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Review article

Parastomal hernias: Background, current status and future prospects

Gloria Tadeo-Ruiz, Joaquín-Salvelio Picazo-Yeste, Carlos Moreno-Sanz,*
and María-Luz Herrero-Bogajo

Servicio de Cirugía General y del Aparato Digestivo, Hospital General La Mancha Centro, Alcázar de San Juan, Ciudad Real, Spain

ARTICLE INFORMATION

ABSTRACT

Parastomal hernia (PH) is the most common delayed complication in stoma surgery. Only a third of these are operated on, something which is partly explained by the high recurrence rate observed after repair. The use of prosthetic materials has improved the results, although they continue to be below the ideal.

For this reason, it has been proposed that the best solution may be in preventing the PH. Several studies show promising results, with very marked reductions in the percentage of IH, on placing a prophylactic peristomal prosthesis.

In this article we present a review of the risk factors associated with PH, a classification of the existing diversity of repair techniques, and an algorithm is proposed for the management of PH, including its prevention.

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Eventración paraestomal: antecedentes, estado actual y expectativas de futuro

RESUMEN

La eventración paraestomal (EP) es la complicación tardía más frecuente del estoma quirúrgico. Sólo un tercio de éstas se intervienen, hecho que en parte se explica por el alto índice de recidivas observadas tras la reparación. La utilización de materiales protésicos ha mejorado los resultados, aunque siguen siendo por debajo de lo ideal.

Por esta razón, se ha propuesto que la mejor solución puede estar en prevenir la aparición de la EP. Varios trabajos muestran resultados prometedores con reducciones muy llamativas en el porcentaje de EP al colocar una prótesis periestomal profiláctica.

En este artículo presentamos una revisión de los factores de riesgo asociados a la EP y una clasificación de la diversidad de técnicas de reparación existentes, y se propone un algoritmo para el tratamiento de la EP, incluyendo la prevención de ésta.

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*Corresponding author.
E-mail address: salvelio@yahoo.es (J.-S. Picazo-Yeste).

Introduction

Parastomal eventration (PE) is the most common late-onset complication of surgical stoma. Its clinical manifestations range from a simple aesthetic problem to hernial strangulation.

Currently it is estimated that interventions are performed on only a third of PEs, owing to the fact that the correction of these hernias is a problem which has not yet been resolved. Classical techniques, such as simple closure of the defect or the repositioning of the stoma, which have high relapse rates, have largely been replaced by reinforcement interventions using prosthetic materials and involving both open surgery and laparoscopy, although the results in terms of relapse and morbidity continue to be far from ideal.[1]

This is why some surgeons have proposed that the best solution may lie in prevention. So far the results have been promising, with important reductions being obtained in the percentage of PE following the prophylactic installation of a prosthesis during the creation of the stoma.

Concept and incidence

We define PE as an incisional hernia which develops in the region of a colostomy or an ileostomy with the formation of a peristomal vault when the loops are passed through the aponeurotic orifice, which is clearly visible, as a result of parietal strain or when the patient is in a standing position, as a protrusion of the abdominal wall around the stoma.[1]

In 1973 Devlin[2] classified PE into 4 types. Although this classification is used little in clinical practice, it is important to distinguish between true PE, mucosal prolapse and paralysis of the abdominal wall produced by the denervation of the lateral muscles of the abdomen.

Although, according to Goligher,[3] "peristomal eventrations are so common that their appearance is almost inevitable", it is difficult to determine their incidence, which varies from 10% to 50%, with any accuracy. Perhaps this can be explained by the lack of consensus with respect to their definition (ranging from a small asymptomatic eventration to an eventration requiring surgical correction), diagnosis and follow-up.[4-6] (Table 1).

Risk factors

We can classify the risk factors for the development of a PE into 3 categories: factors derived from the patient, the surgical technique and post-operative complications (Table 2).

