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Original Research Article

A comparative study for clinical outcome of USG guided percutaneous repair vs open repair for acute Achilles tendon rupture

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Abstract

The purpose of this study is to compare the differences in functional outcomes and complication rates between usg guided percutaneous and open repair of Achilles tendon ruptures.

Methods: This prospective study included 12 patients of Achilles tendon rupture (group 1) treated with ultrasound-guided percutaneous repair and 18 patients (group 2) treated with open repair. Clinical evaluation was performed using the Arner-Lindholm scale, American Orthopedic Foot and Ankle Society (AOFAS), visual analog scale, time to single heel raise, bilateral calf circumferences, and other complications.

Results: While the Arner-Lindholm scale, AOFAS, time point when single heel raise was possible, differences in bilateral calf circumference, and recovery of athletic ability compared to pre-rupture level were not significantly different between the two groups , overall and aesthetic satisfaction levels were higher in the group treated with percutaneous repair under ultrasonography guidance . Overall, there were no cases involving sural nerve injury in either group.

Conclusion: Innovative percutaneous repair provides not only similar clinical outcomes but also greater overall and aesthetic satisfaction levels of operative outcomes and minimal complications (i.e. sural nerve injury) compared to open repair surgeries. Therefore, percutaneous repair may be a useful technique in the treatment of Achilles tendon rupture.

Keywords: Achilles tendon; percutaneous repair; open repair; sural nerve; ultrasonography.

Introduction

Achilles tendon rupture is the most common tendon rupture in the lower extremity.[1] Acute ruptures often present with sudden onset of pain associated with a "snapping" or audible "pop" heard at the injury site. Patients can describe the sensation of being kicked in the lower leg. The injury causes significant pain and disability. [2]

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Etiology

Causes of Achilles tendon rupture include sudden forced plantar flexion of the foot, direct trauma, and long-standing tendinopathy or intratendinous degenerative conditions. Sports often associated with Achilles tendon rupture include soccer, basketball, and racquet games.[1]

Treatment / Management

Treatment can be conservative or operative. In operative treatment it can be open or percutaneous repair.

Open repair surgeries allow for direct confirmation of ruptured Achilles tendon and accurate suturing with tension, thereby reducing the frequency of recurrent ruptures. However, large incisions leading to potential infection, adhesion, and wound-related complications have been highlighted as the drawbacks of open repair surgery. [3] [4] To overcome these limitations, less invasive techniques have been developed. Nonetheless, there have been reported issues of recurrent rupture and sural nerve injuries from these innovative techniques [5]

To reduce the risk of complications linked to conventional open surgery, we utilized an ultrasound-guided percutaneous approach for repairing Achilles tendon ruptures. We also evaluated and compared the clinical outcomes of this method with those of open repair to determine which technique produced more favorable results.

Material and methods

It is a prospective comparative study of patient with acute tendoachillies rupture treated with open and percutaneous repair done in Department of Orthopedics , GRMC , Gwalior ,M.P. for 1 year

Sample size 30

Group 1 -12 patients

Group 2- 18 patients

Open repair

open repair of a ruptured Achilles tendon begins with a 6 to 8-cm incision over the posteromedial aspect of the lower leg. Superficial and deep dissections are performed until the 2 ends of the ruptured tendon are identified. Adhesions are debrided to adequately mobilize and define the proximal and distal segments of the tendon. With use of a fiber tape suture, a modified locking Bunnell stitch is utilized to secure both ends. The repair is reinforced with Vicryl suture (Ethicon). Once the tendon is repaired, the paratenon layer is identified and repaired with a running 0 or 2-0 Vicryl suture. This is an important step to minimize postoperative wound complications. The wound is then closed, and the extremity is splinted in maximum plantar flexion. [6]

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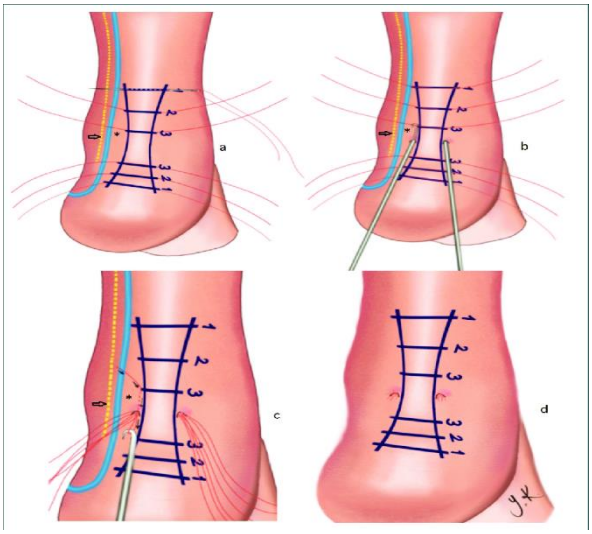
Percutaneous repair

