

**Penn State College of Medicine  
Continuing Education**

**13th Annual Central PA Sports Medicine Symposium**

**Tuesday, June 10, 2025**

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and not referring to an actual patient.**



# Abdominal Injuries in Sport

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# History

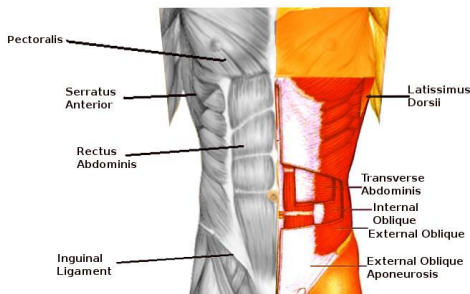
- Thankfully, severe abdominal trauma during sport is rare.
- Remember common things are common
  - Core muscle injury
  - Infectious disease
  - Digestive conditions
  - Genitourinary issues
  - Pelvic pain
- For abdominal pain without obvious incident, a thorough history is key.

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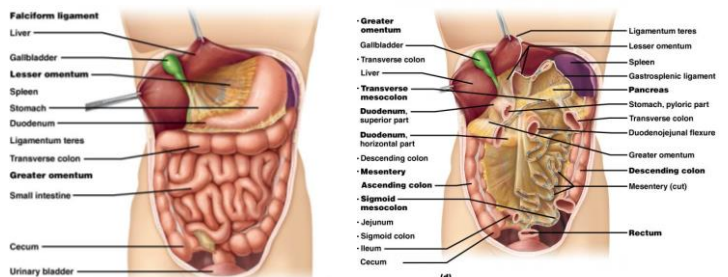
# Anatomy

Abdominal anatomy is complex and encompasses multiple systems

**Muscles of the Anterior Abdominal Wall**



<https://www.ncbi.nlm.nih.gov/books/NBK551649/>



<https://wisc.pb.unizin.org/anatomy/chapter/abdominal-organs/>

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## Case 1

14-year-old male baseball player presents with right side of lower abdominal pain. Occurred somewhat acutely after taking over 100 swings in a batting cage. Did not notice the pain during a particular swing, but now has sharp pain every time he swings the bat or twists. Denies any fevers or chills. Denies any bladder changes. Denies any urinary changes. Otherwise feels well, except for when he tries to run or swing a bat.

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## Abdominal wall injury

- Muscular strain
  - Common
  - Grade by severity
    - Grade 1-mild strain
    - Grade 2 –Partial thickness tear
    - Grade 3- Full thickness tear
  - Can be difficult to treat
  - Treatment includes relative rest, therapeutic modalities, progressive strengthening
    - Limited evidence for many therapeutic modalities including soft tissue mobilization, cupping, electrotherapy, cryotherapy, laser etc.
    - Gradual and graded return to play
    - Aggressive RTP can lead to exacerbation

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## Abdominal muscle injury

- A note on some emerging treatment options.
  - Platelet injections?
    - No clear evidence. Not studied in abdominal injury. Some early support for platelet poor plasma injection for muscle injury.
      - Kruse RC, Volfson E. Platelet-Poor Plasma for the Treatment of Acute Hamstring Muscle Injuries in Collegiate Football Athletes: A Cohort Study. *Clin J Sport Med*. 2024 Nov 22 PMID: 39576137.
  - Extracorporeal Shockwave Therapy
    - No clear evidence. Preliminary studies show benefit as part of comprehensive rehabilitation program.
      - Morgan, J.P.M., Hamm, M., Schmitz, C. *et al*. Return to play after treating acute muscle injuries in elite football players with radial extracorporeal shock wave therapy. *J Orthop Surg Res* **16**, 708 (2021). <https://doi.org/10.1186/s13018-021-02853-0>

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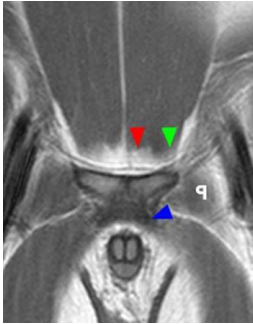
## Abdominal wall injury

- Athletic pubalgia
  - Commonly referred to as sports hernia
  - Not a hernia, but an injury to the aponeurosis of the rectus abdominus and adductor longus
  - Injury to this area is thought related to an imbalance of forces between abdominal and hip musculature
  - Can be difficult to diagnose
  - Physical exam findings include tenderness over the lower abdomen and pelvic area, pain with an abdominal crunch, especially in a frog leg position and pain with resisted abduction.
  - Imaging includes both ultrasound and MRI and requires experienced operators.

