

# Perineal hernia after abdominoperineal resection – a systematic review

## Authors' Contribution:

A – Study Design  
B – Data Collection  
C – Statistical Analysis  
D – Manuscript Preparation  
E – Literature Search  
F – Funds Collection

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## ABSTRACT:

**Introduction:** Perineal hernia (PH), also termed pelvic floor hernia, is a protrusion of intraabdominal viscera into the perineum through a defect in the pelvic floor.

**Aim:** The study was conducted to evaluate the cases of perineal hernia resulting as a complication of abdominoperineal resection (APR) of rectal cancer.

**Material and methods:** 30 cases from 24 articles published in reputable peer reviewed journals were evaluated for eight variables including [I] patient age, [II] gender, [III] time since APR, [IV] clinical presentation, [V] approach to repair, [VI] type of repair, [VII] presence/absence of pelvic adhesions [VIII] complications.

**Results:** There was a total of 30 cases (18 males and 12 females) with a mean age of 71.5 years. The time of onset of symptoms ranged from 6 days to 12 years. Perineal lump with pain was the chief presenting feature followed by intestinal obstruction. Different approaches were adopted to repair by various methods.

**Conclusions:** Perineal hernia as a complication of abdominoperineal resection is reported increasingly nowadays, as the approach to management of rectal cancer has gradually got shifted from open to minimally invasive in recent years. There is a need to spread awareness about this condition, so that it is actively looked for, during the postoperative follow-up. Management is surgical repair; the approach and type of repair should be individualized.

## KEYWORDS:

abdominoperineal resection, biological mesh, perineal hernia, recurrence, synthetic mesh

## ABBREVIATIONS

**APR** – abdominoperineal resection  
**BM** – Biological Mesh  
**BMI** – Body Mass Index  
**CE-CT** – Contrast Enhanced Cranial Computerized Tomography  
**CI** – confidence interval  
**eLAPE** – extra levator abdominoperineal excision  
**LOREC** – Low Rectal Cancer Development programme  
**MRI** – magnetic resonance imaging  
**OR** – odds ratio  
**PH** – perineal hernia  
**PRISMA** – Preferred Reporting Items for Systematic Reviews and Meta-Analysis  
**SM** – Synthetic Mesh  
**UK** – United Kingdom

## INTRODUCTION

Perineal hernia (PH), also termed pelvic floor hernia, is a protrusion of intraabdominal viscera into the perineum through a defect in the pelvic floor [1]. PH can be either congenital or acquired [2]. Acquired perineal hernias can be further subclassified into primary PH and secondary PH. Primary PH are common in older, multiparous women and are associated with factors that cause elevated intraabdominal pressure (prolonged ascites,

constipation), while secondary PH occurs after pelvic surgery, such as abdominoperineal resection (APR) or pelvic exenteration, sacrectomy or coccygectomy [2, 3].

Secondary PH may be asymptomatic and therefore, remain undetected. If symptomatic, clinical presentation may range from perineal bulge and various degrees of perineal discomfort to urinary problems, intestinal obstruction and skin erosion with or without evisceration [4].

Until a few years ago when conventional APR was the standard approach, clinically significant PH was considered an infrequent complication with an incidence of less than 1% [4]. However, over the recent years, surgical management of rectal carcinoma has undergone a gross change with the acceptance of such concepts as clear surgical resection, avoidance of tumor perforation and shift from an open approach to minimally invasive options, including modifications, like extra levator abdominoperineal excision (eLAPE), which result in excision of the entire pelvic floor muscle complex [1]. Such modifications have created conditions that predispose the small intestine to slide down toward the pelvis and reported incidence of post-APR PH has gone up to as high as 27–45%, although the true incidence is expected to be even higher, because small and asymptomatic hernias are often overlooked [5, 6]. Those changes include: (I) creation of a wider pelvic floor defect, leaving only weak ischioanal fat and skin to close the defect, (II) fewer postoperative adhesions [4].

Several other anatomical, technical, and clinical factors have been linked to the occurrence of post-APR PH, including smoking,

Tab. I. Characteristics of patients with perineal hernia.

