Incidence of sliding ovary and fallopian tube in congenital inguinal hernia among female children

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Introduction
Indirect inguinal hernia has incidence of 0.8–4.4%. In female children, the hernia sac contains an ovary in approximately 20–25% of cases, and some also contain a fallopian tube. Different forms of injury to ovaries and fallopian tubes were reported in female children who had herniotomy.
Patients and methods
Prospective study to evaluate incidence and surgical importance of sliding ovary and fallopian tube in congenital inguinal hernia in female children at Menoufia university hospitals between March 2012 and August 2015 included 118 female children with 31 cases with bilateral hernia with total of 149 hernias.
Results
Hernias were bilateral in 31 (26.2%) children, 52 hernias were on the right side (44.1%), and 35(29.7%) were on the left. 18 cases (15.2%) presented with irreducible hernia; 15 of them were sliding hernia and the other 3 reduced spontaneously with induction of anesthesia. Overall sliding hernias with ovary and or fallopian tube were 52 of the 149 hernias (34.8%).
Conclusion
Sliding ovary and fallopian tube is not uncommon finding and it is found in nearly one third of congenital inguinal hernia in female children, so from a clinical point of view, it is of utmost importance to keep in mind this fact while dealing with hernia sac. Hernia sac should be opened in all cases to exclude the presence of sliding ovary and tube; and if present the sliding ovary and tube should be carefully dissected and reduced before ligation of the sac in order to avoid their injuries.

Keywords:
fallopian tube, hernia, ovary, sliding

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Introduction

Indirect inguinal hernia is one of the most common surgical problems in children with a reported incidence of 0.8–4.4% [1]. In female children, the hernia sac contains an ovary in ~20–35% of the cases, and some also contain a fallopian tube [2]. However, only a few cases contain the uterus and both ovaries in the hernia sac [3–5]. In the female fetus, the peritoneum herniates into the canal of Nuck during the descent of the round ligament of the uterus; this path should be obliterated at birth as its persistence and patency after birth results in indirect inguinal hernia in female children [6]. Unfortunately, hernia repair in female children is often carried out with less care than in male children because of the absence of spermatic cord and its contents in the female inguinal canal. However, some previous studies [7,8] have reported incidences of different forms of injury to ovaries and fallopian tubes in female children who underwent herniotomy. The reason for these injuries to the ovaries and tubes is that more than one-fourth of the inguinal hernias in female children are of the sliding type with ovary and fallopian tube as the main contents and herniotomy, without opening the sac, can easily result in injury to these vital female reproductive organs [9,10].

Patients and methods

The aim of this study was to evaluate the incidence and surgical importance of sliding ovary and fallopian tube in congenital inguinal hernia among female children. The study was carried out at Menoufia University Hospitals between March 2012 and August 2015.

The study included 118 female children diagnosed with congenital inguinal hernia; 31 cases had bilateral hernia, with a total of 149 hernias; the age of the children ranged from 4 weeks to 12 years.

Diagnosis was based on the history from children's parents, which was accomplished by clinical exam-

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ination. Patients with sliding hernia (where the contents of the hernia constitute part of the wall of the hernial sac) were suspected clinically by partial reduction of the hernia. All patients underwent abdominopelvic and groin ultrasound for confirmation of clinical diagnosis, especially in cases with suspected sliding ovary and fallopian tube, and to rule out hernia on the other side.

All patients underwent routine laboratory tests such as complete blood count, bleeding time, and clotting time.

General anesthesia was induced through face/laryngeal mask or the endotracheal tube. The inguinal canal was accessed through a groin-crease incision placed just above and lateral to the pubic tubercle. Inguinal canal was not opened in children below 2 years of age. After delivering the hernia sacs into the wound, dissection of the sac was carried out from the round ligament. Opening of the sac was performed in all cases to assess the presence of sliding ovaries and fallopian tubes. Thereafter the contents were inspected and the findings documented. If there were sliding ovary and/or tubes, they were carefully dissected from the wall of the sac and gently reduced to the pelvis, and the herniotomy was then completed. In case of difficulty in dissecting the ovary from the wall of the hernia, a U-shaped incision including the sliding part of the wall of the hernia that was reduced to the abdomen and a purse string suture were applied at the neck of the hernia sacs and tied under direct vision, following which the sacs were invaginated into the pelvis and the inguinal canal was obliterated by running sutures to decrease the incidence of hernia recurrence; then the wound was closed in layers.

Follow-up period ranged from 6 months to 2 years after operation for the assessment of recurrence.

Ethics statement

Before the inclusion of the children in the study an ethical clearance was sought from the competent authority of Menoufia University Hospitals. Written informed consent was obtained from the children's relatives for publication of this research and any accompanying images.

