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Hip Pain in a High School Football Player: A Case Report

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Objective: To describe the evaluation, diagnosis, and conservative treatment of a 15-year-old male high school football player with an avulsion fracture of the ischial tuberosity.

Background: Avulsion fracture of the ischial tuberosity is a rare and often missed diagnosis. A literature review offered limited information concerning the evaluation and conservative treatment of such an injury.

Differential Diagnosis: Avulsion fracture of the ischial tuberosity.

Treatment: The athlete's treatment goal was to return to football and weight lifting without surgical intervention. Treatment initially focused on controlling pain and normalizing gait. The athlete then advanced to a progressive resistance exercise program and functional sporting drills as he improved in hip range of motion, strength, and neuromuscular control. He returned to unrestricted sporting activities 14 weeks after the injury.

Uniqueness: Avulsion of the ischial tuberosity is a rare injury. Most published case reports have recommended surgical intervention for this injury, with little information describing conservative treatment.

Conclusions: Sports medicine practitioners must obtain an accurate history, perform a thorough physical examination, and obtain appropriate radiographs in order to correctly diagnose an ischial tuberosity avulsion fracture. Furthermore, they should consider conservative treatment for minimally displaced ischial tuberosity avulsion fractures. Should the athlete not show significant functional gains within a month of conservative treatment, the health care provider should consider surgical treatment.

Key Words: tuberosity avulsion, hip pain, rehabilitation

Avulsion fractures are injuries commonly seen in adolescent athletes. The injury mechanism is either a sudden violent muscular contraction or an excessive amount of muscle stretch across an open apophysis.[1] Common sites of avulsion injuries include the tibial tubercle and the medial epicondyle. Avulsion fractures also occur at the hip and may affect the anterior superior iliac spine, the lesser trochanter, and the ischial tuberosity.

Avulsion fracture of the ischial apophysis is a rare injury,[2–4] which typically results from a sudden forceful flexion of the hip joint when the knee is extended and the hamstring muscles are powerfully contracted. The athlete complains of pain in the buttock and of difficulty walking, standing, and squatting.[4]

The diagnosis of an avulsion of the ischial tuberosity is often missed because of its rare occurrence and similarity to a muscle tear. Severe muscle tears are less common in the adolescent age group and more common in adults, after the apophyses are closed.[5] Important distinguishing factors between a hamstring tear and avulsion fracture include the athlete's age and inability to bear weight through the affected lower extremity. Consequently, the health care provider must gather an accurate history, perform a detailed examination, and confirm the diagnosis with roentgenograms.[5,7]

Some physicians recommend conservative treatment for such fractures[1,3,6]; others advocate surgical intervention.[2,4,7,8] Therefore, the purpose of this case study is to discuss the evaluation, management, and treatment considerations for an athlete sustaining an ischial tuberosity avulsion.

CASE PRESENTATION

A 15-year-old high school football player with no history of hip or back pain reported to the sports medicine clinic complaining of left buttock pain. He came to the clinic for a second opinion after an initial recommendation for open reduction, internal fixation for an ischial tuberosity avulsion fracture. The athlete's main goal was to return to football and weight lifting without surgical intervention.

The player stated that he had hurt his hip on the previous day while doing squats in the high school weight room. The athlete had routinely and safely squatted 201.85 kg (445 pounds); however, he had changed his technique on this particular day, such that his right leg was 5.08 cm (2 in) in front of the left, placing more weight on the left lower extremity. As he was coming out of the parallel position (thighs parallel to the floor), the athlete felt a tearing and sharp pain in his left buttock. After this lift, he could neither fully extend his left knee or hip nor bear weight on the left lower extremity.

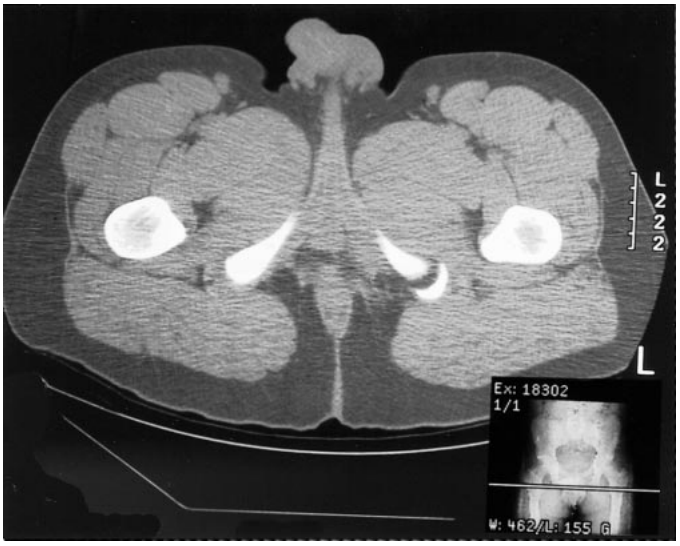

Figure 1. Computed tomography scan showing an ischial tuberosity avulsion fracture displaced approximately 1.2 cm.

