

# Unusual findings during hernia repair surgery. Our experience

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## ABSTRACT

**Background:** Hernia repair operations are among the commonest surgical interventions. Despite being a deeply studied subject, special attention must be given to the possible unforeseen intraoperative findings, a field with very limited literature.

**Material and Methods:** In a retrospective study, we gathered all the unusual hernia sac contents encountered, from a total of 1,829 hernia operations that were performed in our institution, during a 14-year period.

**Results:** In our series, uncommon findings were found in 1.2% of the cases, consisting mainly of the vermiform appendix and the urinary bladder, whose prevalence is 0.53% and 0.50%, respectively.

**Conclusions:** This percentage, although relatively small, is important and must contribute to the surgeon's awareness, in order to assess the surgical field, minimise complications and perform the proper operation according to the findings.

**Key Words:** *Hernia; rare hernia contents; unexpected sac findings*

## INTRODUCTION

Hernias, as an entity, are one of the most thoroughly studied fields of general surgery partly because of their large incidence (about 1/3 of the population presents groin hernias during lifetime) [1], and also due to the long history of surgical treatment approaches, starting with Bassini's first realistic surgical technique at 1884. Many different operative approaches exist and official recommendations can help but not limit surgeons [4]. Furthermore, hernia sac's content can vary, although there are common findings depending on the region

A hernia in the inguinal region usually contains the omentum and small intestine [2]. Umbilical hernia may contain preperitoneal fat tissue, omentum, and small intestine or a combination of those so as in ventral and epigastric hernias [3]. Nevertheless, the presence of unusual intraoperative findings still challenges the modern surgeon. We present one of the few large studies focusing on unusual findings and uncommon situations during hernia repair in our institution. Our goal is to contribute to the existing literature with a notable number of cases and help surgeons to acquire a high clinical suspicion in rare hernia sac's contents.

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## MATERIALS AND METHODS

We performed a case-series study of all patients who were admitted to our surgical department during the period from January 2003 to December 2016. Our Institution is a secondary regional center serving a prefecture with a population of more than 85,000 people.

Our study included all patients over 15 years old who

were operated on any type of hernia, electively or in an urgent/emergent way. Following approval from the Institutional Review Board the patients were identified and their charts were reviewed. Data collected included the patients' demographics, type and location of hernia, reason and mode of admission, preoperative and postoperative diagnosis, case management, type of anesthesia, type of operation performed, postoperative course, complications and mortality.

## RESULTS

A total of 1,829 hernia operations were carried out in the study period. All hernia repairs were performed in an open way. The majority of them (71.2%) were inguinal hernia repair (1,303 cases), 1187 elective and 116 urgent. Femoral hernia repair was the case for 43 patients, 28 urgent and 15 electives. Finally, the rest were hernia repair in the abdomen region. Umbilical hernia repair was performed in 244 cases (35 urgent and 209 elective). Ventral hernia was found in 175 patients (31 urgent and 144 elective) and epigastric hernia was the cause of admission in 59 patients (7 urgent and 49 elective) (Table 1).

We excluded patients whose hernia sac's content was omentum or small intestine in the inguinal region and preperitoneal fat tissue, omentum or small intestine in the abdomen region. In our series, uncommon findings were found in 1.2% of the cases (22 patients), consisting mainly of the vermiform appendix and the urinary bladder, whose prevalence is 0.53% and 0.50%, respectively. It is noticed that the majority of uncommon findings during hernia repair surgery, are the urinary bladder and the appendix, together consisting of 68.1% of the cases. It is also found that in our series, the male/female ratio presenting unusual findings leans towards men (3.4), which is lower than that for hernia repair in our institution during the 14 year period, which is 3.58. It is furthermore noticed that the majority of the unusual findings occurred in emergent/urgent operations, on the right side and in groin hernia. Sex, age, mode of admission, hernia location, clinical

presentation, hernia sac contents, type of operation and anaesthesia and complications (Clavien-Dindo classification) are summarised in Table 2.

