

# Inguinolabial hernia containing ovary, fallopian tube and uterus in female children

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## Abstract

**Background:** Inguinolabial hernia is a common cause of groin swelling in young female children. This study aimed to describe the sonographic appearance and frequency of inguinolabial hernia containing ovary, fallopian tube, and uterus in female children.

**Methods:** Using a radiology search engine, all female children less than 2 years of age who underwent sonography for groin swelling over a 7-year period were retrospectively reviewed.

**Results:** Of 38 patients (mean age 9.2 months) with groin swelling, 31 (82%, mean age 1.9 months) had an inguinal hernia while 7 (18%, mean age 16.5 months) had other etiologies. The hernia sac contained ovary and/or fallopian tube in 26/31 patients (84%), 9 of whom also had the uterus in the sac. Four cases had a male gonad; these were later proven to have androgen insensitivity syndrome (AIS). The bowel was present in only one case. Other etiologies were abscess (n=1), lymphadenitis (n=3), and hydrocele of Canal of Nuck (n=3). Correct sonographic diagnosis was made prospectively in 36/38 cases and retrospectively in 2 cases. All inguinal hernias were successfully treated.

**Conclusions:** Ovary, fallopian tube, and uterus were the most common contents of the hernia sac, with bowel rarely present. Sonography accurately depicted reproductive organs in the hernia and also helped to exclude other causes of inguinolabial swelling.

**Citation:** Bandarkar AN, Adeyiga AO, Reynolds D, Cielma T, Safdar N, Shalaby-Rana E (2017) Inguinolabial hernia containing ovary, fallopian tube and uterus in female children. *Adv Pediatr Res* 4:3. doi:10.12715/apr.2017.4.3

**Received:** October 31, 2016; **Accepted:** February 4, 2017; **Published:** March 1, 2017

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**Competing interests:** The authors have declared that no competing interests exist.

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## Introduction

Inguinal hernias are found commonly in infancy and childhood. Boys are more often affected than girls. In a study of premature infants born before 36 weeks of gestation, the incidence of inguinal hernia was noted to be as high as 30% [1]. According to another study involving female children, inguinal hernia was found in the first 3 months of life in 43% of patients [2]. The occurrence of an inguinal hernia containing reproductive organs in young females is usually due to an incomplete closure of the processus vaginalis of

the peritoneum. In female patients, the incidence of hernia sac containing ovary and fallopian tube has been reported to range from 2.9% in one series [3] to 15–20% in another [2,4]. However, a hernia-containing uterus along with ovary and fallopian tube is rare and has been reported only a handful of times [5].

## Materials and Methods

This study was approved by the Institutional Review Board of our institution. Using a radiology search engine, all female children less than 2 years of age who underwent sonography for groin swelling between September 2005 and May 2012 were retrospectively reviewed. There were 38 cases identified. The clinical presentations, sonographic features, and intraoperative findings were recorded. All sonographic exams were performed with a 5 to 9-MHz curved and linear transducer. Ultrasound scans included grayscale images of both inguinal areas in transverse and longitudinal planes. Color Doppler evaluation and cine sweeps were recorded in some patients to document real-time color flow and reducibility of the hernia contents. The clinical presentation and sonographic features – including location and size of the hernia, its contents, and vascularity – were recorded. Findings were correlated with surgical and clinical outcomes.