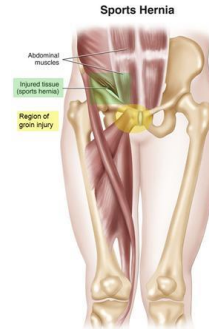
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# Abdominal wall injury

- Athletic pubalgia
  - MR imaging is recommended in 3 planes with T1, T2 and water sensitive sequences.



[Athletic Pubalgia | Radsources](#)



<https://www.orthobullets.com/knee-and-sports/3092/athletic-pubalgia-and-adductor-strain>

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# Abdominal wall injury

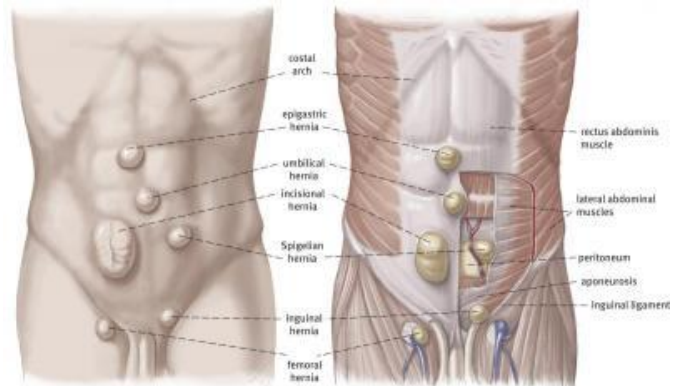
- Athletic pubalgia
  - Treatment can be difficult
  - Initial treatment includes Physical therapy with a comprehensive program that includes core strengthening and relative rest.
  - Pain can often return with resumption of higher level activity
  - Evidence for injection based therapy has not been robust
    - Early case studies supported trial of PRP
    - PRP reportedly associated with heterotopic ossification.
      - Poor AE, Zoga AC, Warren A, Waters LC, Vilotti L, Bentz GP, Meyers WC. Heterotopic Ossification and Platelet-Rich Plasma in Core Muscle Injuries: A Single-Institution Experience Over 6 Years. Am J Sports Med. 2024 Jan;52(1):54-59. PMID: 38164670.
  - Surgery is often the mainstay of treatment for persistent cases.
    - Facial release with goal of balancing force across the pelvis
    - Mesh repair of abdominal muscle or apeunerotic tear
    - Recovery 6 weeks to 3 months

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## Abdominal wall injury

- Hernia

- Inguinal hernia
  - Inguinal canal
  - Spermatic cord men
  - Round ligament women
- Femoral hernia
  - Femoral canal
- Umbilical hernia



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## Case 2

22-year-old college student athlete presents with several weeks of abdominal pain. Does not remember any inciting trauma. No fever or chills. Has vomited once. He notes being full early after eating. Reports similar symptoms in the past, but this is the worst. No bowel or bladder changes. Symptoms seem to have worsened just before midterms.

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## Digestive conditions

- Remember common things are common
- Gastroesophageal reflux
  - Epigastric abdominal pain
  - Often worse after eating
  - Many abdominal conditions, including reflux, can be exacerbated by stress and anxiety
  - Alcohol use will exacerbate
  - Often treated medications to reduce acid production
    - H2 Blocker (Famotidine)
    - Proton Pump Inhibitor (Omeprazole, Esomeprazole, Pantoprazole)
  - Important to review nutrition and diet practice
  - Important to consider anxiety or other stressors that could be contributing

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## Digestive conditions

- Irritable bowel syndrome
  - Common
  - Can lead to intermittent bouts of both diarrhea and constipation
  - Can be exacerbated for athletes with travel when meal time is altered
  - Food options during college or camps can be an issue.

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## Digestive conditions

- Acute or severe abdominal pain without inciting incident requires a broad differential and evaluation
- Common causes not limited to
  - Acute cholecystitis
  - Gallstone
  - Kidney stone
  - Infectious colitis
  - Appendicitis
  - Ovarian cyst
  - Endometriosis
  - Inflammatory Bowel disease
    - Crohn's disease, ulcerative colitis.

