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## Uncommon content in groin hernia sac

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**Abstract** Groin hernia may have very unusual sac content. Vermiform appendix, acute appendicitis, ovary, fallopian tube and urinary bladder have been rarely reported. We aimed to present our experience with these unusual hernia contents. Records of 1,950 groin hernia patients were retrospectively analyzed. Vermiform appendix was found in 0.51% and acute appendicitis was found in 0.10% of groin hernia sacs. The incidence of appendix in femoral hernia was 5%, while inguinal hernia sac contained ovary and fallopian tube in 2.9% of the cases. The incidence of groin hernias containing urinary bladder was 0.36%. We also had 1 patient with incarcerated bladder diverticula in an indirect hernia sac. Iatrogenic bladder injury occurred in 2 patients. Although rare, a groin hernia sac may contain vermiform appendix and exceptionally acute appendicitis. Tubal and ovarian herniation in inguinal hernias can be found in adult and perimenopausal women with an incidence as high as in children. Urinary bladder hernia occurs with a similar incidence of tuba-ovarian hernia, however, it requires special attention because of a high risk of iatrogenic bladder injury during the inguinal dissection. Every effort should be made to preserve the organ found in hernia sac for an uneventful postoperative period.

**Keywords** Hernia · Inguinal · Femoral · Ovary · Bladder · Sac content

### Introduction

Groin hernia is a common surgical problem and almost all intraabdominal organs and a variety of unusual

pathologies can be found in the hernia sac. The presence of vermiform appendix, acute appendicitis, ovary, fallopian tube and urinary bladder has been reported exceptionally in the literature and most of the studies have been low-volume case reports. In this study we aimed to present our experience with unusual hernia contents.

### Materials and methods

One thousand nine hundred fifty patients who underwent groin hernia repair at our institution, between August 1989 and September 2004, were evaluated in this study. The patients' hospital records were retrospectively analyzed particularly regarding the contents of the hernia sac. The patients with unusual sac content—e.g. vermiform appendix, acute appendicitis, ovary, fallopian tubes and urinary bladder—were included in the study. The age and sex distributions of the patients, the type of the hernias, surgical procedures, intraoperative findings and operative complications were recorded.

### Results

Of 1,950 patients, 1,359 had indirect inguinal hernia, 459 with direct inguinal hernia, while 92 patients had combined direct and indirect hernia. Femoral hernia was met in 40 patients. There were 1,708 male and 242 female patients. The organs found in hernia sac were appendix vermiformis, urinary bladder, ovaries and fallopian tubes.

Vermiform appendix and acute appendicitis in groin hernias

Groin hernia sacs were found to contain either vermiform appendix or acute appendicitis in 12 (0.51%) patients (Table 1). The mean age of the patients was 62 (29 – 96) excluding the youngest patient who was a 5 month-old at the time of the operation. There were 8

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**Table 1** Distribution of patients with normal vermiform appendix and acute appendicitis in groin hernias

Patient No	Age and sex	Hernia type	Hernia content	Procedure
1	26, F	Incarcerated indirect	Appendix vermiformis	Appendectomy
2	27, M	Incarcerated indirect	Acute appendicitis	Appendectomy
3	70, M	Incarcerated indirect	Appendix vermiformis	Appendectomy
4	60, F	Incarcerated indirect	Appendix vermiformis	Appendectomy
5	80, M	Indirect	Appendix vermiformis	Appendectomy
6	70, M	Sliding incarcerated indirect	Appendix vermiformis	Appendectomy
7	58, M	Incarcerated indirect	Appendix vermiformis	Appendectomy
8	71, F	Incarcerated femoral	Acute appendicitis	Appendectomy
9	60, M	Sliding incarcerated indirect	Appendix vermiformis	Appendectomy
10	59, M	Indirect	Appendix vermiformis	Appendectomy
11	96, F	Incarcerated femoral	Appendix vermiformis	Appendectomy
12	5 months, M	Indirect	Appendix vermiformis	Reduction

male and 4 female patients. All of the groin hernias in this group were right-sided.

A normal vermiform appendix was present in ten patients. One of these hernias was a femoral hernia in a 96-year-old female patient. Nine were indirect hernias, two of which were sliding type and four of the rest were incarcerated within the hernia sac. Acute appendicitis occurred within the hernia sac in 2 patients. One of these patients was a 27-year-old male patient with an incarcerated indirect hernia, whereas the other patient was a 71-year-old female and had an incarcerated femoral hernia.

Appendectomy was performed in all but one patient. The exception was the 5-month-old patient with an indirect hernia without incarceration, strangulation and inflammation of the vermiform appendix. Operation field was irrigated with saline and no intraperitoneal or scrotal drain was placed. Hernia repair was carried out in all patients without using prosthesis, but rather with one of the Bassini, Shouldice or McWay techniques.

#### Ovary and fallopian tube in groin hernias

Ovary and/or fallopian tubes were found in hernia sac 7 patients (Table 2). The ages of the patients ranged from 7.5 month to 74 year-old. Four cases were on right side and three cases were left-sided. All of the hernia sacs containing ovary and/or fallopian tube were indirect type. Hernia sac contained ovary alone in four cases, ovary and tube together in two cases and the remaining case had a sliding type incarcerated fallopian tube alone.

Four patients, including the youngest, a 7.5 month-old child, underwent resection of ovaries due to strangulation.

#### Vesico-inguinal hernias

Urinary bladder was found in hernia sac in 7 patients (Table 3). The mean age of the patients was 47 (30–69). There was only 1 female patient with a direct hernia whereas the rest was male with indirect herniation. Five of the vesico-inguinal hernias were right-sided and two of them were located on the left. Two hernia sacs contained incarcerated bladders and iatrogenic bladder injury occurred during the hernia repairs in both cases. Another incarcerated hernia was associated with a bladder diverticule and the diverticule was excised.