## Results

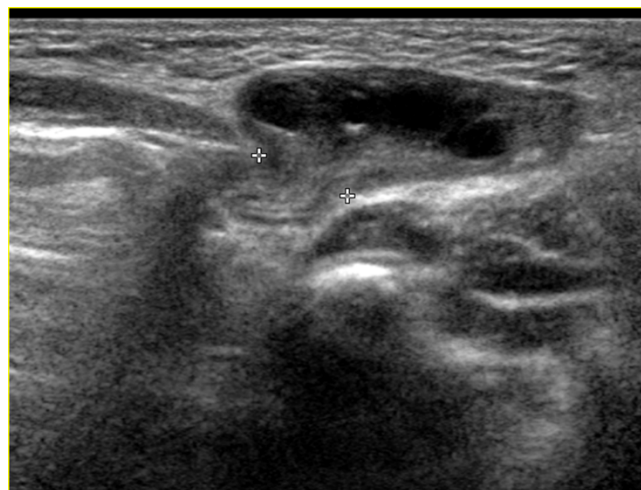
Of 38 patients who received a sonogram for groin swelling, 31/38 (82%) cases had an inguinal hernia while 7/38 (18%) cases had other etiologies. The mean age of patients with inguinal hernia was 1.9 months (range 7 days–5 months) including 13 premature infants (42%), while the mean age in the non-hernia group was 16.5 months (range 5–24 months). The hernia sac contained ovary and/or fallopian tube in 26/31 (84%) cases, 9 of whom also had the uterus in the sac (9/26, 35% cases). All of the patients had swelling of either the right inguinal region (n=10), left inguinal region (n=13), or both (n=3). In 4/31 (13%) cases, the male gonad (either atrophic testis or ovotestis) was present; these were later proven to have androgen insensitivity syndrome (AIS). Bowel was present in only 1/31 (3%) cases. The etiologies in the non-hernia group of 7/38 patients were abscess (n=1), lymphadenitis /cellulitis (n=3) and hydrocele of canal of Nuck (n=3).

All 26 cases of inguinolabial hernia containing female reproductive organs, including the 13 premature infants, were surgically corrected. Of the 13 premature cases, 7 (54%) cases had uterus as contents in addition to the ovary. In the premature group, 11/13 (85%) had elective surgery and 2/13 (15%) underwent emergent repair. These 2 cases presented

with incarcerated hernia and received emergent repair within 6 hours of imaging diagnosis. For the 11 cases who received elective surgery, the average time to surgery was 86 days, with the exception of one case that was repaired electively after 3 years, since the follow-up of the family was lost in the interim.

Of the entire group of 26 cases of hernia, 20/26 (77%) cases received elective surgery with an average time to surgery of 65 days, while 6/26 (23%) cases presented with incarcerated hernia and received emergent surgery with an average time to surgery of 6.3 hours after the imaging diagnosis was made.

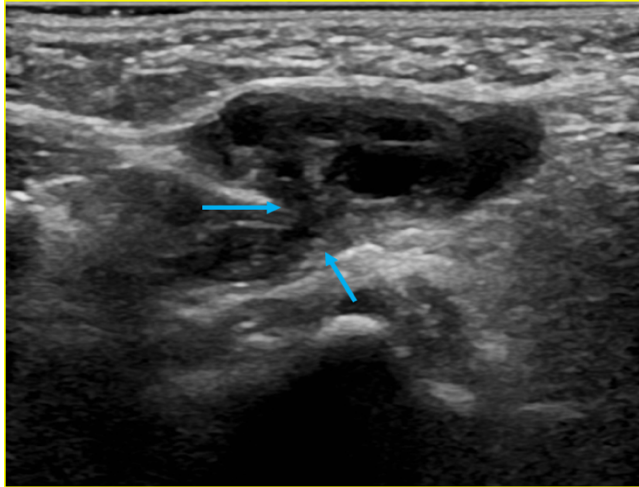
In patients with inguinal hernia, the ovary was seen as an oval hypoechoic structure herniating through the deep ring (between cursors) in the right inguinal region. The discrete, small, round cystic areas within represent ovarian follicles (Fig. 1, 2, 3).