## DISCUSSION

Hernia repair surgery is among the most frequent operations performed. Although it is a well-documented surgical entity, there is scarce documentation in the literature about the possible unusual intraoperative findings the modern surgeon may encounter [5,6]. To the best of our knowledge, we present the largest case series published in the literature so far.

We have shown that within a 14-year period, there was a 1.2% possibility of encountering uncommon intraoperative findings during hernia repair surgery. Although a relatively small percentage, the surgeon must be vigilant and informed about the possible unforeseen findings, in order to prevent complications, and achieve appropriate and prompt decision making for surgical management. The surgeon has to be able to recognise an atypical surgical field and be aware of the possibility to change the plan for hernia repair (herniorrhaphy instead of mesh hernioplasty, or the necessity to use absorbable or biological mesh) if contamination of the field occurs due to bowel resection, or the presence of inflammation as in cases of appendicitis.

The presence of vermiform appendix in the hernia sac is called Amyand's hernia, after Claudius Amyand, the surgeon who first encountered it, and pioneer surgeon of appendicectomy. In the literature Amyand's hernia prevalence is 1% of the inguinal hernias, while in more modern studies, this percentage drops around 0.4-0.6% [9,11], in accordance to our research, where Amyand's hernia prevalence was 0.53%. On the contrary, an inflamed appendix was found in 0.38% of our sample, a percentage significantly higher than the 0.1% of the literature [10,11].

Appendicectomy and non-mesh hernia repair, must follow the finding of inflamed appendix, so as to minimise the possibility of infection. Regarding appendicectomy of a healthy looking, incidentally found appendix, there is controversy among authors, where some suggest prophylactic appendicectomy [10], while others reserve appendicectomy for an inflamed appendix [12].

Furthermore, another point of controversy is whether or not a mesh will be used in the repair. Mesh repair is generally not advised when there is an inflamed organ because of possible mesh contamination, therefore suture repair techniques are preferred [9,10]. Other authors have used mesh repair even in cases with inflamed appendix, without complications [11]. Due to the variety of management, Losanov and Basson presented a 4-type classification of Amyand hernias, and their respective

**TABLE 1.** Demographics of cases during study period.

Type	n	M	F	Urgent	Elective
Inguinal hernia	1303	1191	112	116	1187
Umbilical hernia	244	139	105	35	209
Ventral hernia	175	55	120	31	144
Epigastric hernia	56	27	29	7	49
Femoral hernia	43	15	28	28	15

