

Surgical Pearls

By Richard T. Braver, DPM



HOW TO REPAIR AN ACUTE ACHILLES TENDON RUPTURE

Both seasoned athletes and weekend athletes can experience an acute rupture of the Achilles tendon. You'll usually see this happen when an athlete steps backwards (i.e., in preparation to throw a football) or when the athlete is lunging forward (i.e., when chasing down a tennis ball). Also be aware that individuals who have a history of chronic tendon pains or previous trauma are certainly predisposed to acute rupture.

Simply put, the Achilles tendon can rupture when the force you apply to the tendon is greater than the tensile strength of the tendon. You'll find that the rupture may occur as a result of an overstretched tendon or a forceful muscle contracture. In addition, some think there may be a momentary lapse in motor coordination or nervous conductivity, which allows for the overstress to occur.

When you see a foot that displays signs of equinus from hereditary factors or equinus/tight calves (commonly seen in conditioned athletes), they can lead to Achilles strain. Also when you have a patient whose rearfoot appears to go through excessive ranges of pronation or supination, he or she will be subjected to irritation of the Achilles tendon fibers, which will predispose your patient to microtrauma. All of this results in inflammatory and/or degenerative changes. Also keep in mind that Achilles tendon injuries are slower to heal due to the poor blood supply.

What You Will See In The Initial Presentation

Typically, you'll see these patients come in on an emergency basis, explaining that they heard a pop in the injured area during activity. They will be unable to walk normally.

When you do your physical examination, you'll discover a loss of contour to the Achilles. Not only will the patient have a swollen ankle, you'll often see a palpable gap within the Achilles tendon

as well. Your patient will not be able to raise his or her toes on the affected side and when you do the Thompson test (in which you squeeze the calf), you will notice an absence of plantar flexion. Be aware that this is indicative of a ruptured Achilles tendon.

When To Pursue A Surgical Solution

Doing diagnostic tests, such as an MRI or sonography, can be helpful in determining the extent of the injury. More often than not, however, you don't need these tests if you're dealing with an active or athletic individual and you've diagnosed an obvious complete rupture during the clinical examination. Yet

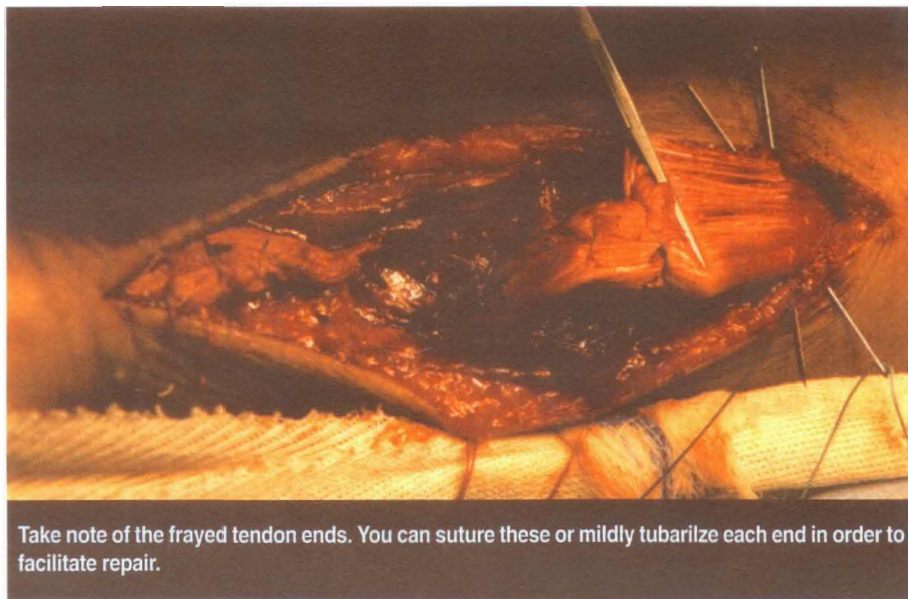
controversy persists as to when you should treat this malady with cast immobilization in ankle equinus. If you go with progressive cast changes, you can reduce equinus and get the patient into a walking cast boot and physical rehabilitation sometime after six to eight weeks, depending on healing.

You may choose to perform a primary repair in an active or younger individual who is in acceptable medical health. Doing an MRI exam, in this instance, can help you determine the amount of gapping within the rupture. This knowledge will influence your decision to perform surgery and what type of surgery you'll perform.

Choosing A Procedure Based On The Rupture Defect

In 1990, Kuwada classified what type of procedure you should use based upon the rupture defect.¹ He advocates doing a cast immobilization to treat a partial Achilles tendon rupture. If you find that the rupture gap is less than 3cm after you've excised friable tissue at the tendon ends, Kuwada emphasizes doing a direct end-to-end anastomosis with the foot held at 90 degrees to the ankle.

