



Evaluation of inguinal swelling in children

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INTRODUCTION

This discussion will be limited to an approach to swelling of the inguinal area.

Evaluation and treatment of hernias, lymphadenopathy, cryptorchidism, and isolated scrotal swelling in children are discussed separately:

- (See ["Inguinal hernia in children"](#).)
- (See ["Peripheral lymphadenopathy in children: Evaluation and diagnostic approach"](#).)
- (See ["Undescended testes \(cryptorchidism\) in children: Clinical features and evaluation"](#) and ["Undescended testes \(cryptorchidism\) in children: Management"](#).)
- (See ["Causes of painless scrotal swelling in children and adolescents"](#) and ["Evaluation of nontraumatic scrotal pain or swelling in children and adolescents"](#).)

INGUINAL ANATOMY

The inguinal area can be generally described as the region between the anterior superior iliac spine to the pubic symphysis. It contains a variety of structures that surround the inguinal and femoral canal. The key landmarks of the inguinal canal include ([figure 1](#)):

- The inguinal ligament
- The internal and external inguinal rings
- The spermatic cord in males
- The round ligament in females

The anatomic region known as Hesselbach's triangle helps differentiate indirect hernias, which pass outside this triangle through the inguinal canal, from direct hernias which protrude into this space ([figure 1](#) and [figure 2](#)). Hesselbach's triangle is defined laterally by the inferior epigastric artery, medially by the lateral border of the rectus muscle, and inferiorly by the inguinal ligament. The femoral canal contains the femoral artery, nerve, and vein that exit the femoral ring into the proximal thigh.

Indirect hernias result from two anatomic defects: weakening of the fascia of the transversalis muscle fibers at the internal abdominal ring and the potential space from a persistent processus vaginalis ([figure 3](#)). In males, the obliteration of the processus vaginalis occurs during the first two years of life, but as many as 40 percent remain patent, 20 percent of which will later develop into inguinal hernias. Indirect inguinal hernias in males and females occur more frequently on the right, the side where the migration of the testicle or round ligament occurs last. The female counterpart of the processus vaginalis commonly disappears by eight months of gestation, although patency may persist into childhood. If patency persists, the patent processus is termed the canal of Nuck. Embryology of the testes and ovaries are discussed in greater detail separately. (See ["Inguinal hernia in children", section on 'Embryology'](#).)

Inguinal lymph nodes are important structures adjacent to the inguinal canal that are present in the superficial and deep planes. The medial portion of the superficial nodes drain lymph from the skin in the perineum, gluteal region, and lower abdominal wall as well as the vaginal mucosa, penis, scrotum, and anal canal. The lateral group and the vertical superficial nodes drain the lower back below the iliac crest, the anterior leg, lateral upper leg, and medial foot. The deep inguinal nodes lie beneath the fascia and medial to the femoral vein and drain the superficial nodes in addition to the clitoris, the glans of the penis, and the medial ipsilateral leg.

CAUSES OF INGUINAL SWELLING

The causes of inguinal swelling are listed in the table ([table 1](#)). Pediatric inguinal swelling occurs mostly from inguinal hernias, especially in boys, who are affected six times more often than girls [[1](#)]. However, it is important to consider the different features and characteristics of

masses in the inguinal or groin area to exclude other causes, such as congenital anomalies, infections, and neoplasms. In most instances careful clinical evaluation with selected use of ultrasonography can rapidly establish the etiology.

Inguinal hernia — Inguinal hernias in children may present as intermittent, reducible, or incarcerated inguinal masses. Inguinal hernias may be indirect or direct ([figure 1](#) and [figure 2](#)) with indirect hernias occurring much more frequently than direct hernias and much more commonly in males than females. (See ['Inguinal anatomy'](#) above and ["Inguinal hernia in children", section on 'Epidemiology'](#).)

Indirect hernias appear when abdominal contents pass lateral to the epigastric artery, through the inguinal canal, and into the scrotum or labia through the external inguinal ring ([figure 1](#)). They may contain omentum, bowel, and rarely, the appendix (also called an Amyand hernia). In males, the scrotum is full which helps differentiate inguinal hernias from retractile, ectopic, or undescended testes ([picture 1](#)). In females, reproductive organs are often present, including the ovary, fallopian tube, and rarely, the uterus ([picture 2](#)). It can be difficult to differentiate a sliding hernia of the ovary from a hydrocele of the canal of Nuck since both can present as non-painful, palpable, movable inguinal masses in females. The ovary, however, can become incarcerated within the canal, presenting as a painful mass. (See ["Inguinal hernia in children", section on 'Clinical features and diagnosis'](#) and ["Inguinal hernia in children", section on 'Inguinal mass in a female'](#).)

Diagnosis and treatment of inguinal hernias varies by gender and presenting features, and is discussed in greater detail separately. (See ["Inguinal hernia in children", section on 'Management'](#).)

Femoral hernia — Femoral hernias are very uncommon. In children, a hernia in the groin area is almost 250 times more likely to be an indirect hernia than a femoral one [2]. Children with femoral hernias have swelling in the upper thigh, below the inguinal ligament and medial to the femoral artery, often in association with crampy abdominal pain ([figure 4](#)). Despite the difference in anatomic location, pediatric femoral hernias can be clinically difficult to distinguish from the inguinal variety and are frequently misdiagnosed preoperatively by surgeons and referring physicians [2-4]. Femoral hernias are less likely to be incarcerated than the inguinal variety, but incarcerated femoral hernias are often complicated by sliding ovaries, especially in female infants [5]. In adults, femoral hernias are more common in older women. (See ["Classification, clinical features, and diagnosis of inguinal and femoral hernias in adults"](#).)

When suspected, prompt surgical consultation is warranted as femoral hernias are more apt to present with strangulation and to require emergency surgery. (See ["Overview of treatment for inguinal and femoral hernia in adults"](#).)

Spermatic cord hydrocele — A hydrocele of the spermatic cord occurs when fluid accumulates along the cord in the inguinal canal or upper scrotum, but is separated from the testes ([figure 5](#)). Whereas an indirect hernia occurs from a failure of the processus vaginalis to close, a cord hydrocele occurs from an abnormal closure of the processus vaginalis where the distal portion closes and midportion remains patent along the cord. Cord hydroceles are much less common than indirect hernias. In a large series of ultrasounds performed to evaluate for inguinal masses or swelling, a cord hydrocele was present in only 1.5 percent of children [6].

Although mixed forms have been reported [7], cord hydroceles are typically classified into one of two types [8]:

- **Non-communicating (encysted)** – This is the most common variety and is characterized by fluid pooling along the length of the cord but not communicating with the peritoneal cavity or tunica vaginalis. Since the encysted type does not communicate with the peritoneal cavity, the size does not change with increases in intra-abdominal pressure, such as crying fits or coughing, nor is this type reducible.
- **Communicating (funicular)** – Unlike the encysted type, the funicular type communicates freely with the peritoneal cavity at the internal ring. Therefore, the swelling in the inguinal area can enlarge with increased intra-abdominal pressure, and can decrease in size when the patient relaxes. Communicating cord hydroceles can be difficult to distinguish from indirect inguinal hernias on physical examination, and ultrasound is frequently required to establish the diagnosis.

Regardless of type, children with spermatic cord hydroceles warrant referral to a surgeon with pediatric and genitourinary expertise. Herniotomy is frequently performed to prevent later development of an indirect inguinal hernia [7,8].

Inguinal lymphadenopathy — Lymphadenopathy is characterized by non-tender swelling or enlargement of the lymph nodes. Lymph node swelling can occur secondary to a generalized or localized process. (See ["Peripheral lymphadenopathy in children: Etiology", section on 'Localized lymphadenopathy'](#) and ["Peripheral lymphadenopathy in children: Etiology", section on 'Generalized lymphadenopathy'](#).)

Although inguinal adenopathy may arise adjacent to the inguinal canal, it can be differentiated from an indirect inguinal hernia because of the characteristic rubbery and limited movement of the swelling and its location outside of the inguinal canal. In addition, the enlarged lymph node will produce a mass that does not extend into the scrotum or labia. Direct and femoral hernias may be confused with lymphadenopathy because the bulge is either above (direct) or below (femoral) the inguinal canal ([figure 2](#) and [figure 4](#)) and the swelling does not extend into the genitalia. However, unless incarcerated, these hernias will have a cystic quality on palpation.