SERIAL NUM-BER	CASE REPORT/SERIES	NUMBER OF CASES	AGE/ [IN YEARS]	GENDER	TIME SINCE APR: DAYS [D] MONTHS [M]; YEARS [Y]	APPROACH OF APR LAPAROSCOPIC [L]; OPEN [O]; ROBOTIC [R]	CLINICAL PRESENTATION / SYMPTOMS	TYPE OF HERNIA REPAIR				APPROACH TO HERNIA MANAGEMENT					SIGNIFICANT ADHESIONS IN PELVIS Y [YES], N [NO]	COMPLICATIONS				
								BIOLOGICAL MESH (BM)	SYNTHETIC MESH (SM)	SUTURE REPAIR	ANY OTHER TYPE OF REPAIR OR ADDITIONAL PROCEDURE	TRANS-PERINEAL	ABDOMINAL (OPEN)	ABDOMINAL (LAPARO-SCOPIC)	ABDOMINAL (ROBOT ASSISTED)	COMBINED (ABDOMINO-PERINEAL)		PREOPERATIVE COMPLICATION	RECURRENCE	PERINEAL WOUND COMPLICATIONS	ANY OTHER COMPLICATION	
1	Lee & Lee [4]	1	73	M	14 d	L	Painful perineal lump	-	+	-	-	+	-	-	-	-	N	-	-	-	-	
2	Yasukawa D. et al. [18]	3	72	M	3m	L	Perineal discomfort	-	+	-	-	-	-	-	-	+	Y	-	-	-	-	
			71	M	7m	L	Perineal bulge and discomfort	-	+	-	Resection & anastomosis of small intestine	-	-	-	-	+	Y	Injury to adjacent small intestine	-	-	-	-
			76	M	12y	O	Intestinal obstruction	-	-	+	Repair of small intestine	-	-	-	-	+	Y	Injury to adjacent small intestine	-	-	-	-
3	Ogi et al. [28]	1	87	F	6m	L	Initially detected on CT scan and then after a gap of 3 months, patient felt discomfort	-	+	-	-	-	-	+	-	-	N	-	-	-	-	
4	Durur Karakaya et al. [29]	1	46	M	6d	R	Intestinal obstruction	-	-	-	-	-	-	+	-	-	N	-	-	-	-	
5	Honjo et al. [30]	1	77	M	2m	L	Perineal lump and discomfort	-	+	-	-	-	-	-	+	Y	-	-	-	-		
6	Kakiuchi et al. [31]	1	75	F	4m	L	Perineal bulge and urination disorder	-	+	-	-	-	+	-	-	N	-	-	-	-		
7	Ymisson et al. [32]	1	67	M	4m	L	Painful perineal lump	+	-	-	-	-	-	-	+	Y	-	-	-	-		
8	Rajabaleyan et al. [3]	1	70	M	20m	L	Perineal lump and discomfort	-	+	-	-	-	-	+	-	N	-	-	-	-		
9	Li et al. [33]	1	75	F	5y	L	Perineal lump and discomfort	-	+	-	-	-	-	+	-	N	-	-	-	-		
10	Rajebhosale et al. [34]	1	84	F	7y	L	Intestinal obstruction with small intestine gangrene	+	-	-	Resection & anastomosis of gangrenous intestine	-	+	-	-	-	Y	-	-	-	Post-surgery, recovery was slow, requiring parenteral nutrition	
11	Tomohiro et al. [35]	1	75	M	2m	L	Small intestinal obstruction, perineal dehiscence	-	+	-	-	-	+	-	-	-	N	-	-	-	-	
12	He et al. [11]	1	68	F	6m	L	Painful perineal lump	-	-	+	-	+	-	-	-	-	Y	-	-	-	-	
13	Fallis et al. [36]	1	81	F	2y	L	Small intestinal obstruction with strangulation	+	-	-	Resection & Anastomosis of small intestine; omental pedicle graft was used to cover the mesh	-	+	-	-	-	Y	-	-	-	-	
14	Papadakis et al. [16]	1	68	M	3y	O	Perineal lump with discomfort while sitting	-	+	-	Cluteal fasciocutaneous rotation flap	+	-	-	-	-	N	-	-	-	-	
15	Teramura et al. [37]	1	63	M	6m	L	Perineal lump with pain	-	+	-	-	-	-	+	-	-	N	-	-	-	Self-resolving symptomatic perineal seroma	

Tab. I. cd. Characteristics of patients with perineal hernia.

