

SURGICAL TREATMENT FOR ACUTE ACHILLES TENDON RUPTURE

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Acute trauma to the Achilles tendon can occur in a variety of ways. Often, the result is some degree of rupture to the tendon. The final outcome depends a great deal on the timely rendering of the appropriate treatment. If neglected, the patient's ability to ambulate can be seriously hindered.

ETIOLOGY

The etiology of acute Achilles tendon ruptures is multi-factorial. One theory is that a degenerative process may be the major factor leading to the rupture. Another is a mechanical component results in tendon rupture. Arner and Lindholm found, in the histologic examination of 64 patients with Achilles tendon rupture, that there was tissue degeneration.¹ This degeneration was noted regardless of the time that had elapsed after the rupture. This finding would support the theory that the degeneration occurred prior to the rupture of the tendon. In contrast to Arner and Lindholm, Hooker² found in his study that only 1 out of 4 patients had evidence of tissue degeneration in the ruptured Achilles tendon. This supports the theory that degeneration of the tendon is not necessary prior to rupture. Hooker² also found that the left Achilles tendon was ruptured more often than the right and this was explained by the hypothesis that the left leg is used in pushing off more commonly than the right.

Hooker classified the etiology of an Achilles tendon rupture into three groups. The first and most common is the group where the tendon is in a contracted position and then a sudden motion such as jumping, or twisting is performed and the tendon ruptures. Occasionally the tendon ruptures even during normal walking or running. The least common categories of Achilles tendon ruptures include passive overstretching of the tendon such as when one slips on an incline such as a stair, or when an external object directly hits the tendon.² Thompson and Doherty described similar etiologies for Achilles tendon rupture with the addition of falling from a height being a significant cause.³

DIAGNOSIS

An Achilles tendon rupture is primarily diagnosed from the history and physical examination. Plain radiographs can also be useful since a ruptured Achilles tendon will show as obliteration of Kager's triangle on a lateral view of the ankle.⁴ Magnetic resonance imaging may be helpful to determine the amount of rupture in a partial tear, primarily diagnose an old neglected tear that has undergone partial healing, or assist with planning for surgical intervention.

The typical patient is a middle-aged, sedentary male.^{1,3} After listening to a few histories from Achilles tendon rupture patients, it becomes easy to establish this diagnosis. The patient will generally describe an episode of acute pain associated with some form of physical activity. The pain will be described as feeling like they were hit or kicked in the Achilles tendon region. The patient will also experience extreme difficulty with ambulation with the injured leg.

The amount of edema present in the region of the rupture will be determined by the amount of time that has elapsed. However, even with significant edema there is usually a noticeable dell at the rupture site. The rupture will most likely be found 2 cm to 6 cm proximal to the insertion into the calcaneus in an area referred to as the watershed area. This area of the tendon has decreased vascularity, which may contribute to the higher incidence of rupture.⁵

The Thompson Doherty test should be performed as part of the physical examination.³ The patient is placed in a prone position on a level surface, such as an examining table. The feet extend beyond the table and are allowed to rest in a position of comfort. The posterior aspect of the leg is then compressed at the middle one third, below the widest portion of the leg. A ruptured Achilles tendon will not allow the foot to plantarflex during the test. An intact tendon will plantarflex the foot. The test should be performed on both legs. It should also be noted that this test

may have false negatives. If a partial tear is present, there may be some plantarflexion noted. Also one must keep in mind that the other plantarflexors of the foot are still intact, and vigorous compression of the calf can cause a contraction of these muscles, resulting in plantarflexion of the foot.

SURGICAL TREATMENT

Once the diagnosis of Achilles tendon rupture is made, the treatment should be begun immediately. Although the injury is technically a soft tissue injury, it should be treated in many ways the same as a fracture. The first step is to prevent or reduce the edema. A compression dressing, such as a Jones compression dressing should be applied as soon as possible. The compression dressing will reduce edema, and make the patient more comfortable. A rigid shell should be applied to the compression dressing to maintain position and maximize comfort for the patient. If surgery will be performed, the position of the ankle is not critical at this point. However, if conservative care will be used, the ankle should be plantarflexed in the cast.

Surgical repair versus conservative treatment with casting of Achilles tendon ruptures is controversial. The literature is replete with studies showing that both are viable options, and should be based on several patient-dependent factors.^{2,6-8} These factors include age, health, and the pre-injury ambulatory status of the patient. All these factors, including extensive discussion with the patient should be considered in determining the treatment plan.