If your patient has rupture gaps measuring 3 to 6cm, Kuwada says you should



Take note of the frayed tendon ends. You can suture these or mildly tubarilize each end in order to facilitate repair.

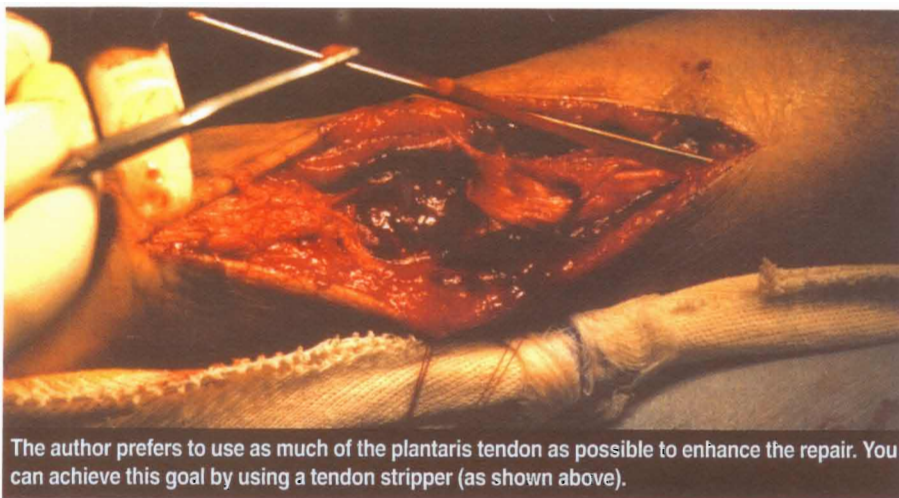
augment the end-to-end anastomosis with an autogenous tendon graft flap. Finally, when you're dealing with ruptured defects greater than 6cm, he recommends doing an end-to-end anastomosis with a free tendon graft along with a gastrocnemius recession.¹

Step-By-Step Surgical Insights

Once you've made the decision to proceed to surgery, you should perform the procedures as soon as possible. Place the patient in the prone position on the operating table and use a thigh tourniquet. Proceed to make a longitudinal incision over the midline of the posterior Achilles. Deepen the incision through subcutaneous tissues in one layer and then retract the incision.

At this time, you can usually see the hematoma. You should perform irrigation with a bulb syringe, which will help you clean out the hematoma and visualize the tendon ends. Identify the paratenon surrounding the posterior aspect of the Achilles. This may also be ruptured. Dissect and tag it for later repair during closure. Keep in mind that the paratenon is important for microcirculation to the tendon and helps to prevent adhesions during the healing process.

With the foot flexed to 90 degrees, proceed to examine the ends of the Achilles tendon and evaluate the



The author prefers to use as much of the plantaris tendon as possible to enhance the repair. You can achieve this goal by using a tendon stripper (as shown above).

ruptured gap. If necessary, free up the proximal and/or distal ends of the tendon from the underlying muscle belly or soft tissue. Since the ends may be frayed or mop-like, then suture each tendon end so as to "bundle it," or mildly tubularize each end to make it a more solid structure.

The next step is to perform a modified Bunnell or Kessler-type suture, using a zero, non-absorbable suturing technique to reapproximate and anastomose the tendon ends together. You may place the suture on straight Keith needles for this intratendinous suturing technique, holding the foot as close to 90 degrees as possible.

Maximize Your Use Of The Plantaris Tendon

You'll notice that the plantaris tendon will be present medially. It is my preference to use as much of this tendon as possible for augmentation repair in an athletic individual. You can use a tendon stripper to help achieve this goal.

Transect the plantaris tendon at its most distal insertion. Insert the free end of the tendon through the stripper and advance the tendon stripper proximally, following along the course of the tendon up the length of the calf to its most proximal site of origin. Here, you should make an incision at the lateral aspect of the leg, near the palpated end of the tendon stripper instrument. Then advance the stripper through the skin, proceeding to transect and dissect the plantaris tendon out completely.

You may cut the free plantaris tendon graft into two pieces. Use one piece to interweave through the two ends of the tendon, thereby creating a box around the tendon to increase stability and strength. You can accomplish this by making a stab incision through the Achilles from medial to lateral, just proximal to each tendon end. Then thread the plantaris tendon from medial to lateral through the proximal end in transverse fashion. Proceed to align it along the lateral edge of the Achilles tendon and again thread it from lateral to medial through the distal end of the rupture. Then align it along the medial edge of

When You Can't Do An End-To-End Anastomosis

Keep in mind that, sometimes, you won't be able to perform a direct end-to-end anastomosis with the foot held at 90 degrees. In this scenario, you must "fill in" the defect with a graft.