- **Generalized lymphadenopathy with inguinal involvement** can be associated with infectious disease (HIV, EBV, miliary tuberculosis, etc), metabolic disease (Gaucher, Niemann-Pick, etc), rheumatologic disease (eg, JIA, SLE, etc), immunologic disease (eg, chronic granulomatous disease, serum-like sickness reaction, etc), malignancy (eg, leukemia, lymphoma, etc), inflammatory disease (eg, sarcoidosis, eosinophilic granulomatosis with polyangiitis [Churg-Strauss], etc), lymphoproliferative disease (eg, hemophagocytic

lymphohistiocytosis, Castleman's disease) or medication reaction. (See ["Peripheral lymphadenopathy in children: Etiology", section on 'Generalized lymphadenopathy'](#) and ["Peripheral lymphadenopathy in children: Etiology", section on 'Uncommon but important causes'](#).)

- **Localized inguinal lymphadenopathy** can be associated with nearby skin and soft tissue infections that drain to the inguinal lymph nodes, which can include regional sites, such as the buttocks, genitals, groin, or the ipsilateral lower extremity. Localized infections causing inguinal lymphadenopathy can include fungal disease (eg, tinea corporis), parasitic disease (eg, filariasis, etc), bacterial skin disease (eg, furuncle, cellulitis, impetigo), and venereal disease (eg, herpes simplex, primary syphilis, lymphogranuloma venereum). (See ["Peripheral lymphadenopathy in children: Etiology", section on 'Inguinal'](#).)

Inguinal lymphadenitis — Lymphadenitis can be differentiated from lymphadenopathy by the presence of tenderness, often accompanied by erythema and fluctuance. Tender lymph nodes in the groin (or axilla) are sometimes termed “buboes”, derived from the exudative lymph nodes characteristic of bubonic plague. The term is now used to describe the tender and swollen lymph nodes associated with local skin infections or ulcerative lymphadenitis caused by venereal diseases, often in conjunction with genital ulcerative lesions. If secondary swelling from the lymphadenitis involves the genitalia, differentiating this condition from an incarcerated inguinal hernia may be difficult, especially when pain limits the inguinal examination. In these instances, ultrasonography can be diagnostic.

Inguinal lymphadenitis can be divided into the following categories:

- **Animal and tick vectors** – Infections spread by animal or tick-borne transmission to the lower extremity can cause a regional lymphadenitis from draining lymph proximal to the area of entry. These infections can cause lymphadenopathy, but typically the nodes are tender. Examples of these diseases include: tularemia, plague, brucellosis, and cat-scratch disease. (See ["Tularemia: Clinical manifestations, diagnosis, treatment, and prevention"](#) and ["Brucellosis: Epidemiology, microbiology, clinical manifestations, and diagnosis"](#) and ["Clinical manifestations, diagnosis, and treatment of plague \(Yersinia pestis infection\)"](#) and ["Microbiology, epidemiology, clinical manifestations, and diagnosis of cat scratch disease"](#).)
- **Direct skin-borne infection** – Skin bacteria (eg, strep, staph, etc) can directly infect the inguinal nodes causing a primary bacterial lymphadenitis, similar to but much less common than cervical lymphadenitis that frequently occurs in young children. (See ["Cervical lymphadenitis in children: Etiology and clinical manifestations", section on 'Pathophysiology'](#).)
- **Venereal disease (buboes)** – Buboes are caused by either *Hemophilus ducreyi* (Chancroid) or the L1, L2, and L3 serovars of *Chlamydia trachomatis* (lymphogranuloma venereum). Both of these diseases have characteristic ulcerative lesions associated with the buboes ([picture 3](#) and [picture 4](#)). (See ["Chancroid"](#) and ["Lymphogranuloma venereum"](#).)

Granuloma inguinale — Granuloma inguinale (donovanosis) is a genital infection that is usually sexually acquired and is most prevalent in tropical regions including India, Papua New Guinea, the Caribbean, South America, and Australia.

Infection with *Klebsiella granulomatis* *comb. nov.* (previously *Calymmatobacterium granulomatis*), the causative agent of granuloma inguinale, can cause pseudo-buboes in the inguinal area which are typically associated with ulcers on the genitalia. Pseudo-buboes may feel like swollen or obstructed lymph nodes but are caused by subcutaneous granulation and are eventually broken down and replaced by ulcers. There are several types of ulcers, but the ulcero-vegetative variety is most common and is characterized by a beefy-red non-tender ulcer that bleeds readily ([picture 5](#)). (See ["Approach to the patient with genital ulcers", section on 'General approach'](#).)

Evaluation and treatment of granuloma inguinale is discussed in greater detail separately. (See ["Approach to the patient with genital ulcers"](#).)

Testes: Retractable, ectopic, or undescended — If a testicle is not located in the scrotum, it may be retractile, ectopic or undescended:

- **Retractile testes** – A nontraumatic, non-tender inguinal mass in the presence of an "empty" hemi-scrotum is suggestive of a retractile testis if it can be brought back into the scrotum. The testes can move up into the inguinal canal as a result of an exaggerated cremasteric reflex. The retractile testis can be "milked" back into the scrotum by gently applying downward pressure across the top of the palpable mass. Testicular retraction can recur, and no treatment is necessary if the testis is freely movable. However, these patients warrant referral to a urologist for follow-up because approximately one-third of retractile testicles can become undescended with time.
- **Ectopic or undescended testes** – An ectopic testis is characterized by a testis that naturally descends through the external ring, but then becomes lodged outside of the natural path, most commonly in a superficial pouch near the external ring or less commonly in the suprapubic region, femoral canal, perineum, or contralateral scrotal compartment ([figure 6](#)). Undescended testes can be one-sided (70 percent) or bilateral ([picture 6](#) and [picture 7](#)) (30 percent) and may present as a mass in the inguinal canal. Undescended testicles are associated with an underdeveloped scrotum. (See ["Undescended testes \(cryptorchidism\) in children: Management", section on 'Natural history'](#).)

The goal of the genital examination is to determine if a suspected testicular mass in the inguinal canal of a patient without significant blunt scrotal trauma is a retractile, ectopic, or undescended testis. If the testicular mass cannot be moved into the scrotum, and the hemi-scrotum is empty, then an ectopic or undescended testis is suggested. An undescended testis can lodge anywhere along its line of descent, including the inguinal canal, the external inguinal ring, or intra-abdominally ([picture 8](#)). While an intra-abdominal testis will not be palpable, remnants of the

gubernaculum or dissociated epididymis and vas deferens may be present in the inguinal canal. If the testicular mass is tender or causes pain, this suggests a torsion of an undescended or ectopic testis, sometimes referred to as a cryptorchid testicular torsion. (See ["Undescended testes \(cryptorchidism\) in children: Clinical features and evaluation"](#), [section on 'Evaluation'](#) and ["Undescended testes \(cryptorchidism\) in children: Management"](#), [section on 'Testicular torsion'](#).)

Differentiation between a retractile and a truly undescended testis can be difficult in some patients and may require consultation with a pediatric urologist. The genital examination in a male with retractile versus suspected ectopic or undescended testis is discussed in greater detail separately. (See ["Undescended testes \(cryptorchidism\) in children: Clinical features and evaluation"](#), [section on 'Examination'](#).)

Testicular dislocation — Testicular dislocation is an uncommon event that occurs in the setting of acute or recent blunt genitourinary trauma, especially straddle injuries sustained in a motorcycle collision. With significant force to the pelvis, the testes can become displaced, often into a superficial pouch anterior to the external oblique aponeurosis, and rarely into the penile, pubic, canalicular, or perineal areas.

