Pediatric Inguinal Hernias

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Pediatric Surgery Ground Round
Embryology

- Indirect inguinal hernias are the result of failure of closure of the processus vaginalis.
- Processus vaginalis is an evagination of the peritoneum through the internal ring, first seen during the 3rd month of fetal life.
- The intra-abdominal testis passes through the processus during the 7th to 9th month of gestation.
- The portion of the processus vaginalis lying above the testicle obliterates, closing the internal inguinal ring, while the distal portion persists as the tunica vaginalis.
- Failure to obliterate results in patency of the processus vaginalis and potentially an indirect inguinal hernia or a hydrocele.
- In females, the canal of Nuck corresponds to the processus vaginalis and communicates with the labia majora.
Most Common Variants of Hernias & Hydroceles
Factors Contributing to Development of an Indirect Inguinal Hernia

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Incidence

• Incidence of inguinal hernia in children 0.8-4.4%
• Incidence depends on many factors:
  • Age
  • Sex
  • Side
  • Family history
Incidence

Age:
• Most commonly presents during the first year of life
• Peak incidence during the first few months of life
• 1/3rd of children are younger than 6 months at time of operation.
• Highest incidence found in premature infants, 16-25%
  • Correlates with patency rates of the processus vaginalis
    • 80% patent at birth then decrease dramatically by first 6 months of age.
Incidence

Sex:
• Males more likely to have hernias
• Male-to-female ration between 3:1 and 10:1

Side:
• 60% of inguinal hernias are right sided
• 10% of the time bilateral hernias are present

Family History:
• Around 11.5% of patients have a family history of inguinal hernias
• There is an increased incidence in twins, 10.6% in males and 4.1% in females.
Clinical Features

• History of a intermittent bulge in groin, labia, or scrotum
• More prominent with increased intra-abdominal pressure (ie crying, straining)
• Usually asymptomatic, especially if just intermittently identifiable
• If incarcerated, can have persistent bulge, abdominal distention, vomiting, and obstipation.
  • Most commonly occurs in first 6 months of life
• A strangulated hernia will present with peritonitis.
  • Can occur in as little as 2 hours
Physical Examination

- Patient should be in supine position and undressed.
- First look for inguinal masses or asymmetry in the groins
- Place your finger across top of scrotum to trap the testis in the scrotum, this will allow differentiation of true inguinal bulges from retractile testis.
- Silk glove sign- palpation of spermatic cord, compare thickness to other side.
  - Sensation of rubbing 2 pieces of silk together
- Can have older child stand and perform Valsalva
Imaging Techniques

• Historically, herniography was performed
  • Injected water-soluble contrast into peritoneal cavity via an infraumbilical fluoroscopic-guided injection.
  • Allow gravity to pool contrast into the hernia sac,
  • Images taken 5, 10, and 45 mins later
  • Good at identifying hydroceles, femoral hernia, and contralateral hernia.
  • Drawbacks: not good at detecting incarcerated hernias, radiation exposure, intestinal perforation, and allergic reaction to contrast media
Imaging Techniques

- Ultrasound is most commonly used for diagnosis of inguinal hernias
- Pros: rapid, noninvasive, and complication free
  - Accuracy can be as high as 97% when using 4mm as upper limit of normal diameter of inguinal canal.
- Cons: dependent on experience of technician
Management

• Inguinal hernia will not resolve spontaneously, surgical correction is always indicated

• Perform repairs of young infants quickly to avoid complications.

• Langer and colleagues found that repair undertaken within 2 weeks decreased the rate of incarceration by half when compared with a 30-day wait.
Anesthesia

• Hernias can be repaired under general, regional, or local anesthesia.

• Healthy full term infants and older patients are usually managed with general anesthesia.

• Premature infants (>36 weeks GA or GA plus chronologic age <60 weeks)
  • Regional techniques include spinal, epidural, and caudal anesthesia may be used.
  • Most centers use less than 60 weeks postconceptual age as cutoff for 23 hour admission for close monitoring.
Surgical Technique

• Key principle in inguinal hernia repair in the pediatric population is high ligation of the hernia sac

• Recently more pediatric surgeons are repairing inguinal hernias laparoscopically.

• Only 2 randomized prospective studies comparing the open vs laparoscopic techniques have been done.
  • They found no significant difference in outcomes, recovery, or cosmesis.
Open Techniques
Laparoscopic Technique

• Laparoscopic techniques can broadly be grouped into 2 groups, those that are performed fully intracorporeally and those that have extraperitoneal components.

• Intracorporeal techniques- all suturing and knot tying is done within the abdominal cavity with laparoscopic instruments.

