

The Outcomes Between Acute and Delayed Repair After Achilles Tendon Rupture

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Abstract

Background: To assess the outcomes of patients with delayed presentation, who had received no treatment until 14 days later following injury of Achilles tendon rupture repaired with open reconstruction surgery and were compared with a group of patients who received surgery within 14 days.

Methods: A total of twenty-four patients with Achilles tendon rupture who were treated with uniform surgical techniques were retrospectively assessed. The cohort was divided into two groups according to the time from injury to surgery (TTS): acute repair ($TTS \leq 14$ days) and delayed repair ($TTS > 14$ days). Function was evaluated by the Tegner activity level. Score evaluation included Achilles tendon Total Rupture Score (ATRS) and Visual analogue score (VAS).

Results: At least 12 months following repair, patients with delayed repair (TTS: 14-28 days) had mean (SD) ATRS score of 88.4(7.8) compared with 89.2(6.3) in patients treated acutely. There were no significant differences between groups: Tegner [mean (SD) delayed: 4.3(1.6), acute: 4.4(1.5)], VAS score [mean (SD) delayed: 1.8(0.7), acute: 1.6(0.9)]. There were also no significant differences in complications between the two groups.

Conclusions: For those patients with delayed presentation of 14 to 28 days—even though the local medical departments don't have minimally invasive incision techniques or Achilles tendon repair equipment, open repair is also a better choice.

Introduction

The incidence of Achilles tendon rupture is 37.3 in 100,000 (1) (In Danish, 1996), and remains rise based on the increased older population (2). Poor prognosis of Achilles tendon rupture could lead to severe gait abnormalities and ankle stiffness (3). The goal of our treatment is to restore the length and tension of the patients' tendon, and allow them to return to the exercise level before injury. Misdiagnosis at the first-examining for Achilles tendon rupture up to 20% (4), and such injuries after 4–6 weeks is generally defined as a chronic ruptures (5, 6).

The ruptured tendon can be treated with surgical and nonsurgical therapies, but there is no consensus on the optimal treatment protocol (7–9). Acute Achilles tendon rupture can be treated conservatively or surgically in 2 weeks. However, in chronic Achilles tendon rupture, the prognosis is extremely poor if end-to-end sutures is not achieved. Most surgeons have shown the need of surgical treatment for chronic Achilles tendon ruptures (10, 11).

Open reconstruction is considered the standard technique for the repair of acute Achilles tendon ruptures (9). Compared with minimally invasive reconstruction, open repair may not be advantageous at the operation time and deep infection, but it has a low incidence of sural nerve injury (12, 13). Open reconstruction also involves more complex surgical techniques, including V-Y advancement, augmentation of the repair with adjacent tendons, autograft or allograft.

There are only a few studies have been reported on the outcome of repair during the acute-on-chronic time period following delayed presentation(14, 15).Anathatee using the Achillon system (Integra, Plainsboro, NJ, USA) to achieve proper approximation of the tendon ends, at 11–31 days following rupture(14).Michael performed end-to-end repair using minimally invasive repair(15).Both of the above two studies used minimally invasive techniques, but no literature has reported the outcomes and feasibility of open reconstruction combined with modified suture in the acute-on-chronic period.

This study aimed to evaluate subjective and functional outcomes of Achilles tendon rupture repair in patients with delayed presentation compared with patients accepted acute repair, with open reconstruction combined with modified suture.

Methods

Patients

This study included 24 patients who were treated for Achilles tendon ruptures between January 2014 and July 2017 at our institution. Patients who were at risk of coexisting chronic Achilles tendinopathies (i.e. inadequate trauma, age > 65 years, previous quinolone therapy, steroid use, renal transplantation, diabetes, peripheral vascular, alcoholic and diabetic polyneuropathy) were excluded. To compare the outcomes according to different post-injury time points, we divided patients into 2 groups; those with surgery longer than 14 days from injury (Group A) and those having surgery less than or equal to 14 days from injury (Group B). Patients were matched according to sex and to the nearest possible age.

Surgical technique and rehabilitation

The operations were performed under general or spinal anesthesia in a prone position using a pneumatic tourniquet. Approximately 7 cm longitudinal incision was made at the midline of the Achilles tendon over the rupture site, exposing tendon stumps and protecting the sural nerve. Krackow technique was used to end-to-end suture Achilles tendon and a 1 – 0 Vicryl (Ethicon, New Jersey, US) was applied to reinforce repair. All procedures were performed by a single surgeon and all patients using the same post-operative rehabilitation protocol.

Outcome evaluation

At the last follow-up visit, the outcomes were also evaluated by ATRS, the Tegner activity level and VAS score. Complications such as sural nerve injury, wound problem and rerupture were also included in the outcome assessment.

Statistical analysis

Statistical analysis was performed using SPSS v21.0 (IBM Corp, Armonk NY, USA). The outcomes were analyzed for normal distribution using the Kolmogorov-Smirnov test. The outcome measures were assessed for significance using a paired samples t test. A level of significance was set at $p < 0.05$.

Results

A total of 24 patients with a minimum 1 years follow up and contacted for review were enrolled in this study. There were no differences between age, Pre-injury Tegner, sex and body mass index (BMI) between the two groups (Table 1).

