care
education
research

KK Women's and Children's Hospital
SingHealth

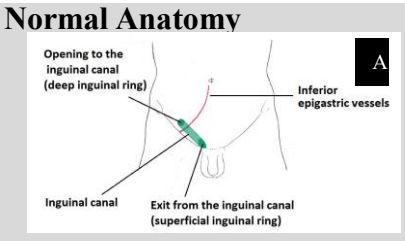
Ultrasound of the Inguinal Canal in Children: A Pictorial Essay

Eu-Leong Harvey Teo
Department of Diagnostic Imaging and Intervention

Introduction

The inguinal canal is a passage that extends inferiorly and medially through the inferior part of the abdominal wall through which passes the spermatic cord in males and the round ligament in females. The processus vaginalis is a tubular outpouching of the peritoneum that penetrates the inguinal canal during fetal development and follows the downward descent of the testis from the abdomen to the scrotum. It usually closes by 2 months of age. A patent processus vaginalis (PPV) results in an abnormal communication between the peritoneal cavity and the scrotum in males, and the labia majora in females. This poster will focus on the complications that may occur as a result of a PPV within the inguinal canal such as indirect inguinal hernias containing incarcerated bowel, ovary, uterus, appendix, as well as other complications such as cryptorchidism, hydrocoeles-communicating and non-communicating, scrotal calcifications and air due to meconium peritonitis and pneumoperitoneum respectively. In females the abnormal PPV is known as the canal of Nuck.

Normal Anatomy



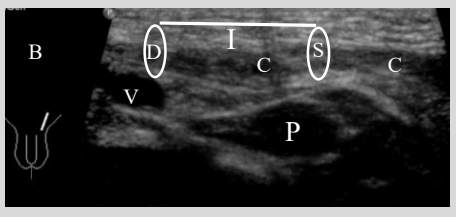
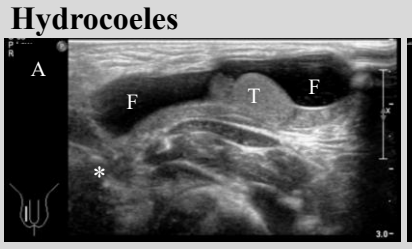
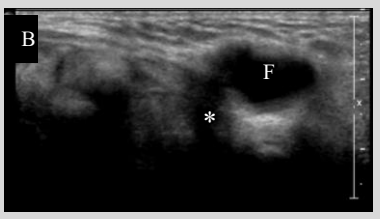


Fig A: The inguinal canal is a short passage that extends inferiorly and medially through the inferior part of the abdominal wall. Its opening is at the deep inguinal ring and its exit is at the superficial inguinal ring. The canal is a pathway through which structures can pass from the abdomen to the external genitalia. (Figure from http://teachmeanatomy.info/abdomen/areas/inguinal-canal). **Fig B:** Oblique longitudinal US of the inguinal canal (I) situated between the deep inguinal ring (D), located lateral to the inferior epigastric vessels (v), and the superficial inguinal ring (S) located just lateral to the pubic tubercle (P). C=spermatic cord

Hydrocoeles





A hydrocoele is an accumulation of fluid inside the patent processus vaginalis and can occur in both males and females.

Fig A: 1-yr boy. Longitudinal (LS) US image shows an inguino-scrotal hydrocoele with fluid (F) surrounding the testis (T) and patent throughout the length of the inguinal canal. The fluid does not communicate with the peritoneal cavity (*). **Fig B:** 1-yr girl. LS US of the canal of Nuck shows encysted fluid in the canal.

Processus Vaginalis

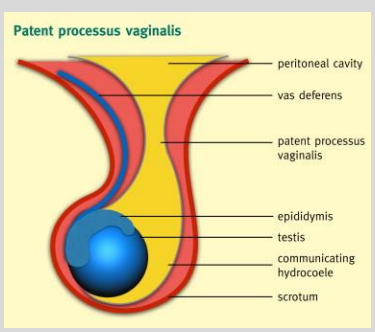


Fig PPV: The patent processus vaginalis is a tubular outpouching of the peritoneum penetrating the inguinal canal into the scrotum in males or labia majora in females. (https://www.sciencedirect.com/science/article/pii/S0263931915000460)

Inguinal Hernia: Bowel I

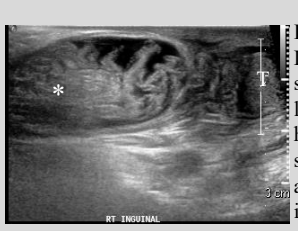
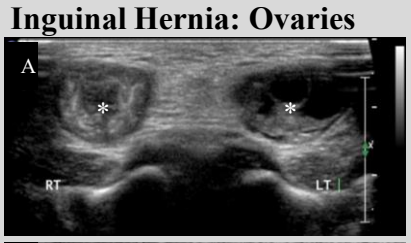


Fig. Bowel I: 5-yr boy. Longitudinal US image shows an incarcerated loop of bowel (*) herniating into the scrotum. The testis (T) is also seen on the image inferior to the hernia.

Inguinal Hernia: Bowel II

Fig. Bowel II: 1-yr boy. Oblique US image of the right inguinal region shows an incarcerated loops of bowel (*) herniating through the deep inguinal ring (between cursors ++). The patient had intestinal obstruction and underwent emergency surgery.