• Extracorporeal techniques- laparoscopic localization with external compression is used to make an incision once the desired spot near the ring is identified.
  • Some surround the sac entirely in the preperitoneal space and others enter the peritoneum adjacent to the vas or vessels for exchange of the suture.
  • With extracorporeal techniques, the suture is tied extracorporeally, with the knot buried in the subcutaneous tissue.
Extracorporeal repair

1. First described by Prasad et al in 2003
2. Stab incision anterolateral to internal ring and pass a curved steel awl threaded with suture until the level of the peritoneum is reached
3. Pass the awl and suture around the lateral half of the internal ring, once half of sac is surrounded, pierce peritoneum with awl and grab suture
4. Reinsert the empty awl and pass around the medial half of the ring
5. Visualize the vas and vessels to ensure they were excluded from repair
6. Pass the end of suture through hole in awl and withdrawl and tie down
Percutaneous Internal Ring Suturing (PIRS)

First described by Patkowski et al in 2006

1. Introduce the suture through the barrel of the hollow-bore needle
2. Maintaining both ends of the preloaded suture extraperitoneally, advance the needle under the peritoneum around lateral half of the internal ring
3. Enter the peritoneum and advance the suture into the abdominal cavity, creating a loop
4. Remove the needle, leaving the loop in place
5. Advance the needle through the same skin puncture site around the medial half of the ring and enter the peritoneum, leaving a small space above the vas deferens and testicular vessels to prevent injury
6. Introduce one end of the suture into the hollow of the needle again and advance the suture into the loop
7. Withdraw the needle
8. Catch the suture end in the loop and withdraw them together
Explore the Contralateral Side?

• In 1955, Rothenburg and Barnet reported that 100% of infants younger than 1 year of age and 68.5% of children older than the age of 1 year had bilateral inguinal hernias.

• For many years it was standard practice for routine exploration of the contralateral hernia, it was reported that they were seeing more patient processus vaginalis and not a hernia.

• Recently more surgeons only explore the other side if there is a clinical indication for investigation.
Explore the Contralateral Side?

• Does age matter?
  • In a large series of 1052 patients followed up to 11 years:
    • Contralateral hernias appeared in 13.1% of boys younger than 1 year of age
    • Contralateral hernias seen in 13.7% younger than 2 years of age.
    • In females contralateral hernias appeared in 9.6% of patients younger than 1 year of age and 13.9% of patients younger than 5 years of age.

• If using Laparoscopy for the repair, it has the advantage of being technically easy and allows direct visualization of the contralateral internal ring.
Postoperative Complications

- Scrotal Swelling
- Iatrogenic Undescended Testicles
- Recurrence
- Injury to the Vas Deferens
- Chronic Pain
Incarcerated Inguinal Hernias

- In children, most incarcerated inguinal hernias will progress to strangulated if not reduced quickly.
- Incidence 12-17%, Boys = girls
- Most likely to occur in 1st year of life
- Premature infants are less likely then full term infants to have an incarceration
Direct Inguinal Hernia

• Once thought to be extremely rare in children.

• Incidence estimated to be 1.2-4%

• If operating and can’t find a hernia sac suspect a direct hernia and there is a fascial defect medial to the inferior epigastric vessels.
Femoral Hernias

• Rare in children
• 2 large studies (Fonkalsrud et al and Burke) reviewed around 10000 infants and children and only 21 were found to have femoral hernias (0.2% incidence)
• Correct preoperative diagnosis made in ~50% of cases
• Whenever the intraoperative findings do not correlate with preoperative diagnosis the suspect a direct inguinal hernia or a femoral hernia.
Special Considerations

• What is the patient has a VP shunt or peritoneal dialysis?
  • There is an increased incidence of inguinal hernia VP shunts and peritoneal dialysis
    • Grosfeld and Cooney found ~14% incidence of inguinal hernia after insertion of VP shunt.
    • Unknown if hernias form from presence of the fluid or is secondary to increased intra-abdominal pressure
  • Kids with peritoneal dialysis have a risk of inguinal hernia developing of 7-15%.
    • When placing PD catheter, examine the internal ring and repair if hernia present.
Special Considerations

• Connective tissue disorders and inguinal hernia:
  • Hunter-Hurler, Ehlers-Danlos, and Marfans syndrome have frequent inguinal hernia and are prone to recurrences.
    • To reduce the rate of recurrence, repair the floor of the inguinal canal in addition to the usual high ligation of the sac.
Questions
Questions 1

• Parents have noticed a groin bulge, but no hernia is appreciated on exam when the patient is seen in clinic. How do you proceed? What if the pediatrician suspected a hernia? What if he/she palpated a hernia?

• Should contralateral exploration be undertaken if this patient has a unilateral inguinal hernia?
Questions 2

• Given a 4-week-old former 32 week premature infant with bilateral inguinal hernias who is constantly fussy but eat well and gaining weight, when should the hernia repair be performed?

• The patient is sent home, but presents to the ER with an incarcerated inguinal hernia. How would you reduce the hernia? How would you manage the patient if you could not reduce the hernia?

• A female infant presents to the ER at 10pm with a 4 day history/exam consistent with an incarcerated ovary. When would you operate?
Questions 3

• During performance of the hernia repair in this premature infant, the sac tears down to a level just above the internal ring. How should this be managed? What if the tear is down to the level of the internal ring?
Questions 4

• When should you perform a floor repair in addition to a high ligation

• How would you perform a floor repair?
Question 5

• How does one arrange follow-up to assess outcomes follow hernia repairs? A premature newborn has a recurrence three weeks after repair of inguinal hernia. When would you reoperate? How would you approach the recurrence?

• During the hernia repair, the vas deferens is noted to have been divided. How would you manage this complication? What if the testicular vessels have been injured/divided?
Question 6

• What are the advantages/disadvantages of a laparoscopic vs open repair in a child? What are the options for approach in a laparoscopic inguinal hernia repair?