Successful local repair of paracolostomy hernia with a newly developed prosthetic device

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Abstract. The basic cause of paracolostomy hernia is enlargement of the trephine opening in the abdominal wall, due to tangential forces working on the circumference of the opening. Our attempts of hernia repair with polypropylene mesh were not successful, as the diameter of the hole in the mesh tended to enlarge with time. For this reason we developed a new device, which secures the desired diameter of the opening. The prosthesis consists of a polypropylene ring with an internal diameter of 20, 25 or 30 mm, mounted in the centre of a polypropylene mesh. In 14 patients with a parastomal hernia, complicating an end colostomy, this prosthesis has been used. In one patient the implant had to be removed owing to infection. In the remaining 13 patients no recurrence or other complications have been noted after a median follow-up of 18 months (range 5-35 months). We conclude that the presented prosthetic device seems to be a useful adjunct for the local repair of a paracolostomy hernia.

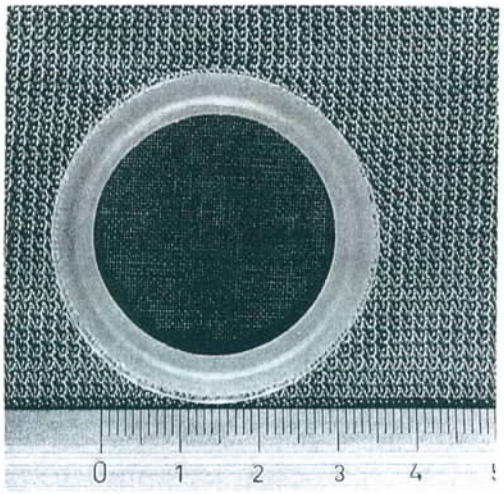

Fig. 1. Polypropylene prosthesis

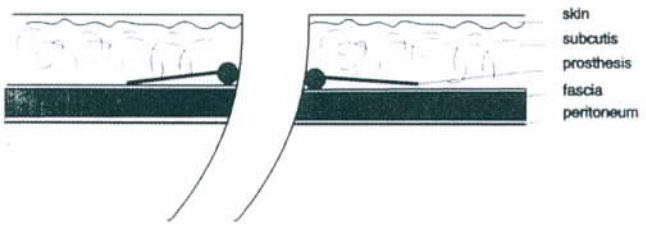

Fig. 2. Position of the prosthesis

Introduction

A paracolostomy hernia is a late complication of an end colostomy, which may interfere with the normal irrigation of the stoma by the patient and the wearing of an appliance. Also pain, obstruction or cosmetic problems may arise. A parastomal hernia is characterized by enlargement of the trephine opening, resulting in the formation of one or more peritoneal hernial sacs. These hernial sacs may be filled with small or large bowel, omentum, stomach etc.
The incidence of paracolostomy hernia is reported to vary from 7 to 50% [1-5]. Current treatment options are resiting the stoma to other quadrants of the abdominal wall or local repair. The recurrence rate for both these types of operation is about 50% [2]. Reinforcement of the abdominal wall with polypropylene mesh is reported to be more successful [1, 3, 4]. Abdu, Rosin and Bayer did not note a recurrence up to 4 years after treatment, of 19 patients in total, with Marlex mesh. However, we observed widening of the opening in the polypropylene mesh within 3 years, followed by recurrent herniation in four out of five patients.
A new type of local repair is presented with the use of a new prosthetic device, securing the diameter of the trephine opening. This procedure has been prospectively tested in 14 patients.

Methods

The prosthesis is depicted in Fig. 1. It is manufactured by melting together two identical halves of a polypropylene ring, through the framework of a polypropylene mesh, after which the mesh inside the ring is removed, taking care to leave a smooth rim. Three different sizes are available. An obese patient needs a prosthesis with an internal diameter of the ring of 30 mm, a patient with a normal weight 25 and a very thin patient an internal diameter of the ring of 20 mm. When placing a large piece of foreign material around a stoma, all must be done to reduce contamination. An antiseptic surgical technique and proper preparation of the patient are required. The stoma is thoroughly irrigated before operation and parental antibiotics (metronidazole and gentamicin) are given, starting 1 hour before until 48 hours after operation. The skin around the stoma is incised circumferentially 2 mm from the mucocutaneous junction and if needed for access, the

incision is enlarged in cranial direction. The stomal loop is freed from the subcutis and securely closed with a running 3-0 polygluconate suture. Instruments and gloves are changed now. The bowel is dissected from the fascia and placed into the abdominal cavity temporarily, after removing the hernial sac. The opening in the fascia is now tightened with interrupted polypropylene sutures, to a diameter of 2-3 cm, depending on the thickness of the traversing stomal loop. Following this, a prosthesis with the appropriate internal diameter of the ring is chosen. The ring is sutured on the external side of the trephine opening in the fascia with 8-12 interrupted polypropylene sutures (Fig. 2). On the desired distance of the ring, usualy 3 cm, the mesh is cut circumferentially and fixed to the underlying fascia with 8-12 interrupted polypropylene sutures as well. The subcutaneous space will be drained for 24 hours, for which purpose two vacuum drains are inserted. The colon is brought out through the trephine opening and the redundant part resected at skin level, after which the free edge of the bowel wall is sutured to the skin with 3-0 interrupted polyglactin knots. During this manoeuvre a non-crushing clamp is left in place on the bowel as long as possible and the prosthesis is covered, temporarily as well, with gauze drenched in pvp-iodine. Stay sutures between bowel and fascia, ring or subcutis are not used.

