



ACHILLES TENDON RUPTURE: COMPARATIVE ANALYSIS OF OUTCOMES FROM NON-OPERATIVE AND OPERATIVE TREATMENT MODALITIES

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Abstract

Background: Achilles tendon ruptures are the most common tendon injuries in orthopaedic practice. The tendon plays a key role in all phases of the gait cycle; injuries therefore affect active movement. Non-operative and operative treatment modalities exist with no clear consensus. The aim of this study was to compare operative and non-operative treatment of Achilles tendon injuries in port Harcourt.

Materials and Methods: A prospective cross-sectional analytical study was conducted among consecutive patients who presented with Achilles tendon injuries over a five-year period. The obtained data were analysed and formed into tables, charts and figures.

Results: thirty-two patients were recruited into the study giving a crude prevalence of 15.8% of all tendon injuries. The 30-50 years age group accounted for more than half of the study population with sports injuries and bicycle spoke injuries being the most implicated. Closed injuries (22) were far more than open injuries (n=10). The conservative group however had better outcomes in terms of length of hospital stay in days (n=1/n=5), wound complications (n=0/n=2) and direct cost of treatment. Time for tendon healing, return to full weight bearing, return to work and re-intervention rate were better for the operative group compared to the non-operative group.

Conclusion: While operative treatment may be ideal for the patient with open injuries, high work demand, complete rupture and desirous of early return to work, non-operative treatment is suitable for the patient with closed incomplete tendon ruptures with low work demands.

Keywords: Achilles tendon injuries, Operative treatment, Non-operative treatment, Port Harcourt.

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INTRODUCTION

The Achilles tendon is the strongest and thickest tendon in the body¹ formed by the terminal fibers of the gastrocnemius (originating from the distal femur) and the soleus muscle (originating from the proximal tibia) with occasional contribution from the plantaris tendon. The tendon plays a pivotal role in ambulation, serving as a link between the ankle plantar flexors and their attachment to the calcaneus. Rupture of this tendon therefore negatively impacts ambulation. Achilles tendon rupture rates are the highest among all tendons in the body, accounting for one-fifth of all tendon ruptures.² Two peak incidences have been observed epidemiologically. The first peak incidence is between age (25-40) years. This group usually have acute ruptures of otherwise healthy tendons from sports-related injuries and trauma.^{3,4} The second peak incidence occurs at age 60 years and above, usually from low energy trauma in a tendon with pre-existing degenerative disease (tendinopathy).^{3,4}

Risk factors for Achilles tendon ruptures include, male gender, involvement in high impact sports, preexisting degenerative tendon diseases, previous Achilles tendon injury, increasing age, previous steroid injections around the tendon and preexisting muscle atrophy.^{5,6,7,8}

Anatomically the Achilles tendon has a highly vascularized paratenon in place of a tendon sheath, perhaps explaining the possibility of tendon healing when fibres across ruptured ends are in contact with each other even without operative intervention. The blood supply to the proximal and distal sections of the tendon is by the posterior tibial artery while the peroneal artery supplies the midsection (2 to 6 cm from the insertion point). The midsection receives a relatively poor blood supply from the peroneal artery and is therefore most vulnerable to degeneration and rupture.

There is no consensus on the treatment of Achilles tendon rupture.^{9,10}

Aggressive surgical intervention was the most popular treatment especially for tendon ruptures resulting from degenerative disease as it restores tendon length and allows early rehabilitation. Superficial and deep wound infection

requiring reoperation have however been reported with this treatment modality.¹¹

Percutaneous repair methods reduced infection rates drastically and improved patients return to work and sports but the risk of injury to the sural nerve was significantly higher with this method.^{12,13} Increased re-operation rates have also been reported^{12,13} since the repair is generally regarded as not strong enough compared to the open type.

