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**THE MANAGEMENT OF PERINEAL HERNIA FOLLOWING ABDOMINO  
PERINEAL EXCISION FOR CANCER**

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## INTRODUCTION

1 Abdomino-perineal resection (APR) is associated with significant morbidity, of which, perineal  
2  
3 hernia (PH) is a late and rare complication. PH occurs when abdominal organs protrude into the pelvic  
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5 floor with incidence ranging from <1% for symptomatic and 7% for asymptomatic. However, due to  
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7 the complexity of diagnosing and under reporting of such complication, the true incidence is unclear.  
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10 [1-3] . ~~Risk factors associated with this complication include obesity, diabetes, smoking,~~  
11  
12 ~~radiotherapy, extended resection, laparoscopy and method of pelvic reconstruction.~~ With the  
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14 increasing use of radiotherapy and extralevator resection, the incidence of PH may increase, with  
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16 more recent reports suggesting occurrence rates of 12%-26% [4, 5].  
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19 PH usually occurs within the first 2 post-operative years, with a median interval of ten months [1, 5].  
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22 Its diagnosis is clinical, with a bulging mass or pain and discomfort worse on standing or in the sitting  
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24 position being the commonest presentations. A CT scan or MRI during oncological follow up can aid  
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26 in diagnosis, however, patient positioning during scanning (supine) may reduce hernia detection rates.  
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29 Furthermore, there currently is no established radiological definition of PH.  
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32 Complications of PH include urinary dysfunction, skins erosions and bowel obstruction.  
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35 Surgical PH repair is indicated based on the severity of the complication along with patient reported  
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37 discomfort. Many repair options are described in the literature and are based on the approach  
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39 (perineal, abdominal, combined and laparoscopic) or on the technique (suture, pexy, synthetic and  
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41 biological mesh or flap). As this is a rare complication of APR, only few studies exist, mainly case  
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43 reports or studies with low numbers and short follow-up. As a result, no consensus can be established  
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45 on the optimal surgical management of PH.  
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48 The aim of this article was to describe the management of PH, analyze the recurrence and  
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50 complications rates and compare our center's results with current studies in the literature.  
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## MATERIAL AND METHODS

### *Patients*

1 We retrospectively included all consecutive patients who had a surgical PH repair at the Saint  
2 Antoine's hospital (Paris, France) between April 2001 and July 2017. All patients had undergone an  
3 APR for cancer as an index surgery (rectal adenocarcinoma or squamous cell carcinoma of the anus).  
4  
5 For each patient, we recorded demographic data (age, gender and comorbidities), first operation data  
6  
7 (tumor type and size, resection and reconstruction type, and postoperative follow up), PH symptoms  
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9 and date of diagnosis, PH repair surgery (hernia size, approach and type of repair) and follow up  
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11 (recurrence and morbidity as defined by the Clavien Dindo's classification [6]). Pathological staging  
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13 of the tumor was in accordance with the UICC classification. Patient charts were utilized for data  
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15 (paper and software), along with imagery software databases, and if needed, patients were contacted  
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17 directly. All data was anonymized.  
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### 22 *PH diagnosis*

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25 PH diagnosis was based on patient reported symptoms (perineal swelling, discomfort, pain) or  
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27 complications (urinary dysfunction, obstruction and skin erosion), and clinical examination (bulging,  
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29 impulsive mass in a standing position or with coughing). A CT scan was performed when the clinical  
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31 diagnosis was questioned. We defined radiological PH as protrusion of abdominal viscera under the  
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33 level of coccyx and ischial bones [7] .  
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37 A surgical repair was proposed for all patients with a significant symptomatic hernia which impacted  
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39 on their quality of life or if complications were present due to the PH. Prior to surgery, all patients  
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41 underwent investigations to out rule a tumor recurrence (clinical examination, extensive CT scan of  
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43 thorax, abdomen and pelvis and tumor markers).  
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### 47 *Surgery*

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49 Surgical repair of PH was based on surgeon preference. The perineal approach was preferentially  
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51 chosen in the department as it is a less invasive approach associated with a faster recovery. An  
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53 abdominal approach was mainly used if another procedure was necessary (hysterectomy, incisional  
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55 or parastomal hernia repair). A biological mesh was commonly used, mainly due to the location of  
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the hernia, presence of irradiated tissue and local infection history which raise postoperative mesh infection risks [8, 9].

