# New minimally invasive technique of parastomal hernia repair – methods and review

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**Abstract**

***Introduction:*** *Parastomal hernia is described as the most common complication in patients with ostomy. It is reported that its incidence varies from 3% to 39% for colostomies and 0 to 6% for ileostomies. Surgical repair remains the treatment of choice. There are three types of surgical treatment – fascial repair, stoma relocation and repair using prosthetic mesh via a laparoscopic or open approach. Recently there have been several meta-analyses and systematic reviews aiming to compare the results of surgical treatment, and the authors agreed that the quality of evidence precludes firm conclusions.*

***Aim:*** *To describe the novel concept of parastomal hernia repair – HyPER/SPHR technique (hybrid parastomal endoscopic re-do/Szczepkowski parastomal hernia repair) and its early results in 12 consecutive cases.*

***Material and methods:*** *Twelve consecutive patients were operated on due to parastomal hernia using the new HyPER hybrid technique between June 2013 and May 2014. The patients' condition was evaluated during the perioperative period, 6 weeks and then every 3 months after surgery.*

***Results:*** *After 6 weeks of follow-up we have not observed any mesh-related complications. All 12 patients were examined 3 months and 6 months after repair surgery for evaluation. No recurrence, stoma site infection or stoma-related problems were found. None of the patients complained of pain and none of them needed to be hospitalized again. Reported quality of life on a 0–10 scale after 6 weeks of follow-up was 8 (range: 7–10).*

***Conclusions:*** *The HyPER procedure for treatment of parastomal hernias proposed by the authors is a safe and feasible surgical technique with a high patient satisfaction rate and a low number of complications. The hybrid procedure seems to be a promising method for parastomal hernia repair.*

***Key words:*** *parastomal, hernia, technique, laparoscopic, minimally invasive.*

## Introduction

Parastomal hernia is a protrusion of the contents of the abdominal cavity or only of the preperitoneal fat through a defect in the abdominal wall to the hernial sac. It is one of the most common late complications of enterostomy-ileostomy as well as colostomy [1]. It is reported that the incidence of parastomal hernia varies from 3% to 39% for colostomies and 0 to 6% for ileostomies [2]. Nevertheless, these statistics could be largely underestimated because of the fact that most parastomal hernias are asymptomatic. It is estimated that parastomal hernia occurs most frequently within the first 2 years after stoma construction but the risk of it developing remains as long as the ostomy is present. Goligher claims that

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even 100% of patients with ostomy develop parastomal hernia during their life [3, 4].

Surgical repair is a treatment of choice, but not all patients require surgery. Indications for elective operation are: pain, difficulty with ostomy appliance causing leakage, discomfort or poor cosmetic effect, but these indications are still being discussed. Indications that require emergent surgery are bowel obstruction and strangulation [5].

Several surgical techniques of parastomal hernia repair have been described. The three most common surgical approaches are fascial repair, stoma relocation and repair with prosthetic mesh. One of the oldest and best described surgical technique is fascial repair, nowadays not recommended because of the very high recurrence rate ranging from 45% to 75%. Some authors even claim that it can reach 100% [6–8]. Another surgical technique is stoma relocation. It has better results in terms of recurrence rate (0–76.2%) but still unacceptable, so this method is also not recommended [2, 9].