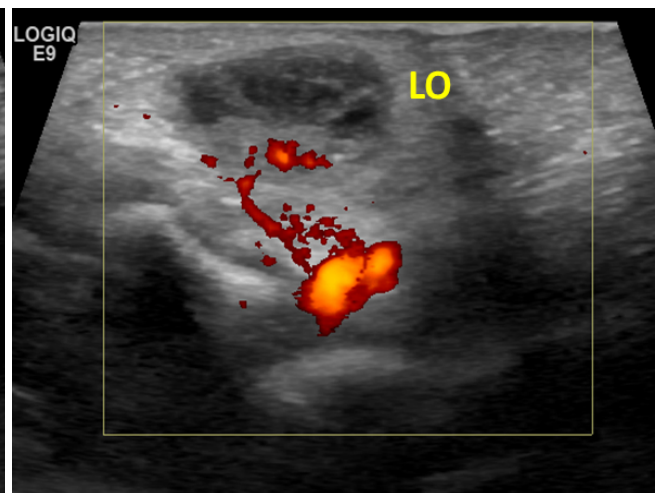
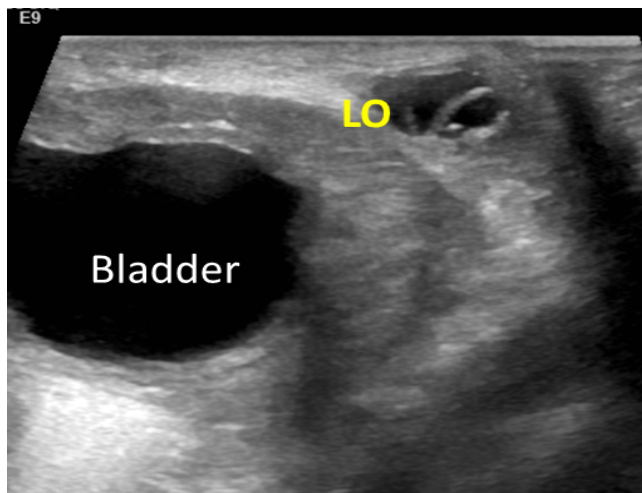
**Figure 1.** Hernia-containing ovary in a 1-month-old girl with right inguinal bulge. The right ovary is seen as an oval hypoechoic structure herniating through the deep ring (between cursors) in the right inguinal region. The discrete, small, round cystic areas within represent ovarian follicles.

When present, the uterus was identified as a tubular, predominantly hypoechoic structure with central linear hyperechoic endometrial canal echo (Fig. 4, 5, 6). Correct sonographic diagnosis was made prospectively in 36/38 cases. The missed findings were identified retrospectively in 2 cases, where the herniated ovary had been initially interpreted as bowel.

We encountered 6 cases (23%) of incarceration in our series. Vascular compromise of the ovary was present in 1 case (Fig. 7) and prospectively identified by color Doppler exam.

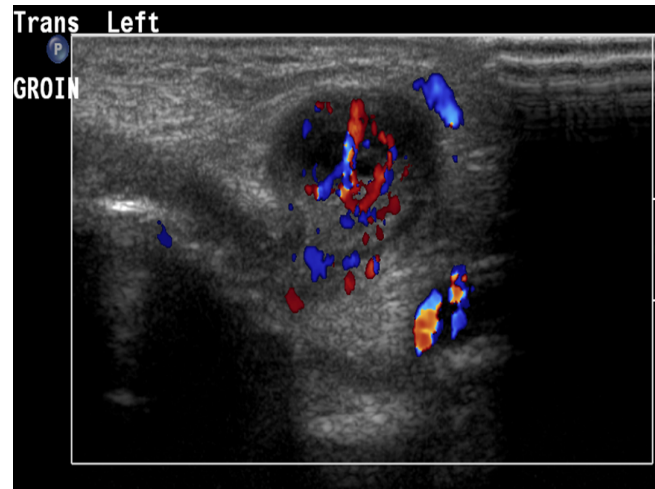


**Figure 2.** Hernia-containing ovary in a 2-month-old girl with palpable left groin mass. A left inguinal hernia containing the left ovary is easily identified (with the deep ring between blue arrows).



**Figure 4.** Hernia-containing ovary in a 21-day-old girl with incarcerated left inguinal hernia. Left ovary in left inguinal hernia does not show intrinsic vascularity, concerning for ischemia. This was corrected promptly.

