

*Case report*

Surgical Treatment of Chronic Post-Traumatic Hamstring Origin Pain with Tendon Transfer from the Unfused Ischial Tuberosity Apophysis to the Native Ischial Bone

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Citation: Uhan L, Strle E, Piliš KA, Kozic M, Vauhnik R. Surgical Treatment of Chronic Post-Traumatic Hamstring Origin Pain with Tendon Transfer from the Unfused Ischial Tuberosity Apophysis to the Native Ischial Bone. Proceedings of Socratic Lectures. 2025, 12, 91-96.
<https://doi.org/10.55295/PSL.12.2025.I12>

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Abstract:

A case report of a 35-year-old female patient suffering from chronic hamstring origin pain after an acute strain injury is presented. The initial clinical examination demonstrated a significant tenderness of the left buttocks. The diagnostics showed a chronic displaced osteochondral fragment in the region of ischial tuberosity. The displaced fragment was interpreted as either an unfused apophysis or an unhealed childhood apophyseal avulsion fracture. The injury uncovered a “weak link” in the kinematic chain of posterior thigh and was therefore treated as a strain injury of pseudoarthrosis between the fragment and the pelvis. Conservative treatment, including physiotherapy and nonsteroidal anti-inflammatory medication, followed by a CT guided pain injection containing a corticosteroid and local anaesthetic failed to provide sufficient results. Therefore, operative treatment was recommended. Release and reattachment of the hamstring tendons from the fragment to the native os ischium, using three suture anchors, was performed with excellent results 15 months postoperatively. During the postoperative period and physical rehabilitation therapy, the patient gradually improved mobility, muscle strength and corrected her gait pattern. The patient was extremely satisfied with the surgical outcome and reported no discomfort or pain while performing daily activities.

Keywords: Ischial tuberosity; Chronic pain; Unfused apophysis; Tendon transfer; Rehabilitation.

1. Introduction

Proximal hamstring tendinopathy is the most common cause of chronic posterior thigh pain (Hunter & Speed, 2007). However, in some cases, the reason for pain can be found in other conditions with similar presentations, and the correct diagnosis is often missed due to the similarities in the mechanism of the injury and the area of pain (Dailey et al., 2013).

1.1. Ischial tuberosity and its ossification

The ischial tuberosity is the origin site of the muscles at the posterior compartment of the thigh, the hamstrings. The long head of biceps femoris and semitendinosus originate from the ischial tuberosity with a common tendon, while semimembranosus originates as a separate tendon laterally (Miller et al., 2007). Endochondral ossification, the process by which most of the skeleton is formed, involves the replacement of hyalin cartilage with bony tissue and proceeds at different rates in different bones (Mackie et al., 2007). Ossification of the ischial tuberosity typically starts between 13 and 15 years of age. During this process, due to the physiological properties of the hyaline cartilage, the ischial tuberosity is two to five times more fragile than the surrounding ligaments and tendons (Liu et al., 2018). The region of the ischial tuberosity has a limited capacity for force absorption, and an increase in mechanical load can result in avulsion fractures (Dailey et al., 2013).

1.2. Mechanism of the injury

Generally, these injuries are rare and occur frequently only in skeletally immature, active patients due to incomplete ossification (Liu et al., 2018). The mechanism of injury typically involves a powerful eccentric contraction of the hamstrings during sport activities involving rapid acceleration (e.g., sprinting and jumping (Liu et al., 2018; Tetsunaga et al., 2019)). As a result of delayed diagnosis or unsuccessful conservative treatment, some cases develop non-union, leading to chronic pain later in life (Ali et al., 2020). Asymptomatic unfused ischial tuberosity apophysis is rarely seen in adults, however, repeated micro-trauma during the process of growth and maturation can, in some cases, lead to non-union. Repetitive overload of the apophysis during sports activities can lead to apophysitis, and if the condition becomes chronic, the apophysis can remain unfused (Ali et al., 2020). The patient may later be symptom-free, while in some cases, the condition can lead to chronic pain in the posterior thigh (Ali et al., 2020; Dailey et al., 2013). Failure to treat the displaced fractures has been associated with pseudoarthrosis and proximal hamstring fibrosis, also leading to chronic pain and limitations on activities of daily living (Lui et al., 2018). An accurate diagnosis is, therefore, essential for proper clinical management.