Clinical findings typically consist of a unilateral tender mass present in the inguinal area in association with an empty hemiscrotum in a patient without a prior history of cryptorchidism or orchiectomy. Rarely, bilateral dislocations may occur [9-11]. A traumatic testicular dislocation can be difficult to recognize on initial examination, especially when associated with swelling, ecchymosis, obesity, and pelvic injury. As an example, in an observational study of 1967 abdominal blunt trauma patients over a 15 year period, nine testicular dislocations were reported and all were missed on initial evaluation. Most were not diagnosed until 3 to 60 days post-injury [12]. When testicular dislocation is suspected, prompt surgical consultation should be obtained. (See ["Scrotal trauma in children and adolescents"](#), [section on 'Indications for subspecialty consultation or referral'](#).)

Surgical repair is often necessary since manual reduction is successful in only 15 percent of cases [13]. A previously dislocated testis has impaired spermatogenesis and may have an increased risk for malignancy.

Tumor — A variety of different tumors have been reported in the inguinal area, ranging from benign to malignant. Benign lesions of the inguinal canal can include, but are not limited to: lipomas, hematomas [14], mesothelial cysts [15], dermoid cysts [16,17], lymphangiomas [14], and fibrous hamartomas [18].

Careful attention is necessary to distinguish features of malignant lesions which could include systemic symptoms (eg, weight loss, fever, or masses in other regions) or a non-cystic, non-lipomatous feeling mass which may be associated with fixed (unmovable) lymph nodes. The most common malignant lesions of the groin are soft tissue sarcomas; however, only 2 percent of both rhabdo- and non-rhabdomyosarcomas arise in the groin [19,20]. Hodgkin and non-Hodgkin lymphoma may rarely present with inguinal lymphadenopathy. (See ["Overview of Hodgkin lymphoma in children and adolescents"](#), [section on 'Lymphadenopathy'](#) and ["Overview of non-Hodgkin lymphoma in children and adolescents"](#), [section on 'Signs and symptoms'](#).)

Other malignancies, such as primary neuroblastoma, have also been reported in the inguinal canal [21]. In addition, neuroblastoma can spread into the spermatic cord [22].

Malignant lesions in the pelvis can metastasize or locally spread to the canal by pushing through the internal ring. Malignancies with lymphatic spread can involve the inguinal lymph nodes. But despite the close proximity, inguinal lymph node metastases from testicular cancers are rare.

Appendicitis — The presence of the vermiform appendix, whether inflamed or not, inside a hernial sac is known as Amyand hernia. Amyand hernia complicates 1 percent of all inguinal hernias with one-third of these cases having associated acute appendicitis [23]. It is unclear whether appendicitis is an incidental finding or rather if there is a causal relationship with these cases. But a ruptured appendicitis can present with a tender inguinal mass secondary to localized abscess formation [24].

Treatment is as for perforated appendicitis. (See ["Acute appendicitis in children: Management"](#), [section on 'Advanced appendicitis'](#).)

EVALUATION

In most patients, a careful history and physical examination establish the underlying cause of an inguinal swelling. In selected patients, ultrasonography is a helpful diagnostic tool.

History — Important aspects of the history in children with inguinal swelling include the following:

- **Duration of symptoms** – Is the onset acute, subacute, or chronic?
- **Pain** – Is the mass painful (in infants, this can be characterized by excessive fussiness, irritability, or an abnormal cry)? (See ["Inguinal hernia in children"](#), [section on 'Incarcerated mass'](#).)
- **Signs of obstruction** – Has there been vomiting, abdominal distension, or lack of bowel movements? (See ["Inguinal hernia in children"](#), [section on 'Incarcerated mass'](#).)

- **Signs of systemic disease** – Are there associated symptoms of fever, night sweats, weight loss greater than 10 percent of body weight, or other systemic disease in the absence of an obvious cause? (See ['Inguinal lymphadenitis'](#) above and ['Tumor'](#) above.)
- **Signs of localized infection** – Are there any skin lesions located in the upper thigh or lower abdominal regions? (See ['Inguinal lymphadenopathy'](#) above and ['Inguinal lymphadenitis'](#) above.)
- **Change in size of the mass** – Does the mass grow larger with increase in intra-abdominal pressure (eg, cough, straining, vomiting, Valsalva, etc)? Commonly an intercurrent illness such as a URI with cough or a child who is constipated with straining and encopresis can make a hernia more pronounced. (See ['Inguinal hernia'](#) above.)
- **Trauma** – Has the patient suffered significant genitourinary trauma? (See ['Testicular dislocation'](#) above.)
- **Past medical history** – Key questions include the following:
 - Does the child have a history of conditions that predisposed to indirect inguinal hernias (eg, previous repair, prematurity, abdominal wall defects [eg, prune belly syndrome], connective tissue disorders [eg, Ehlers-Danlos syndrome], abnormalities of the genitourinary system [eg, bladder exstrophy])? (See ['Inguinal hernia in children', section on 'Associated conditions'](#).)
 - Was scrotal location of the testes documented in the neonatal period (retractile versus ectopic or undescended testes)? (See ['Testes: Retractable, ectopic, or undescended'](#) above.)
 - Is there a history of tick or animal exposure (eg, cat scratch, rabbit, or rodent)? (See ['Inguinal lymphadenitis'](#) above.)
 - Is the patient sexually active? Has the patient traveled to areas endemic for granuloma inguinale (eg, India, Papua New Guinea)? (See ['Inguinal lymphadenitis'](#) above and ['Granuloma inguinale'](#) above.)
- **Family history** – Pertinent family history includes the following:
 - Are there family members who have had an inguinal hernia?
 - Is there a history of unexplained genital anomalies, abnormal pubertal development, or infertility (all suggestive of cryptorchidism)? (See ['Undescended testes \(cryptorchidism\) in children: Clinical features and evaluation', section on 'Epidemiology and risk factors'](#).)

Physical examination — The following aspects of the physical examination should be noted:

- **Visualization and palpation** – The inguinal canal should be assessed for tenderness, compressibility, warmth, feel, color, and size change with maneuvers such as Valsalva or patient relaxation.
 - The hallmark of an indirect inguinal hernia is a firm mass that emerges through the external inguinal ring and enlarges with increased intra-abdominal pressure ([figure 1](#) and [figure 3](#) and [picture 1](#) and [picture 2](#)). A bulge that is above the inguinal ligament and not located in the inguinal canal indicates a direct hernia ([figure 2](#) and [figure 7](#)). A swelling that is more pronounced in the upper thigh is suggestive of a femoral hernia ([figure 4](#)). Both direct and femoral hernias are much less common than indirect hernias. (See ['Inguinal hernia'](#) above and ['Femoral hernia'](#) above.)
 - In the female patient with a palpable hernia, the ovary with or without the fallopian tube may appear as a round mass although it can also slide in and out of the hernia and not be palpable on examination. When a tender mass is present, ovarian torsion is suggested. (See ['Inguinal hernia in children', section on 'Inguinal mass in a female'](#).)
 - A cord hydrocele will show swelling along the inguinal canal without extension into the scrotum. The encysted (non-communicating) type will not fluctuate in size with Valsalva or relaxation maneuvers whereas the funicular (communicating) type should. Transillumination can show a translucent swelling suggesting a fluid-filled cord, however this is not a sensitive test to evaluate the inguinal area. (See ['Spermatic cord hydrocele'](#) above.)
 - Normal lymph nodes should be ≤ 2 cm diameter and are oval, firm, slightly movable, and non-tender. Lymph nodes > 2 cm are consistent with lymphadenopathy. Fixed (unmovable) lymph nodes are suspicious for malignancy or granulomatous disease. Inguinal lymphadenopathy should prompt evaluation of other lymph chains (cervical, axillary, etc) to differentiate signs of a localized or systemic disease. (See ['Peripheral lymphadenopathy in children: Evaluation and diagnostic approach', section on 'Inguinal lymphadenopathy'](#).)
 - Localized tenderness to the lymph nodes is consistent with lymphadenitis. Tender inguinal nodes should prompt thorough evaluation of the genitals for presence of ulcers or other lesions suggestive of a sexually transmitted infection. Additionally, evaluation of the ipsilateral lower extremity is required to evaluate for bite or scratch marks suggestive of vector-borne diseases, although the bites can occur from days to months prior to lymph node involvement, depending on the disease. (See ['Inguinal lymphadenitis'](#) above.)
- **Reduction** – If a hernia is suspected, manual reduction is both diagnostic and therapeutic. Inability to reduce the hernia is suggestive of an incarcerated hernia. In a female patient, an incarcerated inguinal hernia should be presumed to have associated torsion of the ovary

until proven otherwise. Signs of a strangulated hernia are an irreducible mass with necrotic discoloration secondary to venous and lymphatic obstruction. (See ["Inguinal hernia in children", section on 'Incarcerated inguinal hernia'](#) and ["Inguinal hernia in children", section on 'Inguinal mass in a female'](#).)