In this case, there was mild ischemia of the ovary during surgery, but the gonad was viable and hence returned to the abdominal cavity. A 4-week follow up Doppler ultrasound exam showed normal grayscale appearance of the involved ovary with preserved vascularity. In the remaining 5 cases of incarcerated hernia, the decision to perform emergent repair was



**Figure 3.** Hernia-containing ovary in a 19-day-old baby girl with palpable left labial bump. Left ovary seen in left inguinolabial hernia. Color Doppler image shows preserved vascularity.

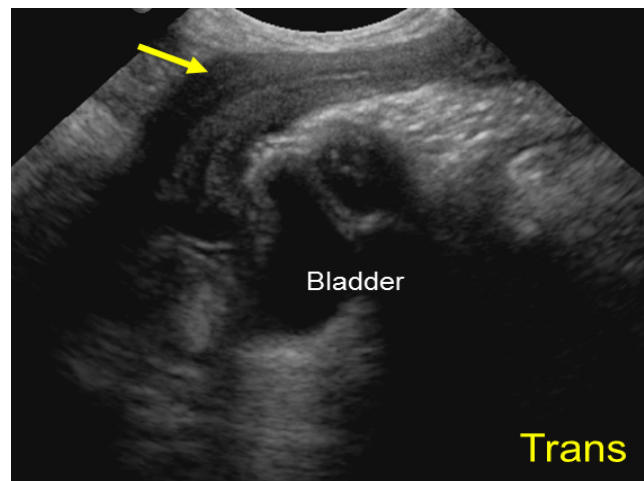
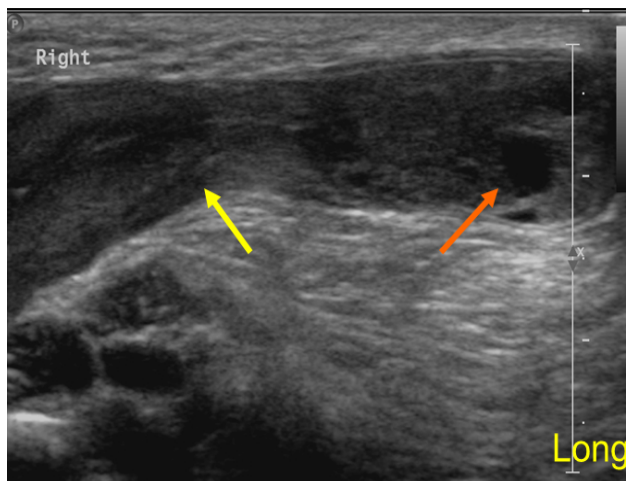
based on the clinical findings of incarceration. Color Doppler evaluation was not performed, thus limiting the ability to comment upon vascular compromise.

All of the inguinal hernia cases were successfully treated with favorable outcomes. Surgical repair is considered as the definitive treatment for inguinal hernias to correct the defect and prevent harm to the

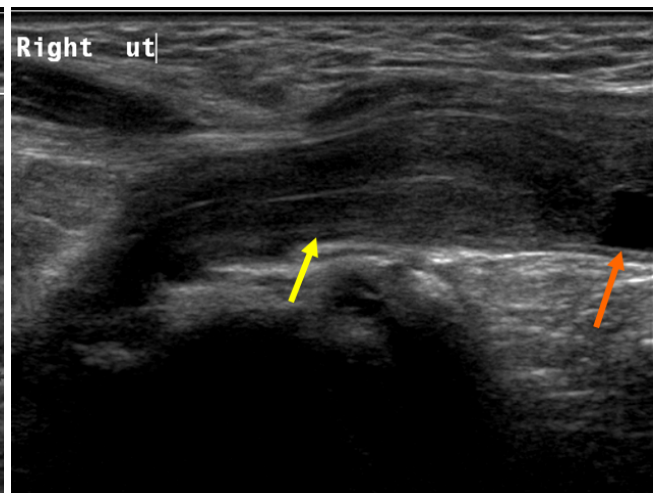
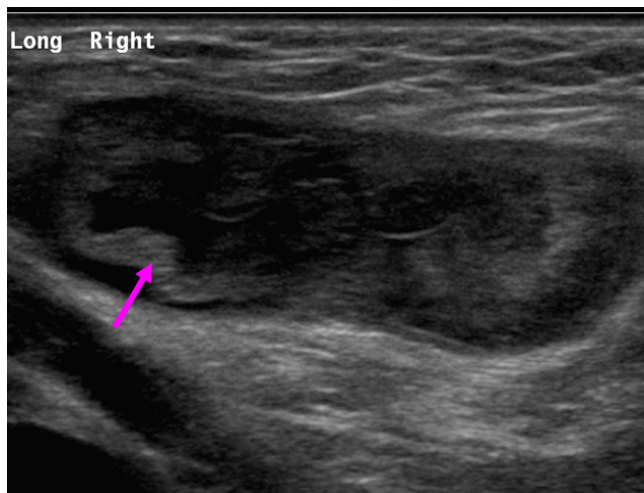


