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ORIGINAL ARTICLE

Parastomal hernia: is prevention better than cure? Use of preperitoneal polypropylene mesh at the time of stoma formation

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Abstract Background This is a prospective study of prophylactic mesh placement in the preperitoneal space at the time of stoma formation to prevent parastomal hernia. **Methods** Patients undergoing elective permanent stoma formation and resiting of a stoma were included. Patients with peritoneal contamination were excluded. A 6×6-cm polypropylene mesh was placed in the preperitoneal space (no stitches), and a circular hole was made to let the bowel come through with ease and the stoma was constructed. At follow-up, the patients were examined standing and lying down for parastomal hernia. In the event of clinical uncertainty, a CT scan was done. **Results** A total of 42 patients (20 women, 22 men, mean age 61 years) were eligible for the study. The patients were followed up for a mean of 31 months (range 9–68 months). There were 29 end-colostomies and 8 end-ileostomies and 5 stomas resited. Four parastomal hernias were detected during the follow-up period (9.52%). One required repair due to an ill-fitting stoma bag and leakage. The other three were asymptomatic. One patient developed stomal necrosis which required a new segment of bowel to be brought out through the same opening and the underlying mesh was left undisturbed. **Conclusions** The results of the 2-year follow-up in this study (incidence of parastomal herniation 9.5%) along with available evidence in the literature (incidence 0–8.3%), compared to the results of repair make a strong case for the use of a mesh at the time of initial surgery for the formation of any permanent stoma to prevent parastomal herniation.

Key words Parastomal hernia · Preperitoneal mesh · Prophylactic mesh placement · Parastomal hernia prevention · Polypropylene mesh

Introduction

Parastomal hernia is considered to be a common complication following stoma formation. The incidence of parastomal hernia is 1.8–28.3% for end-ileostomy and 4–48% for end-colostomy formation [1]. One-third of these patients require surgical intervention due to problems such as an ill-fitting stoma bag, discomfort, obstructive symptoms, leakage and damage to the skin surrounding the stoma. Different techniques have been described for the repair of a parastomal hernia and the failure rates for all these procedures are high. Parastomal hernia can be considered as an incisional hernia that occurs at the stoma site [2]. The recurrence rate of parastomal hernia is the lowest for mesh repair (0–33%) compared to primary fascial closure (46–100%) and relocation of the stoma (0–76%) [1, 3]. Mesh insertion at the time of pri-

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mary stoma formation has been the logical step forward in the prevention of parastomal hernia and this has been recommended in two review articles [1, 4]. The first case series was described by Bayer et al. in 1986 [5], and the results from subsequent studies [6, 7], including the previously published early results of this current study [8], have been encouraging. Although the incidence of parastomal hernia increases with time, most occur within the first 2 years of stoma formation [9]. This was a prospective study in patients undergoing prophylactic polypropylene mesh placement at the time of initial surgery followed over a mean period of more than 2 years.

Patients and methods

All consecutive patients undergoing elective permanent stoma formation from October 2002 to December 2007 were included in the study. Those undergoing planned resiting of a stoma to a new abdominal wall location for various reasons were also included for the study period. Patients undergoing emergency surgery, formation of loop or temporary stomas, and patients with faecal or purulent peritonitis were excluded from the study. Patients who did not survive for more than 3 months following the stoma formation were also excluded. Ethical approval to carry out this prospective study was obtained from the regional ethics committee. The operations were all carried out by one of three specialist colorectal surgeons in the unit.

Operative procedure

The operative procedure is illustrated in Figs. 1–3. A circular disc of skin and subcutaneous fat is excised from the premarked site. A cruciate incision is made on the rectus sheath and the rectus muscle is split. The peritoneum is incised and then separated from the underlying rectus muscle to create a preperitoneal space. An aperture is cut in the centre of a 6×6-cm polypropylene mesh (Auto Suture) such that the bowel can pass through just about with ease. The shape of the aperture is cut to fit the profile of the bowel segment that has to pass through it. This mesh is placed in the preperitoneal space (no stitches or any anchoring method used) and the stapled end of the bowel is brought out through the opening. The midline laparotomy wound is then closed and dressings applied before the bowel is opened to create the stoma in the usual fashion. All patients received a single dose of prophylactic antibiotic at the start of the procedure.

