problem [2].

Definition

Pearl stated that a parastomal hernia is an incisional hernia related to an abdominal wall stoma [3]. The definition of parastomal hernia, which is used in follow-up examinations and in clinical reports, is a matter of discussion [2]. Before 2004, the definition used was given in only one report; herniation was defined as a palpable cough impulse at the ostomy site [4]. Beginning in 2004, many reports presented the definition of parastomal hernia as any protrusion in the vicinity of the stoma; this definition was used in numerous reports [5, 6, 7, 8, 9, 10, 11] and is clinically relevant, since patients with a parastomal hernia, according to this definition, have a poorer quality of life [12].

In studies in which a CT scan was also performed, any intra-abdominal content protruding along the ostomy was the radiological definition used [5, 8, 9]. Unfortunately, the correlation between herniation found at clinical examination and at CT scan has not been very strong.

Herniation found upon clinical examination may not be present in a CT scan and vice versa.

Thus, further studies are necessary, in order to develop consistent definitions.

Several reports have differentiated between parastomal hernia and stoma prolapse [2]. However, a problem is that neither parastomal hernia nor stoma prolapse is defined in the reports. A Cochrane report defined parastomal hernia as a hernia beside the stoma and stoma prolapse as an eversion of the stoma through the abdominal wall [13]. It remains unclear how to differentiate between herniation and prolapse at clinical examination, and when prolapse is present to exclude a concomitant parastomal hernia. Many authors have probably regarded a prolapse as a hernia at follow-up examination and both entities, if it is even possible to differentiate between the two, are certainly undesired complications of stoma formation.

Parastomal hernia has been classified into four subtypes [14]:

1. a subcutaneous type with a subcutaneous hernia sac,
2. an interstitial type with a hernia sac within the muscle/aponeurotic layers of the abdomen,
3. a peristomal type with the bowel prolapsing through a circumferential hernia sac enclosing the stoma,
4. an intrastomal type in ileostomies with a hernia sac between the intestinal wall and the everted intestinal layer.

It is difficult to distinguish between these types of parastomal hernias during physical examination; therefore, this classification has not been used in clinical studies. Because the definition of parastomal hernia is not uniform, it is difficult to compare herniation rates between different reports. As the rate of parastomal hernia increases with time, herniation rates cannot be compared between reports with different follow-up times. Follow-up examination should not be less than 12 months after the index operation, but parastomal hernia can still develop 5–10 years after ostomy formation [2].

The current practice in clinical studies is that parastomal hernia is defined as any protrusion or bulge adjacent to the stoma that is detected when the patient is supine with elevated legs or while coughing or straining when erect [2]. If a CT scan is performed in addition to the clinical examination, parastomal hernia is defined as any intra-abdominal content protruding along the ostomy [2]. Follow-up examina-
tion should be no less than 12 months after the index operation [2].

Incidence

The rate of parastomal hernia reported varies between 5% and 81%; this wide range is probably related to the different definitions of hernia used and diverse follow-up times [2]. Because there is no uniform definition of parastomal hernia and the follow-up time in different reports vary, the true rate of parastomal hernia can only be estimated, but probably lies between 30% and 50% in general surgical practice [2].

There are reports on parastomal hernia rates with ileostomies after a Brick­er diversion; the hernia rate seems to be comparable with other ostomies (5–65%) [2]. Although the rate of herniation has been suggested to be lower after an ileostomy than after a colostomy, a difference has not been detected in a number of studies [2]. Loop ileostomies and loop colostomies probably produce similar rates of parastomal herniation [2]. Hernia rates with end stomas and loop stomas are difficult to compare, since bowel continuity is often restored with loop stomas and follow­up times are, therefore, shorter than with end stomas.

**Surgical considerations in stoma formation**

In the past, enterostomas were sometime brought out through the laparotomy wound, but this produced disastrous results in terms of infection, wound dehiscence, and herniation [2]. To reduce the rate of parastomal hernia, an extraperitoneal construction of the stoma has been tried. In two retrospective studies, this was associated with a lower rate of parastomal herniation than the conventional route [1, 15]. This has been challenged by others and the technique does not seem to have become widely used.

**Enterostomas should be formed through the rectus muscle**

Bringing out the stoma through the rectus abdominis muscle has in two retrospective studies been associated with a lower rate of parastomal hernia than if brought out lateral to the muscle [16, 17]. Four other retrospective studies, however, were not able to confirm these findings [2]. Although there are no randomized studies available to settle this matter, it is probably wise to form enterostomies through the rectus muscle, because it is not associated with any disadvantages and this stoma placement facilitates stoma care by the patient.

It is often claimed that making too large of an opening in the abdominal wall for the ostomy causes a high risk of parastomal hernia [2]. Although there are no clinical data to support this, it appears wise to make the opening just large enough to allow the bowel to pass. To fixate the mesentery or to suture the bowel to the aponeurosis does not reduce the rate of herniation [2].