contents. In premature infants with reducible hernia, surgery was delayed in order to minimize

complications.



**Figure 5.** Hernia-containing uterus and ovary in a 3-month-old ex 24 week premature infant. Uterus (yellow arrow) seen within the right inguinolabial hernia along with the right ovary (orange arrow), which has intrinsic follicles.



**Figure 6.** Hernia-containing uterus, ovary and fallopian tube in a 3-month-old ex 29 week premature infant with incarcerated right inguinal hernia. Uterus (yellow arrow), seen as a tubular hypoechoic structure with central linear hyperechoic endometrium, is present in the right inguinal hernia sac adjacent to the right ovary (orange arrow) and fallopian tube (pink arrow), seen as a tubular wavy structure.

8/26 (31%) cases presented with unilateral hernia but due to physical exam findings that raised suspicions of possible hernia on the contralateral side, they were explored on the contralateral side and fixed during the same operation, thus receiving bilateral hernia repair. 3/26 (12%) cases presented with bilateral hernia and were fixed bilaterally. 6/26 (23%) cases with unilateral hernia had the contralateral side explored and no hernia was found. The remaining 9/26 (34%)

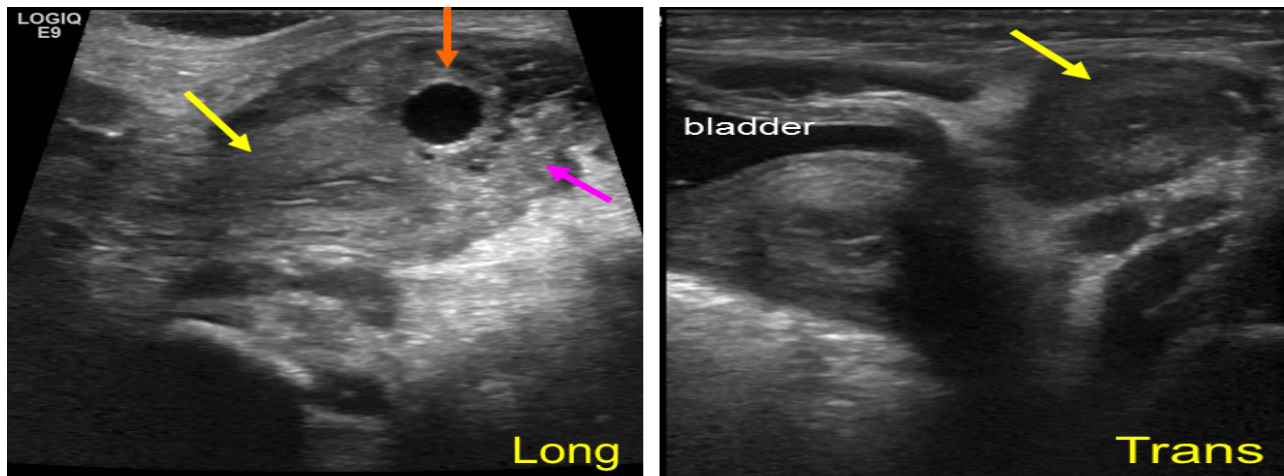
cases did not receive contralateral exploration due to lack of consensus opinion on this subject.

