Endoscopically Assisted Reconstruction of the Achilles Tendon Using Semitendinosus Graft

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Background: Chronic ruptures of the Achilles tendon may lead to symptomatic weakness, despite rehabilitation. Open reconstruction yields good outcome but has a high complication rate, notably wound problems. Endoscopically assisted free semitendinosus transfer restores ankle and preserves first metatarsophalangeal joint (MTPJ) function.

Indications: The main indication for the procedure is symptomatic chronic rupture of the Achilles tendon with a palpable tendon gap.

Technique Description: The procedure can be split into 4 stages: graft harvest, calcaneum and tunnel preparation, proximal graft attachment, and finally graft passage and screw insertion.

Discussion/Conclusion: Following reconstruction, patients use a cast in full plantar flexion for 2 weeks, then a graduated walker for full weight-bearing.

Keywords: Achilles tendon; chronic rupture; reconstruction; endoscopic; semitendinosus graft

VIDEO TRANSCRIPT

Chronic ruptures of the Achilles tendon may lead to symptomatic weakness despite rehabilitation. The literature reports that open reconstruction yields good outcome but can have a high complication rate with problems such as infection and wound breakdown in up to a quarter of cases. Endoscopically assisted free semitendinosus transfer allows restoration of ankle function with minimal reported weakness due to graft harvest and preserves first metatarsophalangeal joint (MTPJ) function. The procedure can be split into 4 stages: graft harvest; calcaneum and tunnel preparation; proximal graft attachment; and finally graft passage and screw insertion. Following reconstruction, patients use a cast in full plantar flexion (PF) for 2 weeks, then they use a walker with heel wedges for full weight-bearing (FWB) for the subsequent 6 weeks.

The main indication for the procedure is symptomatic chronic rupture of the Achilles tendon with a palpable tendon gap.

Prior to intervention, the current patient reported that outcome measure and clinical examination should note the features of chronic rupture and the Achilles tendon resting angle.

Imaging can be used to determine tendon gaping and the integrity of the tendon ends, as well as the calf muscle structural quality.

The first stage is a graft harvest. The patient is positioned in the recovery lateral position, and the pes anserinus is approached through a longitudinal incision. The graft is prepared similar to anterior cruciate ligament (ACL) reconstruction using No. 2 whip suture, and different colors are used on either end of the graft and then soaked it in vancomycin solution.

The second stage is preparation of the calcaneum and, in particular, the calcaneal tunnel. I tend to use a posteromedial and a posterolateral portal and identify the course of the sural nerve and insert the portals at about 45° using a size 11 blade, bouncing the curvature of the back of the blade off the calcaneum.

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Then, I use a knee arthroscope and a 4-mm shaver and under vision clear a pocket just anterior to the Achilles insertion. This allows us to identify the superior aspect of the calcaneum. I use a white hypodermic needle to insert an accessory posterolateral portal. The needle is inserted just posterior to the peroneal tendons and directed backward. A 1-cm skin incision followed by blunt dissection using a curved clip is completed, so that the curve of the clip is directed back in toward the posterosuperior calcaneal tubercle. I open up the jaws of the clip as I withdraw to make a larger passageway for the scope to pass through, so we can get good visualization, and then change the direction of the scope so that we are able to look more directly backward at the Achilles tendon.

The next stage is a calcaneoplasty, and in about 10 minutes and by using a soft tissue shaver, I expand the pocket in the soft tissue just anterior to the Achilles tendon so that I can identify all the superior aspects of the calcaneum. This takes some time, and there is often quite a quantity of bursal tissue to remove. With repeated exchanges and the 12-fluted barrel burr, we are able to identify the Achilles insertion and, with a few upstrokes with the Aggressive Plus Shaver (Stryker), I identify where we are, as it is quite easy to get lost in what actually is a relatively small space.

We can see where the retrocalcaneal recess is and where the bursa sits using the arthroscopic hook, and this gives us a chance to identify and palpate the medial and lateral aspects of the tubercle. We can then use the 12-fluted barrel burr to very quickly remove the posterosuperior tubercle, and by doing this in stages, we are able to smooth down the Haglund protuberance to get a nice superior flat aspect, down to the level of the true insertion of the Achilles tendon. With more and more soft tissue removed here, there is less subsequent soft tissue to get impinged, so it is quite important to get this stage as smooth as you can.