Currently, the Sugarbaker technique, described in 1980, is the gold standard for surgical repair [10, 11]. This method for treatment of primary and recurrent parastomal hernia is based on using prosthetic mesh and placing it intraperitoneally. Mesh selection and proper application allows the recurrence rate to be decreased [12–14]. In the Sugarbaker technique the mesh can be placed in different positions: onlay, sublay and intraperitoneally (IPOM) [15]. In the onlay technique, the mesh is placed on the anterior aponeurosis. The recurrence rate reported for this technique ranges from 0% to 26% [16–18]. In the sublay technique the mesh is placed dorsally to the rectus muscle, anterior to the posterior rectus sheath. The mean recurrence rate is 6.9% in a mean observation time of 12 months [12]. Another technique for mesh application is the IPOM technique, where the mesh is placed intra-abdominally on the peritoneum. It can be performed with the "key-hole" technique or modified Sugarbaker technique. In the key-hole technique parastomal hernia is repaired with an intraperitoneal mesh with a central hole or slit in the mesh to allow the colon or the ileum to pass through the mesh to go to the stoma site. In the modified Sugarbaker technique the colon is pulled to the lateral side of the hernia defect, and then the trephine opening is covered with an intraperitoneally placed prosthetic mesh that is sutured to the fascial edge. The recurrence rate in the key-hole technique is 37%, and it seems to be high in comparison to the Sugarbaker technique. The authors commented that this high risk is a result of patients' high rate of comorbidities and the fact that available meshes have a tendency to shrink [19]. The recurrence rate of the laparoscopic Sugarbaker technique is reported to be 11.6% (vs. 15% via the open approach) in a group of 110 patients across 6 studies [12]. Another surgical technique is the sandwich technique, which was first described by Berger. It is a combination of the key-hole and Sugarbaker technique. After complete adhesiolysis, the mesh is introduced to cover the fascial defect of the hernia and the original midline incision. In special cases, a two-mesh technique was used. Incised mesh is placed around the stoma sling. The second mesh is used to cover the abdominal wall with the first mesh; the stoma sling is placed between the two meshes for at least 5 cm. According to a recent meta-analysis, this technique has the lowest rate of recurrence – 2.1% in a median follow-up time of 20 months (6–48 months). However, it is necessary to confirm those results in a bigger group of patients [20]. Some authors claim that there is insufficient evidence to determine which mesh technique (onlay, sublay or underlay) is the best in terms of recurrence rates and morbidity [21, 22].

The laparoscopic approach is superior to the open approach, which was confirmed by Hansson: it has a lower rate of recurrence and a lower rate of postoperative complications. In the literature, several alternative surgical techniques and approaches have been described, but it should be noted that they are only case reports or very small case series with a low level of statistical significance [23, 24].

To summarize, it is impossible to compare all available surgical techniques based on the present literature. The quality of evidence for each study is often low, so it is very difficult to draw firm conclusions.

## Aim

The aim of this article is to describe the novel concept of parastomal hernia repair – HyPER/SPHR technique (hybrid parastomal endoscopic re-do/Szczepkowski parastomal hernia repair) and its early results in 12 consecutive cases.

## Material and methods

This prospective single surgeon study was assessed to evaluate the novel concept of surgical

technique for parastomal hernia repair. Twelve consecutive patients were operated on using the new HyPER technique between June 2013 and May 2014. The following data were taken into consideration: age, body mass index (BMI), size of defect, ASA score, indication for surgery, quality of life before and after surgery, intraoperative complications, postoperative mortality and presence of recurrence. We use the BHC/EHS (Bielanski Hospital Classification/European Hernia Society (EHS)) classification in order to stage parastomal hernias. The Bielanski Hospital Classification was created based on the huge clinical experience of performing surgeons, and it was a basis for creating a classification affiliated with the EHS. In our study recurrent hernia was defined as a recurrent or persistent bulge when the patient is standing during a Valsalva maneuver. The quality of life was assessed using a modified 0–10 scale (0 – no satisfaction, 10 – patient completely satisfied).

## HyPER (SPHR) – description of surgical technique

This novel surgical technique is a combination of the laparoscopic and open approach. It is based on four main steps: 1 – laparoscopic stage, 2 – open stage, 3 – re-conversion to laparoscopic approach, 4 – final, open stage with neo-stoma formation.

The patient is brought to the operating room and placed on the operating table in the supine position with both arms placed along the body. The abdomen is prepped and draped in the usual sterile fashion. The surgeon and the assistant stand at the contralateral site of the stoma. Using a Veress needle pneumoperitoneum is applied (11–12 mm Hg intra-abdominal pressure). The next step is introducing trocars: three (or four, if necessary) – 5 mm. An optional, fourth trocar can be inserted in the left epigastric area in case of giant hernia, incisional hernia or massive adhesions. In order to visualize the peritoneal cavity and hernia sac, laparoscopic adhesiolysis of intraperitoneal adhesions is performed. When adhesiolysis is completed, the stoma bowel is completely dissected from the fascia. Adhesiolysis of the peritoneum around the trephine opening is performed in order to create at least 7–8 cm of overlap between the abdominal wall and the prosthesis, around the hernia defect. Intraperitoneal adhesiolysis allows one to detect any concomitant incisional hernias.

