Best Practice Recommendations

A series of evidenced-based guidelines to improve your patient care, provided by the developers of ATGenius.com.

HIP APOPHYSEAL INJURIES AND AVULSION FRACTURES

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 injures 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]
- AIIS and ASIS 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]

Best Practice Recommendation #4: TREATMENT & REHABILITATION

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.[6]
- Operative treatment may be recommended for displacement >2cm.[13,14]
- Operative treatment is more successful than conservative treatment (88% vs 79%) among patients with >15mm displacement and high functional demands.[15]

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.[6]
- 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.[9]
- 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.[9]
- Bone stimulation therapy (low-intensity ultrasound) improves healing or delayed union iliac crest apophyseal iliac crest injuries.[16]
- Return to sports should be started no earlier than 2 months after injury.[3]
- Surgically treated ASIS avulsions with suture anchors can allow return to sports at 10 weeks postoperatively.[17]

Best Practice Recommendation #5: PROGNOSIS

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.[6]
- 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.[2,6]
- Fractures with >20mm of displacement are 26 more times more likely to develop nonunion than those with <20mm of displacement.[6]
- A hip labral injury can be associated with an AIIS fracture.[18,19]

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.

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

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