## Discussion

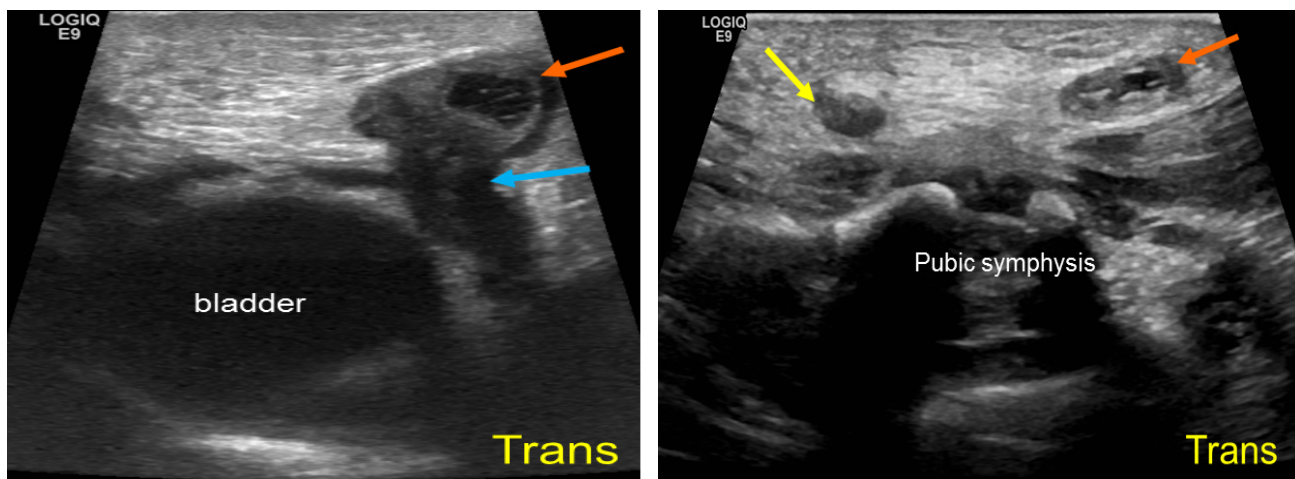
In our study, the hernia sac contained reproductive organs in 82% of cases, which is much higher than what previous reports have described. Only one other large series reported a similarly high incidence [6]. There were no femoral hernia cases. All cases were

indirect inguinal hernia with variable extension of contents into the labia majora, often presenting as

labial swelling or mass, hence the term “inguinolabial hernia” is preferred.



**Figure 7.** Hernia-containing uterus, ovary, and fallopian tube in a 1-month-old with left groin swelling. Left inguinal hernia containing uterus (yellow arrow), left ovary (orange arrow), and fallopian tube (pink arrow) is visualized.