### *Perineal approach*

For the perineal approach, patients were placed in prone position. An elliptical incision was made around the previous perineal scar. The hernial sac was dissected and its contents reintroduced into the abdominal cavity. The hernial sac was either resected or closed and left in situ. Dissection was continued to the level of the levator ani muscle insertion. A mesh was cut and adapted to the size of hernial defect and fixed with interrupted non-absorbable sutures laterally to the levator muscle remnant, anteriorly to the pubis and posteriorly to the sacrum and coccyx. Subcutaneous tissue and skin were closed in two layers after a suction drain was placed in contact **with** the mesh to prevent collections.

### *Abdominal approach*

When an abdominal approach was chosen, **lysis of all adhesions** of the abdominal cavity was performed and the perineal hernia content was reintroduced into the abdomen. The mesh was placed and anchored around the pelvic diaphragm (anteriorly to the pubis, prostate and vagina or uterus, laterally to the levator muscle remnant and posteriorly to the coccyx and the sacrum). A vacuum drain was also placed to prevent any postoperative collection.

When judged necessary a vertical rectus abdominis flap (VRAM) was performed in collaboration with a plastic team according to the technique described by Taylor and al. [10, 11].

### *Postoperative follow up*

When the postoperative course was uneventful, patients were allowed to **eat, drink and mobilize**, except for patients with a flap reconstruction which necessitated a longer immobilization. Drains were removed when the secretion amount was less than 30mL a day or at the surgeon's discretion **depending on the output over the previous days**. Patients were discharged when they were pain free, had a healing perineal scar without a drain and on normal diet.

Clinical exam occurred one-month post discharge, with oncological follow up at the surgeon's discretion.

Early morbidity was defined as any complication during the first 90 postoperative days. Major complication was classified as  $\geq 3$  Clavien and Dindo classification score [6]. Recurrence was evaluated according to the patient symptoms and clinical examination. Radiological follow up was performed if a recurrence was suspected.

### *Literature review*

A systematic review of the literature was performed on the electronic database Pubmed according to the following search terms: "Perineal" and "Hernia". We limited our search to English and French articles, published between 1960 and June 2017. Articles were selected first by title and abstract. Articles were excluded if the repair technique or the recurrence rate was not reported, if the sample size was  $< 3$  repairs, case reports and if the article was for primary perineal hernia repair.

## **RESULTS**

### *Patient characteristics*

Between April 2001 and July 2017, twenty-one patients underwent perineal hernia repair for a symptomatic or complicated PH (15 women and 6 males). A total of 24 procedures were performed. Median age at the time of repair was 60.5 years old (range: 32-84 years). Preoperative patient characteristics are listed in the Table 1.

Only one patient in the cohort did not receive neoadjuvant treatment (95.2%). An APR was performed for 14 (66.7%) rectal adenocarcinomas and 7 anal squamous cell carcinomas.

A laparoscopic approach was performed in 11 (52.4%) index oncological resections. Details of the surgical procedure was known for only 17 patients with an extralevator resection representing 88.2% of the procedures (N=15). An omentoplasty was performed for all patients. Pelvic reconstruction consisted of direct closure in two layers for all patients except one who underwent a Gracilis flap.

1 Postoperative complications occurred in 9 patients (42.9%) including 6 perineal wound complications  
2 (28.6%). Eight patients underwent adjuvant treatment (38.1%). The pathological reports were  
3 available for 18 patients. The mean tumor size was 30 mm (range 0 to 100mm), 58% were classified  
4 stage 1 or 2 (N=12) and 26% classified stage 3 or 4 (N=6).  
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#### 8 9 10 *Perineal hernia characteristic (Table 2)*