If surgical repair is to be undertaken, it should be performed as soon as possible. As time passes, the hematoma in the rupture site begins to organize and the traumatized ends of the tendon become degenerated, thus making the tissue less than optimal to work with. Tendon that has been recently ruptured has easily discernable ends that are of reasonably good quality. At this stage, the peritendinous structures are not scarred down and are more easily repaired.

The preferred surgical incision is just medial to the midline of the tendon to avoid damage to the sural nerve, this will also decrease the chance of nerve entrapment. By avoiding the tissue directly over the tendon, the chance of adhesion and dehiscence decrease as well. A medial approach also gives excellent exposure to the rupture site. The surgeon can determine the amount of

adequate exposure by being able to visualize normal anatomy both proximal and distal to the rupture site. Although time consuming, layered dissection should always be performed. This layered dissection gives the benefits of reduction in postoperative swelling and pain, along with better anatomic reconstruction. Meticulous attention should be paid to the paratenon layer, and an attempt made to salvage as much as possible for later reapproximation over the repaired tendon.

After the dissection is complete, the real art to Achilles tendon reconstruction begins. Initially it is important to examine the tendon and separate the strands of tendon and see if any are still connecting the proximal to the distal section. Additionally one should see if there is a plantaris muscle. These can both be used to aid in the tendon repair, if necessary, and add reinforcement to the primary repair. Hematoma evacuation is also important at this stage, and is accomplished with aggressive irrigation.

The strands of tendon fibers of a recent rupture will look like a horse tail and will usually have a ragged uneven appearance (Fig. 1). This will aid in repair, since it allows overlapping of tendon without shortening the overall length of the tendon in the process. Without a supportive foundation, using the traditional tendon suture techniques can be very difficult and will yield a weak tendon repair. The foundation is made by forming the loose tendon fibers into bundles. Usually the proximal portion of the tendon will be made into two bundles and the distal section into one. This will allow the bundles to be overlapped into a tongue-in-groove type formation. (Personal communication, John A. Ruch, DPM, Tucker, Georgia)

The bundles are made by using a 3-0 absorbable suture and anchoring at one end of the fibers gathered in the bundle. The suture is then woven in loops through and around the fibers to complete the formation of the bundle. At the end of the bundle the suture is tied off to secure the bundle. The suture tension on these bundles should only be enough to hold them together.

After completing the three bundles, the position of the ankle is checked on the contralateral leg so that the resting position on the injured leg can be matched. The contralateral leg should be prepped and draped for surgery so the position can be visual rather than trying to feel the ankle position through the drape.

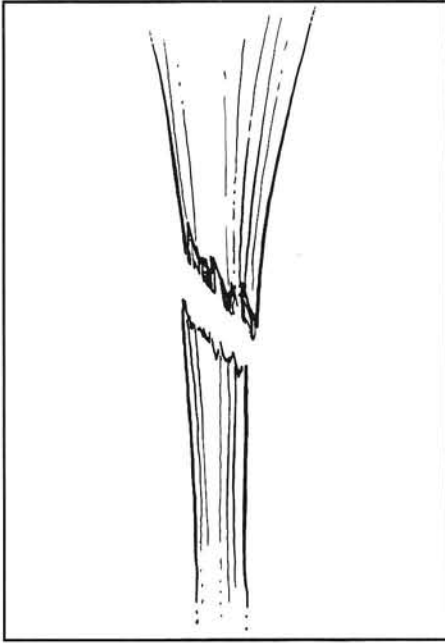


Figure 1. Horse tail appearance of ruptured tendon ends.

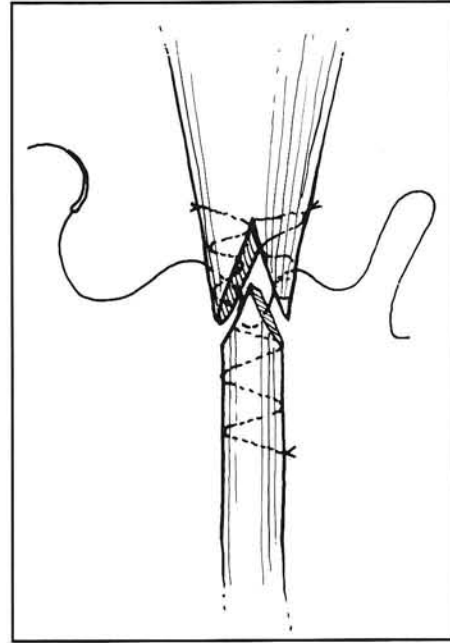


Figure 2. Tendon bundles secured together using pulley technique.