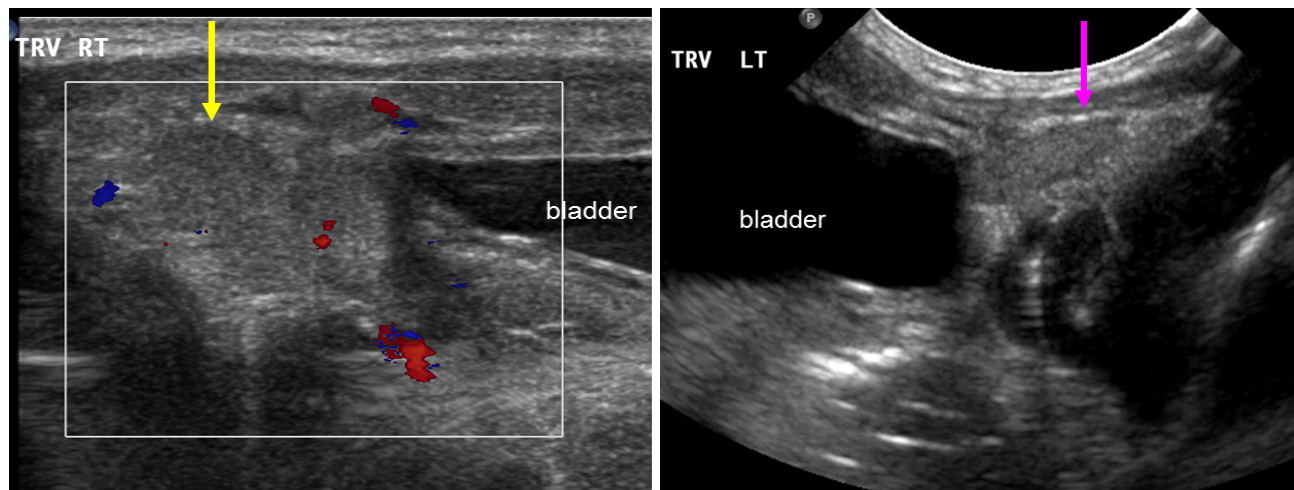
**Figure 8.** Bilateral inguinal hernia in a 2-month-old with bilateral groin swelling. Left inguinal hernia containing left ovary (orange arrow), left-sided hernia defect (blue arrow), and empty right inguinal hernia sac (yellow arrow) are visualized.

In order to fully understand the embryologic basis of inguinal hernia in a female child, two anatomic concepts – namely, gubernaculum testis and processus vaginalis – must be reviewed. Gubernaculum testis is a cord of fibrous and muscular tissue that attaches inferiorly to the skin of the groin and superiorly to the gonad [7]. In males, the gubernaculum helps in testicular descent into the scrotum. In females, the gubernaculum has three

attachments: it attaches midway, to the uterus; superiorly, to the lower pole of ovary (by forming ovarian ligament); and inferiorly, to the labium majus in the groin [4]. Processus vaginalis is a tubular fold of peritoneum that forms by 6 months of gestation and invaginates into the inguinal canal. It starts obliterating by 8 months gestation or just before birth [7]. If it remains patent after birth, it is called the canal of Nuck. In premature infants, the processus vaginalis is open after birth and hence peritoneal

contents can easily herniate into the sac. Thus, inguinal hernia is more likely to occur in a premature

infant.



**Figure 9.** Newborn with 46XY chromosomes and female genitalia. Homogeneous ovoid masses in bilateral inguinal canals represented dysgenetic gonads (right gonad - yellow arrow, left gonad – pink arrow) that were found intraoperatively. Ovaries were not identified. This was a case of gonadal dysgenesis from androgen insensitivity.

The clinical presentation was strikingly similar in girls with a palpable mass over the inguinal region or adjacent labium majus. The palpable mass may be appreciated intermittently in some cases due to reducibility of the hernia contents. The reason for ovary being the most common content of the hernia sac in female infants is not entirely clear. Close proximity of the neonatal ovary to the anterior abdominal wall and its superficial location in the pelvis could partially explain this. In our experience, once the ovary enters the patent processus, it often orients itself horizontally and perpendicular to the long axis of the inguinal canal, thus increasing its chances of irreducibility and incarceration. Incarceration of the ovary has been reported in up to 43% of cases [8]. In our practice, we treat a herniated ovary as an urgent surgical problem.

