A Novel Technique to Repair Acute and Chronic Proximal Hamstring Avulsions

Michael T. Cain, MD; Matthew C. Jones, MD, MS; Dale N. Reed, MD

Abstract: Treatment of proximal hamstring avulsions is challenging regarding both timing and choice of repair. In chronic situations, the tissue can become attenuated, bringing into question the need for adjunctive allograft. In general, proximal hamstring avulsions are affixed back to the ischial tuberosity with suture anchors, with allograft used as needed for chronic situations. This article reports on a novel technique of suspensory fixation with a unicortical button but without allograft to repair both acute and chronic proximal hamstring avulsions. Three patients, all of whom regained full strength and functionality 1 year postoperatively, are described. [Orthopedics. 201x; xx(x):xx-xx.]

Proximal hamstring avulsions can be challenging to treat regarding both timing and choice of repair. The most common location for a tear is the myotendinous junction, with the tear being caused by a combination of hip flexion and knee extension. When the tear is located at the myotendinous junction, nonoperative treatment is generally recommended. However, when there is a complete avulsion of the common proximal tendon from the ischial tuberosity, operative management yields superior outcomes.1,2 The timing of an acute vs a chronic tear has not been well defined. Studies are mixed regarding whether there is a difference between acute and chronic repairs3,4 and whether there is an increase in complications and the need for allograft with chronic injuries.5 The generally accepted technique for proximal hamstring avulsion repair involves using suture anchors to reattach the tendon to the ischial tuberosity, with allograft used as needed for chronic injuries.6 This case series describes a novel technique of using suspensory fixation with a unicortical button to reattach the avulsed proximal hamstring to the ischial tuberosity.

Patient 1
A 67-year-old female cyclist and yoga instructor fell off a curb and felt an immediate “pop” and pain in the left posterior thigh. She presented secondary to pain and difficulty with ambulation. On physical examination, she had extensive bruising along the posterior thigh, and a palpable defect could be felt at the proximal hamstring insertion. Weakness and pain were noted during hamstring resistance testing. Magnetic resonance imaging revealed a proximal hamstring avulsion with retraction. Treatment options were discussed with the patient, and she wanted to proceed with surgical repair.

Patient 2
A 48-year-old male manual laborer fell down stairs and felt a pop and “pull” in the posterior right thigh. He had immediate onset of pain and early swelling and bruising. On examination, he had bruising, swelling, and pain with palpation. A palpable defect could not be felt. Weakness was noted on hamstring resistance testing. Magnetic resonance imaging revealed a proximal hamstring avulsion. He wanted to proceed with surgical intervention.

Patient 3
Four months earlier, a 20-year-old collegiate soccer player felt a pop while playing soccer. He was treated conservatively by the trainers. He continued to have pain with play and weakness, which prompted consultation. On
examination, he had atrophy of the left hamstring and a palpable defect just distal to the insertion site when compared with the contralateral side. He had mild weakness of the hamstring and pain with resistance. Subsequent magnetic resonance imaging revealed complete avulsion of the proximal hamstring tendon from the ischial tuberosity with retraction (Figure 1). The decision was made to proceed with primary repair, using allograft if necessary.

**Surgical Technique**

A transverse or longitudinal incision can be made (Video). In chronic cases, a longitudinal incision may be favored for additional exposure. The gluteus maximus muscle can be identified by the oblique orientation of the muscle fibers compared with the longitudinally oriented fibers of the hamstrings. Once the gluteus maximus is retracted proximally, the hamstring avulsion should be identified. In acute tears, the defect can typically be visualized and palpated. Once the proximal hamstring stump is identified, the tendon must be mobilized. In acute cases, this may be performed with blunt dissection. The knee can be flexed to help mobilize the tendon to its insertion at the ischium. In chronic cases, the hamstring tendon may be retracted and scoured to the surrounding soft tissues, making it difficult to identify and mobilize. Great care must be used not to injure the sciatic nerve in these cases. The nerve is located just lateral to the hamstring muscle/tendon (Figure 2). If desired, fluoroscopy can be used to ensure the button is flipped. Once the button is flipped, the tension slide technique (Pec Button; Arthrex, Inc) is performed to draw the tendon stump to the bleeding bone (Figure 6). The suture is then tied and passed back through the tendon for backup fixation. The repair can then be tested by extending the knee.

