

ATYPICAL CORONAL OR SAGITTAL Z
RUPTURES OF ACHILLES TENDON: A report of
4 cases

V.S.Pai M.S (Orth), Dip. National board (Orth), MCh(Orth)

Health Care Hawkes Bay, Omahu Road

Hastings, New Zealand

Neil Patel FRCS

Health Care Hawkes Bay, Omahu Road

Hastings, New Zealand

Correspondence

V.S.Pai

Healthcare Hawkes Bay, Omahu Rd

Hastings, New Zealand

e-mail: bonifix@gmail.com

Phone: 06 8788109

Abstract

A typical rupture of Achilles tendon occurs as a complete rupture about 4 to 6 cm proximal to its insertion to calcaneum. Authors describe four cases of atypical “z” rupture of the Achilles tendon. In two, the Z rupture was in the coronal plane and other two in the sagittal plane. All four cases were treated by open repair.

KEY WORDS

Achilles

rupture, Z rupture

INTRODUCTION

Spontaneous rupture of the Achilles tendon has been associated with a multitude of disorders such as inflammatory and autoimmune conditions, corticosteroid injection, fluoroquinolones. However, in the majority of cases these factors are not present and the main predisposing factor appears to be age related collagen degeneration (1). Typically an Achilles tendon rupture occurs 4 to 6 cms above the insertion into calcaneus. The major blood supply is through the mesotendon, the richest supply being the anterior mesentery. With age this blood supply has shown to be reduced (2). The cause of rupture is probably a combination of relatively hypovascular area and repetitive microtrauma that causes an inflammatory reparative process that is unable to keep up with

the stresses. A mechanical overload then completes the rupture.

An atypical tear may sometimes be seen, caused by a variable torsion in the Achilles tendon together with sudden asynchronous mechanical overload. When this happens, it causes an atypical rupture with a long Z rupture in the coronal or sagittal plane. The authors report four such cases and discuss clinical findings, pathogenesis, operative findings and treatment. To our knowledge, such cases have previously been reported only in the non-English literature (3).

CASE REPORT

Case 1: An otherwise fit and healthy 32-year-old Caucasian veterinary orthopaedic surgeon presented with acute rupture of the Achilles in the right leg. He felt a pop while he was trying to “push off” in a game of indoor cricket. He complained of swelling, severe pain and muscle spasm in the lower half of his leg. Clinical examination revealed diffuse swelling and tenderness over the distal half of the calf. About five centimeters proximal to the insertion of the tendon, there was a palpable defect with loss of the outline of the tendoachilles. Thomson’s test was positive and painful. At the time of surgical exploration, a “Z shaped tear” in the sagittal plane was seen (Fig 1) from about 4 cm proximal to the insertion to the musculotendinous junction. It was found that the

proximal part of the tendon was rolled up, lying superficial to the muscle belly. The ruptured tendon was repaired (side to side) with a nonabsorbable suture material (Ethibond 2) utilizing multiple interrupted mattress sutures.(Fig 2)

Postoperatively, a below knee cast was applied in 30° of equinus. At 2 weeks, the cast and sutures were removed and the patient was placed in an equinus cast for a further 3 weeks. At 5 weeks, he was allowed into a Range-Of-Movement (ROM) orthosis, with dorsiflexion set at 0 degree, and mobilized touch weight bearing. He was allowed to fully weight bear at 10 weeks. The patient was able to stand on his toes by 16 weeks and was able resume all pre-injury activity by 6 months. Follow up at four years revealed no further problems.

Three other patients were managed in a similar way (Table 1). All were male, aged about forty, with a similar mechanism of injury. One had a Z sagittal tear like case 1; the other two had a coronal Z tear. With regards to the coronal tear, the proximal tear occurred in the superficial fibers of the tendon at the musculotendinous junction and the distal part of the "Z" was found near the tendon insertion to calcaneum with rupture of anterior fibres of the tendon. A vertical tear in tear in the coronal plane connected these two horizontal limbs. They were repaired front to back with interrupted sutures. All these patients made an excellent to good recovery with a return to normal activity.