11 PH diagnosis was made after a median of 16 months post APR (range 3 - 72 months). Discomfort  
12 was the most frequent symptom reported by patients (87.5%), followed by increasing swelling size  
13 (41.7%) and pain (12.5%). PH contents was described during surgery or on preoperative CT scans as  
14 small bowel for 16 of the 21 patients (76.2%), omentum for ten (47.6%), uterus and/or bladder for  
15 six (28.6%) and colon for two (9.2%). A PH complication occurred in 10 patients (41.7%): urinary  
16 dysfunction (n=6), skin erosion (n=2) and bowel obstruction (n=2).  
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27 Prior to surgical repair of PH, an oncological recurrence was eliminated for all patients by tumor  
28 markers and CT scans. A tumor recurrence was diagnosed and treated between the APR and PH  
29 diagnosis in two patients: an inguinal recurrence of a squamous cell tumor treated by  
30 chemoradiotherapy and nodal resection, and a local recurrence of a rectal adenocarcinoma localized  
31 in the labia majora treated by surgical resection and chemotherapy. One further patient had a primary  
32 diagnosis of endometrial adenocarcinoma, treated with a total hysterectomy at the time of PH repair.  
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66 Surgical repair of PH was performed after a median follow up of 24 months post APR (Range 9-190)  
67 and 5.5 months after initial diagnosis of PH (Range 1-166 months).

68 Among the 21 patients diagnosed with PH, a total of 24 procedures were performed including 3  
69 surgeries for PH recurrence. A perineal approach was performed for 16 patients (66.7%), an  
70 abdominal approach for 5 patients (20.8%) and combined for 3 patients (12.5%).

1 The repair techniques included a biological mesh for 17 patients (70.8%), a synthetic mesh for 5  
2 patients (20.8%) and a flap for 2 patients (8.3%). A drain was placed in the perineal cavity for all  
3 patients bar two (91.7%).  
4

5 The median operative time was 140 minutes (range 60-495). Median operative time for a perineal  
6 approach was 135 minutes (Range 60-190), 160 minutes for an abdominal approach (Range 110-  
7 380), and 315 minutes for a combined approach.  
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10 Overall median length of hospital stay (LOS) was 6 days (Range 3-15). Median LOS for a perineal  
11 approach was 5.5 days (Range: 3-12), 7 days for an abdominal approach (Range: 6-12) and 7 days  
12 for a combined approach.  
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### 22 *Postoperative course*

23 The median follow-up was 32.4 months from the PH repair (Range 1-75 months) and 60 months from  
24 the APR (16-214 months).  
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30 No mortality occurred during follow up. Overall morbidity was 37.5% (n=9). A major complication  
31 occurred in 3 patients (12.5%): one wound dehiscence on post-operative day one requiring an  
32 emergency surgery with mesh repair, one obstruction secondary to a PH recurrence and one local  
33 perineal infection requiring VAC therapy.  
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40 Minor complications occurred in 6 patients (25%): 3 urinary infections and 3 perineal healing  
41 complications requiring wick packs to heal. Median complication rate for the perineal approach was  
42 37.5% (N=6) (including 2 major complications), 20% for the abdominal approach (N=1, a minor  
43 complication), and 66.7% for the combined approach (N=2). Complications occurred in 35.3% of  
44 biological mesh repairs (N=6, including 2 major complications and 3 perineal healing issues) and  
45 20% for the synthetic mesh repairs (N=1). During the entire follow up no mesh had to be removed.  
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54 A clinical recurrence occurred in ten patients (41.7%) after a median follow up of 9.2 months (range  
55 1-44.6 months). Recurrences occurred in 47.1% of biological mesh repairs (N=8) and 40% of the  
56 synthetic mesh repairs (N=2). No recurrence occurred in the flap group. Recurrences were seen in  
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50% of the perineal approach cohort (n=8) and 40% of the abdominal approach cohort (N=2). No recurrence was seen in the combined approach cohort. Results of the different techniques and approaches are summarized in the table 3. The median time to recurrence was 11 months for the biological mesh (between 1 and 43 months) and 27.2 months for the synthetic mesh.

Four patients underwent a major surgical procedure at the time of PH repair. Two hysterectomies were performed with no perineal hernia recurrence or post-operative complication. One incisional hernia treated by suture repair who subsequently had a PH recurrence 10 months after with no complication, and one incisional and parastomal hernia repaired by a perineal approach with acute urinary retention post op and a PH recurrence 9 months later.