In all 3 cases, a knee brace locked at 90° of flexion was placed postoperatively. This brace remained in place for a total of 6 weeks. Range of motion exercises and weight bearing were initiated at 6 weeks, with strengthening exercises beginning at 3 months. A representative postoperative radiograph is shown in Figure 7.
RESULTS

All 3 patients had full strength and functionality by their 1-year postoperative visit and have returned to their prior level of work/play without limitation. There have been no failures or complications to date. Formal strength testing was performed, revealing nearly 100% strength compared with the contralateral side by 9 months postoperatively for patient 3. A postoperative magnetic resonance image for patient 3 revealing healed tendon is shown in Figure 8.

DISCUSSION

Several studies have examined the timing and type of repair for proximal hamstring avulsion injuries. Carmichael et al\(^3\) emphasized the need for acute repair because of the increased technical difficulty of repair in a chronic situation with retraction of the tendon stump. Subbu et al\(^4\) compared outcomes among 112 athletes who had complete proximal hamstring avulsion injuries and underwent repair in less than 6 weeks, 6 weeks to 6 months, and greater than 6 months. The early repair group returned to sport in an average of 16 weeks, the intermediate repair group in 25 weeks, and the late repair group in 29 weeks. Two patients in the late repair group experienced partial rerupture, emphasizing the need for early intervention.\(^5\) However, other studies reviewing hamstring repairs found no differences between acute and chronic intervention when examining several outcome measures.\(^6\) Cohen et al\(^2\) stated that both acute and chronic repairs had successful outcomes, but that acute repairs resulted in higher postoperative strength and functional scores. Marx et al\(^6\) described chronic cases of 2-year-old injuries that necessitated allograft use because of the degree of retraction. The patients returned to normal function but had residual weakness. The authors recommended allograft use as a salvage operation only.\(^7\)

Hamming et al\(^8\) performed a cadaveric study, comparing the strength of intact proximal hamstring tendon, a repair with 2 small anchors in the ischial tuberosity, a repair with 2 large anchors, and a repair with 5 small anchors. Equivalent strength was seen between intact tendon and the 5-anchor repair, with both 2-anchor repairs being significantly weaker.\(^9\) Suspensory fixation with both unicortical and bicortical buttons has been well described in the anterior cruciate ligament reconstruction, pectoralis repair, and biceps repair literature.\(^9,10\) The buttons have been shown to be biomechanically sound in multiple studies, and they have been found to be stronger than suture anchor repair in the distal biceps repair and pectoralis repair literature.\(^9,10\) The repair of the hamstring avulsion can be technically difficult. The placement of up to 5 small anchors, as described by Hamming et al,\(^8\) can be difficult because of the depth of dissection, the number of steps needed for repair, and the size of the tuberosity. A unicortical button requires only 1 small hole, and once the button is flipped, the stump can be easily pulled back to the insertion site. Also, because only 1 small hole has been made, accessory anchors can be placed as needed to expand the footprint if the tendon is large. The cost of repair also favors the suspensory button technique. If a surgeon uses 3 to 5 anchors for the repair, the cost can be as high as $1600, compared with $400 for 1 button and $800 for 2 buttons.

CONCLUSION

This technique has been successfully used for 3 patients with proximal hamstring avulsions, with no failures to date. The authors’ experience suggests that this technique is a reliable and reproducible option for repair of both acute and chronic proximal hamstring avulsions.

REFERENCES

4. van der Made AD, Reurink G,