Table 2 – Risk factors for the development of parastomal eventration
Factors
Patient characteristics
Abdominal perimeter > 100 cm
Subjects older than 60 years
Crohn's disease
Surgical factors
Stoma in the colon
Post-operative factors
Long-term survival
Surgical wound infection

Table 1 – Incidence of parastomal eventration in colostomies and ileostomies

Author	Type	Cases, n	Follow-up, months	Incidence of PE, %
Boman-Sandelin and Fenyo[7]	C	211	2.2	2.8
Sjodahl et al[8]	TC	130	7	9
Porter et al[9]	TC	130	35	10.7
Leenen and Kuypers[10]	TC	184	–	11
Fleshman and Lewis[11]	TC	7,083	–	11
Ortiz et al[12]	TC	54	60	48.1
Londono-Schimmer et al[13]	TC	203	120	37
Cheung[14]	TC	156	36	31.1
Gooszen[15]	LC	39	–	2.5
Mylonakis et al[16]	TC	86	–	13.9
Rullier et al[17]	LC	60	3-6	8.3
Sakai et al[18]	LC	63	–	0
Edwards et al[19]	LC	36	4	5.5
Arumugam et al[20]	C	97	12	12.3
Harris et al[21]	TC	210	–	9.5
	LC	47	–	6
Robertson et al[22]	C	408	24	40
Mahjoubi et al[23]	TC	330	–	11.2
Caricato et al[24]	TC	11	4	27
	LC	77	4	1.8
De Raet et al[25]	TC	41	31	46

C indicates unspecified colostomy; LC, lateral colostomy; PE, parastomal eventration; TC, terminal colostomy.

Factors such as obesity, diabetes, malnutrition or chronic pulmonary disease have been linked to colostomy complications of colostomies, such as stenosis, necrosis or peristomal abscess, but only abdominal perimeter and age have been independently linked to a greater risk of PE.[16,22,34]

When De Raet et al[25] prospectively analyzed a total of 41 patients with colostomies performed during abdominoperineal amputations due to rectal neoplasia, they only identified an abdominal perimeter of more than 100 cm as a factor related to the development of this complication, which occurred in 75% of the patients with this risk factor.

The correlation between colostomy and Crohn's-like inflammatory bowel disease appears to be associated with a higher risk of complications and the subsequent appearance of PE, although not of ulcerative colitis.[11,26,27,31,35,36]

With regard to surgical technique, stoma type has been linked to a greater risk of PE. This complication is more common in colostomies than in ileostomies and it is also more common in terminal than lateral stomas. Also important is stoma size, both of the aponeurotic orifice and the cutaneous orifice. Various studies have estimated that these must not exceed 3 cm in the case of colostomies and 2.5 cm in the case of ileostomies.[4,9,28,30,37,38] It has not been demonstrated that technical details, such as subperitonization of the final intestinal segment prior to the stoma or the location of the incision through the rectus muscles of the abdomen, prevent the appearance of a PE, although these issues continue to be a matter of debate.[8,12,13,25,29,32,33,38] Neither does the creation of the stoma by laparoscopy reduce the risk of PE.[39]

As far as post-operative factors are concerned, there are no studies in the medical literature linking parastomal hernias with other concomitant complications, although theoretically it is inevitable that all these processes weaken the abdominal wall and increase the risk of developing a PE.

Finally, although the majority of PEs appear in the first 2 years, long-term survival increases the risk of PE.[40]

Diagnosis and surgical indications

In most patients the only clinical feature is swelling around the stoma and only a third of cases have severe symptoms which require surgical correction. This swelling may grow to the stage where it becomes aesthetically intolerable or it prevents the correct placement of the colostomy bag and leads to leaks, which are incapacitating for the patient. On other occasions, a phenomenon which consists of abrupt distension of the hernial sac occurs, especially in situations in which there is a strain on the abdominal wall, so that the skin around the colostomy finally becomes distended. This phenomenon can result in the distended skin becoming more susceptible to the development of dermatitis (more frequently in ileostomies, in which the evacuated material is more irritant). Pain is a symptom which is frequently associated with PE, owing to the distension of the abdominal wall and the skin because of the protrusion of the hernial sac.[1-4]