Surgery was performed with the patient in the prone position without a tourniquet, and an ultrasound machine was utilized in the operating room with the probe wrapped in a sterilized vinyl.A 1-0 Vicryl was used for sutures, and the modified Kessler stitch was used to perform sutures. The suture thread was passed through the calcaneal attachment, from the distolateral end to the proximal end of the calcaneal-attached tendon. After passing the suture thread in the longitudinal direction 2 or 3 more times at the proximal tendon, the suture thread was crossed to the medial border of the tendon. The thread was passed down again from the proximal tendon to the distal, calcaneal-attached tendon. After passing the suture thread in the transverse direction from the calcaneal attachment to take the thread out through the first needle hole, the final suture was performed with plantar flexion of approximately 10° compared to the neutral ankle angle of the unaffected side[6]



Percutaneous repair of the Achilles tendon. (a) The medial and lateral edges of the proximal and the distal parts of the tendon are determined, and sutures are passed through the determined points of the tendon with the help of a needle or cannula. (b) Two stab incisions (medial and lateral) are made at the rupture site and the sutures are pulled from the determined points to the incision lines with the help of a mini hook. (c) Sutures are pulled out from the stab incisions and are knotted over the tendon. (d) The skin is closed. (*: Saphenous vein, :Sural nerve).

Results

There was no significant difference in age, gender, side, time elapsed between injury and surgery for both groups confirming this was a cohort comparison study (level 3)

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	Group 1 (12)	Group 2 (18)
Sex		
Male	10	15
female	2	3
Age	26-57	28-55
Gap of rupture (mm)	20.2 (6-38)	22.6 (8-40)
Interval between operation and inury (days)	3	3.6

TABLE 1: Characteristics of group 1 and 2

	Group 1	Group 2	P value
AOFAS score	90.5(84-97)	89.7(68-95)	0.320
Arner Lindholm scale			0.98
excellent	8	11	
good	4	6	
poor	0	2	
Single heel raising After repair in months	3.70	3.60	0.625
Cosmetic satisfaction	9.9	6.8	**0.001**
complication	1	2	
Calf circumference difference in mm	14.7 (8-23)	14.2(6-33)	0.482
AOFAS: American Orthopedic Foot and Ankle Society ankle–hindfootscore			

TABLE 2: result of two groups

In both group there were 1 case of re-rupture, they were managed by rotation flap and sural flap turndown procedure.

In group 2, there was a case of deep infection. For the patient with deep infection, debridement and washing were performed to control infection with antibiotics and rotational flaps. Overall , there were no cases of sural nerve injuries.

Discussion

The key finding of this study is that percutaneous repair is significantly more cost-effective than open repair for treating Achilles tendon ruptures, primarily due to a notably shorter hospital stay. Importantly, there was no significant difference in functional outcomes at the time of evaluation. These results indicate that percutaneous surgery offers a more economical option without compromising the quality of patient care.[7]

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Several studies have reported complications associated with infection, adhesion, and wound-related complications in traditional open repair surgeries [3] in our study Re-rupture rates were comparable, with one case reported in each group; however, existing literature indicates that higher re-rupture rates are typically associated with percutaneous repair.[8][9]

Ma and Griffith(10) described percutaneous repair as a hybrid approach that combines elements of open surgery and conservative treatment. Numerous studies have since compared this innovative technique with traditional open repair, and ongoing research continues to explore various minimally invasive surgical (MIS) techniques, which represent refined advancements of these operative methods.

The functional outcome following Achilles repair has been widely reported in the literature, and as in this study, we have shown no difference in outcome[8][11]

Several prior studies have noted that percutaneous repair reduces the incidence of skin-related complications while delivering comparable, high-quality clinical and functional outcomes[12] similarly in our study there was one case of deep infection in open repair along with better cosmetic satisfaction in percutaneous repair.

Similarly Yang et al.[5] suggested that percutaneous repair is better than open repair in operative time, infection, and AOFAS scores.

The sural nerve has varying anatomical pathways, and thus, percutaneous repair will always expose the patient to the risk of sural nerve injury.[13] however in our study there was no incidence of sural nerve injury.

One limitation of this study is the small sample size, which resulted in a non-normal distribution of data in both groups. Additionally, the use of different repair techniques between the groups may have influenced the differences observed in patient outcomes. Lastly no clear indications for the two different operative methods were set.

Conclusions

Tendon achilles rupture can be treated with various modalities but Ultrasound-guided percutaneous repair offers clinical outcomes comparable to those of open surgery, while also yielding higher overall and aesthetic satisfaction. Moreover, this technique reduces the complications typically associated with traditional percutaneous methods. Given the ongoing lack of consensus on the optimal treatment for Achilles tendon rupture, ultrasound-guided percutaneous repair presents a promising and effective alternative.

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