Inguinal Hernia: Ovaries



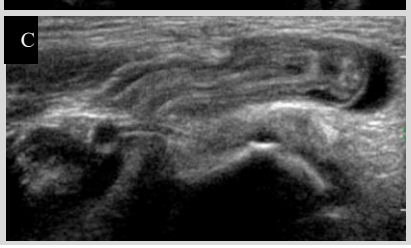


Fig A: 2-mth-girl presented with bilateral inguinal swelling. Transverse US image shows soft tissue lesions (*) in the Canals of Nuck bilaterally. (B) The left sided lesion is ovoid with a few follicles within it consistent with an ovary. (C) The right inguinal lesion appears tubular and a round ligament or fallopian tube were suggested possibilities on the US. A round ligament was confirmed in the right inguinal canal and the left ovary was seen in the left canal at surgery. The patient underwent bilateral herniotomies.

Inguinal Hernia: Uterus

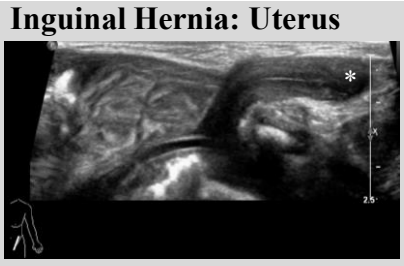


Fig: 2-mth girl presented with left inguinal swelling. Oblique US image of the left inguinal region shows the uterus (*) herniating into the left inguinal canal.

Inguinal Hernia: Appendix

Fig: 2-mth ex-premature male baby. An upper GI study and follow-through was performed to evaluate for intestinal obstruction shows the presence of the appendix herniating into the right inguinal region (arrow). The patient did not undergo surgery.

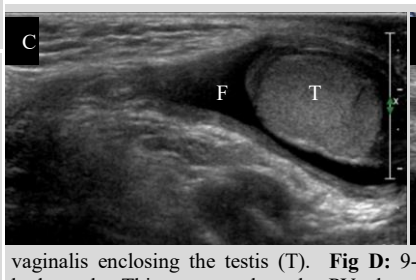


Fig C: 8-yr old boy with a non-communicating hydrocoele. This occurs when the PV closes but some fluid (F) is trapped between the layers of the tunica vaginalis enclosing the testis (T). **Fig D:** 9-yr old boy with an encysted hydrocoele or a spermatic cord hydrocoele. This occurs when the PV closes resulting in fluid trapped alongside the spermatic cord but separated from the peritoneal cavity and the testis (T). The fluid (F) contains some septations in this example.

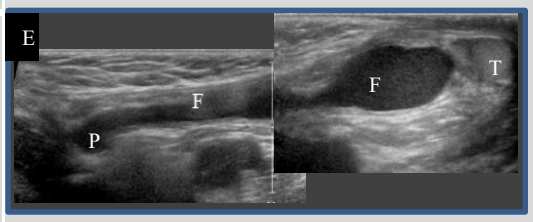


Fig E: Funicular hydrocoele in a 5-yr old boy. The patient presented with a left inguinal swelling. US shows the presence of fluid (F) in the inguinal canal communicating with the peritoneal cavity (P) through the deep inguinal ring but does not communicate with the scrotum T= testis. These features are in keeping with a Funicular hydrocoele.

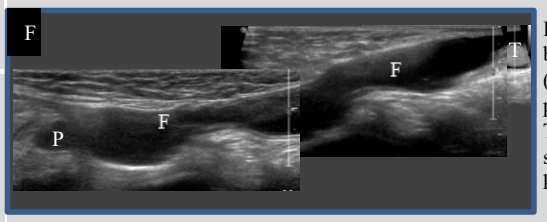


Fig F: Communicating hydrocoele in a 6-yr old boy. US shows the presence of a fluid collection (F) in the inguinal canal communicating with the peritoneal cavity (P) through the deep inguinal ring. The fluid also communicates with the scrotum surrounding the testis (T). These features are in keeping with a communicating hydrocoele.

Pneumoscrotum

The PPV also enables air to move into the scrotum from the peritoneal cavity. This neonate had spontaneous terminal ileum perforation.

Fig A: AXR shows air within the scrotum (*). **Fig B**: Left lateral decubitus AXR shows a large amount of peritoneum over the liver (*).

Scrotal calcification

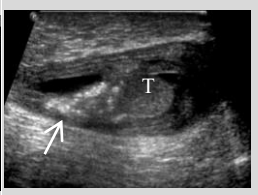
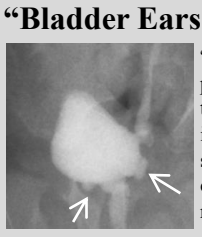


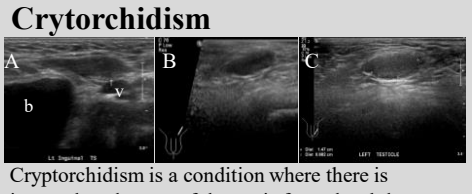
Fig: 2 month old boy with previous history of meconium peritonitis. US scrotum shows the presence of fine stippled calcifications (arrow) situated just above the testis (T).

“Bladder Ears”



“Bladder ears” occur when part of the bladder herniates through the PPV into the inguinal canal. **Fig:** VCUG showing bilateral bladder ears (arrows). VU reflux is noted up the left ureter.

Crytorchidism



Cryptorchidism is a condition where there is incomplete descent of the testis from the abdomen to the scrotum during development. **Fig A**: 2-month old with left undescended testis. The testis (arrows) is within the upper left inguinal canal just adjacent to the bladder (b) and the femoral vein (v). **Fig B and C**: Retractile testis. 6-month old. The left testis was mobile and moved between the inguinal region into the scrotum during the US examination. Note the positions of the transducer as indicated on the body marks.

References

1. Sameshima YT et al. The challenging sonographic inguinal canal evaluation in neonates and children: an update of differential diagnoses. Ped Rad. 2017 Apr;47(4):461-472
2. Lao OB et al. Pediatric inguinal hernias, hydroceles, and undescended testicles. Surg Clin North Am. 2012 Jun;92(3):487-504