Only two patients underwent reintervention (n=3) for PH recurrence, with the majority of patients declining further surgical intervention. Of the two patients who underwent further surgical management, one had a recurrence 44 months after the use of a synthetic mesh following an abdominal approach. A second repair was performed using a biological mesh through a perineal approach.. The patient was free from recurrence after 14 months follow up. The second recurrence occurred in a patient with a biological mesh repair through a perineal approach. This patient had an early recurrence three months after with a further surgery using the same approach and technique. A recurrence occurred one month after this with a concurrent bowel obstruction requiring an emergency surgery. The PH was treated by a combined approach using a Taylor flap with no recurrence reported in this patient after 9 months follow up.

When recurrence of PH was excluded in analysis, there was no difference in the PH recurrence rate: 42.9% for all surgeries, 50% and 40% for the perineal and abdominal approaches, and 46.7% and 40% for biological and synthetic meshes, respectively. Similarly, there was no difference in complication rates: 28.6% for all surgeries, 28.6% for the perineal approach and 26.7% for the biological mesh.

## Literature review

1 Following a literature review, twelve studies describing the management of secondary PH were  
2 published between 1964 and 2016 [1, 2, 4, 5, 12-19]. Median population size was 8.5 (n=130 patients  
3 of which 138 surgeries were performed). Details of pooled studies are given in table 4. The perineal  
4 approach (n=79) and the use of synthetic prosthesis (n=79) was the commonest approach and  
5 technique performed. Recurrence rates ranged from 0 to 66.7% with a mean recurrence rate of 28%.  
6 Recurrence rates were 14.3% for a flap repair, 24.1% for a synthetic mesh repair and 36.4% for a  
7 biological mesh repair. According to pooled results found in the literature, an abdominal or  
8 laparoscopic approach with synthetic mesh repair is associated with less recurrences (8.3 and 12.5%  
9 respectively) and complications rates (30% and 9.5% respectively). Only four studies had a follow-  
10 up > 24 months [1, 2, 8, 14], with five studies having no follow up reported or follow up of <12  
11 months.  
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## DISCUSSION

30 Due to improvements in surgical technologies and neoadjuvant treatments, the indications of APR  
31 have decreased. ~~APR is still indicated for rectal adenocarcinomas invading the sphincter complex~~  
32 ~~post neoadjuvant treatment and resistance or recurrence of anal squamous cell carcinoma following~~  
33 ~~radio and chemotherapy.~~ PH represents a late but rare complication of APR. Real incidence of PH  
34 after APR remains unknown and is probably underestimated in historical reports (<1% for  
35 symptomatic and <7% for asymptomatic) [5] [1-3]. The decrease in APR indications is balanced by  
36 an aggressive attitude in the treatment of rectal and anal tumors (larger surgical resection and more  
37 intense neoadjuvant regime) and the use of laparoscopic surgery which is a suggested PH risk factors  
38 [5, 8, 9, 20]. More recent studies show incidences of 1 to 26% after oncological resection [4, 5, 21]  
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1 Since the first PH repair described by Yeomans in 1939, many repair methods have been reported  
2 and have ultimately been based on the type of approach and technique of defect closure used. As this  
3 is a rare complication of APR, the literature is mostly composed of case reports or studies of small  
4 population size and poor methodology (~~short follow-up and postoperative complications often not~~  
5 ~~describe~~). Furthermore, in small population studies, authors may have the tendency to publish  
6 preferentially good results. No consensus on the optimal operative method to repair PH after APR  
7 can be established from the current literature.

8 Recurrences following PH repair are high in some studies with rates up to 66% with no repair  
9 technique significantly reducing recurrence rates. The abdominal approach seems to have less  
10 recurrence than the perineal approach (respectively 40% versus 50% in the present study and 15%  
11 versus 38% in the literature). Advantages to the abdominal approach include better exposure, the  
12 ability to perform another procedure at the time of repair and perform a diagnostic exploration of the  
13 abdomen to assess oncological recurrence. However, the postoperative recovery may be longer.  
14 (~~extended operative time and hospitalization length of stay, more painful approach and increased risk~~  
15 ~~of post-operative ileus~~). The perineal approach seems to be the less invasive method with a faster  
16 postoperative recovery as operative time is reduced and the risk of postoperative ileus is lower.  
17 Furthermore, re-opening the abdominal scar is not required reducing the risk of wound hernia.  
18 However, good knowledge of the pelvic region anatomy is needed to fix the mesh sparing nerve,  
19 vessels and ureteral damage. The limited exposure associated with this approach may make mesh  
20 fixation difficult leading to the increased risk of recurrence [2, 17]. It seems to be an interesting first  
21 approach for small hernia or patient with significant comorbidities. Our department did not perform  
22 PH repair by a laparoscopic approach. A laparoscopic approach has been reported in the literature,  
23 with 27 patients in the literature review performed in this study (representing 19.5% of the 138  
24 patients) undergoing a laparoscopic approach with a recurrence rate of 14.8%. It seems to be an  
25 interesting and achievable approach, but patient selection is paramount. This approach is not suitable