The next, open step of the procedure is continued with presence of pneumoperitoneum. A circular incision around the ostomy is made – it is carried along the muco-cutaneous junction. The end of the ostomy bowel is closed with running monofilament suture. Subcutaneous tissue preparation is performed in order to obtain access to the hernia gate. Intra-abdominal pressure is maintained because it allows better visualization of the hernia sac and its proper dissection from surrounding tissues from the outside. Additionally, sometimes it is possible to pull out the entire hernia sac as if the surgeon was "giving birth" to the hernia sac using manual maneuvers. Subsequently insufflation is stopped and then the hernia sac is opened with scissors. The next step is bowel freeing and complete removal of the hernia sac at the level of the hernia orifice. The ostomy bowel is delivered through a hole in the mesh. We used DynaMesh-IPST mesh (FEG Tex-tiltechnik, Aachen, Germany), which is specially designed for parastomal hernia. It has a dual-layer composite structure and an elastic funnel with no sharp selvedges that leads to more secure integration of the terminal segment of the bowel and reliably prevents parastomal hernia formation. The mesh is placed intraperitoneally through the hernia gate. The hernia orifice is narrowed to the appropriate size using single 0–1, polyfilament, nonresorbable sutures (we usually use 4–6 stitches). Dressing soaked up with Betadine is placed into the space left after removal of the hernia sac.

After the second application of insufflation and pneumoperitoneum achievement, the mesh is placed in the proper location using laparoscopic instruments. The number of tackers used for fixation depends on the size of the mesh. The mesh was mounted to the abdominal wall using ProTacks™ (Covidien, Inc., USA). The mean number of tackers used varied from 30 to 60. We usually place them using the double crown technique, described by Morales-Conde [25].

Insufflation is stopped. After removal of the trocars, trocar openings are closed and drains (usually 2) are placed into subcutaneous tissue, in the place left after hernia sac removal. Single absorbable monofilament 3-0 sutures are used to close the subcutaneous tissue. Single monofilament nonabsorbable 3-0 sutures are used to form the proper stoma orifice. In the end, the ostomy bowel is shortened and a new stoma is matured.

All patients were seen and evaluated at the moment of discharge from hospital and started being observed every 3 months by the surgeon performing the procedure.

## Results

From June 2013 to May 2014, 12 consecutive patients (9 male and 3 female patients, mean age 71 years, range: 55–84 years) were operated on due to symptomatic parastomal hernia. The demographic details are listed in Table I.

All operations were performed in the Clinical Department of General and Colorectal Surgery in Bielanski Hospital in Warsaw, by a single surgeon. According to the BHC/EHS classification, 2 (16.6%) patients had type II, 5 (41.6%) patients had type III and 5 (41.6%) had type IV of parastomal hernia [26–28].

All 12 patients had a colostomy. Enterostomies were performed in most cases for colorectal cancer – in 9 (83%), prostate cancer in 1 (8.3%), rectal prolapse in 1 (8.3%) and for rectovaginal fistula in 1 (8.3%) patient. Mean time from primary surgery was 3 years (range: 1–12). In all 12 cases there were no previous parastomal hernia repairs. All 12 procedures were performed in an elective setting. Indications for elective surgery were huge size of hernia in 8 cases, stoma care problems in 12 patients, pain problems in 5 patients and cosmetic complaints in 12 patients. Additional complications in the patient group were: subcutaneous ostomy prolapse in 5 (41.6%) patients, prolapse in 1 (8.3%) patient and inflammatory polyps within the stoma in 1 patient (8.3%). Six patients (66.6%) were free of concomitant complications.

The quality of life assessed before the operation was 3 (range: 2–4) according to the quality of life scale.

**Table I.** Demographic data

| Parameter | Results |
|---|---|
| Age, median (range) [years] | 71 (49–84) |
| Gender (male/female), *n* (%) | 9 (75)/3 (25) |
| BMI, median (range) [kg/m$^2$] | 27.11 (21.09–33.23) |
| ASA | I = 1 (8.3%); II = 1 (8.3%); III = 7 (58.3%); IV = 3 (25%) |
| Stoma type | Colostomy = 12 (100%) |
| Indication for stoma | Colorectal malignancy = 9 (83%) |
| | Urological malignancy = 1 (17%) |
| | Rectal prolapse = 1 (8.3%) |
| | Recto-vaginal fistula = 1 (8.3%) |
| Symptoms | Stoma care problems = 12 (100%) |
| | Pain = 5 (41.6%) |
| | Cosmetic complains = 12 (100%) |
| BHC/EHS classification of PH | I = 0 (0%); II = 2 (16.6%); III = 5 (41.6%); IV = 5 (41.6%) |
| Years since primary surgery, median (range) | 3 (1–12) |

### Surgery

The new hybrid procedure was performed in all 12 patients. All patients received standard antibiotic prophylaxis with cephalosporin and antithrombotic prophylaxis according to weight of the patient. The mean operating time was 177 min (range: 120–230 min). The mean stoma size diameter was 4.75 cm (range: 3.5–6 cm). The mean size of the mesh was 446 cm$^2$ (range: 256–625 cm$^2$). The mesh was mounted onto the abdominal wall with ProTacks™.