Non-operative treatment option has better outcomes in acute ruptures in the younger population. Though surgical scar and wound infection is avoided, it has however been associated with higher re-rupture rates compared to surgical intervention and increased risk of joint stiffness and muscle weakness following prolonged immobilization.¹⁴

Recent evidence has shown that accelerated functional rehabilitation can improve outcome of treatment and reduce treatment complications irrespective of treatment modality.^{15,16} The replacement of rigid cast immobilization with functional bracing and the early commencement of ambulation have been reported to improve outcome from surgical and non-surgical treatment modalities.^{17,18}

This study aims to comparatively analyze the treatment outcomes from conservative and operative treatment of Achilles tendon repairs.

METHODOLOGY

This was a multi-center prospective study of treatment of acute Achilles ruptures among patients that presented to the orthopedic department of the university of Port Harcourt Teaching Hospital and two private orthopedic hospitals in Port Harcourt over a five-year period (Jan 2018-Dec 2023). Ethical approval was obtained from the research and ethics committee of the university of Port Harcourt Teaching Hospital.

Inclusion criteria: injury less than three weeks, patients aged between 0 to 70 years, no previous injury to the ipsilateral Achilles tendon and no muscle weakness on the affected limb.



Clinical diagnosis

Patients selected for the study had detailed clinical evaluation. Focused history on sociodemographic variables, pre-existing diseases that could affect treatment, the primary injury factor as well as treatment expectations was followed by detailed clinical examination. The clinical triad of sudden inability to walk, acute pain at the heel and a popping sound or feeling of sudden give around the heel was crucial to the clinical diagnosis of Achilles tendon rupture.

Clinical examination includes the demonstration of a positive Thompson's test, decreased active planter flexion, a palpable defect across the length of the Achilles tendon and patient's inability to stand on the toes on the affected foot. Thompson's test (Simmonds-Thompson's test, calf squeeze test) involved passively squeezing the calf muscles (soleus and gastrocnemius muscles) with the patient lying prone and the legs hanging out from the edge of the examination couch. In a positive test (indicating a rupture Achilles tendon) the squeeze fails to produce ankle plantarflexion while in a negative test, the reverse occurs. Though highly sensitive, false negatives have been reported with the test especially in patients with chronic rupture from degenerative tendon disease. Patients with presumed false negative test had radiologic tests for diagnosis.

Clinical evaluation was the basic screening test for all patients recruited. Two of the patients were requested to do ultrasonography of the tendon while three patients were requested to have a plain radiography of the heel for suspected calcaneal avulsion.

Sample size

A total of 39 patients were eligible and recruited. 34 patients gave consent for the study. Two of these patients had incomplete data, 32 were therefore enrolled for the study. Following patient evaluation, all recruited patients had either surgical fixation or non-operative treatment in a non-randomized manner. Treatment was based on existing hospital-based policy and as modified by the patient's preferences.

Patients who had conservative treatment were placed on an above-knee cast immobilization with the ankle in maximum

planter flexion for three weeks which was thereafter reduced to a below knee cast with the ankle in plantigrade position for another three -five weeks before commencement of full weight bearing. Treatment for this group took place on the day of presentation.

For patients who had surgery, all had open repair of the Achilles tendon. Through the medial para-tendon approach, the tendon was exposed and primary repair done using the modified Kessler's method for core tendon repair, re-enforced by epitendinous sutures. Where ruptures were close to the calcaneal attachment, tendonoplasty was done. Post-operatively, the limb was placed in an above-knee cast with the foot in planter flexion for 2 weeks then later modified to an extended boot cast or functional brace for 2 weeks before commencement of ambulation

Post procedure protocol was similar for the two groups in terms of pain management, anticoagulation and orthotic usage. The operative group only differed for antibiotics use and wound care. Physical rehabilitation protocol for the two groups involved early strengthening of the calf muscles from day 3, range of motion exercises at the knee during conversion and range of motion exercises and ambulation after cast removal. All procedures were done by the investigators and other orthopaedic surgeons at similar level of experience.

Secondary data was obtained from the patients' folders, theatre records, post-operative notes and from follow-up notes. Follow up calls were made when necessary to obtain more data to compliment what was already obtained.