Statistical analysis

The data obtained were analyzed using SPSS (Statistical Package for Social Science), version 17.0, on an IBM compatible computer (Chicago, Illinois, USA), and presented as count, frequency, percentage, and mean±SD.

Results

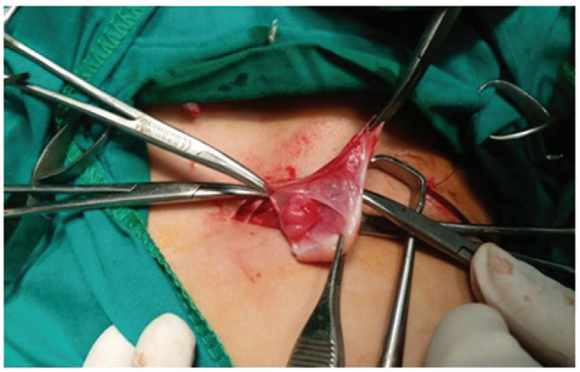
The present study included 118 female children aged between 4 weeks and 12 years (mean=4±2.4 years) who were diagnosed with 149 inguinal hernias (31 case had bilateral hernia) and were treated with hernia repair at Menoufia University Hospitals between March 2012 and August 2015.

As shown in Table 1, 26.2% hernias were bilateral, as diagnosed in 31 children, 52 hernias were on the right side (44.1%), and 35 (29.7%) were on the left side. Eighteen cases (15.2%) presented with irreducible hernia; 15 of them were sliding hernia and the other three reduced spontaneously with induction of anesthesia. Overall, sliding hernias with ovary and or fallopian tube were 52 of the 149 hernias (34.8%), ovary alone in 20 (13.5%) hernias. The ovary and fallopian tube (Fig. 1) were present in 23 (15.4%) hernias, whereas fallopian tube alone was present in eight hernias (5.2%) and sliding ovary, tube, and paraovarian cyst (Fig. 2) were present in one case (0.7%). Four hernias presented with strangulated ovaries, for which the following measures were taken: detorsion of the ovary, and introduction of hot fomites over the ovary, followed by a wait for 10–15 min to see whether the color of the ovary

Table 1

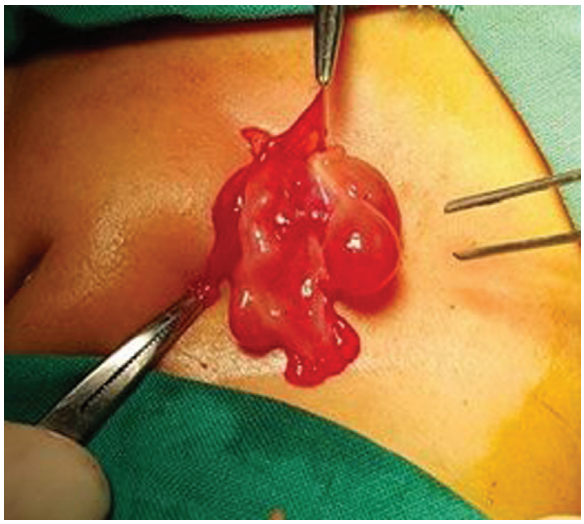
Hernia	Number	Percentage
Bilateral	31	26.2%
Right	52	44.1%
Left	35	29.7%
Irreducible	18	15.2%
Strangulation	4	2.6%
Sliding hernia	52	34.8%
Sliding ovary	20	13.5%
Sliding ovary and tube	23	15.4%
Sliding ovary, tube and paraovarian cyst	1	0.7%
Sliding fallopian tube	8	5.2%

Figure 1



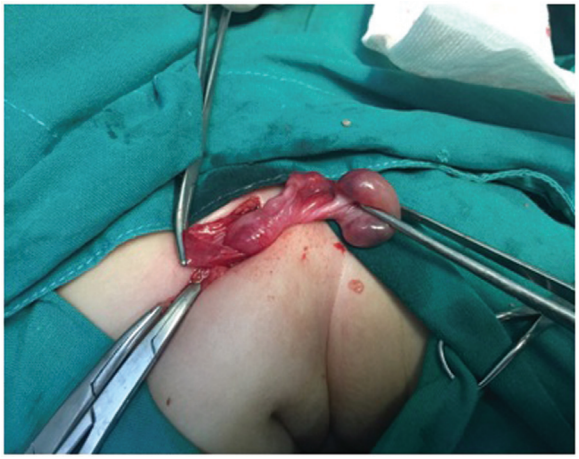
Hernia with sliding ovary and tube.

Figure 2



Opening the hernia sac, sliding ovary, fallopian tube, and paraovarian cyst.