In general, the diagnosis is made on the basis of a clínical examination, but in some cases the existence of a PE may

Table 3 – Indications and contraindications for the repair of parastomal eventration
Indications
Absolute
Incarceration
Strangulation
Obstruction
Fistulization
Perforation
Stomal ischaemia
Relative
History of Incarceration
Symptoms indicative of obstruction
Difficulty in maintaining the collection device
Inability to see and treat the stoma
Irrigation difficulties
Pain related to the hernia
Ulceration of the surrounding skin
Aesthetically unacceptable
The narrow neck of the hernia makes its reduction difficult
Other concomitant complications which indicate a review, such as stenosis or prolapse
Contraindications
Absolute
Terminal malignant disease
Relative
Metastasic or inoperable malignant disease
Serious cormorbidity
Temporary stoma

be overlooked (obese patients, difficult examination due to pain on palpation, retracted scars, coexistent laparotomic eventrations or swellings due to relaxation of the abdominal wall around the stoma). Other times it is difficult to differentiate a hernia from a prolapse. In all these cases, the use of radiological tests (CAT or ECHO) is essential as an aid to diagnosis.[6,29,41]

Traditionally, the poor results obtained from repairing PEs has limited indications for surgical treatment to patients with severe symptoms or complications. Currently, patients with intermittent episodes of incarceration, subocclusion, difficulty in handling the collection device and other symptoms which interfere with their quality of life should be considered as candidates for surgery[42,43] (Table 3).

Repair techniques

There are numerous surgical techniques, depending on the approach route, whether the position of the stoma is changed or not, and whether a prosthesis is used for reinforcement or laparoscopic surgery is employed.

Open techniques without installation of a prosthesis

Without stoma transposition

In 1965 Thorlakson[44] described the repair technique which had been most widely used in the past. The colostomy is

accessed without opening the cutaneous orifice by making an incision around the stoma about 5 cm from the colocutaneous junction (Figure 1A). Through the latter the sac is dissected and then resected, and the margins of the musculoaponeurotic orifice are loosely stitched together using non-absorbable material.

This technique has a relapse rate of 46%-100%, owing to the difficulty of closing the aponeurotic orifice properly without creating any tension, which is why it cannot be recommended as a standard intervention.[42,46,47]

In 1997 Bewes[48] described the closure of the parastomal defect without producing tension by using a sliding peritoneomuscular flap, a procedure which was performed by laparotomy.

The risk of relapse (40%) associated with this technique is compounded by the fact that it produces a new abdominal scar with its consequent risk of laparotomic eventration.[37] This technique would only be justified when the use of biomaterials is not possible and it is necessary to perform a laparotomy to treat associated problems.

With stoma transposition

This consists of opening the stoma by a laparotomy, treating the PE by closing the abdominal wall plane by plane and creating a new stoma.[1] As well as the risk of developing a new PE, transperitoneal transposition poses the added disadvantages derived from the laparotomy itself.[49,50]

In order to avoid these disadvantages, other authors[2,45-47] propose performing this transposition locally and reserving the transperitoneal approach for when there are surgical difficulties or in an emergency in the case of strangulated eventration.

Transposition is better than local repair in terms of the rate of relapse, but at the cost of a higher level of post-operative complications.[47,51]

Open techniques with installation of a prosthesis

The first study appearing in the medical literature about the use of prosthetic reinforcement for repairing a PE corresponds to Hopkins and Trento[52] in 1982, 3 decades after biomaterials were first used in the treatment of laparotomic eventrations.[53-55]

The problems observed in connection with the utilization of non-absorbable materials inside the abdominal cavity and in contact with the internal organs, together with the idea of placing them in a contaminated area, meant that, at first, the use of biomaterials around the stoma was not advised.[53] However, to date, only one case of erosion of the colon by the prosthesis used to repair a PE[56] has been reported in the medical literature.