The herniated ovary appeared as a hypoechoic oval structure and the presence of a follicle was key in diagnosing ovarian origin. Color Doppler exam was used to show internal vascularity (Fig. 3). The uterus was identified as a hypoechoic tubular structure with central linear hyperechoic echo representing the endometrial canal. It is postulated that once the ovary herniates through the patent processus vaginalis, any

increase in intra-abdominal pressure – such as during crying, defecating or fussing – could lead the uterus to proceed along the same path of least resistance. To our knowledge, our study has the highest number of cases of inguinolabial hernia containing uterus. Bilateral inguinal hernia (Fig. 8) was less frequent. Various differential diagnoses for inguinal hernia have been described in the literature. It is important to remember that inguinal hernia is a well-known presentation of complete androgen insensitivity syndrome [9] (Fig. 9). A hydrocele of the canal of Nuck was seen as a thin-walled oblong cyst in the inguinal canal without internal echoes (Fig. 10). Clinically, it manifests as a painless swelling in the inguinal canal and labium majus [10]. Occasionally, a frank abscess pocket was found in the inguinal swelling (Fig. 11).

Inguinal lymphadenitis and cellulitis can be coexistent. In our study, we found one case of bowel herniation (Fig. 12) where the presence of bowel was easy to appreciate due to the gut signature of hernia contents.

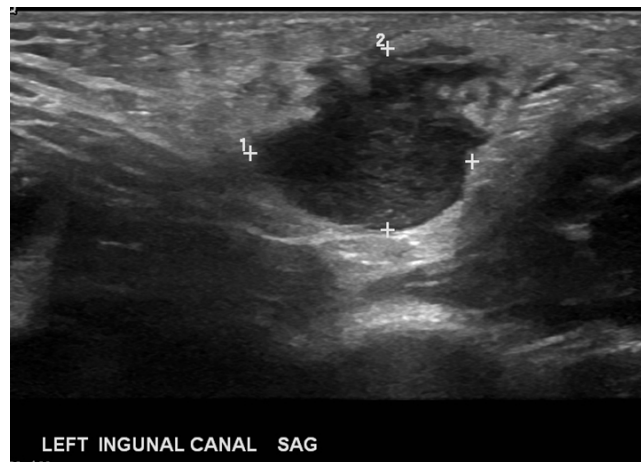
## Conclusions



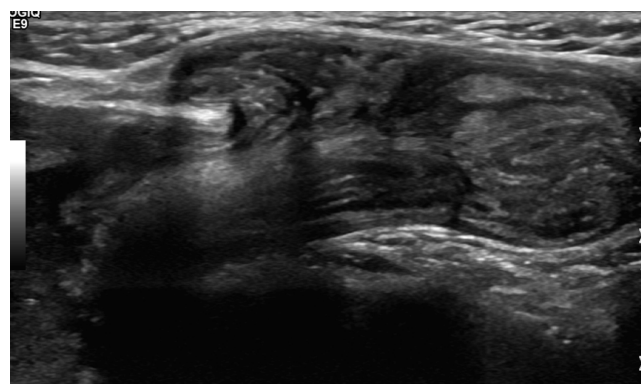
Inguinolabial hernia was the most common cause of groin swelling in young female children, with premature infants comprising one-third of the study group. Ovary and/or fallopian tube and sometimes uterus were the most common contents of hernia sac, with bowel rarely found. Infrequently, testis was present, a clue to the diagnosis of androgen insensitivity syndrome. Sonography easily and accurately depicted the type of gonad in the hernia. Moreover, its dynamic nature helped to assess the reducibility of the hernia. Color Doppler imaging of herniated ovary added valuable information such as the possibility of vascular compromise. Sonography also helped to exclude other causes of inguinal swelling such as hydrocele of canal of Nuck, lymphadenitis, and abscess. Thus, sonography is the imaging modality of choice in the diagnostic and preoperative workup of female infants with groin swelling.



**Figure 10.** Hydrocele of canal of Nuck. 19-month-old girl with intermittent right groin swelling. Well-defined anechoic fluid collection (yellow arrow) in right inguinal canal, without any solid contents, most consistent with hydrocele of canal of Nuck.



**Figure 11.** Inguinal abscess. 15-month-old with left groin swelling. Irregular fluid collection with internal debris in left inguinal canal, most consistent with an abscess. Overlying cellulitis was present.



**Figure 12.** Hernia-containing bowel. 15-month-old with right groin swelling. Right inguinal hernia containing bowel and omentum is seen.

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