All patients were followed up at 6 weeks and then at 3-monthly intervals in the first year. They were subsequently reviewed at 6-monthly intervals during the second year, and thereafter annually. The patients were all examined standing and supine after removal of the stoma bag by a consultant or a staff grade surgeon. Besides the routine appointments, the patients also had direct access

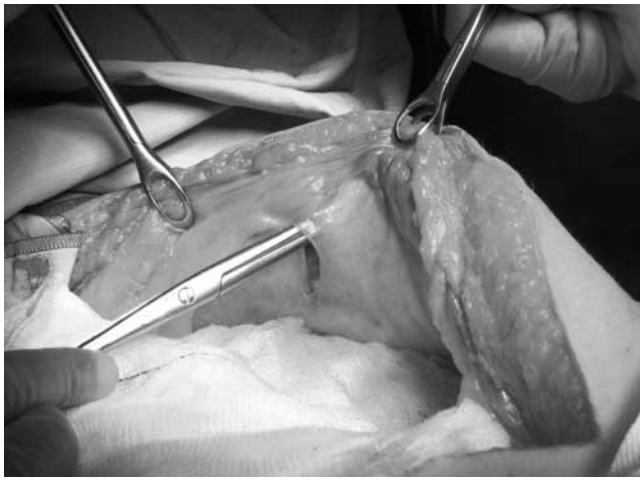

Fig. 1 Creation of preperitoneal space

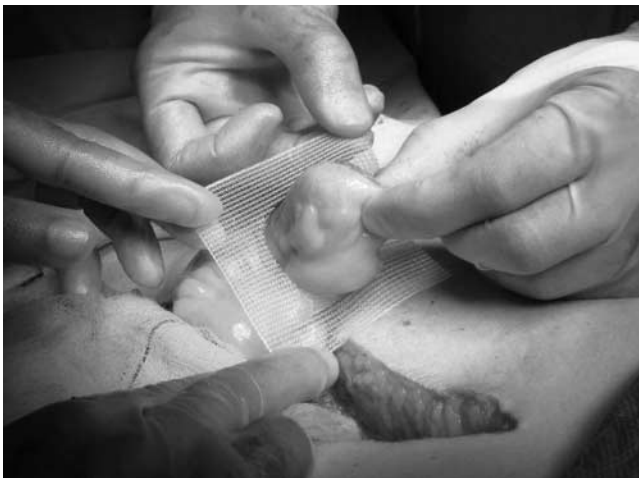

Fig. 2 Hole cut in the polypropylene mesh

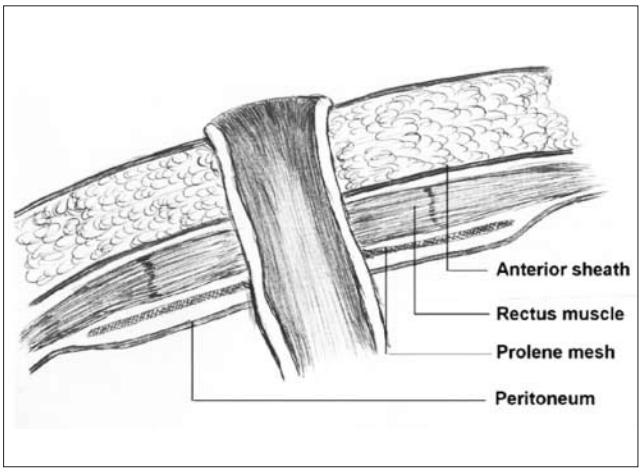

Fig. 3 Line diagram illustrating the preperitoneal mesh placement

to a specialist stoma care nurse in case of any stoma-related complaints. The specialist stoma care nurse also examined the patients independently and any problems associated with the stoma were brought to the team's attention and a clinic appointment was made as required. Any evidence of a bulge associated with a cough impulse adjacent to the stoma was indicative of parastomal hernia. If there was any doubt regarding the clinical finding, a CT scan was performed to confirm or rule out a parastomal hernia. The George Eliot hospital classification was used to grade the parastomal hernia, as follows:

Grade 1: Hernia detected only by imaging
Grade 2: Protrusion on one side
Grade 3: Circumferential protrusion
Grade 4: Hernia presenting with obstruction or strangulation

Grades 1–3 were further subdivided using the suffix 'a' (asymptomatic) or 'b' (symptomatic: ill-fitting bag, leakage, pain).

Information regarding demographic data, indication for surgery and duration of follow-up was collected and complications (mesh infection, stenosis, mesh erosion, stomal necrosis, retraction, parastomal hernia) were documented.

Results

A total of 42 patients (20 women, 22 men) were eligible for the study. Their mean age was 61 years (range 33–86 years). The patients were followed up for a mean period of 31 months (range 9–68 months, median 28 months). There were 29 end-colostomies (25 abdominoperineal resections and 4 Hartmann's procedures), 8 end-ileostomies (proctectomy and ileostomy for colitis), and 5 stomas resited (4 colostomies and 1 ileostomy).