- **Inspection of scrotal contents (in males)** – The presence of an empty hemiscrotum differentiates ectopic or undescended testes from masses, other than those with a testicular origin, that occur in the inguinal region. In the setting of inguinal swelling, the presence of an **empty** hemiscrotum suggests a dislocated, retractile, ectopic, or undescended testes.

These findings can be differentiated as follows:

- Dislocated testicles occur after acute, high force trauma. (See ["Testicular dislocation"](#) above.)
- If the testes can be successfully milked into the empty hemi-scrotum, then the diagnosis of a retractile testes is made. (See ["Testes: Retractable, ectopic, or undescended"](#) above.)
- If the testicular mass cannot be moved into the scrotum in the absence of trauma, then an ectopic or undescended testes is suggested. An undescended testes can lodge anywhere along its line of descent, including the inguinal canal, the external inguinal ring, or intra-abdominally ([picture 8](#)). While an intra-abdominal testes will not be palpable, remnants of the gubernaculum or dissociated epididymis and vas deferens may be present in the inguinal canal. If the testicular mass is tender or causes pain, this suggests a torsion of an undescended or ectopic testes, sometimes referred to as a cryptorchid testicular torsion. (See ["Undescended testes \(cryptorchidism\) in children: Clinical features and evaluation", section on 'Evaluation'](#) and ["Undescended testes \(cryptorchidism\) in children: Management", section on 'Testicular torsion'](#).)

Ancillary studies — Laboratory testing is usually unnecessary in the evaluation of inguinal swelling caused by indirect inguinal hernia, trauma, uncomplicated lymphadenopathy, or lymphadenitis due to a localized skin infection.

The diagnostic approach to children with peripheral lymphadenopathy or lymphadenitis varies from observation and reassurance to comprehensive diagnostic testing and aggressive medical and surgical therapy, depending upon the findings from the history and physical examination ([table 2](#) and [table 3](#)). It is not necessary to identify the underlying etiology in every patient since most cases are benign and self-limited. The pace of the evaluation is dictated by how ill the patient appears. (See ["Peripheral lymphadenopathy in children: Evaluation and diagnostic approach", section on 'Inguinal lymphadenopathy'](#).)

Boys with ectopic or undescended testicles warrant additional evaluation depending upon the age of presentation. Laboratory testing for these patients is discussed in greater detail separately. (See ["Undescended testes \(cryptorchidism\) in children: Clinical features and evaluation", section on 'Diagnostic approach'](#).)

Patients with localized inguinal adenopathy secondary to ulcerative venereal disease require pathogen-specific testing for syphilis and herpes simplex virus in addition to testing for chlamydia and gonorrhea. Additional testing may be necessary for signs of chancroid, lymphogranuloma venereum, and granuloma inguinale. (See ["Approach to the patient with genital ulcers", section on 'Diagnostic testing'](#).)

Masses suspicious for malignancy warrant additional evaluation to establish the diagnosis. (See ["Clinical assessment of the child with suspected cancer", section on 'Lymphadenopathy'](#) and ["Clinical assessment of the child with suspected cancer", section on 'Establishing the diagnosis'](#).)

Imaging

- **Ultrasound with Doppler** – While ultrasound is highly technician dependent, it is the best study for the majority of causes of inguinal swelling in females. In males, most indirect inguinal hernias can be diagnosed and managed without specific testing. However, ultrasound can be useful for evaluation of spermatic cord hydroceles and undescended or ectopic testes. Ultrasound can readily differentiate the features of hernias, hydroceles, atypical masses, testes, and the female reproductive organs. Doppler flow offers additional utility and is indicated for the emergent evaluation of torsion in the displaced testes, testicular dislocation, or incarcerated and entrapped ovary.
- **Point-of-Care ultrasound (POCUS)** – The utilization of POCUS continues to evolve as a diagnostic option in acute care settings. POCUS provides rapid assessment and may be a valuable tool to identify time-sensitive pathology such as a testicular dislocation in the setting of traumatic inguinal swelling and an empty hemi-scrotum [25]. The use of POCUS is limited by the expertise required to both acquire and interpret the images. Use of POCUS should therefore be restricted to trained and experienced providers and should not replace traditional ultrasonography to confirm findings when appropriate. Because the minority of cases of painless inguinal swelling require emergency surgical correction, POCUS may be a reasonable option to expedite emergency department care or to guide coordinated outpatient care when traditional US evaluation may be unnecessary or not readily available. More research is needed to evaluate the impact of POCUS on efficacy, medical decision making, and potential cost savings in children with inguinal swelling [26-30].
- **Computed tomography (CT)** – CT is typically **not** necessary but may offer some utility in the setting of blunt abdominal trauma with testicular dislocation or when evaluating inguinal masses suspicious of malignancy, both for staging and to help better define the mass and its tissue of origin.

APPROACH

The approach to inguinal swelling differs in boys versus girls.

Male — The approach to inguinal swelling starts with recognizing the potentially emergent conditions that require acute management or immediate intervention, which are always signified by the presence of pain ([algorithm 1](#)). In boys, a painful inguinal lump may indicate an incarcerated or strangulated indirect inguinal hernia, lymphadenitis, torsion of an undescended testis, or when occurring after major genitourinary trauma, a testicular dislocation. An incarcerated or strangulated femoral hernia is identified by a painful lump that is located below the inguinal ligament in the mid- or upper- thigh. Other differentiating features include the presence of fever, erythema, or induration which suggests localized cellulitis with lymphadenitis and an empty scrotum in patients with a dislocated or torsed undescended testicle. (See ['Physical examination'](#) above.)

Boys with incarcerated indirect or direct inguinal hernias or incarcerated femoral hernias should undergo prompt manual reduction followed by elective surgical repair. Emergency surgery is necessary for incarcerated hernias that cannot be manually reduced or for strangulated hernias with signs of bowel obstruction. Timely surgical consultation is also indicated for patients with, testicular dislocation or torsed undescended testis. (See ["Inguinal hernia in children", section on 'Incarcerated inguinal hernia'](#) and ['Femoral hernia'](#) above and ['Testicular dislocation'](#) above and ["Undescended testes \(cryptorchidism\) in children: Management", section on 'Testicular torsion'](#).)

Causes of inguinal swelling that are not painful include lymphadenopathy, retractile testis, undescended or ectopic testis, a reducible indirect inguinal hernia, spermatic cord hydrocele, or soft tissue tumor. Typically the presence of lymphadenopathy and a reducible inguinal hernia are obvious upon physical examination. The other causes usually require ultrasound to diagnose and delineate the condition. (See ['Imaging'](#) above.)

Further evaluation and treatment depend upon the condition:

- Boys with a reducible inguinal hernia or spermatic cord hydrocele should be referred for elective surgical repair. (See ["Inguinal hernia in children", section on 'Reducible mass'](#) and ['Spermatic cord hydrocele'](#) above.)
- The diagnostic approach to children with peripheral lymphadenopathy or lymphadenitis varies from observation and reassurance to comprehensive diagnostic testing and aggressive medical and surgical therapy, depending upon the findings from the history and physical examination ([table 2](#) and [table 3](#)). It is not necessary to identify the underlying etiology in every patient since most cases are benign and self-limited. The pace of the evaluation is dictated by how ill the patient appears. (See ["Peripheral lymphadenopathy in children: Evaluation and diagnostic approach", section on 'Inguinal lymphadenopathy'](#).)
- Ulcerated lesions require further diagnostic testing for sexually transmitted diseases. (See ["Approach to the patient with genital ulcers", section on 'Diagnostic testing'](#).)
- Boys with ectopic or undescended testicles warrant additional evaluation depending upon the age of presentation and should be referred to a pediatric urologist. (See ["Undescended testes \(cryptorchidism\) in children: Clinical features and evaluation", section on 'Diagnostic approach'](#) and ["Undescended testes \(cryptorchidism\) in children: Management", section on 'Management of undescended testes'](#).)
- Masses suspicious for malignancy warrant additional evaluation to establish the diagnosis followed by treatment according to the specific neoplasm identified. (See ["Clinical assessment of the child with suspected cancer", section on 'Lymphadenopathy'](#) and ["Clinical assessment of the child with suspected cancer", section on 'Establishing the diagnosis'](#).)

