

Augmented Repair of Achilles Tendon Ruptures

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ABSTRACT

Objectives: Augmented repair techniques are used in defective Achilles tendon ruptures and provide excellent functional results in active individuals, but it carries an incidence of wound complications like tendon adhesion to the skin. Tendon adhesion is an important minor complication. We present an augmentation technique for Achilles tendon rupture that we believe prevents tendon adhesion to the skin.

Material and methods: Four male patients with a mean age of 38 (29 to 56) were diagnosed as having a ruptured Achilles tendon. Duration of ruptures was 1, 2, 35 and 45 days. We used a new flap technique in these patients with defective acute and chronic Achilles tendon ruptures. A strip of aponeurotic flap, 8 cm long and 2cm wide, was elevated proximally from the median raphe of gastrocnemius, and twisted 180 degrees on itself from medial sides, so its smooth external surface lies next to the skin and covers the rupture site, and the plantaris tendon was incorporated in the repair site.

Results: The mean follow-up period was 42 months (23 to 60). There were no reruptures. One had skin necrosis and healed satisfactorily with debridement and secondary sutures. None of them had tendon adhesion to the skin. Satisfactory overall results and very good functioning was achieved in four patients.

Conclusion: If augmented repair of Achilles tendon rupture is preferred, this technique can be used satisfactorily and tendon adhesion to the skin is prevented. ©2006, *Firat Üniversitesi, Tıp Fakültesi*

Key words: *Achilles Tendon Rupture, Tendon Adhesion*

ÖZET

Aşil tendon yırtığının desteklenmiş tamiri

Amaç: Defektif Aşil tendon yırtığının desteklenmiş tamiri aktif kişilerde başarılı fonksiyonel sonuçlar vermektedir, fakat tendonun cilde yapışıklığı gibi önemli bir minör komplikasyon karşımıza çıkmaktadır. Bu desteklenmiş tamir yöntemi ile tendonun cilde yapışıklığını önlemeyi amaçladık.

Gereç ve Yöntem: Ortalama yaşları 38 (29 – 56) olan 4 erkek hastada Aşil tendon yırtığı tanısı kondu. Yırtık süresi 1, 2, 35 ve 45 gündü. Defektif akut ve kronik Aşil tendon yırtığı olan bu hastalarda yeni flep tekniğimizi uyguladık. Sekiz cm uzunluğunda ve 2 cm genişliğindeki gastrokinemius aponevrotik flebi medialden 180 derece döndürülerek, pürüksüz olan yüzeyi cilde bakacak şekilde tamir sahasının üzerine getirilip dikildi ve tamir plantaris tendonu ile de desteklendi.

Bulgular: Ortalama takip süresi 42 ay (23 – 60) idi. Hastalarda tekrardan yırtık oluşmadı. Bir hastada gelişen cilt nekrozu, debridman ve sekonder dikiş ile iyileşti. Hiçbir hastada tendonun cilde yapışıklığı yoktu. Dört hastada fonksiyonel olarak çok iyi sonuç alındı.

Sonuç: Aşil tendon yırtığında destekli tamir yapılacaksa, bu teknik başarı ile uygulanabilir ve tendonun cilde yapışıklığı da önlenmiş olur. ©2006, *Firat Üniversitesi, Tıp Fakültesi*

Anahtar kelimeler: *Asil Tendon Yırtığı, Desteklenmiş Tamir, Tendon Yapışıklığı*

Rupture of the Achilles tendon is a disabling condition, which is difficult to treat if there is a gap or defect between the two ends of the disrupted tendon (3-5,8-12,14,16,19-22,24). Such a gap may result from delay in diagnosis and fraying of tendon ends (22,23). Reconstruction techniques of small Achilles tendon defects include augmentation with local flaps, local tendon transfers or synthetic intercalary material (5,9,14,19-22). Surgery is associated with complications of skin necrosis, delayed wound healing, infection, and tendon adhesion to the skin (1,6,7,11,13,14,17,18,22,23). Tendon adhesion to the skin is an important minor complication of open surgical repair and its rate is 2.6% to 45% in different series (6,7,17,18). Different surgical techniques and rehabilitation methods are used successfully in prevention of tendon adhesion (1,2,7,8).

The aim of this study is to prevent the Achilles tendon adhesion to the skin by using a new augmentation technique for Achilles tendon rupture.

MATERIALS AND METHODS

Four male patients with a mean age of 38 years (29 to 56) were diagnosed as having a ruptured Achilles tendon. All had sustained their injury while playing soccer in a carpet area. Duration of ruptures from injury to surgery was 1, 2, 35 and 45 days. Diagnosis was based on history, a palpable depression on the tendon, and a positive Thompson test. All ruptures occurred about 6 cm proximal to the insertion of the calcaneal tendon. The patients were treated with the same technique, described below.

Operative technique. With the patient under general anaesthesia and tourniquet control, and in a prone position, a posteromedial or posterolateral longitudinal incision was made from the calcaneus to the middle third of the calf and incision was carried sharply through the skin, subcutaneous tissues, and tendon sheath. The ends of the tendon were exposed and any ragged ends (in fresh ruptures) or scar tissue (in old ruptures)

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were excised and average of 3 cm gap occurred between the proximal and distal stump in tension position in all cases. A strip of aponeurotic flap, 8 cm long and 2 cm wide, was elevated proximally from the median raphe of gastrocnemius. The upper end of this flap was freed and reflected distally; its distal end was left attached to the tendon at a site 1 cm proximal to the rupture medially and 2 cm proximal to the rupture laterally (Fig. 1). The ruptured ends of the tendon was tied to approximate with no. 2 nonabsorbable tension suture, using a modified Kessler stitch through the stump 2.5 cm from the rupture in neutral ankle position and 3 cm gap persisted in all cases. After that the flap was twisted 180 degrees on itself from medial sides, so its smooth external surface lied next to the skin and covers the rupture site (Fig. 2). The flap was stretched distally and sutured to the distal and proximal stumps with 3-0 nonabsorbable sutures (Fig. 3).



