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Parastomal hernias: the current state (review)

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ABSTRACT *Every year there is an increase in the number of patients with intestinal stoma, which leads to an increase in the incidence of parastomal hernias (PSH). More than 50% of ostomy patients develop a parastomal hernia two or more years after radical surgery. To date, there are many surgical options for PSH, however, a unified algorithm for choosing an operational technique has not been evolved.*
The purpose of this review is to study modern surgical methods for the treatment of PSH and their late results, to determine the optimal approach and benefits.
The review of the literature showed that in all cases of surgical treatment of PSH it is necessary to use mesh implants. The optimal technique for PSH hernioplasty is the laparoscopic version of Sugarbaker due to the low risk of recurrence and technical simplicity. In patients with large and giant PSH or hernia recurrence, STORRM is the technique of choice; classical stoma transposition is not used due to the high risk of recurrence. The use of Pauli/ePauli technique demonstrates a low recurrence rate, but there are no late results in this category of patients.

KEYWORDS: *Parastomal hernia, Sugarbaker, Pauli, eTEP*

CONFLICT OF INTEREST: *The authors declare no conflict of interest*

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INTRODUCTION

Due to the successful development of the oncological service and the improvement of the quality of surgical treatment of colorectal cancer, the life expectancy of stoma patients increases, which, in turn, leads to an increase in the number of parastomal hernias (PSH). More than 50% of ostomy patients, two years or more after radical surgery, have a parastomal hernia [1].

According to the data provided by SAGES (Society of American Gastrointestinal and Endoscopic Surgeons), 87,000 ileostomy and 135,000 colostomy surgeries are performed annually. According to experts of the European consensus of 2018, the incidence of PSH in ostomy patients is over 30% by 1 year after surgery, 40% by 2 years, 50% or more with further follow-up [2]. To diagnose PSH, computed tomography, ultrasound, magnetic resonance imaging, and physical examination are used [3,4].

The problem of surgical treatment of PSH is certainly relevant, due to the high rate of occurrence of this type of hernias after large intestine surgery [5]. To date, there are many surgical techniques; however, a single standard in the treatment of parastomal hernias has not been established.

AIM

The purpose of this review is to study modern surgical methods for the treatment of parastomal hernias and their late results, to determine the optimal access and surgical aid.

Table 1. *2018 EHS clinical classification of parastomal hernias*

PSH type	Characteristic
I	Isolated PSH < 5 cm
II	PSH < 5 cm + Ventral hernia
III	Isolated PSH > 5 cm
IV	PSH > 5 cm + Ventral hernia

RESULTS AND THEIR DISCUSSION

Classification

To date, there are many classifications of PSH, but from the point of view of the choice of surgical approach, it is most appropriate to use the modified classification by Szczepkowski, M. (2011), adopted by the European Association of Herniologists (EHS) in 2018 (Table1).

The PSH classification is based on the size of the anterior abdominal wall lesion and the presence of concomitant ventral hernia. According to this classification, there are 4 types of PSH: type I — isolated parastomal hernia up to 5 cm, type II — parastomal hernia up to 5 cm in combination with ventral hernia, type III — isolated parastomal hernia of over 5 cm, type IV — parastomal hernia of over 5 cm in combination with ventral hernia [2].

Prevention

There are surgical techniques that allow to avoid the parastomal hernia during colostomy or ileostomy. The following methods of prevention of PSH are distinguished: the transrectal formation of a stoma, the use of mesh implants in the removal of intestinal stoma, the use of SMART techniques (stapled meshstom are in for cement technique) [6].

A meta-analysis conducted by Carne et al. (2003) showed that only in 4 out of 24 publications, the authors demonstrated a lower percentage of the development of parastomal hernias during the formation of a transrectal stoma compared with lateral removal of the stoma [7]. In 2016, a randomized controlled trial (RCT) of PATRASTOM was conducted, which included 2 groups of patients with PSH with previously formed transrectal or lateral stoma. The incidence of parastomal hernias did not differ between the lateral group (5 out of 27) and the transrectal (4 out of 29; P = 0.725) [8]. Thus, the conclusions obtained from these studies demonstrated the absence of a significant difference in the development of PSH when comparing transrectal and lateral stoma.