Female — In girls, painful inguinal swelling is caused by an incarcerated or strangulated inguinal hernia, cellulitis, or lymphadenitis ([algorithm 2](#)). An incarcerated or strangulated femoral hernia is identified by a painful lump that is located below the inguinal ligament in the mid- or upper- thigh. Other differentiating features include the presence of fever, erythema, or induration which suggests localized cellulitis with lymphadenitis. (See ['Physical examination'](#) above.)

Because incarcerated or strangulated indirect inguinal hernias in girls frequently contain reproductive organs (eg, ovary or fallopian tube), the clinician should attempt a gentle reduction and then obtain an US if not successful. If the US shows that reproductive organs are not present, then further efforts at reduction are appropriate. Prompt surgical consultation is warranted for symptomatic girls with entrapped hernias that cannot be reduced. (See ['Physical examination'](#) above and ['Imaging'](#) above.)

Infant females in particular, may have herniated reproductive organs that are **not** incarcerated or strangulated [1]. This is characterized by a palpable, often pearly, movable mass in an asymptomatic female infant. Gentle reduction in these patients will not be successful and further delineation by ultrasound followed by elective referral to a surgeon with pediatric expertise is warranted.

Other causes of non-painful inguinal swelling in girls include reducible inguinal hernias, lymphadenopathy, or soft tissue tumors. As in boys, a reducible inguinal hernia should be referred for elective repair. Additional evaluation of lymphadenopathy depends upon the degree of illness in the patient ([table 2](#) and [table 3](#)), the presence of genital ulcers, or clinical suspicion for malignancy. (See ["Peripheral lymphadenopathy in children: Evaluation and diagnostic approach", section on 'Inguinal lymphadenopathy'](#) and ["Approach to the patient with genital ulcers"](#) and

["Clinical assessment of the child with suspected cancer", section on 'Establishing the diagnosis'.\)](#)

SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See ["Society guideline links: Inguinal hernia in children"](#).)

SUMMARY

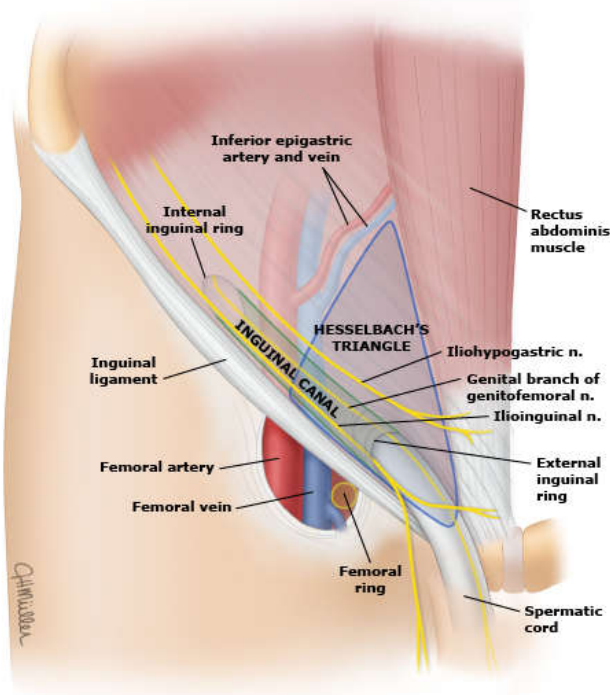
- The causes of inguinal swelling in children are listed in the table ([table 1](#)). (See ["Causes of inguinal swelling"](#) above.)
- In most patients, a careful history and physical examination establish the underlying cause of an inguinal swelling. In selected patients, ultrasonography is a helpful diagnostic tool. (See ["Evaluation"](#) above.)
- The approach to an inguinal mass is largely determined by the patient's sex and the presence of pain ([algorithm 1](#) and [algorithm 2](#)). Most masses arise from either an indirect inguinal hernia or from inflammation of the inguinal lymph nodes. (See ["Approach"](#) above.)

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Topic 13883 Version 11.0

GRAPHICS

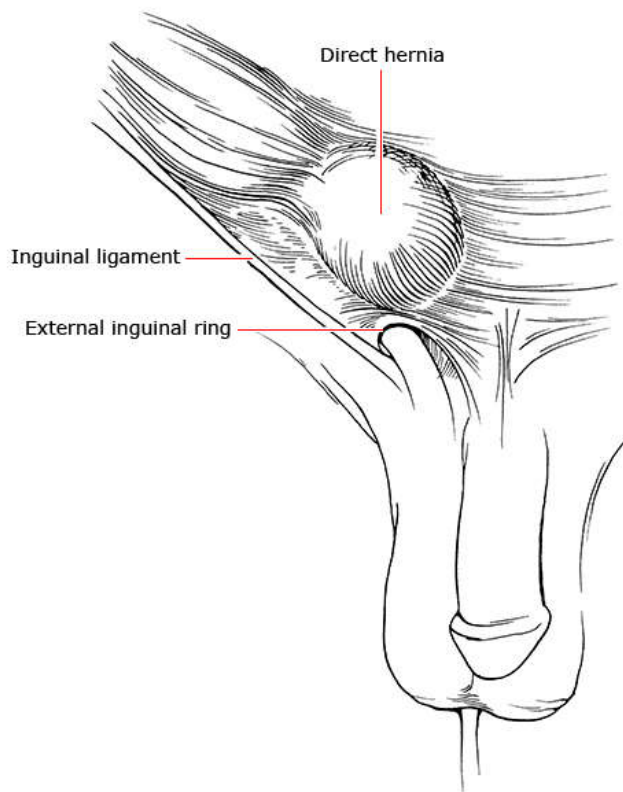
Groin hernia anatomy



Indirect inguinal hernias develop at the internal inguinal ring and are lateral to the inferior epigastric artery. Direct inguinal hernias occur through Hesselbach's triangle (outlined in blue) formed by the inguinal ligament inferiorly, the inferior epigastric vessels laterally, and the rectus muscle medially. Femoral hernias develop in the empty space at the medial aspect of the femoral canal, inferior to the inguinal ligament.

Graphic 61841 Version 2.0

External view of a direct inguinal hernia

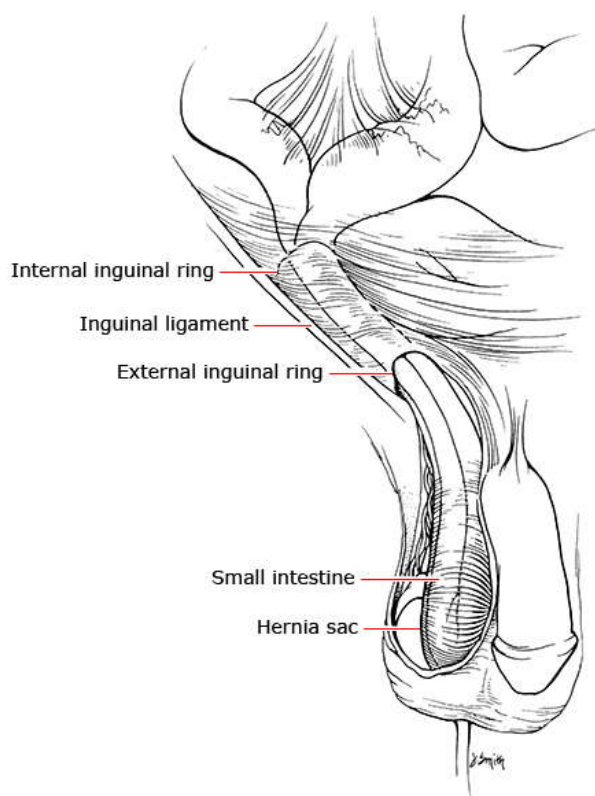


Direct inguinal hernias protrude through Hesselbach's triangle above the inguinal ligament.