Using the same principles which are applied in laparotomic eventrations, different techniques of tension-free prosthetic
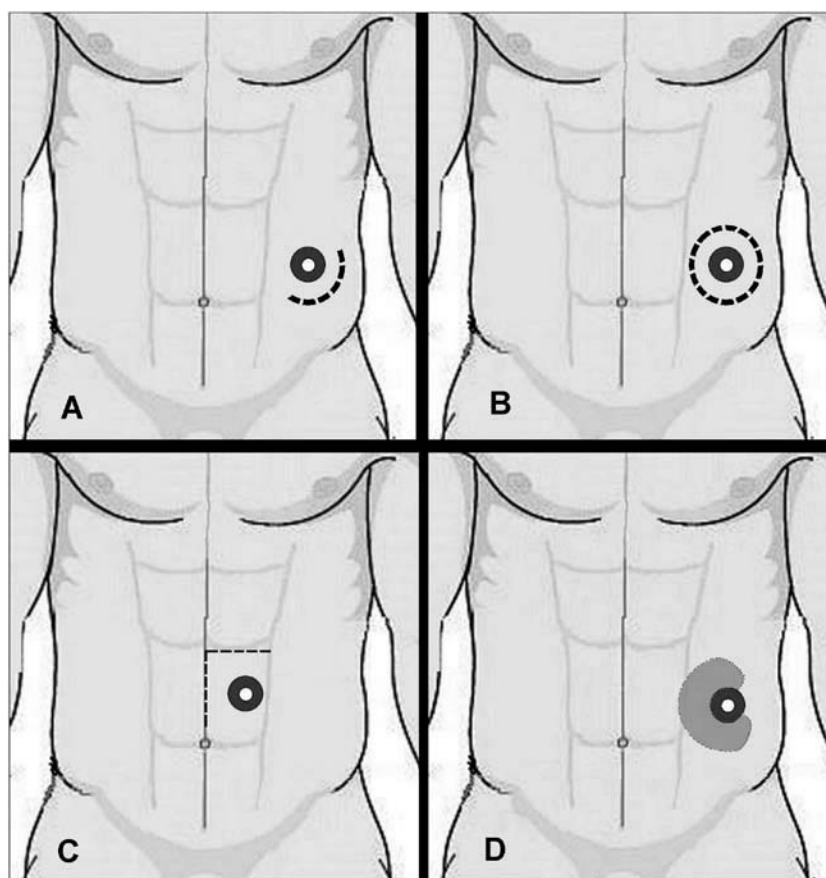

Figure 1 – A) Cutaneous incisions in the thorlakson technique, B) cutaneous incisions in the rosin technique, C) cutaneous incisions in the leslie technique, D) cutaneous incision and area of implantation of the prosthesis in the tekkis technique.

repair of PE have been described. The development of biomaterials which show better integration and a lower inflammatory response makes these the "gold standard" to be used for correcting abdominal wall defects, including PE.[57]

With a superficial prosthesis (onlay technique)
The general principles underlying this technique are local intervention of the hernial sac by means of a cutaneous incision without laparotomy, dissection and treatment by closing the aponeurotic defect and reinforcing it with reticular prosthetic material.

In 1977 Rosin and Bonardi,[58] and then Abdu[59] in 1982, performed a circular incision around the stoma and created a 2 cm wide cutaneous ring around it (Figure 1B). After stapling and sealing off the redundant colon, the aponeurotic margins and the peritoneal sac, which was resected, were then released. A polypropylene mesh with a circular orifice in its centre for the colon, which is attached to the prosthesis at various points, to pass through is placed in the area of the parietal defect.

Leslie[60] recommends an "L-shaped" access route, located about 10 cm from the stoma, with part of the incision over the previous scar (Figure 1C). The fact that this this cutaneo-subcutaneous flap can be moved permits not only the dissection of the parastomal hernial sac, but also the repair of a concomitant laparotomic eventration. After resecting the sac and suturing the aponeurotic margins, the wall is covered with 2 sheets of polypropylene that surround the colon and the latter is attached to the skin.