In a meta-analysis by Lopez-Cano et al., the authors demonstrated that the prophylactic use of a mesh implant in 451 patients with terminal colostomy significantly reduces the rate of PSH formation (RR 0.43, 95% CI 0.26–0.71; P = 0.0009) [9]. In the ROCSS RCT, the authors found that the preventive use of a biological mesh implant during the closure of the stoma is associated with a lower percentage of PSH development in a two-year period, compared with the group of patients where prevention was not carried out (12% vs 20%) [10]. In 2019, a multicenter STOMAMESH RCT was performed, which included patients who underwent open colorectal surgery, followed by the creation of a permanent terminal colostomy, and divided into 2 groups depending on the installation of a mesh implant. Patients were observed for 1 year after the surgery. The results showed no connection between the preventive use of mesh implants and a lower percentage of the development of parastomal hernias in the analysis of clinical (p = 0.866) and radiological (p = 0.748) data [11]. Thus, despite the contradictory research results, it can be assumed that the preventive use of mesh implants is appropriate and reduces the likelihood of PSH formation.

Another method of preventing the formation of PSH is the SMART technique, which was first proposed by Williams, N.S. et al. in 2011 [6]. The technique consists in using a circular stitching device to strengthen the muscular-aponeurotic lesion in the intestinal stoma using a mesh implant. In a prospective study by Chen, M.Z. et al. in 2021, the authors

demonstrated that using the SMART technique, the PSH in 53 patients in a two-year period was observed in only 8% of the study group [12]. In a 2018 study by Canda et al., it was shown that a high percentage of PSH was observed in the group of patients without the use of the SMART technique (39.5% vs 13.8%, $p = 0.029$) in comparison with the group where the SMART technique was used [13].

Surgical Methods of Treatment

The main method of eliminating PSH is hernioplasty. There are 3 groups of methods of surgical treatment of PSH: hernioplasty using the patient's own tissues, intestinal stoma transposition, and hernioplasty using mesh implants. According to the European consensus of 2018, PSH hernioplasty using the patient's own tissues is not recommended due to the high risk of recurrence [2]. All modern surgical methods of PSH treatment involve combinations of treatment options and differ in the following parameters: type of access (open, laparoscopic, extraperitoneal), type of mesh implant (biological, polytetrafluoroethylene (ePTFE), polyvinylidene fluoride (PVDF), polypropylene (PP)), as well as the choice of anatomical space for implant placement (onlay, inlay, sublay, IPOM — intraperitoneal technique) [14].

Stoma transposition is a technically simple method of surgical treatment of PSH. However, currently this technique is used less and less. According to the data of the European consensus on the prevention and treatment of PSH in 2018, the classic variant of stoma transposition is not recommended, since when moving the stoma, the risk of developing a hernia of a new localization reaches 70% [2]. The optimal method for stoma transposition is the STORRM surgery (Stapled Transabdominal Ostomy Reinforcement with Retromuscular Mesh), proposed by Majumder, A. in 2018. The technique consists in the transposition of the intestinal stoma, a combination of the SMART technique and TAR (Transversus Abdominal Release) separation. The STORRM surgery is used in patients with large, giant parastomal hernias or with recurrent PSH. According to the results of the study, the recurrence rate of PSH with this technique is 17%, while with the use of classical stoma transposition, the recurrence rate is 24–35% [15].