for large hernia or patient with multiple prior surgeries with high risk of small bowel injury. No data on robotic approach have been published so far.

Similar recurrence rates are seen in the type of mesh (biological or synthetic) used (47.1% versus 40% in the present study and 36.4% versus 24.1% in the literature). Due to their expensive cost, biological mesh must be reserved for high risk populations (long history of chronic pelvic sepsis, high irradiated tissues, enterocutaneous fistula and bowel injury during dissection). Some authors have suggested that biological mesh could contribute to late recurrences due to their slow and progressive resorption. [16]. However, the use of synthetic mesh remains a good option in the absence of pelvic floor infection and when the peritoneum can be totally closed. Synthetic mesh repair is associated with complications including bowel obstruction, fistulas and may complicate a future reintervention. There is paucity in the literature with regard to mesh complications post PH repair currently. More studies are needed to investigate the complications of each form of mesh repair.

Flap reconstructions have good results (14.3% recurrence rate) but must be reserved for complex or recurrent PH in patients fit for a more invasive surgical repair (increased operative time, postoperative immobilization, donor-site morbidity and complication rate). Myocutaneous flaps seem to be more expensive than a biological mesh due to the cost of the hospitalization, patient immobilization and nursing [22]. VRAM flaps have been shown to reduce PH post APR perineal repair compared with myocutaneous or fasciocutaneous gluteal flaps [23].

Limitations of the present study include its retrospective nature with a small sample size. ~~The methodology restriction is due to the rarity of PH and the necessity to include patients for a long period.~~ However, this study adds to the limited literature currently on the topic of PH management, presenting concise outcome data on the different approaches and techniques for repair. Recurrence rates in the present study are higher than in previous reports (mean recurrence rate of 27% in the literature versus 37.5% in the present study). This difference can be explained by the absence of consensual definition of recurrence (based only on patient feeling pain or discomfort, clinical examination or radiological imagery). Clinical diagnosis of hernia is complex in patients with chronic

1 pain and perineal wound inflammation secondary to multiple surgeries and radiotherapy. Some  
2 patients with recurrence still complained of symptoms post PH repair. Furthermore, some patients  
3 attribute functional symptoms to the initial hernia despite full resolution and repair of the PH.  
4 We limited our inclusion criteria to APR for cancer, although, some articles included APR for  
5 inflammatory bowel disease. An oncological resection requiring wider margins could influence  
6 results leading to bigger PH defects and may influence the tissue available for anchoring the mesh  
7 during the repair. Previous studies also failed to report complications and used different definitions  
8 of PH which further adds to the differences seen in the present study.  
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10 Follow up in the present study may influence recurrence outcomes. Although median follow up was  
11 **25 months, one patient** had short follow up (one month). The same problem is found in other studies  
12 of the literature **with only five studies with a follow up > 24 months**. This follow up might be too  
13 short since recurrence can occur after two years following repair. **We were not able to pool follow up**  
14 **data based on the technique used as the various articles did not detail this.**

15 More studies are necessary to determine the real incidence of PH after oncological APR and identify  
16 risk factor for its occurrence. ~~Many risk factors were investigated: female sex, diabetes, tobacco, age,~~  
17 ~~obesity, radiotherapy, laparoscopy and perineal wound left open. There is some divergence in the~~  
18 ~~literature with the majority of risk factors not being able to be avoided.~~ However, better identification  
19 of patient PH risk could tailor surgical repairs for individual patients, especially in the reconstruction  
20 technique used during the APR. It is assumed that all reconstruction technique of the pelvic floor  
21 during APR do not lead to the same PH rate [21, 24]. In our department we routinely perform a  
22 VRAM flap reconstruction after APR for anal squamous carcinoma due to the size of the cutaneous  
23 resection. This procedure has shown good result in PH prevention without increasing complication  
24 outcomes [11]. For adenocarcinoma populations with high PH risk factor, a similar protocol could be  
25 proposed, preventing synthetic mesh placement in perineal reconstruction. ~~However, outcomes of~~  
26 ~~studies assessing biological mesh reconstruction as opposed to synthetic mesh repair after APR are~~  
27 ~~required to highlight the associated complications of both techniques.~~