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Graphic 83015 Version 1.0

Indirect inguinal hernia



Indirect hernias result from two anatomic defects: weakening of the fascia of the transversalis muscle fibers at the internal abdominal ring, and the potential space resulting from the a persistently patent processus vaginalis. In males, the obliteration of the processus vaginalis occurs during the first two years of life, but as many as 40 percent remain patent, 20 percent of which will later develop into inguinal hernias. The female counterpart of the processus vaginalis commonly disappears by eight months of gestation, although patency may persist into childhood. If patency persists, the patent processus is termed the canal of Nuck.

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Graphic 83013 Version 1.0

Causes of inguinal swelling in children

Male or Female
Inguinal hernia (direct or indirect)
Inguinal lymphadenopathy or lymphadenitis
Granuloma inguinale
Femoral hernia
Appendicitis within the hernial sac (Amyand hernia)
Benign or malignant tumor*
Male only
Hydrocele of the spermatic cord
Retractile testis
Ectopic or undescended testis
Traumatically dislocated testis
Female only
Herniation of the ovary or fallopian tube

* Benign lesions of the inguinal canal can include, but are not limited to, lipomas, hematomas, mesothelial cysts, and dermoid cysts. Soft tissue sarcomas comprise the most common malignant tumors of the groin.

Graphic 83582 Version 3.0

Indirect inguinal hernia in a male



This infant has a large left inguinal hernia, seen as a bulge in the inguinal canal and a swelling of the left hemiscrotum.

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Graphic 83101 Version 1.0

Indirect inguinal hernia in a female infant

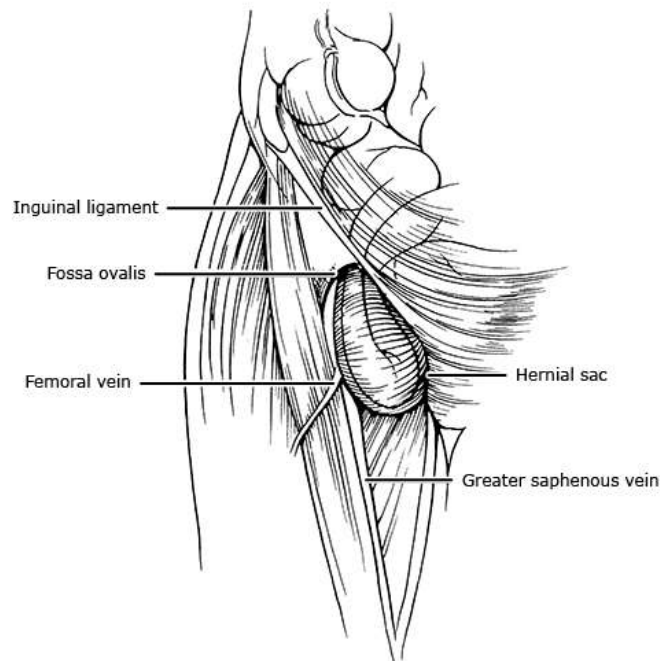


One-month-old girl with bilateral inguinal hernias. Normal ovaries were found in the hernia sacs.

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Graphic 83100 Version 1.0

Femoral hernia anatomy

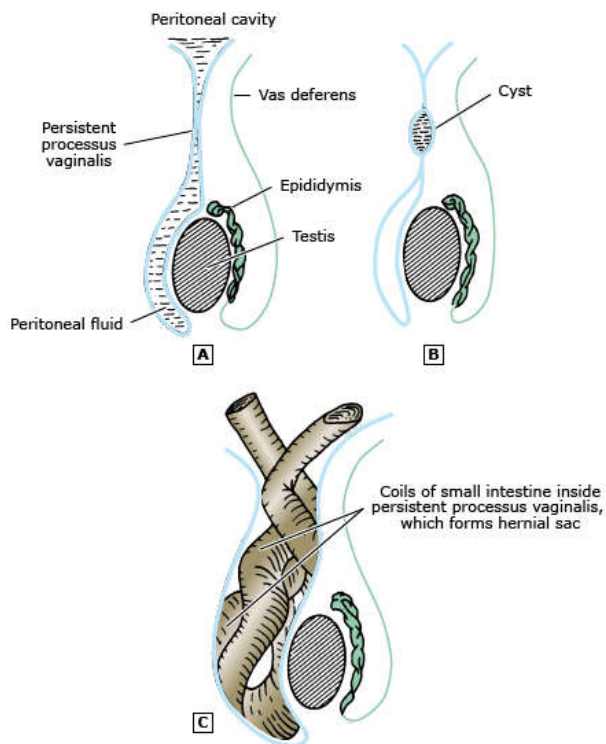


The femoral hernia protrudes below the inguinal ligament and medial to the femoral artery, often in the upper thigh area.

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Graphic 83045 Version 1.0

Congenital anomalies of the processus vaginalis



(A) Congenital hydrocele.

(B) Encysted hydrocele of the spermatic cord.

(C) Preformed hernial sac for indirect inguinal hernia.

Reproduced with permission from: Snell RS. *Clinical Anatomy By Regions*, 8th Edition. Philadelphia: Lippincott Williams & Wilkins, 2008. Copyright © 2008 Lippincott Williams & Wilkins.

Graphic 83047 Version 1.0

Chancroid ulcer on penis



Penile ulcer due to chancroid which is accompanied by marked inguinal lymphadenitis

Graphic 76843 Version 1.0

Inguinal syndrome in lymphogranuloma venereum



The characteristic "groove" sign is seen in this man with inflamed superficial and deep inguinal lymph nodes. These may go on to rupture.

Reproduced from the Centers for Disease Control and Prevention.

Graphic 61366 Version 2.0

Ulcerovenetative granuloma inguinale

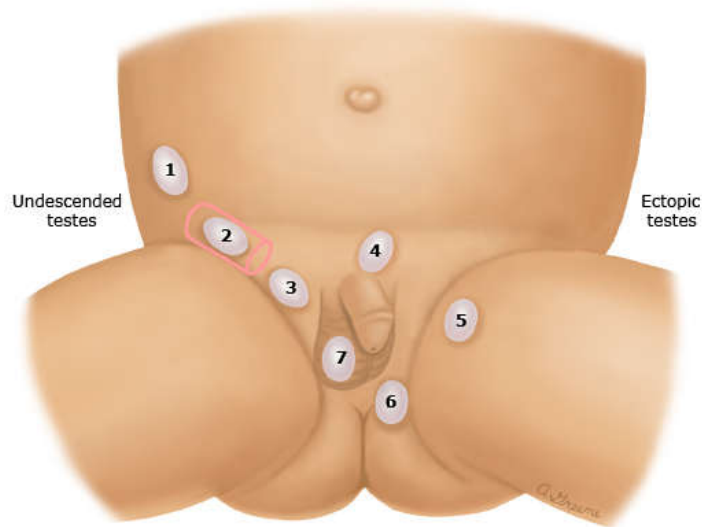


The ulcerovenetative ulcers of granuloma inguinale start as pseudo-buboes that break down to form spreading ulcers, typically on the genitalia and in the inguinal region.

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Graphic 83016 Version 4.0

Possible locations of undescended and ectopic testes



Undescended testes may be located in the abdomen (1), inguinal canal (2), and suprascrotal (prepubic) regions (3). Ectopic testes may be located in the suprapubic (penile) region (4), femoral region (5), perineal region (6), and contralateral hemiscrotum (7).