SERIAL NUMBER	CASE REPORT/SERIES	NUMBER OF CASES	AGE ([IN YEARS])	GENDER	TIME SINCE APR: DAYS (D) MONTHS (M); YEARS (Y)	APPROACH OF APR LAPAROSCOPIC (L); OPEN (O); ROBOTIC (R)	CLINICAL PRESENTATION / SYMPTOMS	TYPE OF HERNIA REPAIR				APPROACH TO HERNIA MANAGEMENT					SIGNIFICANT ADHESIONS IN PELVIS Y (YES); N (NO)	COMPLICATIONS			
								BIOLOGICAL MESH (BM)	SYNTHETIC MESH (SM)	SUTURE REPAIR	ANY OTHER TYPE OF REPAIR OR ADDITIONAL PROCEDURE	TRANS-PERINEAL	ABDOMINAL (OPEN)	ABDOMINAL (LAPARO-SCOPIC)	ABDOMINAL (ROBOT ASSISTED)	COMBINED (ABDOMINO-PERINEAL)		PREOPERATIVE COMPLICATION	RECURRENT PERINEAL WOUND COMPLICATIONS	ANY OTHER COMPLICATION	
16	Harris et al. [38]	1	75	F	1y	O	Perineal pain and swelling for 4 years, followed by intestinal obstruction and perineal dehiscence with evisceration of intestine	+	-	-	-	-	-	-	-	+	N	-	-	+	Postoperative ileus, slow recovery
17	Kameyama et al. [23] [39]	1	65	M	10d	L	Abdominal discomfort and perineal wound dehiscence	-	-	-	Urinary Bladder patch to cover pelvic inlet	-	-	+	-	-	N	-	-	-	-
18	Ewan et al. [40]	2	65	F	3m	L	Perineal lump & discomfort	-	+	-	-	-	+	-	-	-	Y	-	-	-	-
			63	M	13m	L	Perineal lump & discomfort on walking	-	+	-	Omental pedicle fashioned and placed in the pelvis, covering the mesh.	-	+	-	-	-	Y	-	-	-	-
19	Imaizumi et al. [41]	1	80	M	3y	L	Perineal bulge	-	+	-	-	-	-	-	-	+	Y	-	-	-	-
20	Sapci et al. [27]	1	86	M	2y	R	Perineal discomfort while sitting	-	+	-	-	+	-	-	-	-	N	-	-	-	-
21	Kato et al. [42]	1	83	M	1y	L	Perineal discomfort while sitting	-	-	-	Coverage of the pelvic brim with mobilized cecum	-	-	+	-	-	Y	-	-	-	-
22	Alobuia & Laryea [43]	1	72	F	4y	L	Perineal lump impairing walking	+	-	-	transperineal wound repair using gluteal myocutaneous flap	-	-	-	-	+	Y	-	-	-	-
			60	M	8d	R	Intestinal obstruction	-	+	-	Removal of mesh placed at APR	-	-	+	-	-	N	-	-	-	-
			58	M	7d	L	Intestinal obstruction	-	-	-	Resection & anastomosis of ischemic intestine; removal of mesh placed at APR	-	-	+	-	-	N	-	-	-	-
23	Melich et al. [9]	4	63	F	10d	R	Intestinal obstruction	-	-	-	Resection & anastomosis of injured intestine; removal of mesh placed at APR; pelvic floor was obliterated by suturing the uterine wall to the periosteal tissue of the sacrum	-	-	+	-	-	N	Injury to adjacent small intestine	-	-	-
			81	F	10d	L	Intestinal obstruction	-	-	-	Resection & anastomosis of ischemic intestine; removal of mesh placed at APR;	-	-	+	-	-	N	-	-	-	-
24	Torres Villachica et al. [44]	1	66	F	2y	L	Perineal discomfort while sitting	-	+	-	Repair of iatrogenic bladder injury	-	-	+	-	-	Y	-	-	-	-

preoperative radiotherapy, previous hysterectomy, larger size of feminine pelvis, coccygectomy, excessive length of small intestinal mesentery, omentoplasty to repair pelvic floor during APR and postoperative perineal wound infection [1, 7, 8].

The literature on PH repair is still scarce, and there are no universally accepted standardized surgical procedures. It was against this background that this analysis was undertaken in order to attain greater understanding of this entity.

## AIM

The study was conducted to evaluate the cases of perineal hernia resulting as a complication of abdominoperineal resection (APR) of rectal cancer.

## MATERIALS AND METHODS

### Methods

Systematic literature search was conducted through electronic databases, including PubMed, ResearchGate, SEMANTIC SCHOLAR and Scopus using the keywords: “perineal hernia, abdominoperineal resection, pelvic floor hernia”. The search was carried out using individual keywords with a combination of Boolean Logics (AND). Furthermore, only studies that were published in English were considered for inclusion in this study. Time frame was fixed at 2012–2022.

### Criteria for considering studies

Articles including case series and case reports, that provided clear/detailed account of the variables were included in the review process. No original article, systematic review or metanalysis fulfilled the criteria of inclusion due to lack of complete information about all the variables.

### Participants and outcome measures

Only those cases were included where diagnosis of secondary perineal hernia after APR had been made by clinical examination and established by imaging or during surgery. The eight variables (Tab. I.) reported and analyzed include: [I] age of the patient, [II] gender, [III] time since APR, [IV] clinical presentation, [V] approach to repair, [VI] type of repair, [VII] presence/absence of pelvic adhesions [VIII] complications.