1.3. Treatment

Conservative treatment, including modification of activities and anti-inflammatory medication is usually adequate for apophysitis (Ali et al., 2020). If diagnosed early and the size of fracture displacement is less than 2 centimeters, bony avulsions are also managed conservatively (Lui et al., 2018). Conservative treatment plan for avulsion fractures consists of four phases (**Table 1**) (Cereti et al., 2013).

Table 1. Conservative treatment plan for avulsion fractures (Cerreti et al., 2013).

Phase	Week	Conservative treatment plan
1	1 – 3	Resolution of pain, inflammation and acute symptoms. Rest, anti-inflammatory medication and passive mobilization are recommended.
2	3 – 8	Performing progressive agility and trunk stabilization exercises with low to moderate intensity for regaining mobility.
3	8 – 16	Performing progressive agility and trunk stabilization exercises with higher intensity.
4	16 – 24	Performing static stretching and isometric strengthening, followed by controlled eccentric and concentric contractions to increase strength and endurance.

Before returning to regular activity, the avulsed bone fragment must unite with the rest of the bone and the patient must regain full range of motion and adequate muscle strength. If the dislocation of the apophysis is greater than 2 centimeters or conservative treatment has not been successful, surgical reattachment may be considered (Liu et al., 2018). In cases of delayed diagnosis, unfused avulsed fragment usually forms a fibrous pseudoarthrosis with the rest of the bone (Liu et al., 2018). Excessive fibrous overgrowth during the healing process of avulsed ischial apophysis often causes symptoms later in life, such as discomfort while sitting and pain during activities (Schlonsky & Olix, 1972). Aggressive conservative treatment, including local corticosteroid injections and physiotherapy, is used to treat those symptoms. If the conservative treatment is unsuccessful, surgical dissection of fibrous tissue usually provides resolution of pain. In some cases, surgical reattachment of the avulsed fragment is performed (Liu et al., 2018; Schlonsky & Olix, 1972). Even though surgical treatment is considered effective in alleviating chronic pain, there is a lack of data published on these procedures (Liu et al., 2018). This report presents a case of successful surgical treatment of chronic post-traumatic hamstring origin pain with tendon transfer from the unfused ischial tuberosity apophysis to the ramus of the ischial bone.

2. Injury and treatment course

A 35-year-old female patient was presented to the emergency clinic after a slip in her bathroom, which resulted in an injury to her left leg. The patient described a typical stretch-type injury to the hamstrings, an extensive hip flexion with an extended knee (Danielsson et al., 2020). The initial clinical examination demonstrated a significant tenderness of the left ischial tuberosity. A computed tomography (CT) scan of the pelvis showed a displaced osteochondral fragment, interpreted as either an unfused apophysis or an unhealed childhood apophyseal avulsion fracture (**Figure 1a**). The patient's childhood history of gymnastics and athletics raised suspicion that sport-induced stresses could have contributed to either an acute trauma (which the patient does not recall) or an overuse injury that inhibited apophyseal fusion. Magnetic resonance imaging (MRI) of the pelvis confirmed a displaced osteochondral fragment, with all proximal hamstring tendons attached to it (**Figure 1b**). There was an effusion in the pseudoarthrosis between the fragment and the ischial bone, a sign of inflammation. Strain injury to the pseudoarthrosis was diagnosed. It seemed that the injury uncovered a developmental skeletal deficit.



Figure 1a. X-ray image from the time of the initial examination.

Figure 1b. MRI from the time of the initial examination. Note the effusion and accumulation of fluid within the pseudoarthrosis.

A senior trauma surgeon was consulted. Conservative treatment focused on alleviating pain was initiated, including physiotherapy and nonsteroidal anti-inflammatory medication. The patient was instructed to avoid movement that aggravated the symptoms. After three months, the patient was scheduled for control at the outpatient clinic. Conservative management did not provide sufficient results. The pain persisted, with increasing limitations in the activities of daily living. The patient reported having problems with sitting, walking and weight-bearing activities. Antalgic gait with decreased weight bearing on the affected site was observed. A pain management specialist was consulted and recommended a CT-guided pain injection. The injection containing a corticosteroid, and a local anaesthetic was injected to the affected area. The procedure provided temporary relief.

But, the pain rebounded, and the patient reported mild postprocedural irritation of the sciatic nerve, with an occasional tingling in the peripheral nerve field. Electromyography (EMG) demonstrated no abnormalities and MRI showed preserved nerve continuity. Ultimately, the pain management injection failed to provide sufficient results, and therefore, operative treatment was indicated.