1 CONCLUSION

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3 Many PH repair methods have been described in the literature based on the approach (abdominal,  
4 perineal, combined or laparoscopic) and technique (suture, pexy, biological or synthetic mesh or flap)  
5  
6 of the repair. Due to the paucity of literature on the topic, conclusions on the best repair method can't  
7  
8 be drawn as high recurrence rates are found for each technique. More studies are necessary to prevent  
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10 PH by identifying patients with PH risk factors and deciding the appropriate perineal reconstruction  
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12 during index APR. **In our daily practice, we prefer a perineal approach with use of a mesh as a first**  
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14 **step for PH. In case of recurrence after previous repair or in case of large defect with skin lesion, an**  
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16 **abdominal approach with a VRAM give excellent results but with increased morbidity.**  
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Characteristics	N=21
Gender (M/F)	6/15
Age (y)	60.5 (32-84)
BMI	23.6(20-45)
Neoadjuvant treatment	20 (95.2%)
Long course radiotherapy	16 (76.2%)
Short course radiotherapy	4 (19%)
Primary disease N (%)	
Adenocarcinoma	14 (66.7%)
Squamous cell carcinoma	7 (33.3%)
Stage	
I-II	12 (58%)
III-IV	6 (26%)
NA	3 (14.3%)
Tumoral size (mm)	30 (0-100)
Resection R1	0 (0%)
Laparoscopy	11 (52.4%)
Omentoplasty	21 (100%)
Perineal closure	3/17 (17.6%)
Pelvic reconstruction	
Simple suture	20 (95.2%)
Muscle flap	1 (4.8%)
Adjuvant treatment	8 (38.1%)
Complications post APR	9 (42.9%)
Perineal wound infection	6 (28.6%)
Interval APR/PH diagnosis (month)	16 (3-72)
Interval PH diagnosis/PH repair (month)	5.5 (1-166)

Continuous variables are given as median (IQR)

**Table 1.** Patient and tumor characteristics.

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Symptoms	N (%)
Discomfort	21 (87.5%)
Pain	3 (12.5%)
Increasing size	10 (41.7%)
Urinary trouble	6 (25%)
Skin erosion	2 (8.3%)
Bowel obstruction	2 (8.3%)

**Table 2.** Perineal hernia symptoms before surgical repair (N=24).

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	Tot N (%)	Operation time med min (IQR)	Hospitalization length of stay med day (IQR)	Complications N (%)	Recurrences N (%)	Interval PH repair/recurrence month med (IQR)	Follow up month med (IQR)
<b><u>Approach type</u></b>							
Perineal	16 (66.7%)	135 (60-190)	5.5 (3-12)	6 (37.5%)	8 (50%)	7.9 (1-43)	26.4 (1-64)
Abdominal	5 (20.8%)	160 (110-380)	7 (6-12)	1 (20%)	2 (40%)	27 (9-44)	25 (1-45)
Combined	3 (12.5%)	315 (150-495)	7 (7-15)	2 (66.7%)	0 (0%)	-	50 (16-75)
<b><u>Technique repair</u></b>							
Biological mesh	17 (70.8%)	138 (60-380)	6 (3-12)	6 (35.3%)	8 (47.1%)	11 (1-43)	25 (1-64)
Synthetic mesh	5 (20.8%)	150 (110-185)	7 (6-7)	1 (20%)	2 (40%)	27.2 (9-44)	16 (1-45)
Muscle flap	2 (8.3%)	405 (315-495)	11 (7-15)	2 (100%)	0 (0%)	-	63 (50-75)
<b>Total</b>	<b>24 (100%)</b>	<b>140 (60-495)</b>	<b>6 (3-15)</b>	<b>9 (37.5%)</b>	<b>10 (41.7%)</b>	<b>9.2 (1-44)</b>	<b>29 (1-75)</b>