Figure 1. Flap was freed and reflected distally; its distal end was left attached to the tendon at a site 1 cm proximal to the rupture medially and 2cm proximal to the rupture laterally.



Figure 2. Flap was twisted 180 degrees on itself from medial sides, so its smooth external surface lies next to the skin and covers the rupture site.

The plantaris tendon was released proximally (Fig. 4) and incorporated in the repair site by passing it from the proximal and distal stumps circumferentially, and was sutured itself and proximal stump at superomedial corner, after that the defect between gastrocnemius aponeurosis was repaired with 3-0 nonabsorbable sutures (Fig. 5).



Figure 3. The flap was sutured to the distal and proximal stumps.



Figure 4. Plantaris tendon was released proximally.



Figure 5. Plantaris tendon was incorporated in the repair site and the defect between gastrocnemius aponeurosis was repaired.

The paratenon, deep fascia and subcutaneous tissue were closed with 3-0 absorbable sutures. The skin were closed with 3-0 nonabsorbable sutures and a long leg cast was applied with the knee in 30 degrees of flexion and the ankle in 20 degrees of plantar flexion. After 2 weeks, the cast and sutures were removed and a new cast was applied in same position for 2 to 4

weeks. After that, a below-knee walking cast was applied with the ankle in neutral position for an additional 4 weeks and full weight bearing was given. At the end of this period, cast was extracted, active range of ankle motion was started and patients wore shoes with high heels for a period of 3 months.

RESULTS

The mean follow-up period was 38 months (24 to 54). There were no reruptures. One had skin necrosis and healed satisfactorily with debridement and secondary sutures. None of the others had skin problems. None of them had tendon adhesion to the skin and the skin over the tendon was movable. All were able to do a single-toe rise and returned to their preinjury levels average of 9 months (8 to 12) after surgery. Calf circumferences were average of 6 mm (0 to 10) less than the uninjured side. Active range of motion on the effected side was found to be reduced in one case due to limitation of dorsiflexion, and the difference was less than 10° when compared with unaffected side. All of the patients declared that they were satisfied with the operation.

DISCUSSION

Augmentation adds collagen to the repair site and gives more biomechanical stability to the repair (24). In defective Achilles tendon ruptures, different surgical procedures have been described to attempt to restore continuity of the tendon by bridging the defect with grafts (3-5,8-12,14,16,19-22,24). The conventional grafts of fascia lata, plantaris, turned-down aponeurosis of gastrocnemius are avascular and tend to produce adhesions (3,14).

Tendon adhesion to the skin is especially seen after the open surgical repairs (6,7,17,18). In primary end to end repair techniques, tendon adhesion rate was found as 2.6% to 45% (6,7,17,18). Augmented repair with different flap techniques in 2347 cases, adhesion rate was found to be 3.1% (6). Tendon adhesion is an important minor complication and it may need reoperation (6,13,15).

Different surgical techniques were defined for prevention of tendon adhesion (1,2,7,8). Cetti et al compared the mobile cast group (which leaves the ankle motion in early postoperative period) and rigid cast group. Adhesion rate were 3.3% in mobile cast group and 13.3% in rigid cast group. They pointed that the granulation that forms the scar tissue between the ends of the rupture does cause scar tissue bridges to the surrounding tissue if immobilization is prolonged, resulting in a decreased of the mobility of the tendon (7).

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Lindholm devised a method of repairing ruptures of the tendo calcaneus that reinforces the sutures with living fascia and prevents adhesion of the repaired tendon to the overlying skin. He fashioned two flaps from the proximal tendon and gastrocnemius aponeurosis and twist each flap 180 degrees on itself so that its smooth external surface lies next to the skin (2).

Aldam made a 3 to 4 cm transverse incision in the skin just distal to the palpable gap in the tendon and adhesion between the skin and the tendon are avoided because they lie at different levels after the operation (1).

Esemeli et al used a new open surgical repair technique in three cases without opening the rupture site and none of them had tendon adhesion to the skin (8).

Some principles are important for prevention of tendon adhesion in open surgical methods;

1. Making paramedian (posterolateral or posteromedial) incision (2).
2. Making incision away from the rupture site (1,8).
3. Closing the paratenon and deep fascia (21).
4. Closing the rupture site with flap and make a smooth surface in repair area (2).
5. Early postoperative ankle motion (7).

We used 1st, 3rd and 4th principles in our technique. Our flap technique is a combination of classical median gastrocnemius aponeurosis flap turned down for augmentation of repair (24) and Lindholm's two flaps techniques (2). In classical flap, rough surface lies next to the skin and tendon adhesion to the skin may be expected. In our technique, smooth surface lies next to the skin like Lindholm's technique and tendon adhesion to the skin is prevented.

According to us, our technique is strong than Lindholm's technique, because we used only one large flap and augment the repair site with plantaris tendon. Our technique can be used easily by any Orthopaedic surgeon.

Turn-down fascial grafts are avascular and theoretically must be revascularized to be incorporated in to the repair (3,14). So, flap base folding in our technique is not important problem for revascularization of flap.

In conclusion, if augmented repair of Achilles tendon rupture is preferred, this technique can be used satisfactorily and tendon adhesion to the skin is prevented.

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