Other 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 [2].

**Surgical treatment of parastomal hernia**

Surgical repair has been reported to be indicated in about 30% (11–70%) of patients with a parastomal hernia [2]. Local aponeurotic repair should not be performed, because it produces an unacceptable recurrence rate (50–76%) [2].

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**Fig. 1** Repairing parastomal and incisional hernias, the mesh can be placed in an onlay, an inlay, a sublay, or an intraperitoneal onlay position. **a** An onlay mesh is placed anterior to the anterior rectus aponeurosis. The mesh overlap must be considerable (10 cm) and the mesh firmly fixated to the aponeurosis. **b** An inlay mesh fits the abdominal wall defect and is sutured to wound edges. This method produces inferior results. **c** A sublay mesh is placed dorsal to the rectus muscle and anterior to the posterior rectus sheath. The mesh overlap must be at least 5 cm. **d** An intraperitoneal onlay mesh (IPOM) is in open or laparoscopic surgery placed on the peritoneum from within the abdominal cavity. The overlap must be more than 5 cm and the mesh surface facing the abdominal cavity must not cause adhesions.
Relocation of the stoma into another quadrant produces a recurrence rate at the new site that is at least as high as after the primary enterostomy (24–86%) [2]. Recurrence rates are further increased, if the stoma is relocated a second time [2]. Relocating the stoma into a quadrant on the same side of the abdominal wall is associated with an increased risk of recurrence [2].

After relocation of the ostomy, the defect in the abdominal wall at the parastomal hernia site may be very large and, thus, must also be repaired with a mesh like other large abdominal wall defects. Accordingly, suture repair of the defect in the abdominal wall after a parastomal hernia has produced a high rate of incisonal hernia at this site—6 hernias in 23 patients, who underwent physical examination, and in 11 patients, in whom a CT scan was performed [5].

Mesh techniques demand that the mesh be placed with considerable overlap

Mesh repair is a well-established method for repairing incisional hernias and is also evolving as the method of choice to repair parastomal hernias. Meshes can be placed in an onlay, an inlay, a sublay, or an intraperitoneal onlay position (IPOM) ([2], Fig. 1). All mesh techniques demand that the mesh be placed with considerable overlap and extends at least 5 cm in all directions beyond the edge of the defect. Clinical reports consistently state better results with mesh repairs than with suture repair or relocation of the stoma. However, randomized studies comparing mesh techniques and other techniques are lacking; long-term follow-up studies are also needed.

With an onlay technique, the mesh is placed on the anterior aponeurosis. As the intra-abdominal pressure tends to displace the mesh, it must be anchored to the anterior aponeurosis, which demands extensive flap mobilization. A few nonrandomized reports are available on this technique, which together report a recurrence rate of 10% in 51 patients [2].

With an inlay technique, the mesh is cut to fit the abdominal wall defect and sutured to wound edges. This technique

Abstract · Zusammenfassung

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Abstract

After stoma formation, parastomal hernia develops in 30–50% of patients, with one-third of these requiring operative correction. Recurrence rates are very high after suture repair of parastomal hernias or relocation of the stoma. Open or laparoscopic mesh repairs have resulted in much lower recurrence rates. Long-term follow-up of the various techniques for parastomal hernia repair is lacking, as are randomized trials.

Placement of a prophylactic prosthetic mesh in a sublay position at the index operation has reduced the rate of parastomal hernia in randomized trials. A prophylactic mesh in an onlay position, a sublay position, and an intraperitoneal onlay position has also been associated with low herniation rates in nonrandomized studies.

Although several questions within this field still have to be answered, it seems obvious that use of a mesh represents a suitable measure for the prevention of parastomal hernia as well as parastomal hernia repair.

Keywords

Parastomal hernia · Parastomal hernia repair · Mesh repair · Laparoscopic hernia repair

Parastomale Hernienversorgung mit prothetischer Netzplastik

Zusammenfassung


Schlüsselwörter

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has largely been abandoned in incisional hernia surgery, because of high recurrence rates.

With a sublay technique, the mesh is placed dorsal to the rectus muscle and anterior to the posterior rectus sheath. This technique allows good anatomical preparation; in addition, the intra-abdominal pressure does not displace the mesh easily. Only a few nonrandomized reports are available on outcome after sublay mesh repair of parastomal hernia [2]. Together, a recurrence rate of 7% in 27 repairs is reported.

With the IPOM technique, the mesh is placed intra-abdominally on the peritoneum with either an open or a laparoscopic technique. With an open IPOM technique, nonrandomized studies report a recurrence rate of 22% after the repair of 49 parastomal hernias [2]. With a laparoscopic IPOM technique, nonrandomized studies report a recurrences rate of 12% in 91 repairs [2]. Recently, Berger reported a large personal series with a recurrence rate of 2% in 47 repairs employing a sandwich laparoscopic IPOM technique [18, 19]. The laparoscopic technique is not feasible in all patients and, in one report, conversion to open surgery was demanded in 8 out of 55 patients [20]. The possibility of bowel injury must be considered in laparoscopic surgery, and in two reports this occurred in 13 of 59 operations [20, 21].