Tekkis et al[61] have published a similar technique of aponeurotic closure with prosthetic reinforcement in situ. The incision is semicircular, around the stoma, and after the dissection of the hernia and the reduction of the parietal orifice, a polypropylene prosthesis, which encircles the parietal orifice through 270°, is placed on its surface (Figure 1D). These authors insist on the importance of not permitting contact between the colon and the prosthesis, to ensure which they leave 2-3 mm between the internal edge of the prosthesis and the aponeurotic orifice.

With a prosthesis implanted deep into the wall (sublay technique)
Other authors[1,62] install the prosthesis deep between 2 musculoaponeurotic planes. After opening the stoma and temporarily closing the colon by stapling it together, an extensive subaponeurotic dissection space is created.

Martínez-Munive et al[62] open the stoma and close the posterior plane, leaving a 2-3 cm orifice for the colon to pass through. Then, a large fenestrated prosthesis is placed in the space which is freed up and fixed to the posterior plane by means of threads or staples. The anterior plane is closed in front of the prosthesis and leaves only an orifice adapted to the size of the colon. After that, the stoma is resutured to the skin.

Cuilleret and Bou[63] propose opening the peritoneum, exclusively accessing the hernia by the intraabdominal route, resecting the sac from within and then reinforcing the hernial defect by the preperitoneal installation of a prosthesis. Finally, the peritoneum is closed and the distal segment of the colon is parietalized.

Kasperk et al[64] describe a combined technique, given that they first of all access the eventration by laparotomy and,

after having reduced the hernia, they insert a non-absorbable prosthesis in a retromuscular position. After closing the laparotomy, the margins of the aponeurotic defect are closed anteriorly.

Bouillot[1,65] uses a technique which entails transposition of the stoma and creates a large retromuscular space by means of local access. After being opened and sealed, the stoma is reinserted into the abdominal cavity. A large polyester prosthesis is placed in this space and fixed by means of transparietal sutures to the aponeurosis. The prosthesis must cover the old and new sites of the stoma with room to spare. Then the intestine is extracted and the stoma is matured. The authors report a relapse rate of 10% and a 0% rate of complications in a series of 10 patients.[65]

With an intraabdominal prosthesis
The aim of this approach is to avoid local access to the stoma, which theoretically reduces the risk of sepsis, by treating PE internally. However, it is technically more complex and there is a risk of an eventration in the new laparotomy.

Sugarbaker[66] does not touch the peritoneal sac. The herniated segment is reduced and the aponeurotic orifice is reinforced from inside by means of a mesh, which is sutured to the periphery of the aponeurotic margins and forms "a bridge" over the colon, in a similar way to classical subperitonization. This way, the prosthesis stays in an intraabdominal position.

There are few series in the medical literature with enough patients to enable us advising a particular prosthetic technique (Table 4).

Laparoscopic techniques

In 1998 Porcheron et al[78] described the first PE correction by laparoscopy. During this procedure, after releasing any peristomal adherences, partially reducing the sac and conserving part of it, the authors sutured the hernial orifice and then reinforced this suture by installing a polytetrafluoroethylene prosthesis (PTFE) fixed with staples. Since then, the application of the laparoscopic approach for repairing PE has gradually increased, as proved by the numerous articles published in the medical literature.[79-88] It is too early to know the long-term results of this type of intervention, as the series have small numbers of patients and short follow-up periods, which could explain the disparity in the results (Table 5).

In the *Keyhole* technique, described by Hansson et al,[79] the prosthesis is cut radially until its centre is reached. Then a circle, adapted in each case, is resected in the centre in order to accommodate the stoma, which is completely encircled. It is a technique which has been widely used since it was first described and the authors themselves have recently reported a relapse rate approximating 90%, although the majority of these are asymptomatic.[80]

In Sugarbaker's modified technique, described by Voitk,[81] the prosthesis covers the hernial defect in a similar way to that described for the open route. The non-fenestrated prosthesis, applied directly in an intraperitoneal position, contains the colon against the wall.