n=Number of patients M=Male F=Female

**TABLE 2.** Data of patients presenting uncommon findings.

P	Sex	Age	Mode of Admission	Hernia Location	Clinical Presentation	Hernia Sac Contents	Operation	Anaesthesia	Complications (Clavien-Dindo)
P1	M	80	Emergent	Right inguinal hernia	Strangulated hernia Haematuria	Bladder	Bladder debridement, suture repair. Mac Vay herniorrhaphy	General	-
P2	M	67	Elective	Left inguinal hernia	Inguinal hernia	Bladder	Lichtenstein hernioplasty	Spinal	-
P3	F	72	Emergent	Umbilical hernia	Strangulated hernia Small Bowel obstruction	Small bowel with a GIST	Small bowel resection and primary anastomosis. Mesh Hernioplasty	General	I
P4	M	83	Emergent	Right inguinal hernia	Strangulated hernia	Gangrenous appendicitis	Bassini herniorrhaphy Right paramedian laparotomy- Appendectomy	General	III
P5	M	69	Emergent	Right recurrent inguinal hernia	Incarcerated hernia Partial small bowel obstruction	Small Bowel and bladder	Lichtenstein hernioplasty	General	-
P6	M	69	Elective	Right inguinal hernia	Inguinal hernia	Bladder	Bassini herniorrhaphy	Spinal	-
P7	M	78	Emergent	Right inguinal hernia	Incarcerated hernia	Appendix	Lichtenstein hernioplasty	Epidural	-
P8	M	95	Emergent	Right inguinal hernia	Strangulated hernia Peritonitis	Perforated appendicitis	Bassini herniorrhaphy Median laparotomy- Appendectomy –Wash out of peritoneal cavity	General	I
P9	M	93	Emergent	Right inguinal hernia	Incarcerated hernia Closed loop large bowel obstruction	Cecum, Sigmoid colon	Lichtenstein hernioplasty	General	I
P10	M	88	Emergent	Right inguinal hernia	Strangulated hernia Bowel obstruction	Cecum (ischaemic) and appendicitis	Bassini herniorrhaphy Median laparotomy-right colectomy	General	III
P11	M	89	Emergent	Left inguinal hernia	Incarcerated hernia. Peritonitis	Sigmoid colon with Hinchey IV diverticulitis	Bassini herniorrhaphy Median laparotomy and Hartmann's procedure	General	I
P12	F	80	Emergent	Right femoral hernia	Strangulated.hernia Peritonitis	Perforated appendicitis	Femoral ring herniorrhaphy. Median Laparotomy- Appendectomy-Wash out of peritoneal cavity	General	I
P13	M	60	Elective	Left inguinal hernia	Inguinal hernia	Bladder	Lichtenstein hernioplasty	Spinal	-
P14	M	59	Elective	Right inguinal hernia	Inguinal hernia	Bladder	Lichtenstein hernioplasty	Spinal	-
P15	M	76	Emergent	Right inguinal hernia	Incarcerated hernia	Appendicitis	Darn herniorrhaphy Median laparotomy- Appendectomy	General	-
P16	M	46	Elective	Right flank incisional hernia	Inguinal hernia	Right liver lobe	Mesh hernioplasty	General	-
P17	F	61	Emergent	Left Spigelian hernia	Strangulated hernia	Sigmoid colon Left ovary and fallopian tube	Left salpingoophorectomy Herniorrhaphy	General	-
P18	M	64	Emergent	Right inguinal hernia	Incarcerated hernia. Haematuria	Bladder diverticula	Lichtenstein hernioplasty	General	-

**TABLE 2.** Data of patients presenting uncommon findings (*continued*).

P	Sex	Age	Mode of Admission	Hernia Location	Clinical Presentation	Hernia Sac Contents	Operation	Anaesthesia	Complications (Clavien-Dindo)
P19	F	73	Elective	Incisional hernia (Pfannenstiel incision)	Incisional hernia	Right colon and terminal ileum with adenocarcinoma of the caecum	Right colectomy and primary anastomosis. Mesh (vicryl) hernioplasty	General	I
P20	F	53	Emergent	Umbilical hernia	Strangulated	Meckel's diverticulum	Small bowel resection and primary anastomosis. Mesh hernioplasty	General	-
P21	M	86	Emergent	Right inguinal hernia	Strangulated	Gangrenous appendicitis	Appendectomy Bassini herniorrhaphy	Spinal	-
P22	M	83	Elective	Bilateral inguinal hernias	Inguinal hernia	Appendix on the right side. Small bowel with neuroendocrine tumor on the left side	Small bowel resection and primary anastomosis. Lichtenstein hernioplasty on the right side and Bassini herniorrhaphy on the left side	Epidural	I

P: Patient, M: Male, F: Female

management [12]. In our series, regarding the cases with an inflamed appendix (type 2), appendicectomy was performed, in one case through hernia, and in the other two through laparotomy in order to secure appendiceal stump because of severe inflammation at the base of the vermiform appendix. The three cases presenting with appendicitis and concurrent peritonitis (type 3), were managed with appendicectomy through laparotomy as indicated. Concerning the two cases with incidentally found macroscopically healthy appendix, reduction to the peritoneal cavity was preferred, followed by mesh hernioplasty (type 1), as indicated.