### Exclusion

All articles that (I) lacked clear information related to the variables (II) where PH had occurred following surgery other than APR (III) where PH was primary or congenital, were excluded.

### Risk of bias

Since our study is evaluating case reports only, due to the fullness of the required details about variables, there is a risk of bias as case reports have a general tendency to predominantly present successful outcomes.

## Methodological quality checking

Checklist items used in Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) and well cited articles in peer reviewed literature, were selected and considered for comparison with a self-drafted checklist for this study.

## Data Synthesis (extraction and analysis)

Data related to the eight variables was extracted (Tab. I.). The collected data was entered into Statistical Package for Social Sciences (IBM-SPSS version 27.0) and Microsoft Excel (Office Version 16) for analysis. Descriptive statistical analyses such as simple frequencies, measures of central tendency, and measures of variability were used to describe the characteristics of participants. Then, the information was presented using frequencies, summary measures, tables, and figures as shown in the results.  $P < 0.05$  and 95% confidence level were used as indicators of statistical significance for differences. Drawing a conclusion was based on high quality studies that reported the effectiveness of the procedures and suggestions for clinical application. Moreover, the details of included studies were clarified in Tab. I.

## RESULTS

### Study selection

The electronic database search resulted in a total of 69 articles; 34 were identified in PubMed, 15 in ResearchGate, 11 in SEMANTIC SCHOLAR and 9 in Scopus. After excluding 18 duplicated articles, 51 were used to screen titles and abstracts, after which, 28 potentially relevant articles in English language were assessed for the eligibility criteria. Finally, 24 articles were included in the review after detection of deficient data in 4 articles, as shown in Fig. 1.

### Study characteristics

Study characteristics are summarized in Tab. I. There were 24 articles including 20 case reports (each with a single patient), 1 correspondence (with a single patient) and 3 case series/case reports (with 2–4 patients). There was a total of 30 cases (18 males and 12 females) patient age ranging from 46 to 87 years (mean 71.5 years). Time of onset of symptoms since the primary APR ranged widely from 6 days to as long as 12 years (Fig. 2.). 7 cases (23.3%) were reported within 2 weeks post APR, 18 cases (60%) by 1 year and 26 (86.7%) cases by 3 years.

APR had been primarily conducted by laparoscopic approach in 23 (76.7%), robotic approach in 4 (13.3%) and open technique in 3 (10%) cases. The clinical presentation (Fig. 3.) included presence of perineal lump with various degrees of discomfort/pain in 16 cases, intestinal obstruction in 9 cases, perineal dehiscence in 1 case, perineal discomfort with urinary disorder in 1 case, perineal bulge with no discomfort in 1 case, abdominal pain with perineal dehiscence in 1 case and incidental detection by radiological examination during routine follow-up in 1 case. Resection of non-viable intestine and anastomosis was undertaken in 5 out of 9 (55.5%) cases of intestinal obstruction, whereas in 1 (11.1%) case, repair of enterotomy created by dissection was required.

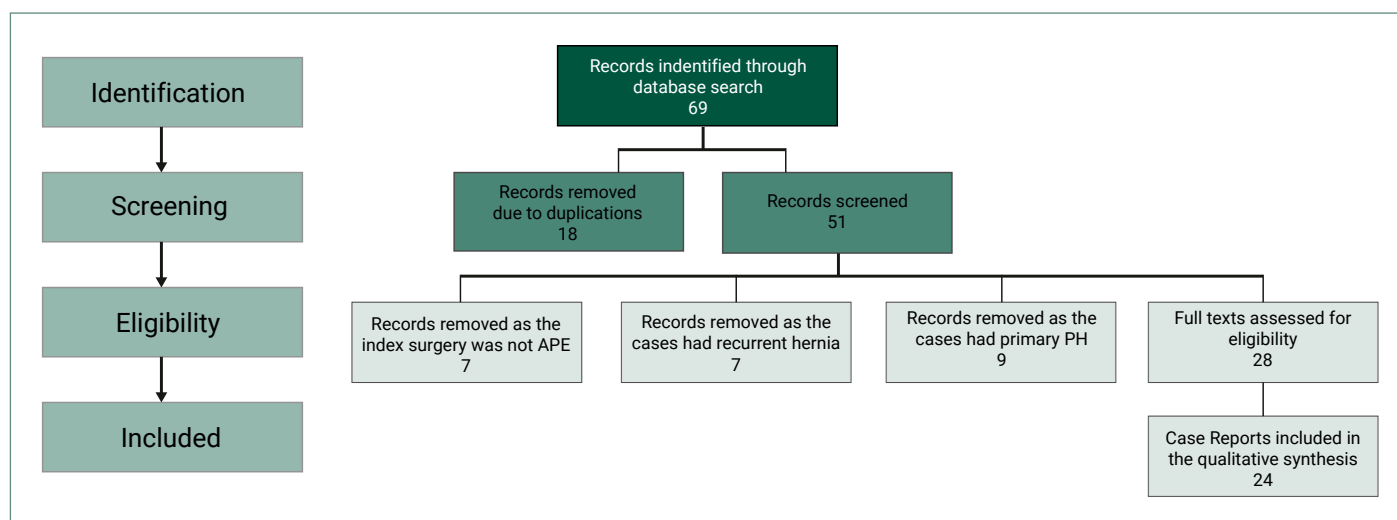


Fig. 1. Flowchart of the reviewed articles.