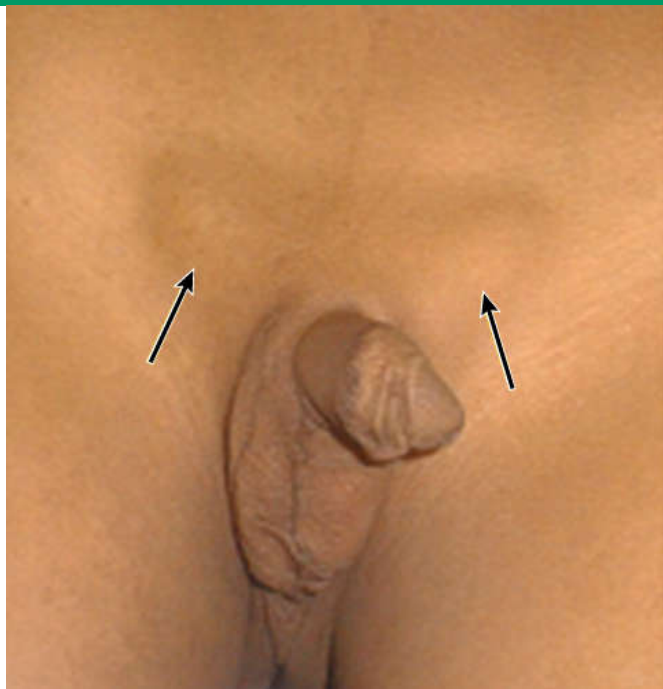
Graphic 74686 Version 4.0

Bilateral undescended testicles



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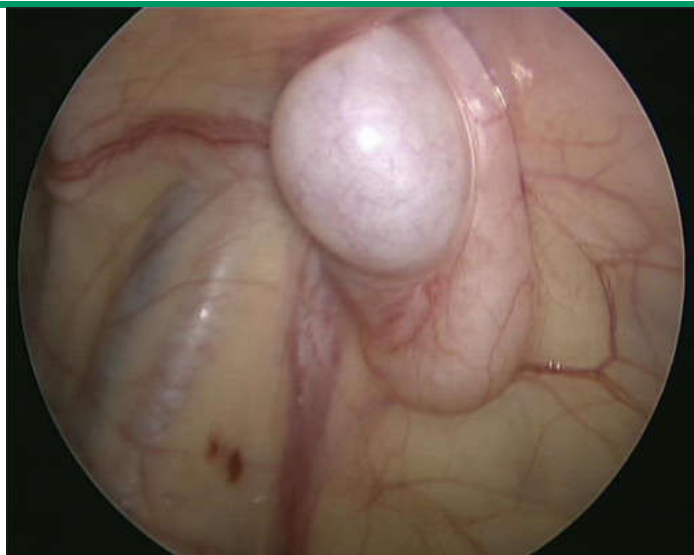
Graphic 51355 Version 7.0

Bilateral suprascrotal undescended testes

Bilateral undescended testes visible on physical examination at the external ring (arrows).

Graphic 89318 Version 2.0

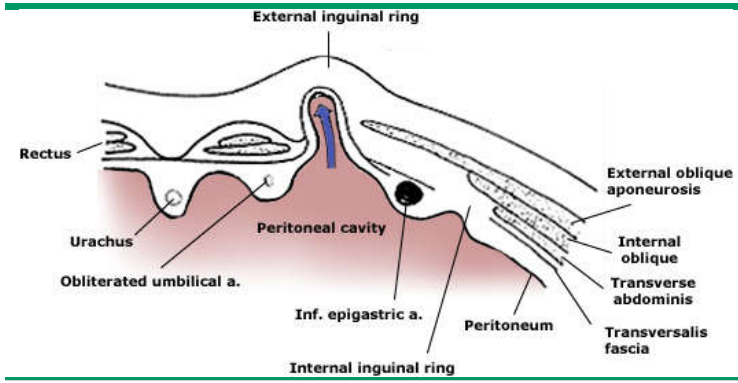
Laparoscopic view of intra-abdominal testis



Laparoscopic view of a right intra-abdominal testis close to the right internal ring.

Graphic 89319 Version 3.0

Direct inguinal hernia



Direct inguinal hernias are medial and inferior to the deep epigastric vessels. As seen in this transverse section of the anterior abdominal wall, the hernia passes directly through the external inguinal ring and does not traverse the inguinal canal.

Adapted from O'Rahilly. *Abdominal walls*. In: *Basic Human Anatomy*, W.B. Saunders Company, Philadelphia 1983. p.230.

Graphic 51224 Version 1.0

Our step-wise approach to the evaluation and initial management of inguinal lymphadenopathy in children

1. History and examination to look for obvious causes or worrisome features*
2. Refer children with worrisome features for early biopsy¶
3. Evaluate and treat causes that appear obvious based on initial evaluation
4. When the cause remains uncertain after the initial evaluation: <ul style="list-style-type: none">■ Lymph node ≥2 cm (0.8 inches) in longest diameter and tender:<ul style="list-style-type: none">• Initiate 10 to 14 day trial of antibiotic therapy, broadened as indicated^Δ<ul style="list-style-type: none">◦ Regression in size: No additional evaluation or therapy◦ No regression in size: Obtain CBC/differential, ESR/CRP, CXR, TST, <i>Bartonella henselae</i> serology and provide referral or treatment based on the results■ Lymph node ≥2 cm (0.8 inches) in longest diameter, nontender, with symptoms/signs of infection within or distal to node<ul style="list-style-type: none">• Obtain bacterial and fungal cultures or other fungal studies as indicated by the initial evaluation, <i>B. henselae</i> serology, and provide a 10 to 14 day trial of antibiotic therapy, broadened as indicated^Δ<ul style="list-style-type: none">◦ Regression in size: No additional evaluation or therapy◦ No regression in size: Obtain CBC, ESR/CRP, and CXR to evaluate worrisome features*■ Lymph node ≥2 cm (0.8 inches) in longest diameter, nontender, no symptoms/signs of infection within or distal to node<ul style="list-style-type: none">• Obtain CBC/differential, ESR/CRP, CXR and abdominal ultrasonography<ul style="list-style-type: none">◦ Worrisome features*, abdominal mass, or abdominal lymphadenopathy: Proceed to biopsy¶◦ No worrisome features*, no abdominal mass or lymphadenopathy, and cause remains uncertain: Perform TST and provide a 10 to 14 day trial of antibiotic therapy broadened as indicated^Δ<ul style="list-style-type: none">■ TST positive: Additional testing may be necessary to establish diagnosis of tuberculosis or NTM■ TST negative and lymph node regresses in size: No additional evaluation or therapy■ TST negative, lymph node does not regress: Obtain additional microbiologic studies as indicated by the history and examination and provide referral or treatment based on the results■ Lymph node <2 cm (0.8 inches) in longest diameter:<ul style="list-style-type: none">• Worrisome features*: Proceed to biopsy¶• No worrisome features*: Continue to observe, even if the lymph node does not regress after four weeks
5. For lymph nodes ≥2 cm (0.8 inches), obtain biopsy¶ after four weeks if the diagnosis remains uncertain and the lymph node has not regressed in size or there is no response to antimicrobial therapy/broadened antimicrobial therapy

CBC: complete blood count; ESR: erythrocyte sedimentation rate; CRP: C-reactive protein; CXR: chest radiograph; TST: tuberculin skin test; EBV: Epstein-Barr virus; CMV: cytomegalovirus; NTM: nontuberculous mycobacteria; CA-MRSA: community-associated methicillin-resistant *Staphylococcus aureus*.

* Worrisome features include systemic symptoms (fever >1 week, night sweats, weight loss [$>10\%$ of body weight]); fixed nontender nodes in the absence of other symptoms; abnormal chest radiograph (eg, mediastinal mass or hilar adenopathy); abnormal CBC/differential; lack of upper respiratory tract symptoms; lymph nodes >2 cm in diameter that have increased in size from baseline or have not responded to two weeks of antibiotic therapy; and persistently elevated ESR/CRP or rising ESR/CRP despite antibiotic therapy.

¶ Excisional biopsy is preferred; fine needle aspirate biopsies usually are inadequate for evaluation of pediatric malignancies or infiltrative diseases.