There were four parastomal hernias detected (see Table 1) during the follow-up period (incidence rate 9.52%). Two hernias were in end-colostomies, one in an end-ileostomy and one in a resited end-colostomy. One of the four parastomal hernias required repair due to an ill-fitting stoma bag and leakage (George Eliot grade 2b). This was in the patient who had resiting of an end-colostomy with additional mesh repair of a midline incisional hernia. The parastomal hernia (initially grade 2a) was diagnosed at the 6-month follow-up. The patient began to develop symptoms over the next 12 months, and revision surgery was performed during the 24th month. At surgery the herniation was lateral to the mesh which had rolled close to the stoma. The stoma was resited to the opposite side using a preperitoneal mesh. One patient with end-colostomy was found to have a small swelling close to the stoma at the 3-month follow-up. A CT scan done on this patient during the 4th month failed to demonstrate a parastomal hernia. Repeat clinical examination at 6 months revealed definite clinical evidence of parastomal hernia (grade 2a). One patient with an end-ileostomy was seen to have developed a parastomal hernia (grade 2a) at the 14-month follow-up. One patient was seen to have developed a midline incisional hernia and a grade 3a parastomal hernia at the 18-month follow-up. At the time of this report these three patients with parastomal hernias were asymptomatic and had not required surgical intervention.

Two patients died during the follow-up period due to causes not related to the mesh. One patient developed stomal necrosis on the second postoperative day. This was reoperated upon and the devascularized segment of bowel was excised. A new segment of colon was brought out through the same opening and the colostomy was fashioned. The same patient developed superficial laparotomy wound infection and peristomal cellulitis which settled with conservative treatment. The mesh was left in situ, and did not contribute to any morbidity in the patient.

Discussion

Parastomal hernia is an incisional hernia related to an abdominal wall stoma [2]. The use of prosthetic mesh is a well-established way of treating an incisional hernia. Earlier studies indicated that the use of mesh in close proximity to open bowel (as in a stoma) is associated

Table 1 Parastomal hernia formation (4 out 42 patients = Incidence 9.52%)

Patient no.	Age (years)	Sex	Type of stoma	Time of diagnosis (months)	Mode of diagnosis	Grade of parastomal hernia	Outcome
1	57	F	Resiting of end-colostomy	6	Clinical	2a at 6 months; 2b symptomatic at 12 months	Stoma resited to the opposite side with mesh at 24 months
2	79	M	End-colostomy	6	Clinical[a]	2a	Asymptomatic
3	47	F	End-ileostomy	14	Clinical	2a	Asymptomatic
4	66	M	End-colostomy	18	Clinical[b]	3a	Asymptomatic

[a]Clinically suspicious bulge felt near the stoma site at 3 months; CT scan done at 4 months (normal)
[b]Patient also developed a midline incisional hernia

with the risk of infection and complications including mesh erosion and abscess formation [10, 11]. More recent studies have shown that parastomal mesh placement can be done safely with reduced complications [12, 13]. Rosin and Bonardi first suggested in 1977 the use of mesh at the time of initial surgery to prevent parastomal hernia (as opposed to its use to treat an established parastomal hernia) [14]. The first case series was published in 1986 [5]. In the last 4 years there have been only four papers published in relation to this technique including a randomized controlled trial [6–8, 15]. Of these studies, one was a longer term follow up of previously published data [6, 15], and another was the early results of this current study [8].

The prosthetic mesh can be placed either in the onlay (above the fascia) or in the sublay (preperitoneal) position. In two studies (non-randomized), primary onlay mesh placement at the time of stoma formation was investigated. In a study by Bayer et al. [5] in 1986 an onlay polypropylene mesh was placed in 36 patients, and no recurrences were seen over a follow-up period of 4 years. In a recent study by Gogenur et al. [7] using similar technique 24 patients were followed over a median period of 12 months and 2 of these patients (8.3%) had developed parastomal hernia at the time of reporting.

Janes et al. [15] reported a randomized controlled trial comparing the prophylactic placement of preperitoneal (sublay) mesh with the traditional no-mesh technique. This study had to be terminated prematurely for ethical reasons, as incidence of the parastomal hernia in the control arm (no mesh) was high (8 out of 18) compared to the intervention arm (0 out of 16) of the study. Further data from the same authors [6] after 12 months of follow-up showed one parastomal hernia in 21 patients (4.7%) in whom mesh was used. A series of 18 patients followed over a mean period of 16 months in our unit using a similar preperitoneal mesh placement technique had no parastomal hernia formation at the time of reporting [8].