Outcome variables

Treatment outcomes for analysis include

1. Length of hospital stay
2. Wound healing
3. Intervention-ambulation interval
4. Re-intervention rates
5. Period of cast immobilization
6. Time required for return to work and sports
7. Direct cost of treatment

Data analysis

Frequencies and cross tabulations were used to create two-way and multi-way tables. Charts and graphs were used to display appropriate categorical variables. Numerical variables based on their distributions were expressed in mean, median (inter-quantile range), proportion and standard deviation. Where appropriate, P values were determined using standard chi- square test. A p-value of less than or equal to 0.05 was considered statistically significant. Statistical methods were carried out using IBM SPSS statistics for windows version 28.0 Armonk NY IBM corp.

RESULTS

The study centre recorded a total of 202 tendon injuries within the study period. 15.8% of all tendon injuries therefore were Achilles tendon injuries.

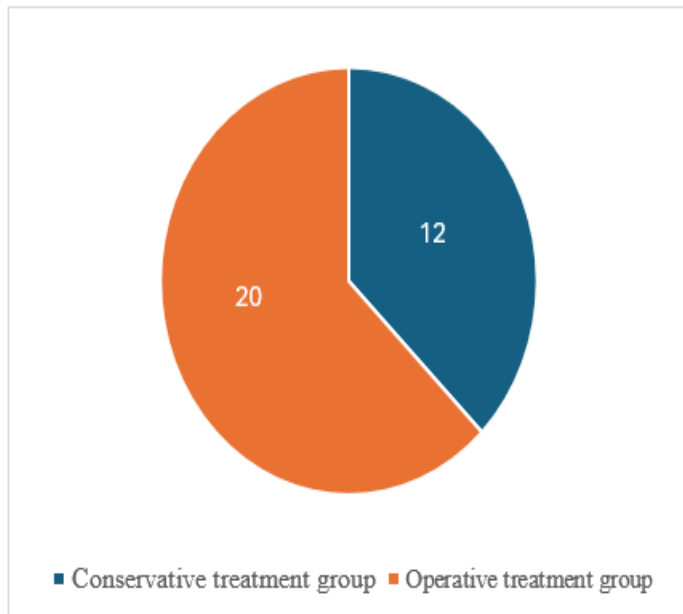


Figure 1: Distribution of treatment groups groups

The age distribution is as stated in Table 1

Table 1: Age and other Demographic distributions

Characteristic	Frequency N=32	Percentage (%)
Age		
0-10	0	0.0
11-20	1	3.1
21-30	3	9.3
31-40	5	15.6
41-50	12	37.5
51-60	8	25
61-70	3	9.3
>70	0	0.0
Gender		
Male	24	75
Female	8	25
Occupation		
Professional sports	5	15.6
Retired	3	9.3
Students	6	18.7
Other occupations	18	56.2

Table 2: Aetiologic considerations

Etiologic considerations	Frequency N=32	Percentage (%)
Sports injury	15	46.8
Low energy trauma	4	12.5
Industrial injury	3	9.3
Bicycle/motor bike spoke injury	10	31.3