Table 4 – Some published series on open prosthetic repair of parastomal eventration

Author	Patients, n	Technique	Type of prosthesis	Location	Recurrences, %	Follow-up, months
Rosin[58]	7	Local	Polyethylene	Pre-aponeurotic	0	3-48
Abdu[59]	5	Local	Polypropylene	Pre-aponeurotic	0	36
Leslie[60]	2	Local	–	Pre-aponeurotic	0	48
Sugarbaker[66]	7	Laparotomy	–	Intraabdominal	0	48
Alexandre and Bouillot[65]	10	Local+transposition	Polypropylene	Retromuscular	10	–
Hofstetter et al[67]	13	Laparotomy	PTFE	Retromuscular	0	96
Tekkis et al[61]	5	Local	Polypropylene	Pre-aponeurotic 270°	0	9-38
Martínez-Munive et al[62]	3	Local	Polypropylene	Anteromuscular	0	3-20
Kasperk et al[64]	7	Laparotomy	Polypropylene+polyglactin	Anteromuscular	28	4-36
Franks and Hrebinko[68]	6	Local	Polypropylene	Pre-aponeurotic	0	26
Kald et al[69]	5	Laparotomy	Polypropylene	Pre-aponeurotic	20	12
Amin et al[70]	9	Local	Polypropylene	Pre-aponeurotic	0	3-12
Steel et al[71]	58	Local	Polypropylene	Pre-aponeurotic	26	50
Rieger et al[72]	19	Local	Polypropylene	Pre-aponeurotic	11	–
Stelzner et al[73]	20	Laparotomy	PTFE	Intraabdominal	15	6-36
Saclarides et al[74]	9	Local	Polypropylene	Pre-aponeurotic	11	–
Kanellos et al[75]	4	Local	Polypropylene	Pre-aponeurotic	0	36
De Ruiter and Bijnen[37]	46	Local	Polypropylene	Pre-aponeurotic	16	60
Logman and Thomson[76]	10	Local	Polypropylene	Retromuscular	0	30
Guzmán-Valdivia et al[77]	25	Local	Polypropylene	Pre-aponeurotic	8	12

PTFE indicates polytetrafluoroethylene.

Berger and Bientzle[82] combined both techniques by using 2 prostheses: the first around the colon and the second to "parietalize" the segment of the distal colon.

Whatever the case, we recommend following the principles of the laparoscopic technique for repairing eventrations as ensuring that the prosthesis extends at least 5 cm beyond the edge of the defect and fixing it properly.

Choosing the parastomal eventration repair technique

Although the best technique is usually the one we have most experience in, it is important to tailor the treatment to each individual case and to apply the procedure which is best suited to

Table 5 – Some published series on laparoscopic repair of parastomal eventration

Author	Patients, n	ST	TP	IC, %	Relapse, %	Follow-up, months
Porcheron et al[78]	1	–	60	–	0	12
Voitk[81]	4	Sugarbaker	120	–	0	12
Hansson et al[79]	4	Keyhole	–	0	0	–
Safadi[84]	9	Keyhole	240	33	40	24
Le Blanc et al[85]	12	Sugarbaker Keyhole	–	25	8	20
Hansson et al[80]	55	Keyhole	120	14	2	2
Mancini et al[86]	25	Sugarbaker	–	23	4	19
Muysoms[87]	5	Sugarbaker	–	–	0	–
Berger and Bientzle[82]	66	Sugarbaker (2 meshes)	115	–	12	12
Zacharakis et al[88]	4	Keyhole	115	0	25	9
Hansson et al[83]	55	Keyhole	–	–	37	36