De Garengeot's hernia, defined as the presence of the appendix in a femoral hernia, has a similar approach to Amyand's hernia. With very limited reports in the literature, a standardised operative pattern does not exist [13]. In our series, only one case with a perforated appendicitis along with peritonitis was encountered, and suture herniorrhaphy with appendicectomy through laparotomy was mandatory to wash out the peritoneal cavity.

The presence of urinary bladder in the sac is reported in the literature between 1 and 4% of all inguinal hernias [6]. In our series, this percentage was 0.5%, significantly lower than that reported in the literature. The presence of bladder diverticula, as in one of our cases, is even scarcer with the literature consisting solely of few case reports [6,8,14]. The surgeon must be aware of the possibility of urinary tract herniation in order to avoid frequent (12%) complications such as bladder injury, while preoperative evaluation such as sonography is advised to selected

patients [6]. In case of bladder presence in an incarcerated hernia, where the complication rate is even higher (reported 28.6%), there must be alertness for haematuria, like in our cases, and the use of a Foley catheter must be considered [5].

In female patients, the presence of ovaries and/or fallopian tubes in the hernia sac is encountered in 2.9% of inguinal hernias according to the literature [8]. It is associated with genital tract abnormalities and is more frequently found in the pediatric population [15]. Again, organ salvation must be pursued unless signs of inflammation or strangulation are present [8]. In our case, the left ovary the left ovary and fallopian tube were herniated in a Spigelian hernia, an even scarcer entity with a literature comprising only three case reports [17].

The presence of sigmoid colon in the hernia sac is a rare entity, and follows the same management principles discussed above. In our series, along with two cases of sigmoid colon herniated in a left hernia, we encountered the extremely rare entity of a sigmoid colon herniated in a right inguinal hernia. Only 4 such cases were reported so far [16]. Another rarity is the presence of herniated sigmoid colon with diverticulitis as a content of a left inguinal hernia. It is not clear if the diverticulitis is the result of hernia incarceration or the vice versa. To the best of our knowledge, this is the fourth such case reported so far [18,19]. A Hartmann's procedure, due to perforation, followed by Bassini hernia repair, was performed in our case.

Transabdominal herniation of the liver is another extremely rare entity and only very few case reports

have been published [20,21]. Liver herniation is, in most cases, diaphragmatic and occurs congenitally or after blunt trauma. We presented a right flank incisional hernia containing the right liver lobe, in a non-cirrhotic patient, where mesh repair was used without complications.

In our series of uncommon findings, we must absolutely point out the occurrence of three gastrointestinal tumours as hernia contents. The presence of a small bowel Neuroendocrine Tumour (NET), a small bowel Gastrointestinal Stromal Tumour (GIST), and an adenocarcinoma of the caecum, raises not only hernia management issues, but also oncological ones. Although rare entities with scarce case reports [22-28] they must not be missed, as they thoroughly change the operative plan. In our series both small bowel tumours (NET and GIST) were managed with small bowel resection and primary anastomosis, followed by hernia repair, while in the case with the adenocarcinoma of the caecum, right colectomy and primary anastomosis followed by absorbable mesh hernioplasty was performed. One case presented as an emergency.

A Littre's hernia is a very rare hernia, which is defined by the presence of Meckel's diverticulum in a hernia sac. Its frequency as an umbilical hernia is estimated to be 11.3% and it occurs mainly in female patients at mean age of 52 years old, like our patient. Strangulation of a Littre's umbilical hernia occurs in one third of the patients [29].

## CONCLUSIONS

Uncommon findings during hernia repair surgery, although rare, pose difficulties to the surgeon, demand vigilance for early detection of their presence, and challenge for appropriate decision making and management upon discovery. The goal of this study is to contribute to the limited literature around the issue, highlighting the need for further documentation, aiming for effective and efficient surgical management.

**Ethical standards declaration:** *Written consent of the patients.*

**Conflict of interest:** *None*

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