#### Discussion

Inguinal hernia is a common surgical problem which may sometimes surprise the surgeon with its unusual sac content. Almost all intraabdominal organs, including stomach [1] and their pathologies can be found to be located in the hernia sac [2].

The presence of a normal vermiform appendix in inguinal hernia sac is uncommon, reported with an incidence of 0.6% [3] to 1% [4] of inguinal hernias, always on the right side and in male patients. It has generally been large indirect inguinal-scrotal hernia but direct hernia containing vermiform appendix has also

**Table 2** Distribution of patients with ovary and fallopian tube in groin hernias

Patient No	Age	Hernia type	Hernia content	Procedure
1	7.5 months	Right strangulated indirect	Ovary	Oophorectomy
2	45	Left strangulated indirect	Ovary	Oophorectomy
3	3	Right sliding Incarcerated indirect	Ovary	Reduction
4	9	Left incarcerated indirect	Ovary and fallopian tube	Reduction
5	74	Left strangulated indirect	Ovary and fallopian tube	Salpingo-oophorectomy
6	42	Right strangulated indirect	Ovary	Oophorectomy
7	31	Right sliding Incarcerated indirect	Fallopian tube	Reduction

**Table 3** Distribution of patients with urinary bladder hernias

Patient No	Age and sex	Hernia type	Procedure and complication
1	42, F	Left direct	Reduction
2	50, M	Right recurrent incarcerated indirect	Iatrogenic bladder laceration, reduction
3	34, M	Right incarcerated indirect	Excision of bladder diverticule
4	69, M	Right indirect	Reduction
5	30, M	Left indirect	Reduction
6	55, M	Right indirect	Reduction
7	48, M	Right incarcerated indirect	Iatrogenic bladder laceration, reduction

been reported [3]. Exceptionally, an appendix complicated by acute appendicitis can be found in groin hernia sac. This rare type of hernia is defined as Amyand's hernia, with the name of a surgeon of the eighteenth century, who described a case of acute appendicitis the hernia sac of a male child for the first time [5]. Amyand's hernias are generally found on the right groin [5], but they can also be found in obturator, umbilical and incisional hernias [6–8]. Although the exact incidence is not known [5], it has been reported to vary between 0.08% [3] and 1% [8]. Acute appendicitis can also complicate femoral hernias particularly in older postmenopausal women [9–12]. Tight femoral hernia neck has been accused for the relatively higher incidence of acute appendicitis in femoral hernias [13].

In our experience, we found vermiform appendix in ten cases (0.51%) of 1,950 groin hernia patients. The figure was two cases (0.10%) considering acute appendicitis located in groin hernia sacs. The incidence of finding appendix in femoral hernias was 5% in our series.

Appendectomy through herniotomy followed by hernia repair was generally performed as the treatment of choice [3, 8, 14] despite a recent review suggested to postpone the hernia repair [5]. We performed appendectomy in all patients, except one who was a 5 month-old at the time of the operation. The clearly normal appendix was replaced into the abdominal cavity. This patient's postoperative course was uneventful. The other patients who underwent appendectomy followed by one of the conventional non-mesh hernia repair procedures developed no complications.

Ovarian and tubal herniation in groin hernias is rare and generally found in pediatric population [15–18]. Bradshaw et al. [16] reported that 71% of patients were younger than 5 year-old. Inguinal herniation of the adnexa is often associated with congenital abnormalities in the genital tract [16, 17, 19]. Reduction of the sac content should be attempted in reproductive young woman and children without any ovarian and tubal abnormalities [19], provided that any life-threatening complication such as acute salpingitis does not exist [15]. Majority of the cases are indirect inguinal hernias [15, 16] but an incarcerated direct inguinal hernia containing adnexa has also been reported [17].

The incidence of inguinal hernias containing ovary and fallopian tube is 2.9% in the present series. Contradictory to the literature, most of our patients were adult and there were not any genital abnormalities in

our child patients. Four of our patients, including one who was a 7.5 month-old, had strangulation of the hernia content at the time of presentation and they underwent resection. Preservation of the adnexa could be achieved in two children and in another patient of reproductive age.

The incidence of groin hernias containing urinary bladder is 0.36% in the present series. Bladder hernias are often asymptomatic and a small percentage of them are diagnosed preoperatively [20, 21]. Male sex, associated urological signs and symptoms, older age, and obesity have been considered as risk factor for bladder herniation. No patient was diagnosed preoperatively in our series. Mean age of the patients was 47. Despite it being reported that majority of these hernias were direct [22], a recent review showed that indirect hernias more frequently contain bladder, a finding which is consistent with our series [20]. There have been twelve cases of inguinal hernias containing bladder diverticule in the literature up to date [20]. We had one patient with incarcerated diverticule in an indirect hernia and this case was treated by excision. Iatrogenic bladder injury occurred in two patients (28.6%) in this series. They both had incarcerated bladders contained in indirect hernia sacs, one of which was a recurrent hernia.

## Conclusions

Although rare, a groin hernia sac may contain vermiform appendix and exceptionally acute appendicitis. Diagnosis can only be made during the operation. Treatment involves appendectomy, irrigation and cleansing of the sac, preventing the spread of the inflammation to the peritoneal cavity and avoiding hernia repairs with prosthetic material implantation.

Tubal and ovarian herniation in inguinal hernias can be found in adult and perimenopausal women with an incidence as high as in children. Underlying genital tract anomalies are not so common and every effort should be made to preserve adnexa in children and women of reproductive age, provided that the hernia content is viable.

Urinary bladder hernia occurs with a similar incidence of tuba-ovarian hernia; however, it requires special attention because of a high risk of iatrogenic bladder injury during the inguinal dissection.

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