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 has been reported in one small nonrandomized series [22]. No recurrence was detected after 12 months in 13 patients.

For parastomal hernia repair, nonabsorbable, absorbable, partly absorbable, and acellular collagen matrix meshes have been used [2]. Polypropylene meshes and low-weight large pore meshes can be placed in a contaminated environment without major complications [6, 23, 24]. Meshes, which induce a major inflammatory tissue response, can bring a risk of fistula formation, adhesions, and septic complications [25]. With the IPOM technique, a mesh constructed of two layers is usually used with the surface facing the abdominal contents being of a nonreactive active material so that adhesions are not formed. When EPTFE is used for this surface, a drawback is that it is very prone to infection in contaminated areas and, if an infection occurs, the mesh must be removed [2].

Prevention

In the attempt to prevent development of parastomal hernia, the most promising results have been achieved by using a prophylactic prosthetic mesh placed at stoma formation [31]. Two prospective trials randomized 108 patients to conventional enterostomy through the rectus abdominis muscle or to the same procedure with the addition of a mesh placed in a sublay position [8, 26]. Together these trials report a rate of parastomal hernia at the 12-month follow-up of 45% without a mesh and 10% with a mesh [7, 8]. In one of these trials, results at the 5-year follow-up are available: the herniation rate was 81% without a mesh and 13% with a prophylactic mesh [27]. In these trials, the mesh was not associated with infection or any other complications.

The prophylactic use of prosthetic meshes is the best prevention

The surgical technique for employing a prophylactic mesh in open surgery in these trials consists of the abdominal cavity being accessed through the midline (Fig. 2). The skin at the stoma site is grasped with a clamp and a circular excision is made. After dissection through the subcutaneous tissue, a cross is cut in the anterior rectus sheath.

Corresponding to the stoma site, the peritoneum and the posterior rectus sheath is opened along the midline for...
a length of 10–15 cm. Dissection is continued dorsal to the rectus muscle to the lateral border of the muscle.

A partly absorbable low-weight large pore mesh (Vypor® or Ultrapro®, Ethicon, Norderstedt, Germany) is cut to 10×10 cm and a cross is cut in its center. The mesh is placed in the retromuscular plane created, and the upper and lower lateral corners are anchored to the dorsal rectus sheath with single stitches.

The peritoneum and the dorsal rectus sheath are opened at the intended stoma site. The stapled bowel end is first brought out through the opening in the dorsal rectus sheath and then through the opening in the mesh. The length of the bowel and the size of the opening in the mesh can then be checked. Lastly, the bowel is brought out through a split in the rectus muscle and through the skin opening.

In the midline incision, the anterior or rectus aponerotic is closed by a continuous suture technique with a slowly absorbable or nonabsorbable monofilament suture. The medial upper and lower corners of the prosthetic mesh are anchored as the running suture in the aponeurosis also incorporates the peritoneum and the mesh. Along the mesh, every second stitch in the aponeurosis also includes peritoneum, so that bowel does not come into contact with the mesh.

Placing a low weight large pore mesh with reduced polypropylene content and a high proportion of absorbable material in a sublay position at the primary operation is the only method that has reduced the rate of parastomal hernia in randomized trials [11]. A positive effect of a prophylactic mesh on the rate of parastomal hernia in these trials is quite convincing, but larger randomized trials with long-term follow-up would provide further confirmation. Further studies are also necessary to clarify how large a proportion of patients that are excluded from receiving a prophylactic mesh due to, for example, scarring after previous surgery. More data are also needed on whether a prophylactic mesh can be used in severely contaminated wounds.

The use of a prophylactic mesh has also been reported in nonrandomized studies. The first series using a prophylactic mesh was presented in 1986 by Bayer, who placed a mesh in a sublay position in 43 patients with no recurrence noted within up to 4 years [28]. Marimuthu placed a prophylactic mesh in a sublay position in 18 patients and no recurrence was noted within 6–28 months [10]. Gögenur reported two parastomal hernias within 2–26 months in 24 patients with a prophylactic mesh placed in an onlay position [29]. Berger placed a prophylactic mesh in an IPOM position in 22 ostomies with no complications within 2–19 months [30]. The mesh was designed especially for the IPOM position and was constructed with a flat portion and a funnel arising for the bowel to pass through.

**Conclusion**

It is interesting that the path towards preventing the development of parastomal hernia as well as the repair of parastomal hernias has evolved into containing the use of a mesh. Randomized trials are very much needed in order to determine optimal mesh material, the best shape of the mesh, and the most effective placement of the mesh for both prophylactic measures and parastomal hernia repair.

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**References**