Assessment and Diagnosis

The player walked into the clinic using crutches because he was unable to bear weight on the left lower extremity secondary to pain. Palpation revealed extreme point tenderness at the ischial tuberosity. The athlete was neurovascularly intact, yet he had decreased tone of the left hamstring muscles. Goniometric measurements showed hip extension to neutral. In the sitting position, he had 45° of hip flexion. We did not measure hip abduction, internal rotation, or external rotation because these positions increased his pain. In the prone position, he had 90° of active knee flexion. The athlete had normal quadriceps strength. Sitting hip flexion strength was graded at 3+/5. Hip extension was graded at 1/5 because he could not extend his left hip from a prone position, although he did have a visible hamstring contraction. The athlete was limited in all activities of daily living due to increased posterior hip pain, as well as decreased strength, range of motion, and flexibility of the left hip. A computed tomography scan (Figure 1) revealed a left ischial apophyseal avulsion displaced approximately 1.2 cm. Of note, the athlete had anterior-posterior pelvis films made at another hospital's emergency room but did not bring them to our clinic. The physician felt no need to repeat the X-ray films because the computed tomography scan provided a clear diagnosis.

Clinical Course

During the first week, the athlete took a nonsteroidal antiinflammatory drug and continued with ice and rest. One week after the injury, he began rehabilitation (Table). Rehabilitation initially focused on pain control, gait training, and hamstring strengthening. Specifically, the initial treatment plan included modalities such as moist heat before and ice after each exercise session for pain control, weight-bearing activities (weight shifts with progression to single-leg stance) to normalize gait, submaximal hamstring isometrics for muscle re-education, and gentle hip stretches for restoring flexibility. Two weeks after the injury, the athlete walked with a normal gait pattern, demonstrated improved hip range of motion, and reported a significant decrease in pain.

Athlete's Rehabilitation Program

Week(s)	Goals	Activity
1	Pain reduction	Rest, icing, and nonsteroidal antiinflammatory drug
	Muscle re-education	Submaximal hamstring isometrics (pain free)
2–4	Pain reduction	Moist heat and ice
	Normal gait	Weight shifts and single-leg stance balancing
	Normal hip range of motion	Stationary bicycle, gentle hip stretches
	Improve hip strength*	Leg press, standing hip therapeutic exercises (all planes); front, side, backward step-ups, bridging
	Restore neuromuscular coordination	Quarter lunges, quarter squats, balance activities on minitrampoline
5–8	Normal cardiovascular endurance	Bicycle, jog, swim
	Normal hip strength†	Leg press, multihip machine, half squats, half lunges, hamstring curls
9–14	Return to sport	Weight room activities as above, sport-specific drills

*The athlete performed 3 sets of 20 repetitions of each exercise at 65% of the maximum repetition for muscle endurance, range of motion, and flexibility.
†The athlete performed 3 sets of 10 repetitions of each exercise at 80% of the maximum repetition for strength effects.

Based on these functional improvements, the athlete was then progressed to a more aggressive strengthening program, which included both open and closed kinetic chain exercises with concentric and eccentric activity. At this point, he tolerated riding a stationary bicycle and walking on a treadmill to improve cardiovascular endurance. Had a regular stationary bicycle been uncomfortable, then the athlete could have used a recumbent bicycle. The athlete used the leg press and multihip machines to strengthen the hip musculature. He also progressed to lunges with the knee at 45° of flexion and quarter squats. Four weeks after the injury, the athlete demonstrated normal hip range of motion and significant strength improvements, and he began a jogging program. The physician felt that the athlete could safely initiate the jogging program based on his functional gains and the fact that the fracture was stable and nondisplaced. Initially, the athlete jogged at 25% effort on a treadmill for 5 minutes and gradually progressed to running at 50% speed for 20 minutes on the football field over the next 4 weeks.