For our tunnel site, we want to be as far back on the Achilles tendon as possible so that we are close to the level of the insertion and it is possible that the good vascularity of the Achilles insertion may subsequently with the incorporation. Here, we can see that the arthroscopy hook is used to identify that we have reached the far back aspect of the Achilles. We can use graduations on the hook to make a small aperture and put the needle into the white hypodermic needle into the midportion, and then follow this up with a size 11 blade so that we can perform a midportion tenotomy. We have to remember that the whole of the graft is going to be passed through with a guide pin, so I tend to put this right on the edge of the insertion. I place the guide pin on the edge and advance it through the calcaneum aiming at the insertion of the plantar fascia. The angle looks a bit strange, but this is the angle when the ankle is relatively dorsiflexed, and it is going to be plantarflexed with the passage of the graft and the screw. In terms of tunnel size, I use a 7-mm tunnel being passed completely through the calcaneum. Many of these patients are quite elderly, with chronic ruptures with varying reasons for presentation, and the bone itself is relatively soft. By aiming for the insertion of the plantar fascia, this means we have plenty of bones around the tunnel. In patient cases who have osteoporosis, this causes good screw compression of the surrounding bone.

Having drilled the tunnel, it is important to clear up the debris from around the tunnel aperture on the inside around the calcaneum. This prevents any strands of Achilles tendon or bursal tissue from being pulled into the tunnel, and it makes it easier for screw passage.

The third stage is proximal graft attachment, and this tends to be performed through the midline incision. This is at the level of the proximal tendon stump and care should be taken here, as the sural nerve is a midline subcutaneous structure, and we have to identify and mobilize the sural nerve and its accompanying venae comitantes. I perform a longitudinal incision through the fascia cruris and release the paratenon, and we are very careful to dissect around the end of the tendon releasing any adhesional scar tissue. There may be pseudotenon present, and we have to perform a tenotomy at the end of the tendon and then inspect the end of the tendon for quality. It is good to be able to see proximal tendon structure and to hold this and stretch it out before breaking down any adhesions using a digit. I next put in a locking running suture across the end of the proximal stump and use an absorbable No. 2 suture, and this holds the tendon end together so that with subsequent traction of the graft, it does not pull out of the end of the proximal stump.

Having secured this, we need to do a tenotomy in the coronal plane of the tendon with a size 11 blade. This is passed from one side to the other side and is grasped on the end using a clip, and then the blade is reversed passing the clip across the tenotomy. The site is 1 cm proximal to the end of the tendon and, by grasping the sutures attached to the graft, we can pull the actual graft through the Achilles. There is good biomechanical research to show that having a locked suture in 4 corners of the end of the proximal stump provides very secure fixation and using the locking sutures we get the maximum amount of strength with the smallest amount of suture material used. You can see that gauze has been placed between the graft and the skin, and this aims to reduce graft contamination and the infection rate. If a polyester suture is used, we have to use the sharp edges of a scalpel blade to cut it rather than using scissors which can result in frayed edges.

Next, I check the length of the graft to ensure that there is enough to reach all the way through into the calcaneum.

A Lahey clip is used subcutaneously to retrieve the whip sutures attached to the proximal stump and allow the graft to be passed subcutaneously toward the calcaneal tunnel. Then, the loop suture is used to pull the graft into the tunnel itself.

The fourth and final stage is graft passage through the tunnel and screw insertion. It is important that with the ankle in the resting position, there is an adequate length of graft to actually be pulled into the calcaneal tunnel. I insert the screw guide wire and, by applying tension to the graft and using a strong sustained pull, as well as by plantar flexing the ankle, we are able to pull the graft as far into the tunnel as possible. We then advance the screw until we get a good firm grip. I check for screw depth using

either the hook or the scope so we can see where we are. The hold is usually good, as we use a screw the size of the tunnel plus 1 mm, which gives us good compression of this relatively osteoporotic calcaneal bone. Having inserted the screw, we can see that the Achilles tendon resting angle has improved, and we can also check on the tension of both strands of the graft and then cut off the sutures.

Now, all that remains here is to close the fascia cruris, the paratenon, and the skin using absorbable and nylon sutures.

The main potential pitfall is not having an adequate length of graft to go all the way into the calcaneal tunnel with the ankle in the resting position. With a shorter graft, it can be difficult to advance the graft into the tunnel as the ankle is being plantarflexed due to the end of the graft snagging on the tunnel mouth and impingement of the soft tissues.

Here is the postoperative management and rehabilitation protocol. Patients normally return to routine activities in 6 months and exercise about a 1 year.

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