Percutaneous Achilles Tendon Repair Combined with Real-Time Sonography

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Abstract

Background: When encountering complaints of pain in the area of Achilles tendon with a suspected lesion, the clinician seldom reaches a precise diagnosis based only on X-ray and clinical examination. Ultrasonography is useful for evaluating the pathology and treatment.

Objectives: To assess the relative contribution of real-time intraoperative ultrasound examination and immediate postoperative ultrasound in patients with acute rupture of the Achilles tendon treated by percutaneous suture method. The combination of both procedures provides a unique advantage that could facilitate better results.

Methods: Ultrasound examination was used in 20 patients with acute rupture of the Achilles tendon who were treated surgically. Intraoperative as well as postoperative ultrasound examinations were performed in 5 patients while 15 patients underwent an immediate postoperative ultrasound.

Results: Ultrasound pathologies were found in all patients. Percutaneous surgical correction of ruptured Achilles tendon with accurate positioning of the foot using real-time sonography was successful in all the patients.

Conclusion: As in many other soft tissue lesions, ultrasonography is a useful tool for evaluating the pathology and for planning the surgical correction of ruptures in the Achilles tendon.

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Rupture of the Achilles tendon is a common trauma among physically active adults. It is treated with either conservative or surgical methods, but controversy still exists regarding the proper approach. Several reviews have concluded that recurrent ruptures are more prevalent following conservative treatment. Wills et al. [1] analyzed the literature and reported a recurrence rate of 1.5% of re-ruptures after surgery, compared with 17.7% with conservative treatment. Others reported similar observations, and noted that the strength, power and endurance were also higher after surgical repair [2-4]. Others found the conservative approach advantageous and without risk of surgical or anesthetic complications [5].

The risks of open surgery could be minimized by the percutaneous repair of the Achilles tendon introduced by Ma and Griffith [6]. It is described as bridging the gap between surgical and conservative treatment of Achilles tendon rupture, and is discussed in several other reports [2,7-10]. When this technique was evaluated against open surgery, it was concluded to be simpler and reliable.

The use of sonographic imaging techniques in the treatment of Achilles tendon has been described previously [11-13]. Our report describes the combination of percutaneous correction of ruptured Achilles tendon with intraoperative sonography or immediate postoperative ultrasound examination. The combination of both procedures, assuring good opposition of the tendon cut ends, provides unique advantages that facilitate recovery.

Patients and Methods

From January 2002 until February 2004 we conducted a prospective study of a consecutive group of 20 patients who presented with complete rupture of their Achilles tendon. The tear [Figure 1A] was diagnosed both clinically and sonographically. The patients' demographic and clinical characteristics are listed in Table 1.

Five out of the entire group of 20 patients had an intraoperative ultrasound examination. The whole group had been examined both clinically and with ultrasound immediately postoperatively and at the follow-up. The Achilles tendon of all patients was bilaterally examined by ultrasound using a 5–13 MHz linear transducer (A.T.L. 5000, Siemens G-50). Plain X-rays were taken only occasionally.

Surgical technique

The surgical procedure followed the method described by Ma and Griffith [10]. After ascertaining the full rupture with sonography, and visualization of the widening of the gap in dynamic dorsi-flexion position [Figure 1B], the location of the gap was palpated, and two stab wounds were made in the skin with a #15

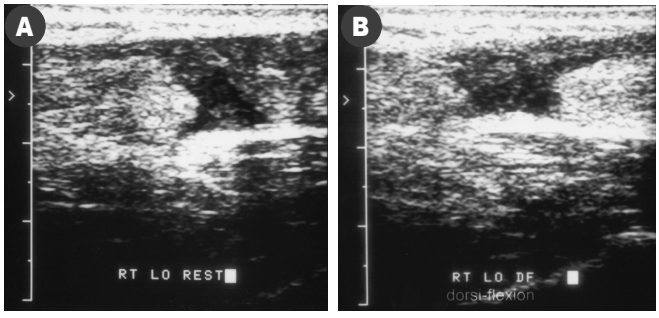

Figure 1. [A] Sonogram of a complete rupture of the Achilles tendon viewed longitudinally in the neutral position. **[B]** Longitudinal view. Ultrasonographic visualization of the widening of the gap in a torn Achilles tendon, with dorsiflexion position of the ankle.

Table 1. Demographic and clinical attributes of patients with ruptured Achilles tendon

Age (range of years)	21–56
Male gender (%)	85
Active in sports (%)	63
Tear occurred during sporting activity (%)	60
Right laterality of tear (%)	64
Tear preceded by tendonitis (%)	25

Figure 2. Longitudinal view. Ultrasonographic visualization of the intrasurgical end-to-end approximation of the gap in the torn tendon, with plantar flexion position of the ankle.