Hernioplasty using a mesh implant is the most common and effective method of treating PSH. However, there is currently no generally accepted surgical standard in the use and location of a particular mesh implant [2]. According to the results of a study by Slater, N.J. et al. in 2011, it was shown that the use of biological mesh implants is associated with a high recurrence rate. The review included four retrospective studies involving 57 patients. In all the studies, patients underwent PSH hernioplasty with the installation of a collagen biological mesh implant. Recurrence of a parastomal hernia occurred in 15.7% (95% CI 7.8–25.9) patients [16]. Implants without an anti-adhesive coating, as a rule, are not considered for IPOM plastics due to the high risk of developing adhesions, intestinal fistulas and strictures [2]. A retrospective cohort study demonstrated a higher incidence of intestinal obstruction when using PVDF implants compared to polyester composite implants (11.5% vs 0%) [17]. In a systematic review by Hansson et al. in 2012, depending on the location of the mesh implant, the following rates of PSH recurrence were observed: onlay — 17.2% (95% CI 11.9–23.4), sublay — 6.9% (95% CI 1.1–17.2), IPOM — 7.2% (95% CI 1.7–16.0). The results of the study demonstrated that the location of the Sublay or IPOM implant is preferable [18]. Hernioplasty with the installation of mesh implants Onlay and Inlay in PSH is currently not recommended due to the high percentage of complications and recurrences (25–70%) [2].

Due to the rapid development of endovideosurgery, laparoscopic and robot-assisted surgical methods of PSH treatment are being actively introduced into daily practice. Paul Sugarbaker in 1985 first described PSH hernioplasty with the installation of a mesh implant by the IPOM method. The technique is carried out by performing the mobilization of the stomated intestine, dissection of the hernial sac and suturing of the hernial lesion (Fig. 1, Fig. 2). Next, the large intestine is lateralized by fixing the latter to the abdominal wall (Fig. 3). The next step is to install a composite mesh implant that overlaps the eliminated hernial lesion and the

lateralized part of the large intestine (Fig. 4) [19]. In recent years, this technique has been actively used in the laparoscopic version [20]. The advantages of this surgery are reliable fixation with the help of a valve mechanism (abdominal pressure ensures reliable fixation of the intestine under the mesh implant) and a low risk of recurrence (11.6%). The main disadvantages of the technique are the large contact area of the implant with the intestinal loops, which, despite the anti-adhesive properties of the implant, leads to the development of the adhesive process; dissection of the intestine during mobilization, as well as the use of braces for fixing the implant, increases the risk of intestinal injury with the development of perforation and peritonitis [19].

Another variant of the IPOM technique is the Keyhole hernioplasty, developed by BME Hansson in 2003 [21]. The technique of the surgery is to eliminate the hernial lesion and create a stomal intestinal tunnel. The next step is the installation of a mesh implant with its cutting around the stoma intestine. Thus, the lesion is closed and a kind of a "keyhole" is created. The advantage of this technique is the qualitative overlap of the lesion and technical simplicity. The intra-abdominal location of the implant is the same disadvantage as with Sugarbaker hernioplasty [22].

The Sandwich method, described by Berger in 2007, is a combination of the two techniques presented above [23]. First, a mesh implant is installed according to the "keyhole" type, which is then covered with a second mesh implant according to the Sugarbaker technique. This technique is recommended for use in large parastomal hernias. The advantage of this surgery is: reliable fixation with the help of double overlap of implants. The main drawback is the technically complex execution of this technique, the location of the stoma intestine between the