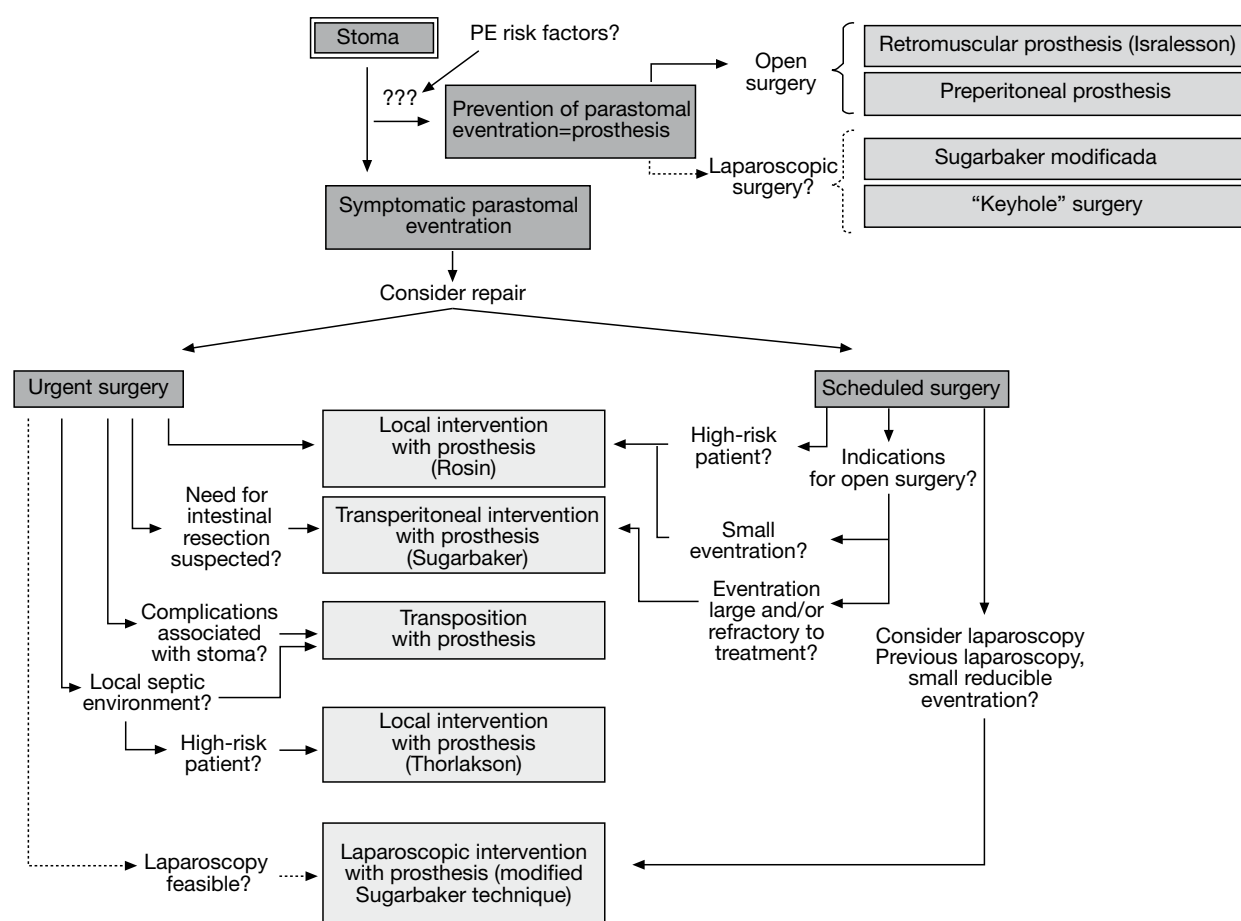IC indicates immediate complications; ST, surgical technique; TP, type of prosthesis.

Figure 2 – Proposed algorithm for the treatment and prevention of parastomal eventration. PE indicates parastomal eventration.