The surgery was performed in a prone position under general anaesthesia. An incision was made along the gluteal crease, followed by the skin and subcutaneous tissue dissection. With the retraction of the gluteal muscles, the osteochondral fragment with attached hamstring tendons was exposed, and the sciatic nerve was identified. Fibrous tissue around the fragment was removed, while care being taken to avoid nerve damage. The release of hamstring tendons from the unfused fragment was performed. Reattachment of the tendons to the native os ischium was performed in the 60 degrees knee flexion, using three suture anchors. The postoperative anteroposterior radiogram of the pelvis and proximal femora is presented in **Figure 2**.



Figure 2. Postoperative anteroposterior radiogram of the pelvis and proximal femora.

Postoperatively, the left knee was immobilized in a hard frame brace, fixed at 60 degrees of flexion. At discharge, the patient was mobilized on crutches without load. Two weeks postoperatively, the brace was fixed at 30 degrees of knee flexion for an additional three weeks. The patient was instructed to avoid any active hip extension or knee flexion. Pain decreased significantly over time. Sciatic irritation faded. Six weeks postoperatively, full weight bearing was permitted. The patient started with physiotherapy, which included passive range of motion improvement exercises, ultrasound and laser to improve healing and electrotherapy for pain management. Seven weeks postoperatively, the patient improved significantly and could stand and walk without any discomfort. The range of hip motion was sufficient. A slight antalgic gait was still present. Nine weeks postoperatively, she underwent an intensive inpatient rehabilitation and balneotherapy at a local wellness center. Physiotherapy was focused on pain management, improving mobility and function. The two-week protocol consisted of active exercise, balance training, group hydro gymnastics, manual therapy, laser, and magnetotherapy. Pain was no longer present at discharge, and her gait pattern improved significantly. The range of hip motion increased in both flexion, extension, internal and external rotation and was in the range of normative

values for healthy adults. Fifteen months postoperatively, the patient was extremely satisfied with the surgical outcome and reported no discomfort or pain while performing activities of daily living.

3. Discussion and conclusion

This case report describes a patient suffering from chronic hamstring origin pain that started as an acute strain injury. The diagnostics uncovered a developmental skeletal disorder that was interpreted as either an unfused apophysis or an unhealed childhood apophyseal avulsion fracture. Generally, apophyseal avulsion fractures are rare and frequently occur only in skeletally immature, active patients. Individuals with undiagnosed, asymptomatic fractures are susceptible to recurrent injuries or complications. An unhealed avulsed fragment often forms a fibrous pseudoarthrosis with pelvis girdle and is prone to strain under heavy load. In the presented case, the patient injured the pseudoarthrosis between the hamstring origin and the pelvis. As a result, with muscle activation, the connection between the fragment and the ischium was subjected to strain, leading to the development of chronic pain. Initial conservative treatment, including physiotherapy, medication, and corticosteroid injections, did not alleviate the pain.

The literature confirms limited success of conservative treatment in chronic cases (Liu et al., 2018). Most authors agree that displacement greater of 2 centimeters is an indication for surgical intervention. Potential complications of conservative treatment include chronic pain, fibrosis at the origin of the hamstrings, sciatic nerve complications, muscle weakness, and inability to sit for a prolonged period (Liu et al., 2018; Schlonsky & Olix, 1972). Nevertheless, surgeons are often reluctant to operate in this anatomical region without extensive experience on account of the proximity of the sciatic nerve (Ali et al., 2020). To our knowledge, this is the first report describing surgical treatment of chronic hamstring origin pain with tendon transfer from the unfused ischial tuberosity apophysis to the native ischial bone. Suture anchor repair of the hamstrings was performed with direct exposure and protection of the sciatic nerve. Although the delayed diagnosis made it technically more challenging, excellent clinical, functional, and subjective results were achieved 15 months postoperatively. A comprehensive postoperative rehabilitation program contributed to improved mobility and muscle strength.

In conclusion, surgical intervention can address chronic issues caused by pseudoarthrosis and fibrous tissue overgrowth of hamstring origin, providing resolution of pain and functional deficits. The presented case demonstrates that hamstring tendon transfer with suture anchor repair to the ischial bone is an effective treatment option for chronic pain associated with unfused apophysis of the ischial tuberosity. When conservative treatment fails, surgical intervention can restore function and significantly improve quality of life.

Conflicts of Interest: The authors declare no conflict of interest.

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