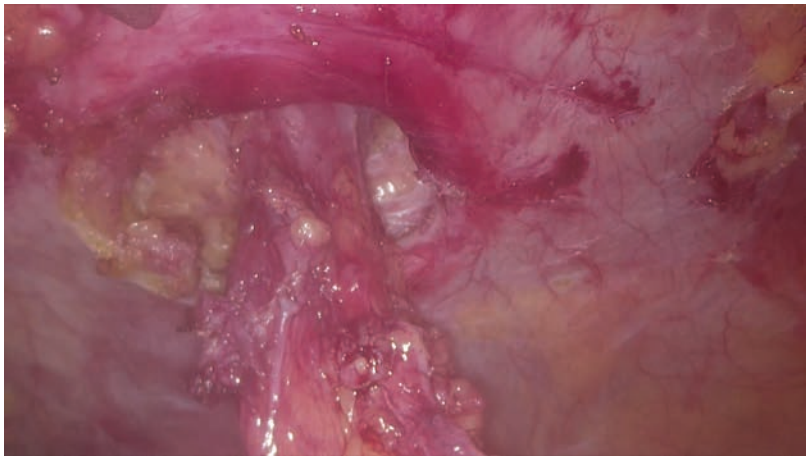

Figure 1. *Performed dissection of the hernial sac*

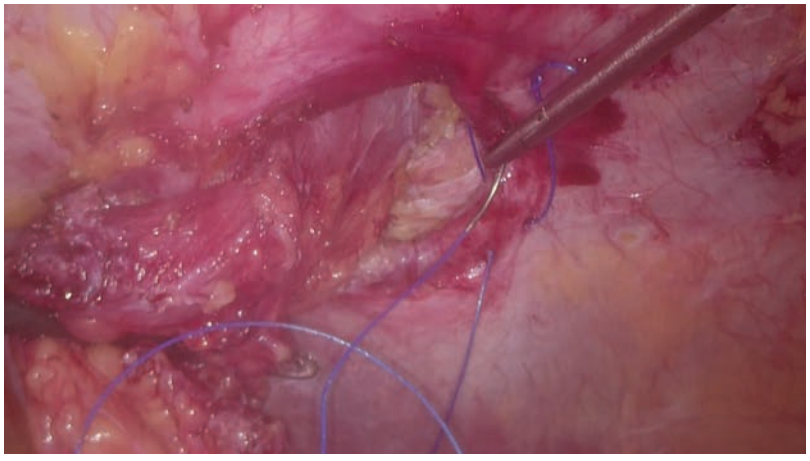

Figure 2. *Sewing of the hernial defect*

implants, as well as the large area of contact of the intestine with the mesh implant [24].

The solution to the disadvantages of the IPOM-hernioplasty in PSH was proposed by Eric Pauli. His hernioplasty (PPHR-Pauli parastomal hernia repair, 2016) consists in a combination of TAR separation and the Sugarbaker hernioplasty with the installation of a mesh implant retromuscularly. This technique is carried out by performing laparotomic access followed by TAR separation behind the stoma intestine. Thus, an additional space is created for the intersection of the posterior leaf of the aponeurosis with the peritoneum and the lateralization of the excreted intestine is performed. The next step is to suture the posterior leaf of the aponeurosis with the placement of the mesh implant extraperitoneally. The advantages of the PPHR hernioplasty are the absence of the influence of intra-abdominal pressure on the migration of the mesh implant and the absence of contact with the contents of the abdominal cavity. The disadvantages of the Pauli surgery include the implementation of open surgical access and the complexity of technical execution [25].

The endoscopic version of the surgery was named after the author — ePauli hernioplasty. In the European Consensus of 2018, this surgical technique is not considered. In addition to conferences and congresses, ePauli is mentioned only in publications by Belyansky, I. as the Pauli-eTEP hernioplasty [26].

A study conducted by Huiyong Jiang et al. in 2021demonstrated that the use of eTEP access during the ePauli surgery is technically complex and requires a lot of surgical experience. With the completed learning curve, the surgery is safe and effective. The recurrence rate requires