Eight weeks after the injury, the athlete's hip strength returned to a functional level. At this time, he began sport-specific drills. Examples included lunges to 90° of knee flexion, jump squats (standing in a squatting position with 30° of knee flexion, jumping upward and landing in the same position), single-leg balance clock drill (balance on the left leg and touching different points on the ground with his fingertips), and low-level cutting drills. Except for the cutting drills, the athlete performed 3 sets of 10 repetitions for each exercise. As he progressed with each activity, we challenged him more by adding rubber tubing resistance to the left lower extremity. Cutting drills began at submaximal speeds without sharp turns over a 45.72-m (50-yard) distance and progressed to sharper turns at faster speeds over the same distance. The player con-

Figure 2. X-ray film (inlet view) taken approximately 1 year after the initial injury.

tinued these activities in conjunction with his weight-room program for another 6 weeks. After successfully completing therapeutic exercise and all functional drills specific to playing football, the athlete returned to his previous sporting level 14 weeks after the initial injury. He played throughout the entire football season without limitation, returned to regular weight-room activities, and won his high school's annual weight-lifting award that following spring. Approximately 1 year later, the athlete reported no pain or decrease in sporting capability (Figure 2).

DISCUSSION

Bony avulsions from the ischial tuberosity are rare.[2,4] Injuries of the ischial tuberosity occur most commonly in individuals whose tuberosity is not yet fused.[6] Generally, the mechanism of injury is a forceful flexion of the hip with the knee extended and the hamstring muscles powerfully contracted, which can occur with sprinting, long jumping, or hurdling.[2,6,7,8] Such injuries involve the hamstrings working eccentrically in decelerating hip flexion. Our patient's injury differed in that the avulsion occurred as he performed a strong concentric contraction across an open apophysis.

The athlete with such a fracture has localized swelling, tenderness, and limitation of motion about the site of the avulsion fracture. Pain may be extreme. In addition to obtaining an accurate history and performing a complete physical examination, the examiner must obtain radiographs to confirm the diagnosis.[1,5,6] Additionally, sports medicine practitioners should order radiographs whenever an athlete cannot bear weight on a lower extremity in order to rule out a fracture. The health care provider should also rule out other potential diagnoses such as piriformis syndrome, intervertebral disc disease, ischial tuberosity bursitis, and osteomyelitis.[5,6]

Wootton et al[8] recommended nonsurgical intervention for avulsions separated by less than 2 cm. Other authors[1,3,5,6] also advocated conservative treatment; however, few follow-up studies have demonstrated the long-term effects of conservative treatment. A potential complication resulting from conservative treatment is nonunion of the avulsion fracture, or the ''hamstring syndrome,'' in which shortening and usually fibrosis occur in the hamstring origin near the ischial tuberosity.[9] Symptoms include an inability to sit, groin or buttock pain, muscle weakness, and decreased sporting ability. In patients with nonunion or persistent pain sitting or during functional activities, surgical restoration of normal hamstring length by an orthopaedic surgeon can help the athlete regain normal function.[8]

Our case involved an athlete with a 1.2-cm ischial tuberosity avulsion, and our orthopaedic surgeon recommended conservative treatment. He did discuss the potential for surgical intervention should the athlete not achieve significant functional gains with conservative treatment after 4 weeks.

We patterned our rehabilitation plan after Metzmaker and Pappas'[5] 5-phase program. First, they recommended rest and ice. Second, they initiated gradual mobilization as pain subsided. Third, the athlete began a comprehensive resistive exercise program as active range of motion improved. When the athlete demonstrated hamstring strength (knee flexion and hip extension on manual muscle testing) of 50% of the expected outcome, he or she could begin more functional activities. Finally, the athlete could return to full sporting activities after achieving full strength and neuromuscular coordination. Our treatment plan incorporated these principles, and our athlete safely returned to full sporting activities.

CONCLUSIONS

Avulsion fracture of the ischial tuberosity is a rare, often misdiagnosed injury. Factors vital to the proper diagnosis include an accurate history, thorough physical examination, and appropriate radiographic views. After making a proper diagnosis, the physician must then decide between conservative or surgical treatment.

Our case demonstrates an athlete's safe return to full sporting activity after conservative treatment. Health care practitioners should consider conservative treatment for minimally displaced (less than 2 cm) avulsion fractures. Early goals of rehabilitation include controlling pain and normalizing gait. As pain subsides and gait improves, the athlete can safely begin a progressive resistance program. Once full range of motion and strength are restored, the athlete can begin functional activities in preparation for full return to sport. If an athlete fails to make significant gains in hip range of motion, strength, function, and pain within the first month of rehabilitation, then surgical intervention may be indicated.

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