Figure 3



Strangulated ovary that improved and then reduced to the abdomen.

improved or not; if improved, it was preserved, but if not, we made an incision in the ovarian tissue to assess for bleeding, but if no bleeding occurred and necrotic tissue was revealed, gangrenous ovary was verified and oophorectomy was carried out. Two patients with strangulated ovaries improved after the previous measures and reduced to the pelvis (Fig. 3), whereas the other two cases had to undergo oophorectomy due to gangrenous ovary (Fig. 4).

In all cases with sliding ovaries and fallopian tubes, the ovaries and tubes were carefully dissected with combining sharp and blunt dissection and returned to the pelvis. Difficulty in dissecting the ovary from the wall of the hernia was encountered in five cases. A U-shaped incision including the sliding part of the wall of the hernia that was reduced to the pelvis and a purse

Figure 4

Case with strangulated gangrenous ovary that underwent oophorectomy.

string suture were applied at the neck of the hernia sacs and tied under direct vision, following which the sacs were reduced to the pelvis. The postoperative course was uneventful for all children and they were discharged within 24 h of surgery. Follow-up ranged from 6 months to 2 years (mean=12±5.2 months), with no recurrence and no complaints reported from the patients' relatives.

Discussion

The diagnosis of congenital inguinal hernia in children, especially when containing an ovary in female infants, is usually based on the history taking and physical examination [11]. However, when the diagnosis of inguinal hernia is unclear, further diagnostic evaluation is necessary. Because ultrasonography is a relatively straightforward and accessible diagnostic procedure, it is advised to be performed in all cases, especially when an atypical inguinal hernia is suspected in a female child, because unexpected reproductive structures that require prompt surgical intervention may be involved [12].

In general, the standard goal of the repair of congenital inguinal hernias in children is definitive closure of the patent processus vaginalis. However, in female children, ovaries and fallopian tubes are occasionally found as sliding hernias, where they form part of the wall of the hernia sac [8], and injury to the fallopian tube with tubal occlusion has been reported after inguinal hernia repair in female children [13].

The mechanism responsible for the development of inguinal hernias with sliding ovary and tube is regarded as being homologous to the normal descent of the testis in male children [14]. During the development of male fetuses, each testis is anchored to the groin by a well-developed gubernaculum, whereas in female fetuses the gubernacula is attached to the uterus [15].

The caudal part of the gubernaculum in females forms the round ligament, which extends from the uterus through the inguinal canal and to the labia majora, and the cranial part forms the ovarian suspensory ligament. The processus vaginalis descends into the labia majora with the round ligament [14,16].

Associated injury to fallopian tubes and ovaries during herniotomy in young girls is alarming. This has been attributed to the high number of female sliding hernias with vital reproductive organs, particularly ovary and fallopian tube, and in some reports the uterus may be involved in the hernia [5,9]. In this study of the 149 hernias, whose contents were inspected, 52 (34.8%) hernias were found to contain sliding ovary and fallopian tube in different combinations, including one case with paraovarian cyst; therefore, nearly one-third of the hernias contained sliding female reproductive organs, and therefore it was mandatory to open the sac in all cases as some surgeons tend to twist the sac with ligation without opening the sac with the possibility of injuring the ovary or the tube, which results in tubal ligation – as reported in some studies [7]. Osifo and Ovueni [6] reported in their study that, out of 176 hernias, 145 (82.4%) were found to contain ovary and fallopian tube, which is a very high percentage in comparison with that obtained in the present study.

The ovaries and the fallopian tubes are thought to be at an increased risk for injury by unwary surgeons during inguinal hernia repair in female children – at a higher risk than what is expected. Damage to female reproductive structures during herniotomy is an unusual cause of infertility, and there have been only a few case reports in the literature on this [8]. Damage to female reproduction organs during herniotomy is rare, but its actual incidence may be underestimated, and, also, cases of unilateral fallopian tube damage may be underreported, because some of the women may have normal fertility [17].

In this study, four cases presented with strangulated ovaries: two of them were rescued, but the remaining two were resected due to irreversible gangrene. Therefore, surgery should not be delayed and carried out as soon as possible as an elective case under the best circumstances.

Conclusion

The presence of sliding ovary and fallopian tubes is not an uncommon finding: it is found in nearly one-third of congenital inguinal hernia in female children. Therefore, from a clinical point of view, it is of utmost importance to keep this fact in mind while dealing with the hernia sac. Ligation of the sac without opening should be avoided. The hernia sac should be opened in all cases to exclude the presence of sliding ovary and tube, and if present, the sliding ovary and tube should be carefully dissected and reduced to peritoneal cavity before ligation of the sac to avoid their injuries. In addition, it is recommended that surgery should not be delayed to avoid strangulation of the ovary.

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Conflicts of interest

There are no conflicts of interest.

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