Discussion

The Gastrocnemius component of the Achilles tendon begins as a broad aponeurosis from the deep (anterior) surface of the muscle bellies. As the tendon proceeds distally, the Gastrocnemius fibers converge and rotate toward the lateral aspect of the calcaneus. The soleus portion is thicker and begins as a broad aponeurosis superficial to the muscle. Soleus fibers converge and descend in a spiral course, making up the medial aspect of the tendon's insertion. The Gastrocnemius component of the tendon, which originates on the femur, crosses the knee, ankle, and subtalar joints while its counterpart traverses the ankle and subtalar joints only. (4)

The soleus muscle begins contracting shortly after heel contact, continues through midstance, and ends shortly after heel lift. The Gastrocnemius contracts during midstance and half way into the propulsion phase. As a result of these two forces, the stability of the foot is maintained throughout the stance phase. More recently, Arndt et al (5) showed that the Achilles tendon can be subjected to non-uniform stresses through modifications of individual muscle contributions. A healthy tendon may rupture after a violent muscular strain in the presence of certain functional anatomical conditions (6). An injury, therefore, can be produced by a discrepancy in individual muscle forces ie., asynchronous contraction of various components of the triceps surae may explain the pathogenesis of different types of atypical ruptures. A coronal Z rupture probably occurs when both Gastrocnemi contract violently with a

relaxed soleus. An asynchronous contraction of two gastrocnemii may be responsible for a sagittal rupture..

In a recent cadaveric study, Van Gils (7) confirmed existence of torsion of Achilles tendon. They observed variation in the tendon torsion, with a range of 11 to 65 degrees and this may be partly responsible for various types of ruptures. It has been hypothesized that the torsion may increase the tendon's strength during weight bearing and prevents rupture (8). Without torsion, during movements of the ankle and subtalar joint, the tendon may be subjected to undue tension .

Literature is full of articles on the various methods of treatment of Achilles tendon (9,10,11,12,13) but atypical tears are rarely described (3,14). It is our opinion that the rupture starts at the typical site with a tear of the lateral fibers in a sagittal "Z" and anterior fibres in the coronal "Z". It then extends vertically up in a coronal or sagittal plane to the musculotendinous junction and finally transversely or superficially at the musculotendinous junction. It is possible that it may stop at any stage and present clinically as an incomplete rupture.

Although clinically, these lesions mimic a typical rupture, these patients have more pain and tenderness at the musculotendinous junction. It is possible to recognize these lesions by Ultrasound or MRI, but it is not our policy to

perform these investigations routinely in a case of Achilles rupture.

There is continuing controversy in the literature about the best method of treatment of Achilles rupture (15,16,17). In the active patient who requires the strongest result and wishes to minimize the incidence of re-rupture, surgery would seem to be the treatment of choice. The exact incidence of atypical rupture is not known as our policy is to operate only in active patients when the Thompson's test is positive. These reported four cases of atypical Z rupture were noted among 104 Achilles tendon rupture operated on by the senior author .

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Legend

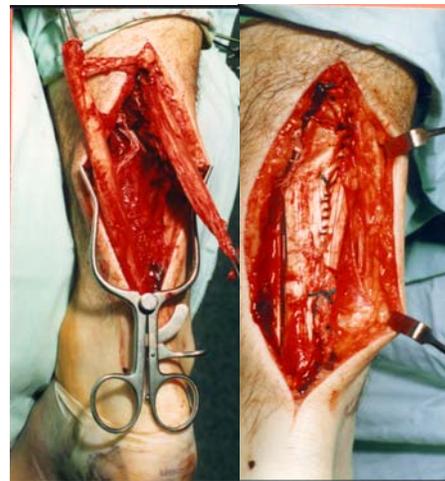


Fig 1: Intraoperative view of ruptured Achilles tendon. Tendon is ruptured in a Sagittal fashion

Fig 2: Intraoperative photograph demonstrating side to side repair of the tendon

ACKNOWLEDGEMENTS

The authors are grateful to Dr. Peter Lloyd for his help in preparing this manuscript and Mr. Wayne Blair, medical photographer, Memorial Hospital. No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

TABLE 1 CLINICAL DETAILS OF FOUR PATIENTS WITH ATYPICAL RUPTURE

Patent	Age/Sex	H/Otrauma	C/F	Type of tear	Treatment	Results
SB 4/97	43/M	Indoor cricket	Swollen Calf Tenderness + Gap 2" above C Pain ++++	Z Sagittal Plantaris rup 100 cc of clot	Side to side Flynn's	Exc
JP 7/98	42/M	Netball	" Pain ++	Z sagittal Plantaris int	Side to side repair	Exc
CR 3/00	37/M	Pushing Concrete cylinder	" Pain +++	Z coronal Plantaris divided	Front to back repair Flynn	Exc
WS 5/00	47/M	Rugby	Pain+ "	Z Coronal Plantaris intact	Front to back	Good