The approach adopted to manage the hernia included laparoscopic abdominal in 11 (36.7%), open abdominal in 5 (16.7%), combined (abdominoperineal) in 8 (26.7%), trans-perineal in 4 (13.3%) and robot assisted abdominal in 2 (6.7%) cases. In 28 cases (93.3%), pelvic defect was repaired to prevent the recurrence and in 2 (6.7%) cases, only hernia reduction was done following assessment of pelvis. Pelvic repair was accomplished with Synthetic Mesh (SM) in 17 (56.7%), Biological Mesh (BM) in 5 (16.7%) and Suture Repair in 2 (6.7%) cases. Pelvic floor was obliterated by suturing uterine wall to the periosteal tissue of the sacrum in 1 (3.3%) case. In 1 case (3.3%), urinary bladder patch was used and in a single (3.3%) case, mobilized cecum was used to cover pelvic inlet. In 1 (3.3%) case, gluteal fasciocutaneous rotation flap was used to fill the pelvic defect and in 1 (3.3%) case gluteal myocutaneous flap was used through transperineal approach. Resection and anastomosis were undertaken for ischemic intestine in 5 (16.7%) and for peroperative damage in 1 (3.3%) case. Out of the 30 cases, significant pelvic adhesions were found in 14 (46.7%) patients. In some cases, it was due to these adhesions that complications arose during dissection. Small intestine was extensively damaged in 1 (3.3%) case, requiring resection and repair of enterotomy in 1 (3.3%) case, whereas repair of urinary bladder was required in 1 (3.3%) case. Other complications that occurred in the postoperative period included perineal seroma (n-1, 3.3%), paralytic ileus (n-1, 3.3%) and slow recovery (n-1, 3.3%). Prophylactic mesh had been placed during primary APR in only 4 (13.3%) patients and in those cases intestinal obstruction occurred earliest (less than 2 weeks) in this series. No recurrence was reported during follow-up in any of the cases.

## DISCUSSION

Secondary PH after APR is an incisional hernia through the pelvic floor, resulting in protrusion of abdominal or pelvic contents, including small intestine, large intestine, bladder, uterus, and omentum. PH may lead to formation of a perineal bulge accompanied by various degrees of discomfort and even intestinal obstruction. In this study, 54% of reported cases presented with perineal lump and that corroborates with the studies reported in the literature. Even though PH has a unique physical appearance, the definitive diagnosis is usually confirmed by abdominal CE-CT. MRI can also easily define the stretching of soft tissues [1].