**Table 3.** Hernial repair: recurrences and complications after 24 procedures.

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	Raphie/Pexy/ graft/other	Synthetic mesh	Biologic Mesh	Flap	Total
<b>Abdominal</b>					
N	4	12	2	-	20
Recurrence	0/4 (0%)	1/12 (8.3%)	0/2 (0%)		3/20 (15%)
Complication	0/2 (0%)	3/10 (30%)	0/1 (0%)		4/15 (26.7%)
<b>Perineal</b>					
N	19	42	14	4	79
Recurrence	8/19 (42.1%)	15/42 (35.7%)	7/14 (50%)	0/4 (0%)	30/75 (38%)
Complication	5/9 (55.6%)	8/37 (21.6%)	0/2 (0%)	UNK	12/48 (27.1%)
<b>Laparoscopic</b>					
N	2	24	1	-	27
Recurrence	½ (50%)	3/24 (12.5%)	0%		4/27 (14.8%)
Complication	UNK	2/21 (9.5%)	UNK		2/21 (9.5%)
<b>Combined</b>					
N	3	1	-	-	4
Recurrence	0/3 (0%)	0/1 (0%)			0/4 (0%)
Complication	UNK	UNK			UNK
<b>Total</b>					
N	28	79	22	7	138
Recurrence	9/28 (32.1%)	19/79 (24.1%)	8/22 (36.4%)	1/7 (14.3%)	39/138 (28.3%)
Complication	5/11 (45.5%)	13/68 (19.1%)	0/3 (0%)	UNK	19/84 (22.6%)

**Table 4.** Literature review pooled results of surgical repair of perineal hernia.

First author	Patients	Technic (Approach/Method)	Recurrence %	Complication %
Ego-aguirre [19]	N=9	Perineal/Suture N=6	66.7% (4)	50% (3)
		Perineal/Synthetic N=3	66.7% (2)	66.7% (2)
		Redo surgery		
		Perineal/Suture N=3	66.7 (2)	
		Perineal/Synthetic N=1	0%	0%
Beck [2]	N=10	Abdominal N=2	100% (2)	50% (1)
		Perineal/Synthetic N=2	100% (2)	0%
Allen [13]	N=6	Abdominal/Synthetic N=8	12.5% (1)	37.5% (3)
		Laparoscopy/Synthetic N=5	0%	33.3% (2)
Musters [14]	N=6	Combined/Synthetic N=1	0%	
		Perineal/Biologic N=11	63,6% (7)	
So [17]	N=15	Perineal/Flap N=3	0%	20% (3)
		Abdominal/Biologic N=1	0%	
		Perineal/Synthetic N=4	25% (1)	
Aboian [1]	N=19	Perineal/Suture N=8	25% (2)	
		Perineal/Flap N=1	0%	21.1% (4)
		Abdominal/Synthetic N=1	0%	
		Abdominal/Suture N=2	0%	
		Combined/Suture N=3	0%	
		Abdominal/Suture N=2	0%	0%
Martijnse [4]	N=8	Abdominal/Synthetic N=2	0%	0%
		Perineal/Suture N=2		50% (1)
		Perineal/Synthetic N=2		50% (1)
		Perineal/Synthetic N=29	31% (9)	17.2 (5)
Mjoli [16]	N=3	Perineal/Biologic N=2	0%	0%
		Abdominal/Biologic N=1	0%	0%
Abbas [12]	N=7	Laparoscopy/Synthetic N=3		
		Laparoscopy/Biologic N=1		
		Laparoscopy/Suture N=1	0%	14.3% (1)
		Perineal/Biologic N=1		
		Abdominal/Synthetic N=1		
Goedhart-de Haan [15]	N=12	Laparoscopy/Synthetic N=12	25% (3)	8.3% (1)
Sayers [5]	N=8	Biologic N=5	20% (1)	UNK
		Flap N=3	33.3% (1)	
Dulucq [18]	N=4	Laparoscopy/Synthetic N=4	0%	0%
		Laparoscopy/Suture N=1	100% (1)	UNK
		Perineal/Synthetic N=1	100% (1)	UNK

**Table 5.** Literature review detail.



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