Each Best Practice Recommendation includes key elements to evaluating or treating the condition, a Strength of Recommendation (SOR) grade based on research quality, and supporting evidence.

**Best Practice Recommendation #1: INCIDENCE**

Hip apophyseal injuries occur most commonly among adolescent male athletes who participate in soccer, track and field and football. SOR:B (references include retrospective reviews, case series and a systematic review with meta-analysis)

- Hip apophyseal injuries are most common among adolescents; the average age of occurrence is between 3.8 -15.2 years old and can range as old as the mid-20s.\(^1-5\)
- The most common sports are soccer (32%) track and field (24%) and football (14%).\(^1\)
- Apophyseal avulsion fractures are more common in males (76%).\(^6,7\)

Hip apophyseal injuries occur most commonly to the AIIS, ASIS and the IT, and less commonly at the Iliac Crest. IT fractures occur to older athletes; lesser trochanter fractures in older athletes raises concern with metastatic disease. SOR:B (references include retrospective studies, some inconsistent results regarding the most common site).

- Most apophyseal injuries in soccer occur at the ischial tuberosity (IT), followed by anterior inferior iliac spine (AIIS) and anterior superior iliac spine (ASIS).\(^1\)
- AIIS avulsions represent about half of hip apophyseal injuries, followed by the ASIS (30%), IT (11%), and iliac crest (10%); ischial tuberosity fractures are the most common among Olympic athletes.\(^1,6\)
- Ischial tuberosity apophysitis occurs at a younger age (14 yo) compared to ischial tuberosity avulsion fractures (19 yo).\(^8\)
- Older studies have found both the ASIS and the IT to be the most common injury site.\(^2,3\)
- The iliac crest (21-25 yo), ASIS (21-25 yo), and ischial tuberosity apophyses (20-25 yo) close at an older age than the AIIS (16-18 yo) and the lesser trochanter (15-17yo). ASIS injuries may be more common than AIIS injuries since the ASIS stays open longer.\(^9\)
- Less trochanter avulsion fractures present with groin pain; injuries to this area in adults raises suspicion of metastatic disease.\(^9,10\)
Best Practice Recommendation #2: INJURY MECHANISM

Hip apophyseal injuries commonly occur from running, jumping, kicking a ball or twisting the trunk. SOR:C (references include retrospective research, literature review and a case series).

- Most injuries occur when an athlete is kicking a ball, running or jumping; repetitive microtrauma from intense training can also cause physeal plate failure. The most common injury mechanism is sprinting/running (39%), followed by kicking (29%).\(^1,11\)
- IT injuries often occur from sudden and passive lengthening of the hamstring muscles (gymnasts floor exercises), running, kicking or doing a split.\(^1,2,3,8\)
- ASIS and AIIS injuries in soccer occur from kicking or a powerful shot involving maximal hip flexion and knee extension.\(^1\)
- Iliac crest injuries are usually due to a twisting mechanism.\(^4\)

Best Practice Recommendation #3: PRESENTATION & DIAGNOSIS

Hip apophyseal avulsion fractures are characterized by sudden pain, feeling a pop, and difficulty with weight bearing and ambulation, while apophysitis presents with an insidious onset. Muscle tenderness, weakness and painful passive motion occurs and the injury may be mistaken for a muscle strain or contusion. SOR:C (references include retrospective studies, literature review, a case series and expert opinion)

- ASIS and AIIS injuries present with hip or groin pain, are often associated with a pop, and weight bearing may be uncomfortable.\(^9\)
- Typical symptoms include sudden, shooting pain referred to the involved tuberosity, loss of muscle function, weakness, swelling, local tenderness and pain with passive motion.\(^1,4\)
- With IT injuries, standing is more comfortable than sitting, but weight bearing is painful.\(^2,3,8\)
- Apophysitis is often insidious worsened with activity and relieved with rest. Apophyseal avulsion fractures usually have a sudden or traumatic onset; many patients feel a pop, and are unable to ambulate comfortably.\(^9\)
- Apophyseal injury diagnosis is often delayed and may be initially mistaken as a muscle strain or hip pointer.\(^9\)

Apophyseal injuries can be identified on x-ray; advanced imaging such as MRI may be necessary to make the diagnosis. SOR:C (retrospective studies, inconsistent results, literature review)

- Nearly all injuries are identified on plain film radiographs with few requiring advanced imaging such as CT/MRI to make the diagnosis.\(^6\)
- AIIS avulsions may only be seen with an oblique x-ray view because they displace less than ASIS avulsions due to additional apophyseal soft tissue attachments.\(^2,9\)
- With apophysitis, radiographs are often normal; ultrasound, MRI and CT are more reliable in identifying apophyseal injuries.\(^12\)
Most apophyseal injuries can be treated successfully with conservative measures; operative treatment is necessary for displaced fractures > 2mm. SOR:B (references include consistent retrospective reviews and one systematic review with meta-analysis)

- 97% of adolescent apophyseal avulsion fractures are managed successfully with conservative treatment.  
- Operative treatment may be recommended for displacement >2cm.  
- Operative treatment is more successful than conservative treatment (88% vs 79%) among patients with >15mm displacement and high functional demands.

Conservative treatment consists of a period of 2-4 weeks of non-weight bearing, followed by progressive rehabilitation and functional activities, with return to play commonly occurring 2 months or longer post-injury. Bone stimulation can assist healing of some delayed union apophyseal injuries. SOR: C (expert opinion, usual practice, small case reports)

- Acute fracture management consists of 4-6 weeks of protected weight bearing on crutches followed by therapeutic exercises focusing on flexibility.
- Treatment initially consists of non-weight bearing ambulation followed by weaning of crutches over a period of 2-4 weeks. Once full weight bearing and ADLs are tolerated.
- Rehabilitation begins with gentle flexibility, then gentle strengthening, balance and proprioception added later. Once this is pain-free (anywhere from 3-12 weeks following the initial presentation), jogging then sports-specific activities can begin.
- Bone stimulation therapy (low-intensity ultrasound) improves healing or delayed union iliac crest apophyseal iliac crest injuries.
- Return to sports should be started no earlier than 2 months after injury.
- Surgically treated ASIS avulsions with suture anchors can allow return to sports at 10 weeks postoperatively.

AIIS, IT and displaced fractures can result in chronic pain or non-union. Labral injury is associated with an AIIS fracture. SOR:B (retrospective studies, case series)

- 14% of all patients and 22% of AIIS fractures can have some pain 3 months or more after their initial injury.
- AIIS avulsion fractures are 4-5 times more likely to have chronic pain. AIIS and ischial tuberosity fractures have higher risk for non-union and future pain. Most non-unions and injuries resulting in chronic pain or functional impairment are ischial tuberosity fractures.
- Fractures with >20mm of displacement are 26 more times more likely to develop nonunion than those with <20mm of displacement.
- A hip labral injury can be associated with an AIIS fracture.

Information researched and provided by Casey Christy, DAT, ATC, CSCS, Co-Developer, ATGenius.com. Treatment decisions should be made based on the best available evidence, patient preference, and clinician expertise, in consultation with, and at the direction of a physician.
See our other best practice documents:

- Acromioclavicular Joint Injuries
- ACL Injuries
- Abdominal Injuries
- Shoulder Dislocations
- Patella Dislocations

References