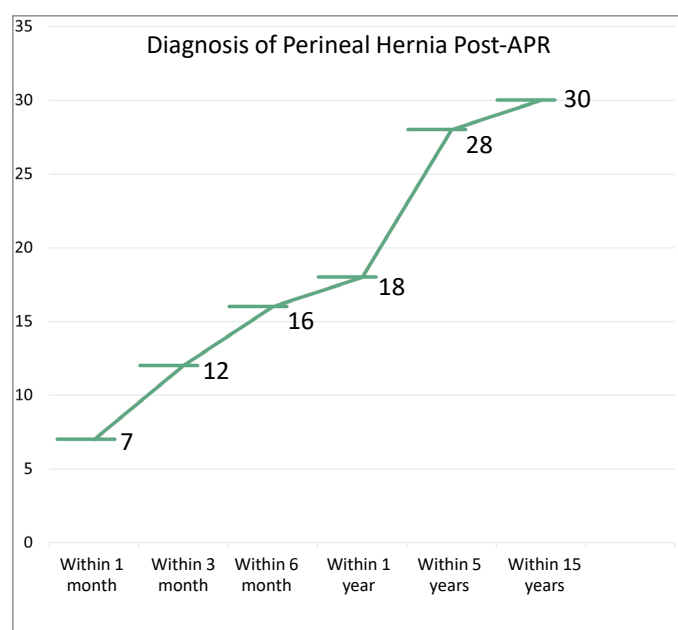
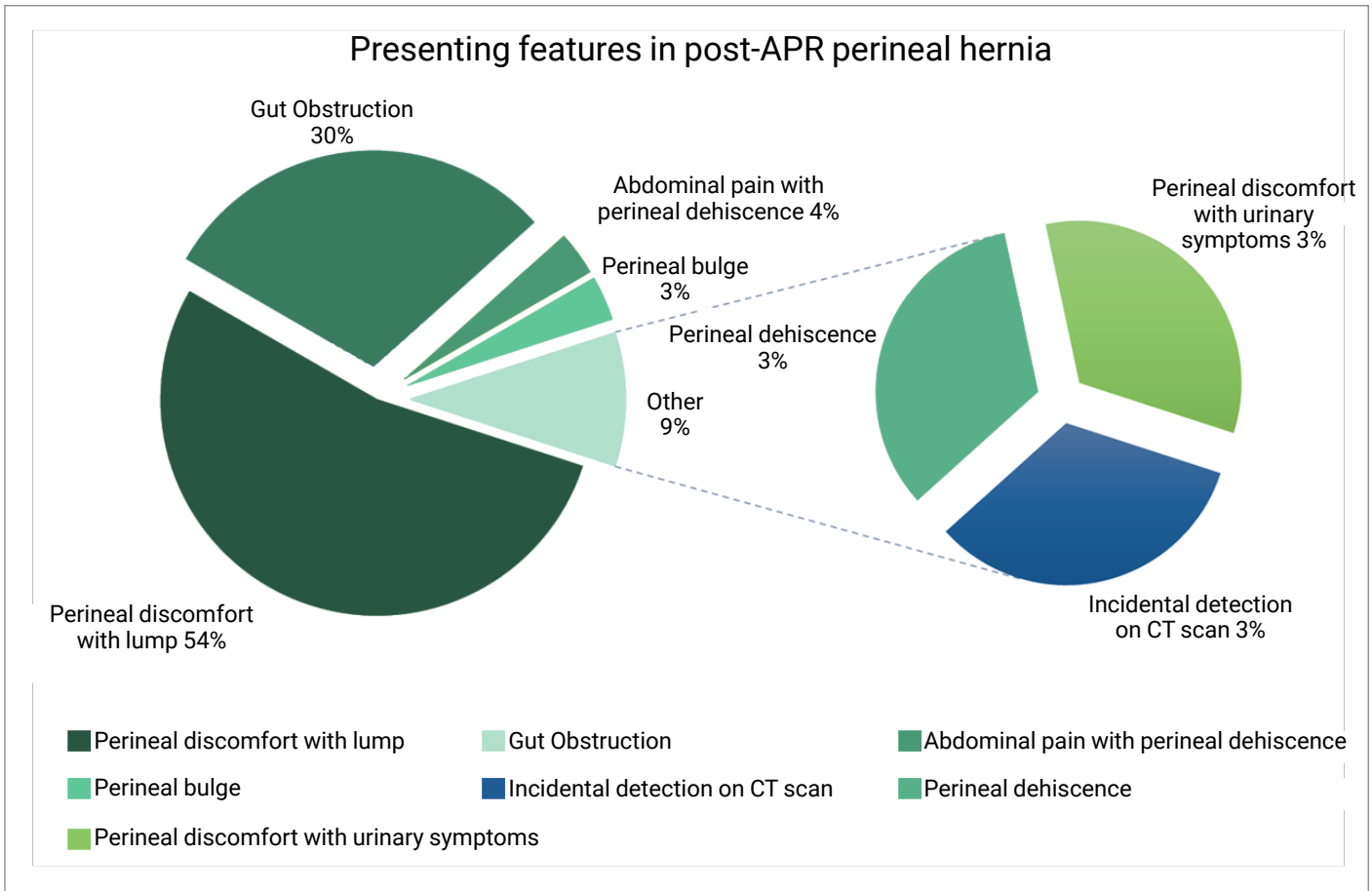


Fig. 2. Timeframe of the occurrence of perineal hernia post-APR.

In one otherwise asymptomatic case in this study [2], PH was detected incidentally on imaging conducted for post-surgical follow-up of rectal cancer and the symptoms, such as discomfort, appeared only after three months from detection, thereby pointing towards the possibility that a time lag could exist between the appearance of PH in imaging studies and the onset of symptoms. This possibility of PH being asymptomatic and thereby remaining undetected potentially leads to faulty reporting and hence, lower apparent incidence. And since 30% of cases in this study presented as intestinal obstruction with the majority ending up with resection and formation of an anastomosis, a possibility exists of a window period where timely detection can have great importance for averting complications. The typically reported duration between APR and PH formation in the literature is 4–14 months [7, 9], but the cases in this study were characterized by wider time range, from as short as 6 days to as long as 12 years. The earliest to present were the ones where mesh reinforcement of the pelvic floor was performed at index APR. In a study by McKenna et al. that analyzed 25 years of their experience in PH repair, the median time to repair was 13 months (range 2–127 months) after the index operation [10].