Table 2. Postsurgery foot mobility and tendon thickness

	Mean ± SD	Median	Range
Dorsiflexion (degrees)	12.2 ± 3.6	10.0	5–20
Plantar flexion (degrees)	34.1 ± 9.5	30.0	20–50
Tendon thickness (mm)	12.1 ± 1.2	12.0	10–14
Contralateral thickness (mm)	5.0 ± .6	5.0	4–6

blade at about 3 cm proximal to the tear, under local anesthesia. A #1 non-resorbable suture 30–36 cm in length was passed through the tendon with an 8 cm straight needle, and about equal lengths of it were left on both sides of the leg. From these stab wounds the needle was inserted obliquely along the tendon to emerge contralaterally. Thereafter, with a curved needle the suture is passed between the tendon sheath and the overlying subcutaneous tissues to emerge about 1 cm distal to the rupture gap. The exit hole was slightly enlarged and the suture was led to transverse the tendon, and there, with a curved needle it was moved subcutaneously to exit at half of the gap on the medial side. The other end of the suture was similarly led to the same exit hole, forming a figure "8" of the suture. In five patients ultrasound imaging was used to intraoperatively check the minimal plantar flexion that was required to approximate both parts of the tendon [Figure 2]. In all patients ultrasound was performed immediately after surgery to ascertain good approximation of the tendon cut ends. We found a real advantage of intraoperative ultrasound, and the few minutes delay until the sutures are tightened does not impair our results. However, after gaining surgical experience we found that immediate postoperative ultrasound is sufficient to assure appropriate approximation of the tendon cut ends. After surgery a plaster boot in ten degrees of plantar flexion was applied for 3 weeks, followed later by another plaster cast in neutral position for a further 3 weeks.

Results

At a follow-up examination 6 months later both clinical and ultrasound examinations were performed. Table 2 summarizes the mobility obtained 6 months after surgery. Thirty percent of the patients suffered from deficient subtalar movement, 25% had lateral hypoesthesia, and 20% could not tiptoe. The repaired tendon was significantly thicker than on the contralateral counterpart ($P < 0.0001$), and its collagen fibers were disorganized and not parallel, unlike normal tendons that are visualized by sonography as a band comprising parallel echogenic lines. At this point patients were referred to physiotherapy.

Discussion

The role of sonography in the treatment of Achilles tendon lesions has been described [12,14]. Imaging of acute ruptures of the tendon and during follow-up, either by computerized tomography or sonography, has also been reported [15]. However, the use of sonography during the percutaneous surgical repair, detailed here, provides the surgeon with a powerful modality that enables minimizing the plantar flexion position of the foot only to the extent required for approximating the opposite parts as well as to assure correct approximation and avoid over-correction that would result in a too-short Achilles tendon and limitation of ankle dorsiflexion. This improves rehabilitation. In the short follow-up period of 3 years no re-ruptures were observed.

The ultrasound contribution in the intraoperative time enabled the surgeon to confirm a precise Achilles tendon approximation as well as to select the proper foot position for plaster cast immobilization. The delayed ultrasound examination (after plaster cast removal) enabled the surgeon to confirm tendon continuity and to choose the proper mode of physiotherapy in cases where the tendon did not seem to heal completely. Non-weight bearing and gentle physiotherapy were undertaken whereas full weight bearing and intensive physiotherapy were recommended for those with good healing. Ultrasound does not facilitate recovery; however, as a mode to guide us with regard to further treatment it certainly influences recovery. In other words, ultrasound alone is not a treatment tool but a diagnostic tool that affects treatments.

Most reports suggest immobilization of the leg for several weeks to protect the tendon [16]. However this impairs the function of the ankle joint. It is our impression that the percutaneous procedure with precise positioning of the tendon's parts added by sonography gives better results, as shorter time of plaster immobilization is possible. The high level of sural nerve damage resulting in lateral hypoesthesia was reported in the retrospective study of Klein et al. [9]. We currently use the front-to-back suture

method. In conclusion, percutaneous surgical correction of ruptured Achilles tendon with accurate positioning, using real-time sonographic imaging, has a potential for better results.

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The true civilization is where every man gives to every other every right that he claims for himself

Robert Green Ingersoll (1833-1899), U.S. lawyer and orator, and staunch defender of agnosticism. He was the most popular orator of the age, when oratory was public entertainment. He spoke on every subject, from Shakespeare to Reconstruction, but his most popular subjects were agnosticism and the sanctity and refuge of the family. He committed his speeches to memory although they were sometimes more than three hours long. His audiences were said never to be restless.

Capsule

Scabies, an itching neglected skin disease

Scabies has been a scourge among human beings for thousands of years. Its worldwide occurrence with epidemics during war, famine and overcrowding is responsible for an estimated 300 million people currently infested. Scabies refers to the various skin lesions produced by female mites, and their eggs and scybala that are deposited in the epidermis, leading to delayed-type hypersensitivity reaction. Recent immunologic findings such as cross-reactivity with house dust mite allergens and an altered T-helper-1/T-helper-2 pattern contribute to a better understanding of the pathomechanism. Furthermore, progress in molecular biology and cloning of relevant antigens could enable the development of a diagnostic ELISA system and candidate vaccines in the near future. Typical and atypical clinical presentations with pruritus as a hallmark of scabies occur in young, pregnant, immunocompromised, and elderly patients and include bullous and crusted (Norwegian) manifestations as well as those masked by steroid use (scabies incognito). Hengge et al. review scabies management strategies in developed countries and resource-poor communities as well as typical complications, including the emergence of resistance and drug-related adverseevents. Other problems such as post-scabies eczema and reinfestation, and newer treatments such as ivermectin are also discussed.

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