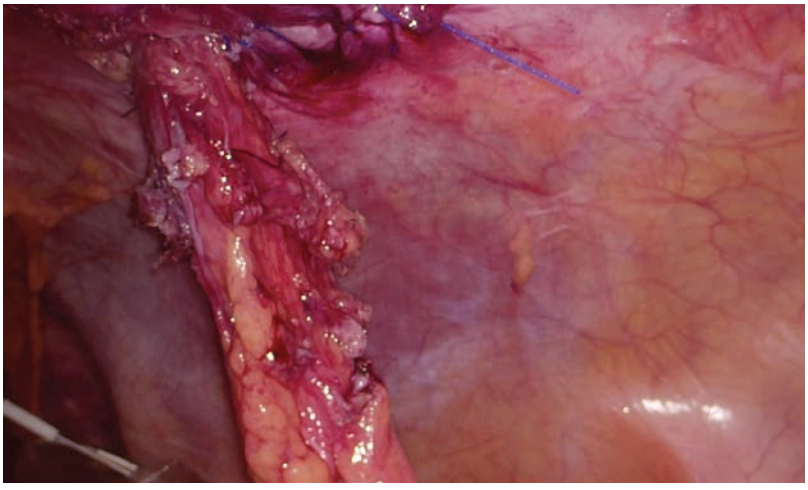

Figure 3. *Lateralization of the colon was performed*

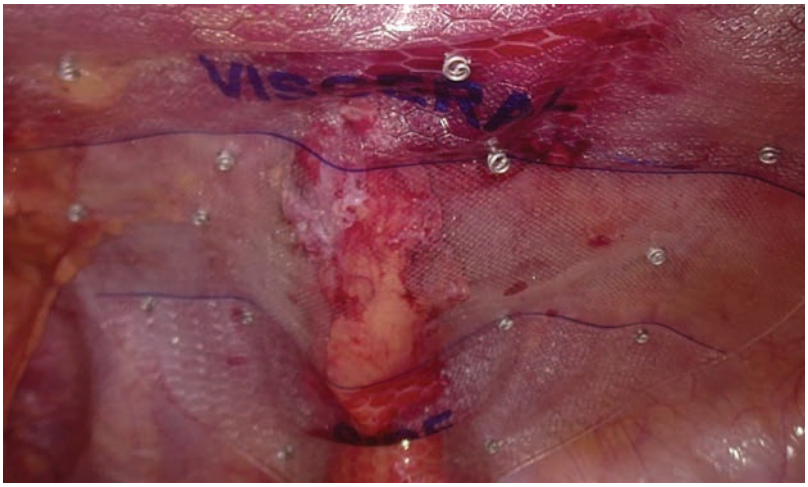

Figure 4. *Fixed composite mesh implant*

further evaluation. However, short-term results in terms of postoperative complications are comparable with the results of the laparoscopic Sugarbaker technique [27]. In a study conducted by Lambrecht, J.R., the author points out that despite the low recurrence rate (6%) 1 year after surgery, the use of the ePauli hernioplasty in primary PSH or recurrence as a surgery of choice is a controversial issue and requires long-term follow-up results [28].

Based on the obtained surgical experience and in-depth study of the problem, E. Pauli proposed a surgical algorithm for the treatment of PSH [29]. Based on the classification of parastomal hernias in 2018 [2], the author recommends using a laparoscopic or robotic version of the Sugarbaker technique for type I of PSH. In type II of PSH, PPHR or Sugarbaker IPOD ventral hernioplasty is recommended. In type III of PSH, a laparoscopic or robotic version of the Sugarbaker technique is used, or PPHR in open, laparoscopic and robotic versions. In case of type IV of PSH or recurrence, Pauli recommends the STORRM technique or PPHR [29].

CONCLUSION

Analyzing the data of late results of RCT and meta-analyses, it was found that in all cases of surgical treatment of PSH it is necessary to use mesh implants. Completing the planned surgical treatment for colorectal cancer by removing a permanent stoma, it is possible to prevent PSH by installing a mesh implant in the retromuscular space around the stoma or using the SMART technique. Due to the development of minimally invasive surgical techniques, preference is given to endovideosurgical hernioplasty methods. Among the existing set of options for surgical treatment of PSH, the laparoscopic option of the Sugarbaker surgery can be called the method of choice due to the low risk of recurrence. If patients have large, giant PSH or a recurrence, it is recommended to resort to the STORRM technique; classical stoma transposition is not recommended due to the high risk of recurrence. Currently, based on the results of research by foreign authors, among all accesses, preference is given to extraperitonal methods of surgical treatment of PSH. However, due to the small experience and complexity of the technical performance of surgeries, the lack of long-term observation results, it cannot be unequivocally stated that extraperitoneal access is superior to other methods.

AUTHORS CONTRIBUTION

Concept and design of the study: *Victor A. Kashchenko, Alexander A. Bogatikov, Nikita R. Kopteev*

Collection and processing of the material: *Timofey S. Ovchinnikov*

Statistical processing: *Timofey S. Ovchinnikov*

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