**Fig. 3.** Timeframe of the occurrence of perineal hernia post-APR.

In this study, APR was conducted predominantly by minimally invasive (laparoscopic and robotic) approach – in 27 (90%) cases, and open techniques were adopted in only 3 (10%) cases. This figure is in line with the current surgical practice. In the literature, among various probable factors predisposing to PH after APR through a minimally invasive approach is the development of fewer postoperative adhesions [1, 4]. But in this study, significant pelvic adhesions were found in 14 cases, and of these, only 1 had been operated on by the traditional open approach; the remaining 13 had been operated on through laparoscopic and robotic approaches (48%). The adhesions were reported to be so dense, that the small intestine and urinary bladder sustained injuries during dissection. Hence, the relative scarcity of adhesions does not appear to play a primary role in this regard. The fact that dense adhesions may be present in the pelvic region needs to be kept in mind when planning surgical approach to hernia, and no management plan should be conceived with an erroneous presumption that the operative field will be adhesion-free and easily dissectible.

Other factors that improve oncological outcome, such as extralevator APE (eLAPE), end up creating a wider pelvic floor defect. Due to significant width of the pelvic defect and tissue fibrosis/retraction resulting from preoperative chemoradiotherapy, suture closure may not be feasible and hence, pelvic peritoneum may be left open at the end of a minimally invasive procedure, predisposing to development of PH [6, 11]. However, the cause-effect relationship with peritoneal suturing is not clearly established [4]. The other possible risk factors that have been mentioned in the literature include female gender, previous hysterectomy, coccygectomy, post-operative pelvic wound complications, a long mesentery of the small intestine, higher Body Mass Index (BMI), and smoking [1].

There are no universally accepted guidelines for reinforcement of a surgically weakened pelvic floor during APR and, despite the lack of evidence in the literature, many options are being used and have been reported, including suture closure if sufficient levator muscle is available, or else reinforcement of the pelvic floor by mesh (prosthetic, biological) or myocutaneous flaps. Among the cases presented in this study, only 4 patients had a history of prosthetic mesh placement high on the pelvic brim at primary APR to prevent perineal herniation.

Musters et al., in a multicenter, randomized, controlled trial, demonstrated that biological mesh closure during eLAPE with preoperative radiotherapy can potentially lead to a significantly lower rate of PH at 1 year after APE, compared with primary closure [12]. Devulapalli et al., in a systematic review and meta-analysis, documented that myocutaneous flap closure was more effective in reducing perineal morbidity after APR compared with primary closure, particularly among patients with preoperative irradiation to the pelvis [13]. Foster et al. performed a pooled analysis of 340 patients from 11 small cohort studies reporting the outcome relating to the perineum following eLAPE [14]. They discovered that there was no significant difference in the rates of perineal wound complications or PH development between 255 individuals who had flap repair and 85 who received biological mesh repair.

In 2017, Jones et al. [15] presented an analysis of the Low Rectal Cancer Development programme (LOREC) – perineal wound healing registry that had been developed to record the data on APR for rectal cancer in colorectal units in the UK between 2012 and 2014 in order to identify prevalent practices in operative technique as well as outcomes [16]. They concluded that ELAPE was utilized in

two-thirds of patients and traditional APR in one-third, but the former was not associated with increased morbidity. In the ELAPE group, the perineal wound had been closed primarily with sutures in 15% of cases, reinforced with mesh in 55%, and with a flap in 21%. In the traditional APR group, 54% of wounds were closed primarily with sutures, 29% with mesh and 5% with a flap. Primary closure with mesh was found to be as effective as flap reconstruction.

Based on a reduced incidence of perineal hernia after one year (OR 0.400 with 0.240–0.665 95% CI and P value of 0.001) but comparable rates of early perineal wound complications, Zaheer Ahmad et al. determined that biological mesh reconstruction is preferable to primary closure [17]. However, after primary perineal closure, procedure duration and hospital stay were both reduced (p 0.001).

Various approaches to PH repair have been documented in the literature, but the optimal strategy remains controversial [18, 19]. The approach can be abdominal, perineal or combined abdominal and perineal, but none of these techniques have been proven advantageous in all instances [3]. The approach adopted to manage the hernia in the described cases included laparoscopic in 11 (36.7%), open abdominal in 5 (16.7%), combined (abdominoperineal) in 8 (26.7%), perineal in 4 (13.3%) and robot assisted abdominal in 2 (6.7%) cases. In the perineal approach, hernial sac is dissected from the perineum and abdominal cavity is not entered.