Table 1
Patient characteristics

Mean (SD)	Delayed repair	Acute repair	P value
Number(n=)	16	16	
Time to surgery	19.5(4.1)	5.75(3.4)	< 0.001
Male:female ratio	9:3	10:2	1.000
Age/years	44.83(11.8)	42.3(10.9)	0.595
Body mass index	25.3(2.89)	26.0(3.5)	0.587
Pre-injury Tegner	5.9(1.6)	5.8(1.6)	0.802
Follow-up period/days	13.1(1.0)	12.8(0.8)	0.512

The acute repair group had a mean ATRS of 89.2(SD: 6.3), Tegner of 4.4 (SD: 1.5), and VAS score of 1.6(SD: 0.9). The delayed repair group reported an ATRS of 88.4(SD: 7.8), Tegner of 4.3(SD: 1.6), and VAS score of 1.8(0.7). And there were no significant differences in the ATRS, Tegner or VAS score with p-values of 0.828, 0.857 and 0.275 respectively (Table 2). There was no significant difference in the outcome scores between the two groups (Fig. 1).

Table 2
Outcomes after 12 months of reconstruction following repair

Mean (SD)	Delayed repair	Acute repair	P value
ATRS	88.4(7.8)	89.2(6.3)	0.828
Tegner	4.3(1.6)	4.4(1.5)	0.857
VAS score	1.8(0.7)	1.6(0.9)	0.275

There was one patient in each group who showed signs of transient sural nerve symptoms, but they all recovered to normal within 2 months. In the delayed group, one patient who suffered from wound infection requiring antibiotic therapy. There were no cases of thromboembolic event and re-rupture in either group (Table 3).

Table 3
The relative complications

Mean (SD)	Delayed repair	Acute repair
Complication		
Re-rupture	0	0
Wound problem	1	0
Long-term sural nerve symptoms	0	0
Transient sural nerve symptoms	1	1
Thromboembolic event	0	0

Discuss

At present, there is no literature report on the clinical effect and feasibility of open incision for patients with delayed presentation of Achilles tendon rupture. The most important finding of this study is that patients with delayed repair can achieve similar results in patients undergoing acute repair.

Open repair is a classic surgical method and there are many surgical options for chronic Achilles tendon rupture.(16–19) Minimally invasive has the advantages of small wound and beautiful postoperative appearance. MA put forward the percutaneous minimally invasive surgery to the Achilles tendon rupture, (20) and then the minimally invasive auxiliary equipment was developed, such as Achilles tendon repair system and PARS. Although to a certain extent, it promote the development of minimally invasive treatment, but there is no obvious improvements on avoid sural nerve injury. Our study showed that the incidence of transient sural nerve sensory disturbance was 8% and long-term sural nerve symptom was 0%, lower than that of M Yasser Anathallee 's patients(14) with delayed surgery. This is related to the incision which is enough to expose the tendon and secure the suture.

The strength of the sutures associated with different surgical procedures is still controversial. Minimally invasive sutures are not as strong as open incisions on biomechanical testing (21, 22). However, Heitman pointed out that Achillon repair can be stronger than an open repair using the Krackow locking loop(23). Our study has no rerupture after surgery, and we also achieved a clinical outcome which was similar to the previous study(15). Minimally incision may be lead to skin necrosis because of excessive retraction, and sural nerve injury. However, open repair may be also bring about wound problems or infection.

The study showed that open reconstruction could also achieved better results.

Conclusion

For those patients with delayed presentation of 14 to 28 days,even though local medical departments don't have minimally invasive incision techniques or Achilles tendon repair equipment, open repair is also

a better choice.

Abbreviations

TTS

Time from injury to surgery; ATRS:Achilles tendon Total Rupture Score; VAS:Visual analogue score; SD:Standard Deviation.

Declarations

Acknowledgements

None

Authors' contributions

JM and QW contributed to the study design. JM and QW drafted the manuscript and searched the articles. HL and XX accomplished the statistical analyses. JM, HL and QW revised the manuscript. All authors read and approved the manuscript.

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Availability of data and materials

All data are fully available without restriction.

Ethics approval and consent to participate

Patients' consent was obtained and documented prior to study participation. Ethical approval for this study was obtained through Yijishan Hospital.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Figures

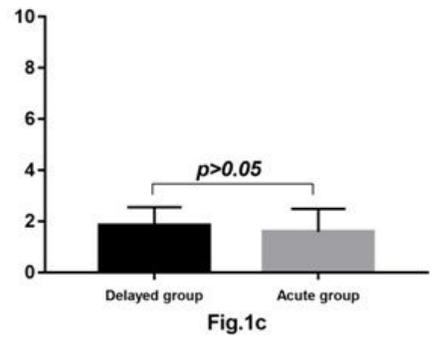
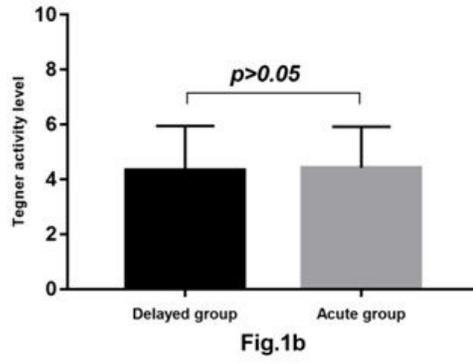
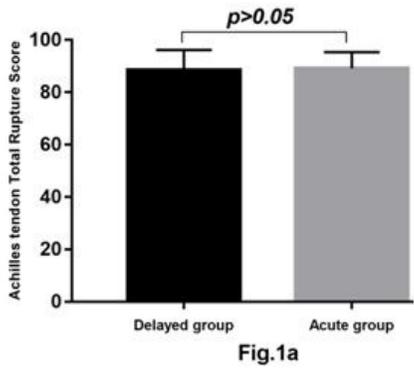


Figure 1

The outcomes of at least 12 months follow-up.