Δ Empiric antibiotic therapy should include coverage for common pathogens such as group A *Streptococcus* and *S. aureus* (eg, clindamycin in areas with a high prevalence of CA-MRSA or a first-generation cephalosporin [eg, cephalexin] or amoxicillin-clavulanate in areas with a low prevalence of CA-MRSA). If the patient's systemic symptoms (eg, fever) do not improve within 72 hours or the lymph node increases in size (at any point during treatment), we broaden the antimicrobial coverage to include coverage for common pathogens that were not included initially (eg, CA-MRSA, *B. henselae*). Refer to UpToDate topic on diagnostic approach to peripheral lymphadenopathy in children for details.

Refer to UpToDate topic on evaluation of peripheral lymphadenopathy in children for details.

Graphic 106348 Version 2.0

Our step-wise approach to the evaluation and initial management of generalized lymphadenopathy in children

1. History and examination to look for obvious causes
2. Early biopsy* of most abnormal node for children with: <ul style="list-style-type: none">■ Supraclavicular nodes■ Massively enlarged nodes (ie, >4 cm [1.6 inches])■ A group of nodes with a total diameter >3 cm (1.2 inches)
3. Initial testing typically includes: <ul style="list-style-type: none">■ CBC with differential, ESR/CRP■ Serology for CMV and EBV■ Serology for other viral illnesses as warranted by the history and examination¶■ TST■ Chest radiograph
4. Provide treatment or additional evaluation as indicated for conditions that are identified through initial history, examination, and testing
5. When the cause remains uncertain after the initial evaluation, obtain the following second tier tests if there are indications based on the initial evaluation ¶: <ul style="list-style-type: none">■ Serology for <i>Bartonella henselae</i>, toxoplasmosis, histoplasmosis, coccidiomycosis, brucellosis, syphilis, HIV, and other viruses■ ANA
5. Obtain biopsy* of the most abnormal node within four weeks of initial evaluation if: <ul style="list-style-type: none">■ Any lymph nodes increase in size■ There is a lymph node ≥2 cm (0.8 inches) in diameter and either of the following:<ul style="list-style-type: none">• The diagnosis remains uncertain after four weeks• There is no response to therapy as indicated by the findings of initial or second tier tests

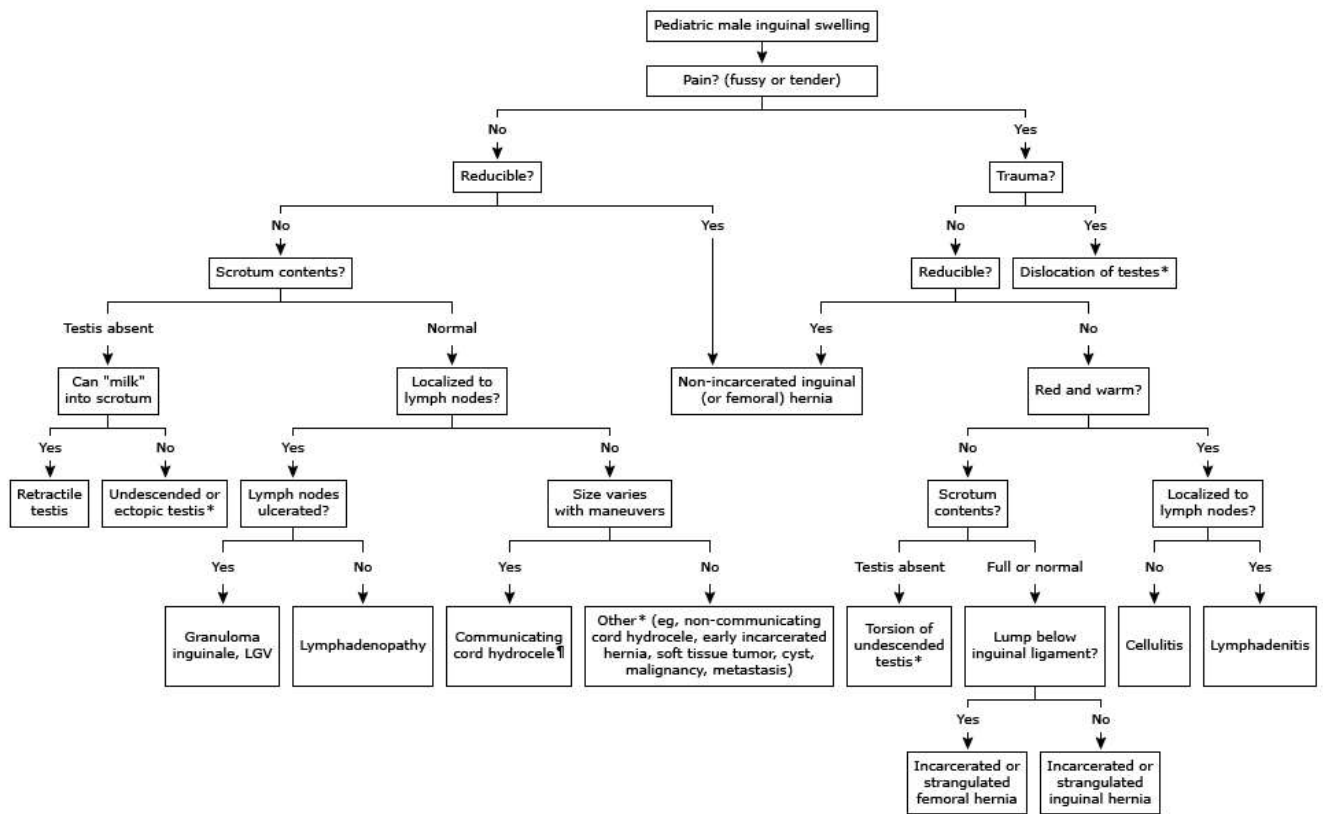
CBC: complete blood count; ESR: erythrocyte sedimentation rate; CRP: C-reactive protein; CMV: cytomegalovirus; EBV: Epstein-Barr virus; TST: tuberculin skin test; HIV: human immunodeficiency virus; ANA: antinuclear antibody.

* Excisional biopsy is preferred; fine needle aspirate biopsies usually are inadequate for evaluation of pediatric malignancies or infiltrative diseases.

¶ Refer to UpToDate topic on evaluation of peripheral lymphadenopathy in children for details.

Graphic 106345 Version 2.0

Inguinal swelling in a boy



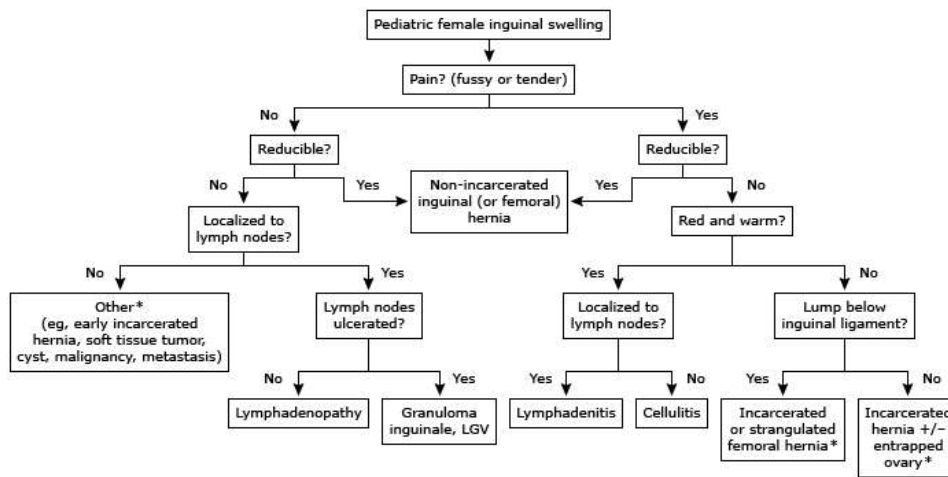
LGV: lymphogranuloma venereum.

* Ultrasound should be performed.

¶ Ultrasound may provide additional diagnostic information.

Graphic 83583 Version 4.0

Inguinal swelling in a girl



* Ultrasound should be performed.

Graphic 83584 Version 2.0