The incidence of 9.5% in our expanded series over a follow-up period of more than 2 years compares favourably with similar results for prophylactic mesh placement reported so far (0 to 8.3%). The one complication of stomal necrosis in our series was due to the technical error in bringing out the stoma rather than the mesh placement. This is evidenced by the fact that the mesh was left undisturbed on second laparotomy. No patient required removal of the mesh and there were no other complications such as prolapse, stenosis or erosion. Most hernias tend to occur in the first 2 years following formation. although the incidence can increase with a longer follow-up and there is evidence that hernias can occur up to 13–20 years after surgery [16, 17]. We intend to follow-up these patients for a longer period.

The patient who required revision surgery for parastomal hernia had had resiting of an end-colostomy following problems with the stoma. This patient incidentally also had a midline incisional hernia and the operating surgeon noted poor abdominal musculature and fascial sheaths at the time of surgery. Two separate meshes were used for this initial surgery. It is very likely that the weak structures could have contributed to the formation of the parastomal hernia despite the use of mesh.

There is no clinically useful method of classifying parastomal hernia. Devlin [18] proposed a classification based on the anatomical position of the hernial sac, although this has not been taken up in clinical studies. We have devised and used the George Eliot Hospital classification, as it is quite easy to follow and stratify the problem. It requires further validation to be used as an effective tool.

The main technical areas of consideration have been the nature of the prosthetic mesh (biological vs. synthetic, non-absorbable vs. absorbable vs. composite meshes), size of the mesh, size and construction of the aperture to let the bowel through (simple cut vs. complex stitching of the mesh to prevent mesh erosion) and the anchoring technique to keep the mesh in place (none vs. stitches or glue).

Polypropylene mesh was used in our study rather than Vypro mesh (large-pore lightweight mesh with a reduced polypropylene content) used in the randomized trial [15]. The authors of that study claim that Vypro mesh is less irritant and inflammatory than polypropylene mesh. Other materials have also been tried for parastomal hernia repair (e.g. GORE-TEX [19], porcine collagen [20], and Marlex [14]). There was no evidence of mesh erosion or stenosis in our series, indicating that the type of mesh may not be an important factor.

The nature of the defect to be made in the polypropylene mesh and the smoothing of the edges prior to placement has been discussed in various articles (Lasercut mesh [7], fashioning of the aperture by folding back and stitching [21], polypropylene ring [22]). We used a simple ‘loose fit’ technique providing an aperture sufficient for the bowel to slide through with ease. This proved to be effective in our series.

In our series, the mesh placed in the preperitoneal space was neither stitched nor anchored in place, in contrast to the methods used in other studies [15]. This factor, besides the size of the mesh, may have contributed to the rolling of the mesh and formation of the parastomal hernia lateral to the mesh in the one symptomatic patient who underwent surgical repair. Using a larger mesh and siting it in a larger preperitoneal space could prevent this potential problem. But creating a larger preperitoneal space medial to the stoma site is impossible, as the space

available medially is limited due to the midline incision and the stitches taken for midline closure. The 6×6-cm mesh size was chosen for our study as this provides an optimum amount of mesh around the constructed defect. The alternative is to use a larger mesh with an eccentric opening that could provide a 5-cm overlap on three sides of the stoma (except the medial aspect). The availability of newer composite meshes [23] that could be placed safely intraperitoneally could theoretically provide a 5-cm overlap on all four sides of the stoma leading to better reinforcement. The potential cost of the use of these meshes routinely would have to be weighed against the socioeconomic burden of parastomal hernia treatment.

Conclusions

The results of the 2-year follow-up in our study (parastomal hernia incidence of 9.5%) along with the available evidence in the literature (incidence of 0–8.3%), compared to the results of repair of parastomal hernia (0–100% recurrence rate), make a strong case for the use of a mesh at the time of initial surgery for the formation of any permanent stoma to prevent parastomal herniation. Prevention is better than trying to cure the problem of parastomal herniation once formed. The use of preperitoneal mesh is as effective as on-lay repair for this purpose. The type of mesh to be used (biological, synthetic, absorbable, non-absorbable or composite), the size of the mesh, size of the aperture constructed, and the question of securing the mesh in place are still not clear. These areas are open to debate, and require further studies for clarification.

Conflict of interest statement The authors declare that they have no conflict of interest related to the publication of this article.

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