Patients and results

In the period October 1988 - April 1991 14 patients with a symptomatic hernia, complicating an end colostomy in the left lower quadrant of the abdominal wall, have been treated with this technique by five different surgeons in four hospitals. Eight of these 14 patients were female, six male. The average age was 56.4 years (range 46-77 years). In four patients one or more unsuccessful local repairs had been attempted, with or without polypropylene mesh or resiting. Coexisting pathology was present in five patients: two patients were more than 50% over ideal bodyweight and three patients had chronic respiratory disease. The underlying disease leading to colostomy was rectal carcinoma in 12 patients, feacal incontinence in one and megarectum in another patient. Dominant complaints were signs of obstruction in four patients, problems with irrigation in three, pain in two, cosmetic in two and combinations in three patients. At exploration eleven patients proved to have an enlarged trephine opening up to five fingertips, in three patients more than five fingertips could be passed. Eight of the 14 patients received a prosthesis with an internal diameter of the ring of 25 mm, two patients a 20 mm and fout patients a 30 mm prosthesis. In 13 patients the post-operative recovery was uneventful. In a 68-year-old female patient however, a wound infection developed, caused by stafylococcus aureus. After unsuccessful treatment with the local gentamicin and systemic flucloxacilline for 6 weeks, the prosthesis had to be removed. The patient were seen on the outpatient department with 3-6 months interval. After a median follow-up of 18 months (range 5-35 months) no other complications or recurrent hernia have been noted.

Discussion

Reported incidences of paracolostomy hernia vary from 7-50% [1-5], depending on the positioning of the stoma in the abdominal wall, factors concerning the general conditions of the patient, and methods and duration of the follow-up. Sjödahl [5] observed only 2.6% parastomal herniation when the colon had been pulled through the rectus abdominis muscle, but 26.1% when the colostomy had been constructed lateral to this muscle. Stomas positioned in the laparotomy incision are prone to be followed by parastomal herniation. As in other peritoneal hernias, obesity, malnutrition, chronic cough and postoperative abdominal distension are contributing factors. However neither increasing age, sex or underlying disease (carcinoma or inflammation) seem to be of influence. The incidence increases with time, half of the paracolostomy hernias being present within two years after the initial operation [2]. According to Todd [6] most patients with a longstanding colostomy develop a parastomal hernia. Small parastomal hernias can easily remain undetected [7]. Although some patients with relatively large hernias appear to be more or less symptomless, many are handicapped by intermittent pain, obstruction, difficult stoma care or cosmetic problems.
Regarding the etiology, the position of the stoma in the abdominal wall and the general patient factors have already been mentioned. We looked at the etiology of parastomal herniation in cooperation with physical engineers. The basic event is enlargement of trephine opening, due to tangential forces working on the circumference of the opening. According to the law of La Place the radial force (F^{rad}) on a normal abdominal wall is related to the pressure (P) in the abdominal cavity and the radius (R^1) of the abdominal cavity according to the formula:

$$F^{rad} = \frac{PxR^1}{2}$$

After construction of a trephine opening in the abdominal wall the tangential force(F^{tang}) on the edge of the opening is related to the radial force (F^{rad}) and the radius of the trephine opening (R^2) according to the formula (see Fig. 3):

$$(F^{tang} = (F^{rad}) \times R^2$$

The law of La Place explains why for instance an obese patient (large radius of abdominal cavity and trephine opening) is more prone to the development of a parastomal hernia in comparison to a thin patient. Acordingly the trephine opening should be constructed as small as will safely allow passage of the intestine to skin level, 25-30 mm for an end colostomy. The rationale for the presented method of local repair of a paracolostomy hernia , is securing the desired diameter of the trephine opening, being the only factor that can be influenced

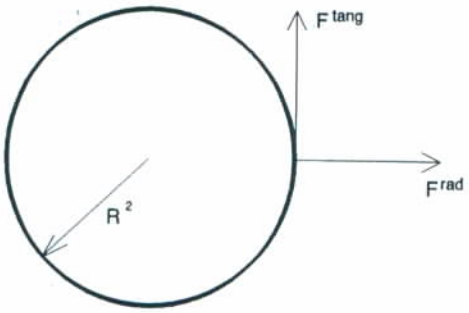

Fig. 3. $F^{tang} = F^{rad} \times R^2$

surgically, apart from the positioning of the stoma in the abdominal wall.
The use of a prosthetic device undoubtedly carries the risk of infection of the implant, especially if the bowel has to be opened. Abdu [1], Rosin [3] and Bayer [4] reported three infections on a total of 19 patients. In our series of 14 patients throrough irrigation of the stoma, antibiotic prophylaxis and a precise surgical technique, resulted in primary wound healing in all but one case. This infection has not been caused by bowel flora.
Pressure necrosis in unlikely to occur, if the bowel can move freely through the smooth innerside of the ring and sharp angles in the bowel are avoided, when passing the trephine opening in fascia and skin.
For incisional hernia repair a plea is made for placing the implant between peritoneum and internal side of the abdominal wall. Although in theory this might be preferable, it is impracticable in parastomal hernia repair, as it would extend the operation with a laparotomy and make removal of the implant more complicated, in case of infection. In our series of patients we did not notice loosening of the prosthesis from the external side of the fascia, thus it seems to make no difference. When necessary the operation can be performed in combination with an open laparotomy, but in our experience until now open laparotomy could always be avoided, even in the presence of massive adhesions. The size of the polypropylene mesh can be custom-tailored to the individual patient by cutting the circumference. Hitherto the three available sizes of the ring proved to be sufficient. In conclusion, in spite of a relatively short follow-up of 5-35 months, this prosthesis seems to be a safe method in the treatment of paracolostomy hernia and avoids a major laparotomy.

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