To achieve this goal, there are several flap-down procedures, including the Lindholm double flap as well as the Goldstein-Dickerson single flap-down procedure, that you may consider performing. In doing these procedures, you would make a longitudinal aponeurotic flap within the central portion of the Achilles or gastrocnemius aponeurosis, proximal to the ruptured area. Then flap this strip of aponeurotic/tendon tissue downward and rotate it 180 degrees to cover the defect. Then you would do primary closure of this newly created donor site from which you harvested the graft tissue.

Alternatively, you can obtain a free graft or a longitudinally split graft from the peroneus brevis or peroneus longus tendon.

During the procedure, hold the foot as close to 90 degrees as possible. If this is not possible, then you may need to do a gastroc recession to prevent post-operative recurrence of the Achilles rupture /or re-strain.

the Achilles tendon and suture it upon itself. Perform additional interweaving as necessary. This is a modification of the Bosworth-type procedure.

As far as the remaining portion of the plantaris tendon goes, you can fan it out or "unroll" it (modified Lynn procedure) until it is flattened smooth in order to allow for encapsulation of the tendon. Then tack down this expanded portion of tendon over the repair with 4-0 absorbable suture. Doing this can help reduce post-operative scarification and adhesions.

Other Key Pointers

Reapproximate the paratenon layer and suture it together, using a running 5-0 absorbable suture. You'll find this helpful in reducing post-op adhesions and fibrosis, and it also helps supply micro-circulation to the tendon. Perform subcutaneous tissue closure and skin closure in the standard manner.

Administer anesthesia to the leg by way of a common peroneal and popliteal nerve block along with local infiltration. Proceed to apply a below-knee cast, with the foot as close to 90 degrees dorsiflexion as possible.

Final Notes

There are various procedures for repairing the Achilles rupture. It is imperative that you evaluate the amount of rupture by holding the foot at 90 degrees to the leg. Keep in mind that, sometimes, this is not possible due to inherent equinus of the gastrocnemius, which would then need to be released.

You should also be aware that the plantaris tendon often limits ankle dorsiflexion and once you've transected it, the patient will have an appropriate range of motion. It is also important not to overlengthen the Achilles as this leads to weakness and subsequent problems. Therefore, you should perform the rupture repair first and then decide if a gastrocnemius recession is necessary.

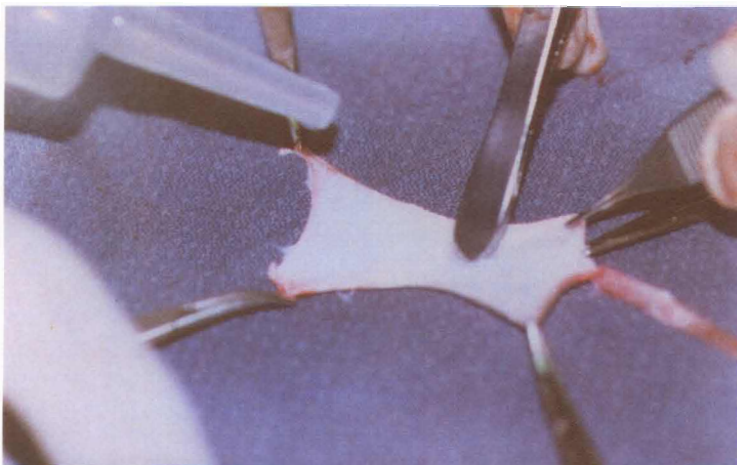
It is my preference to remove the below-knee cast three weeks after the operation and transfer the patient into a removable below-knee walking cast. By

maintaining the ankle at 90 degrees during the repair and casting process, you'll find that the post-operative rehabilitation is often quicker with less functional limitations of motion. However, it is not unusual for scar tissue to be present after either conservative or surgical repair. Let patients know that it takes about a year for scar tissue to remodel.

You may need to perform a secondary adhesiotomy to help release bound tissues and restore the gliding mechanism, if necessary, especially in those patients who are prone to keloids.

Finally, due to the traumatic nature of the injury, it is advisable to have the patient attend physical therapy and for him or her to wear an elastic compressive brace or stocking for several months following the repair to help retard and/or reduce inflammation to the Achilles area. Patients are usually able to return to sports in three to six months. ■

Editor's Note: For more information on the tendon stripper mentioned above, contact Link Orthopedics at (800) 923-0616.



You can fan out or "unroll" a portion of the plantaris tendon graft until you've flattened it smooth in order to allow for encapsulation of the tendon.



Here you can see a completed repair of the Achilles tendon rupture, which is covered with the fanned-out plantaris tendon graft.

References

1. Kuwada, Gerald. Classification of Tendo Achilles Rupture with Consideration of Surgical Repair Techniques. *Journal of Foot Surgery*. Vol. 29, No. 4. 1990. Pgs. 361-365.

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