None of the patients died in the postoperative course. A surgical complication occurred in 1 case: it was a small wound hematoma which was treated successfully with no need for reintervention. No other medical complications occurred during the follow-up period. The mean hospital stay was 6.5 days (range: 4–8 days).

### Follow-up

We did not observe any mesh-related complications during follow-up. Mean follow-up time was 13.5 months (range: 6–17 months). Seven patients are 1 year or more under follow-up. No recurrence, stoma site infection (SSI) or stoma-related problems were found. None of the patients complained due to pain and none of them required hospitalization. Mean reported quality of life after 6 weeks of follow-up was 8.4 (range: 7–10).

## Discussion

Parastomal hernia remains an unsolved problem. Although there is plenty of literature available on parastomal hernia repair, the quality of evidence for the various surgical techniques remains low. The majority of the studies are retrospective or contain

small heterogeneous groups of patients with different types of stomas and different indications for surgical treatment. It is important to mention that also for years the definition of parastomal hernia remained unclear until the Polish guidelines for treatment of patients with parastomal hernia were created [1]. Despite plenty of surgical techniques available, it is well proven that some of them – such as fascial repair or stoma relocation – should be abandoned because of the high recurrence rate. The most well-established approach is surgery using prosthetic mesh. Using synthetic meshes significantly improved the results in comparison to suture repair with respect to SSI and recurrence rate.

During the last years we have observed rapid development of different laparoscopic techniques in hernia surgery. Laparoscopic technique has gained in popularity because it combines the advantages of minimally invasive technique and mesh usage [29]. The main advantages of this technique is minimization of postoperative pain, shortening the period of convalescence, reducing the wound complications and others connected with laparotomy [30, 31]. In parastomal hernia surgery laparoscopy allows for minimization of the postoperative wound and complications associated with it.

This article presents a prospective single center and single surgeon study which shows early results of the novel concept of minimally invasive surgical technique of parastomal hernia repair. According to the initial results this new technique is very promising, and further research could reveal that it has better results than techniques used nowadays, because it combines the advantages of the open and laparoscopic approach. Although it is partly based on the open approach, it still remains a minimally invasive technique.

In our opinion, the main goal of parastomal hernia surgery (open or laparoscopic) is removal of the hernia sac (especially in the case of giant hernias) and creating a proper ostomy canal with an accurate diameter. A review of the literature concerning laparoscopic surgical repair indicates that most surgeons, like in other types of hernia, do not excise hernia sac but only cover it with prosthetic mesh [32]. LeBlanc in his article from 2000 states: "I also do not close the fascial defect because I believe that the security of the repair depends on use of the appropriate patch size and adequate patch fixation rather than closure of the hernial orifice" [30].

We do not agree with this statement because we are convinced that narrowing of the hernia orifice could seriously influence the recurrence rate. Another comment is that in the laparoscopic technique the hernia sac is left, probably because of the fact that sac removal is technically very difficult – nearly impossible, especially in giant hernias. We believe that both factors have a significant influence on patients' follow-up in terms of hernia recurrence. These considerations have greatly contributed to creating the HyPER technique. The HyPER technique seems to be a promising option even in type III and IV parastomal hernias. In our study most of the patients had complicated parastomal hernias – 10 patients (83.33%) had large hernias (type III and IV according to the BHC/EHS classification) and 7 (58.33%) patients had concomitant incisional hernia (type II and type IV BHC/EHS). Our patients presented symptoms for years before repair surgery. Only 2 (16.66%) patients had their parastomal hernias defined as small (type II), so it means that even patients with a small parastomal hernia had a concomitant incisional hernia. Additionally the patients claimed that they had symptoms of parastomal hernia for many years. This is a good example of how useful the HyPER technique could be. In our opinion, an exception for this technique (and also for laparoscopic technique or SILS) is giant hernia with significant deformation of the abdominal wall.