Author	Patients, n	Type of study	ST	TP	IC, %	Relapse, %	Follow-up, months
Bayer et al[89]	43	Retrospective	Pre-aponeurotic	Polypropylene	0	0	48
Nagy et al[90]	14	Retrospective	–	Polypropylene	0	0	12
Jänes et al[91]	21	Randomized	Retromuscular	Low-density	0	5	–
Gogenur et al[92]	25	Prospective	Pre-aponeurotic	Low-density	37	8	12
Marimuthu et al[93]	12	Prospective	Preperitoneal	Polypropylene	8	0	16
Berger[94]	22	Prospective	Intraabdominal laparoscopy	Composite	0	0	11
Vijayasekar et al[95]	42	Prospective	Preperitoneal	Prolene	–	9.5	31
Hammond et al[96]	10	Randomized	Retromuscular	Collagen	–	0	6
Berger and Bientzle[97]	47	Prospective	Intraabdominal laparoscopy	Composite	8	2	24
Jänes et al[98]	27	Randomized	Retromuscular	Low-density	–	7	60
Serra-Aracil et al[99]	27	Randomized	Retromuscular	Low-density	0	15	29

Table 6 – Studies published on the prevention of parastomal eventration by prosthetic reinforcement

IC indicates immediate complications; ST, surgical technique; TP, type of prosthesis.

the clinical conditions of the patient and the possible association of the PE with a concomitant laparotomic hernia, which is a common finding.[40] The therapeutic approach summarized below is the one we follow at our centre (Figure 2).

As a general rule, it is accepted that reinforcement of the abdominal wall by means of a prosthesis is the only technique which permits solid repair in the long term and, with the new biomaterials that are available, it offers acceptable relapse and morbidity rates. The current trend is to use wide-pore low-density prostheses to reduce retraction and inflammatory reactions as far as possible.

Urgent surgery

Probably the most widely used technique is local repair with the implantation of a prosthesis.[58] It is simple, given that it does not require opening the stoma along its entire length, but it has a high relapse rate.[58] The transperitoneal approach with a prosthesis may be the best alternative when another concomitant intraabdominal disease needs to be treated,[66,73] while the existence of complications associated with the stoma, such as incorrect position, retraction or stenosis, may make a transposition with a prosthesis advisable.[1] Nowadays, the presence of a severe local septic process with a peristomal abscess in a very high-risk patient is perhaps the only indication for performing fast, local surgery without leaving a prosthesis in the contaminated area.[42] Finally, the laparoscopic approach deserves to be mentioned if it is a feasible option for dealing with a small PE and the surgeon has experience of laparoscopy.[79,81]

Scheduled surgery

In high-risk patients, the treatment of choice consists of local repair with the implantation of a prosthesis,[58] a technique which is also indicated in small PEs for any patient. They have to assume a high risk of relapse in exchange for a non-intensive intervention. If the PE is large, refractory to treatment or associated with a concomitant incisional

hernia, a transperitoneal intervention with a prosthesis.[66] is advisable, since it enables the hernial segment to be readily reduced and permits the installation of a large prosthesis. If the patient has had a laparoscopic procedure before (which is increasingly common) or requires another video-assisted surgical procedure and the PE is small and reducible, a laparoscopic correction with a prosthesis can be considered, in this case, using the modified Sugarbaker technique,[81] which for now is the one which offers the best results.

Prophylaxis of parastomal eventrations by prosthetic reinforcement

Based on the same principles as for inguinal hernias and assuming that the construction of a colostomy implies the artificial weakening of the abdominal wall, in recent years a number of studies have appeared which propose the prevention of PE before it appears (Table 6).

In our opinion, the results in the medical literature make the idea of advising the prophylactic use of a prosthesis when constructing the stoma attractive, although we will need to have more scientific evidence that supports their systematic use.

Nowadays PE prophylaxis continues to be the subject of debate, so it seems reasonable to start by selecting patients who are most at risk of developing a PE (large abdominal perimeter, age over 60, Crohn's disease, etc.) for this procedure. If the intervention is performed by open surgery, retromuscular[91] or preperitoneal techniques can be recommended, as they avoid the insertion of an intraperitoneal prosthesis. If the intervention is performed by laparoscopy, the prosthesis is implanted intraabdominally and there are already some devices which have been specially designed for this purpose.[94,97]

Conflict of interest

The authors declare that they have no conflict of interests.

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