A multi-center series of 12 cases with symptomatic PH was documented by Goedhart-de Haan et al. and these patients were treated with a laparoscopic technique. In that series, even the recurrences were managed with redo-laparoscopic repair, and it was determined that PH following APR can be repaired safely and successfully using laparoscopic technique [20]. A combination laparoscopic-perineal method has been proposed by Li and Zhnag as a safe option [21].

Martijnse et al. [22] reported 95-percent success rate for perineal approach. In a case series comprising of 21 patients (n = 12 male) by McKenna et al. [10], the approach was transabdominal in 9 (43%), perineal in 9 (43%), and combined in 3 (14%) patients, and outcomes did not differ between the three types of repair approach. In a retrospective study by Bertrand et al., 24 PH repairs were analyzed, and the approach was perineal in 16 (66.7%), abdominal in 5 (20.8%) and combined abdominoperineal in 3 (12.5%) cases. They determined that the adopted approach had no significant impact on the outcomes [23]. Balla et al. [24], in a systematic review of literature that included 21 studies with a total of 108 patients, found that PH repair was performed using the perineal approach in 75 patients (69.44%), laparoscopic approach in 25 patients (23.14%), open abdominal approach in 3 patients (2.77%), laparoscopic perineal approach in 3 patients (2.77%) and open abdominoperineal approach in 2 patients (1.8%). Bertrand et al. found that the overall morbidity for the perineal, abdominal and combined approach was 37.5%, 20% and 66.7%, respectively [23].

Pelvic repair was accomplished in the presented cases using synthetic mesh (SM) in 17 (56.7 %) patients, biological mesh (BM) in 5 (16.7%) patients and primary suture repair in 2 (6.7%). In 1 case (3.3%), pelvic floor was obliterated by suturing the uterine wall to the periosteal tissue of the sacrum. Similarly, in 1 case (3.3%), a urinary bladder patch was used, while in a single (3.3%) case mobilized cecum was used to cover the pelvic inlet. Flap reconstruction was undertaken in 2 (6.7%) cases.

In a systematic review of literature Balla et al. [24] found that non-absorbable mesh was used in 37.96% of cases, composite mesh in 18.51%, biological mesh in 17.59% and flap reconstruction was performed in 23.14% of patients. They also found that primary suture repair has been abandoned in the recent years in favor of synthetic or composite mesh placement, and that the use of flap reconstruction has also spread rapidly.

Musters et al. conducted a study to determine the outcome of PH repair with a biological mesh after APR and concluded that this technique was associated with a high recurrence rate [25]. Jafari et al. [26] conducted a study to determine the outcome of six patients who underwent PH repairs via perineal approach, using a biological mesh. There were three patients (50%) who developed recurrent perineal hernias after a median interval of six months. Blok et al. [5], in a retrospective review of consecutive patients who underwent PH repair post-APR, found a recurrence rate of 39% with biological mesh and 31% with synthetic mesh. Bertrand et al. also found the biological and synthetic meshes to be almost similar when it comes to complications and recurrence [23].

Case reports included in this study do not mention recurrences and this appears to be an inaccuracy, as individual case reports tend to predominantly present successful outcomes and might lead to the wrong conclusions if taken into consideration, without understanding of the trends projected in the literature. Bertrand et al. [27] conclude from their retrospective analysis of 24 post-APR PH repairs performed between 2001 and 2017 that recurrences following PH repair are common irrespective of the technique of repair. They reported a recurrence rate of 41.7% for biological mesh repair and 40% for synthetic meshes. Balla et al., in an analysis of outcomes of 108 patients, reported first and second recurrences as 24.07% and 26.92%, respectively. Bertrand et al. [23], Blok et al. [5] and Balla et al. [24] suggested that recurrence rate is lower if pelvic reconstruction is done with a flap at the time of PH repair.

### Limitations of evidence

The study is limited by (I) a small number of cases (II) inclusion of case reports and case reports, have an inherent risk of imprecision and publication bias, whereas outcomes influence the decision whether to publish or otherwise. This became clear with the absence of recurrences, even though recurrence is well described in literature related to PH repair.

## INTERPRETATION AND CONCLUSION

Perineal hernia (PH) is an important complication after abdominoperineal resection, and its incidence has increased in recent years due to changes in approach and management of rectal cancer. This complication should be actively looked for during a routine follow-up after APR. There is no general agreement in current literature about the most appropriate operative strategy to PH repair, but various options are being applied through different approaches. The operating surgeons should base these decisions on the general condition of the patient, complexity of the hernia and local tissue conditions.

Pelvic adhesions should always be expected, and they should be kept in mind at the time of adopting any strategy to PH repair.

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