For repair of parastomal hernias it is necessary to choose an appropriate prosthetic material. In our study all repairs were done using PVDF-PP meshes (DynaMesh-IPST, FEG Textiltechnik, Aachen, Germany). It is a 3D, preshaped, specially designed open-pore and monofilament mesh consisting of polyvinylidene fluoride (PVDF) and polypropylene. The PVDF side of the 2-component filament structure with the funnel is oriented to the visceral side of the abdomen. No polypropylene is exposed to the abdominal content. This type of mesh provides proper incorporation of mesh with tissue, which is impossible for ePTFE meshes used commonly by different authors [12, 33]. ePTFE or polypropylene mesh incised before placing it around the stoma loop may cause a stenosis in the long term because of mesh shrinkage. The "guillotine effect" can be observed when mesh stenosis leads to bowel erosion [34, 35].

In recent years, many factors influencing proper surgical techniques have been described, and fixation of the mesh seems to play a key role in this procedure [36]. Different properties of tacks lead to

different forces that may rip the fascia–mesh connection, and the number of tacks varies according to the device used [37]. We used ProTacks™ (Covidien, Inc., USA) in every procedure because they have the highest tearing force needed to destroy the connection. In the future it is very likely that glue fixation will play a significant role [38, 39]. So far the force to maintain the connection when using glue is not sufficient, especially concerning the HyPER technique.

In the literature, the outcome for different surgical techniques varies depending on the article, and we find it quite difficult to compare available results with our results. Nevertheless, the laparoscopic Sugarbaker technique has a recurrence rate of 11.6 % across 6 studies from pooled data [12]. The recurrence rate of the laparoscopic keyhole technique tended to be higher than in the Sugarbaker technique reporting over 55 repairs using the keyhole technique with a recurrence rate of 34.6% on average in a median 36-month follow-up [12, 19, 40]. Such a high recurrence rate is connected by the authors with defects in wound healing and collagen metabolism and mesh shrinkage. In contrast, the study by Wara *et al*. showed a lower recurrence rate: in a group of 72 patients recurrence occurred in 2 patients (3%) 1 month and 52 months after surgery (95% CI: 1–10) [41].

More beneficial seemed to be the sandwich technique with an overall recurrence rate of 2.1% in a group of 47 patients in a median 20-month follow-up. Additionally, in this group of patients there was a low rate of complications (2.1% wound infection, 2.1% other complications) and there were no mesh infections [20]. The sandwich technique was first described by Berger in 2007, and since then it has been used only by him in one center. It is essential to mention that this technique has not yet spread worldwide, so we cannot compare these results with other centers' experience.

Overall it is estimated that the recurrence rate for all laparoscopic techniques is 14.2% (95% CI: 10.7–18.0) across 12 studies. Weighted pooled proportions using only studies with a 12-month mean follow-up for all those techniques show that the wound infection rate is 3.3% (95% CI: 1.6–5.7), the mesh infection rate is 2.7% (95% CI: 1.2–5.0) and the rate of other complications is 12.7% (95% CI: 10.2–17.5) [12]. Comparing the results, none of the patients operated on using the HyPER technique had wound or mesh-related infection.

All available studies had a follow-up of at least 12 months. Even though the follow-up in our study was shorter, it has an adequate follow-up, with a mean period of 13.5 months. Comparing our initial results and the results of different surgical techniques described in the literature, fortunately, until now we have no recurrences. This result seems to be very promising. This is the main reason why we have decided to prolong the research on the HyPER technique and its long-term results in terms of complications and recurrence. We intend to continue performing parastomal hernia repair in this technique and report long-term results on our patients after 6 months, 1 and 5 years after repair surgery. We hope it will help us to prove the superiority of this approach and lead to better results [42].

We believe that factors such as narrowing the fascia aperture and removal of the hernia sac have greatly contributed to reduction of the recurrence rate of parastomal hernia. Literature analysis revealed that the authors do not mention whether they narrow the fascia or remove the hernia sac, so we assume that those maneuvers have not been performed in the majority of repairs using the laparoscopic technique described to date. Other important factors that could reduce the recurrence rate are most likely adequate mesh selection and the fact that all procedures were performed by a single, experienced surgeon. Nevertheless, further studies need to be conducted to confirm this thesis.

## Conclusions

According to our study, the HyPER technique is a feasible and safe technique for surgical treatment of parastomal hernia. Early results show that is has a high patient satisfaction rate and a low number of complications. This novel approach seems to be very promising in terms of the complication rate and recurrence rate, but further randomized controlled trial studies with larger groups of patients and longer follow-up need to be conducted.

## Conflict of interest

The authors declare no conflict of interest.

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