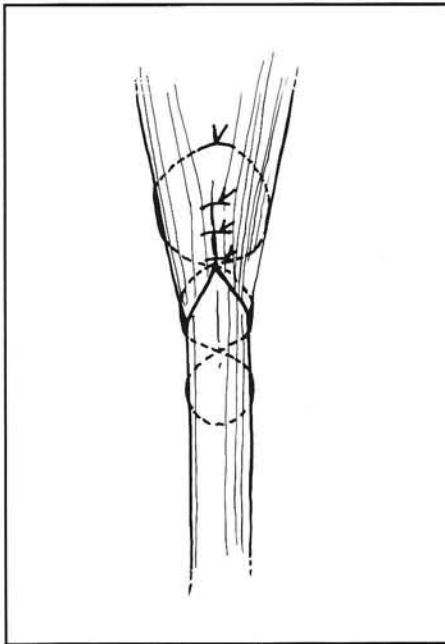


Figure 3. Retention suture in place.

Once position is decided upon, the ankle is held in position and the distal bundle is secured between the proximal bundles with the appropriate tension. The suture should be passed through all three bundles in pulley fashion and tied off (Fig. 2). The tendon should have the appearance of a tendinous cord after securing the bundles. Any gap still open between the proximal bundles can then be closed using the same suture.

At this point, the intratendinous reinforcement is used to add stability as the tendon heals. A non-absorbable suture of at least 2-0 gauge is used in a Bunnell or modified Kessler technique (Fig. 3). Since the tendon is already reapproximated, the internal suture is used as additional support to add tensile strength. The paratenon and deep fascia are carefully closed with 3-0 absorbable suture. The subcutaneous layer and skin are both closed, each using an absorbable suture in buried running fashion.

A dressing is applied, and an above-knee compressive dressing cast is applied. The leg is in a mildly plantarflexed position. The author feels that the first cast change should occur within the first week. Schubert's postoperative course includes a second cast change at about the 4th

week and then the cast is converted to a short-leg cast at 6 weeks. The cast change on the 8th week should enable the foot to be positioned safely at 90 degrees to the leg. At ten weeks the patient can bear weight in the cast. At 12 weeks the patient is taken out of the cast and given 1\2 inch heel lifts for both feet. The heel lifts should be used for 6 weeks.⁹

One of the most common complications associated with Achilles tendon rupture is a recurrence of the rupture, whether surgically repaired or not.⁶⁻⁸ To avoid this complication the postoperative course should be carefully monitored and followed.

REFERENCES

1. Arner O, Lindholm A, Orell SR: Histologic changes in subcutaneous rupture of the Achilles tendon: a study of 74 cases. *Acta Chir Scand* 116:484-490, 1958.
2. Hooker CH: Rupture of the tendo calcaneus. *J Bone Joint Surg* 45B:360-363, 1963.
3. Thompson TC, Doherty JH: Spontaneous rupture of tendon of Achilles: a new diagnostic test. *J Trauma* 2:126, 1962.
4. Weissman S: Changes in soft tissues and bony mineralization. in Weissman S, ed., *Radiology of the Foot*. 2nd ed. Baltimore, MD; Williams and Wilkins; 1989:198-232.
5. Lagergren C, Lindholm A: Vascular distribution in the Achilles tendon. *Acta Chir Scand* 116:491-495, 1958.
6. Quigley TB, Scheller AD: Surgical repair of the ruptured Achilles Tendon. *Am J Sports Med* 8:244-250, 1980.
7. Lea RB, Smith L: Non-surgical treatment of tendo achilles rupture. *J Bone Joint Surg* 54A:1398-1407, 1972.
8. Gilles H, Chalmers J: The management of fresh ruptures of the tendo Achilles. *J Bone Joint Surg* 52A:337-343, 1970.
9. Schuberth JM: Achilles Tendon Trauma. In Scurran BL, ed. *Foot and Ankle Trauma*. 2nd ed. New York; Churchill Livingstone; 1996:205-232.