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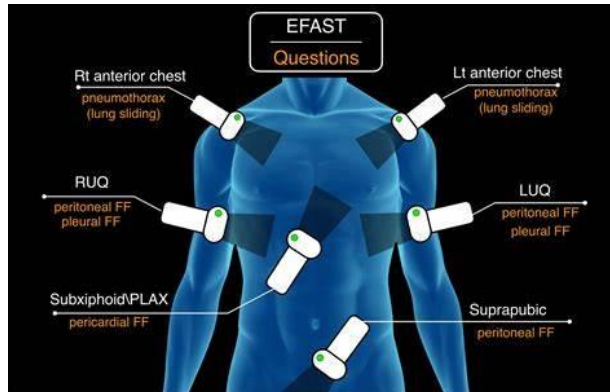
## Case 3

21-year-old ice hockey player come set a bench with severe abdominal pain after being checked into the boards. He became pale and diaphoretic. Pain mostly in the left upper quadrant and radiated to his left shoulder. He was transported to the ED. An eFAST scan was performed and was negative. CT scan showed a grade one splenic laceration. He was admitted for observation in the hospital.

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## eFAST exam

- Rapid evaluation with ultrasound to evaluate for intraabdominal fluid or lung injury after acute trauma. Can be considered as a sideline modality when available.



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## Solid organ injury

- Spleen laceration
  - Fortunately, this is uncommon
  - Most common after blunt trauma
  - Presents with left upper quadrant pain can radiate to the shoulder(Kehr's sign)
  - Higher risk for athletes after recent mononucleosis infection
    - Most pronounced in the first three weeks
    - Can occur up to two months after mono infection
    - Athletes are generally held from participation for three weeks from the start of symptoms
    - Ultrasound or other imaging is not helpful in determining risk of spleen rupture in infectious mononucleosis.

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## Solid organ injury

- Spleen laceration
  - Graded 1-5
  - Lower grades treated with observation and rest.
  - Occasionally embolization to stop bleeding or surgical repair are needed
  - Grade 5 grade injury generally require emergent surgery with splenectomy
  - Athletes who undergo splenectomy for any reason are at higher risk for infection from encapsulated bacteria and should be vaccinated. This includes meningitis and pneumococcal vaccines.
  - Return to play after a splenic laceration depends on the severity of injury.

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## Solid organ injury

- Liver laceration
  - Less common than spleen
  - Similar mechanism
  - Right upper quadrant pain
- Kidney injury
  - Anatomically, the kidneys are retroperitoneal
  - This position helps to protect the kidneys from injury
  - Injury can occur, usually with direct posteriolateral trauma
  - Kidney injury is often associated with urinary signs, including dark or bloody urine

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## Case 3 Continued

While being observed the athlete overnight developed a fever to 101° and his white blood count increased from 9000 to 19000. His abdominal pain became more pronounced. He was taken to the operating room immediately for laparoscopic exploration. He was found to have a laceration in his jejunum, which was repaired operatively. He remained hospitalized for another six days and then discharged to home. He ultimately did return to ice hockey about 2 months after his injury.

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## Hollow organ injury

- Injury to the hollow abdominal organs is much less common
- A few reports in the literature
- Most commonly occur with direct blunt trauma to the organ
- Most commonly seen in handlebar related injuries
- Should be considered in any blunt trauma during athletics and especially during sport with stick related trauma, such as ice, hockey, and lacrosse

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## Hollow organ injury

- Injury to hollow organs such as the intestine, which occur after blunt trauma, can be normal on initial imaging and can progress over several hours
- Trauma can cause local vascular compromise leading to tissue necrosis and then rupture
- It's important to serially reevaluate athletes after a blunt abdominal injury
- Injury, such as this are often accompanied by peritoneal signs on exam
  - Peritoneal signs include abdominal, guarding, rebound, tenderness, acute fever, and chills
- When an acute abdomen is suspected, the patient is generally taken directly to the operating room as imaging can delay definitive care

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## Take home points

- Severe abdominal injury in sport is fortunately rare
- The most common injuries in athletics are muscular strains or tears
- Treatment for muscular injuries include relative rest and rehabilitation
- Benefit of injections and Extracoporal Shock Wave Therapy is unclear
- Occasionally surgery is warranted.
- Significant blunt force trauma can lead to abdominal organ injury, and this should always be considered when an athlete has persistent severe symptoms
- Don't forget that common things are common and that acid reflux, irritable, bowel syndrome, and other common causes of abdominal pain can lead to persistent pain in our athletes.

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