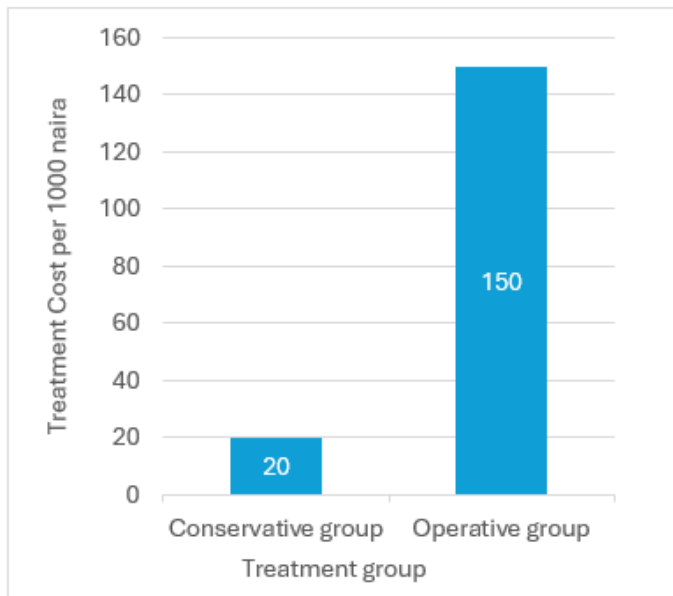


Figure 2: comparative financial cost of treatment per thousand naira

Table 4: Physiotherapy outcomes

Variables	Conservative group	Operative group
Return of muscle power in calf and high muscles in 12 weeks	8 (66.6%)	17 (85.0%)
Return to full range of motion in the knee and ankle	7 (58.3%)	18 (90.0%)
Acceptable power in ankle planter flexors (Grade 4 and 5)	8 (66.6%)	16 (80.0%)
Absence of exaggerated dorsiflexion (increased Achilles tendon length)	10 (83.3%)	18 (90.0%)

Table 3: Treatment outcomes

Treatment outcomes	Conservative group N=12	Operative group N=20
Mean Length hospital stay in days	1 (n=1-3)	5 (n=3-10)
Mean Duration of limb immobilization in weeks	6.3 (5-8)	4.2 (3-6)
Wound complications	0 (0%)	2 (10%)
Superficial wound infection	0 (0%)	2 (10%)
Deep wound infection	0 (0%)	0 (0%)
Intervention- ambulation interval in weeks	8.3 (8-12)	6.1(6-7)
Duration to Full weight bearing in weeks	10.5 (9-13)	6.8 (6-8)
Re-intervention rates	33.3% (n=4)	5% (n=1)
Duration to Return to work/sports in weeks	12.4 (11-14.5)	7.1 (6.4-8.8)

DISCUSSION

The Achilles tendon is commonly implicated among tendon tears accounting for 15.8% of all tendon tears in the study center. Gilles and Chalmers reported 20% prevalence 55 years ago.¹⁹ Men are three times more likely to be affected than women which is similar to reports from many scholars.^{20,21}

The 30-50 years age group constitute more than half of the entire study population. Both Moller et al²²and Nillius et al⁴ have reported a bimodal age distribution with the 25-40 years age group accounting for most of the ruptures from otherwise healthy tendons and the above 60 years age group accounting for rupture in tendons with pre-existing degenerative diseases. Those above 60 years in this study were just below 10% perhaps reflecting the youthful population in the study centre.



Sports and bicycle/motorbike spoke injuries accounted for most of the tendon ruptures seen in this study. High energy sports injuries have been the most commonly implicated etiologic factor in most studies.^{4,20,21,22,}

The operative group had faster return to work/sports (7.1/12.4), shorter period of limb immobilization (4.2/6.3), faster full weight-bearing ambulation (6.1/8.3) and less re-intervention rate (n=1/n=4) Gupta et al²³ reported >80% of patients who had operative repair returned to pre-injury state early enough and were able to bear weight earlier than those treated conservatively.

Heikkinen et al²⁴ also reported that surgical repair gives optimal restoration of tendon length (a key factor for the restoration of tendon function), less calf muscle weakness and early return to work. This study corroborates this finding. The absence of exaggerated dorsiflexion, a measure of tendon length restoration was more for the operative group compared to the conservative group. (n=18/n=10)

The conservative group however had better outcomes in terms of length of hospital stay in days (n=1/n=5) and wound complications (n=0/n=2). The latter may arise because of the limited operating space in the study center necessitating surgical repairs to do done at the earliest operating days compared to conservative treatment that can be done on the day of presentation.

The cost of treatment is also significantly lower in the conservative group. This is a key determinant of treatment preference by patients especially in sub-Saharan Africa where most patients still pay out-of-pocket for treatment.

The results from this study show that surgical option remain a better option for the patient that can afford the cost of treatment especially when early return to work and sports is a prime concern. Conservative treatment still remains a viable alternative when cost is a prime consideration especially in the young population. The risk of reoperation still needs to be explained to these patients.

CONCLUSION

Operative treatment may be ideal for the patient with open injuries, high work demand, complete rupture, ruptures in

degenerative tendons and patients desirous of early return to work. The non-operative treatment is suitable for the patient with closed incomplete tendon ruptures with low work demands.

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