Injuries of Achilles Tendon

ESSAY

Submitted for Partial Fulfilment for
Master degree in Orthopaedic Surgery

by

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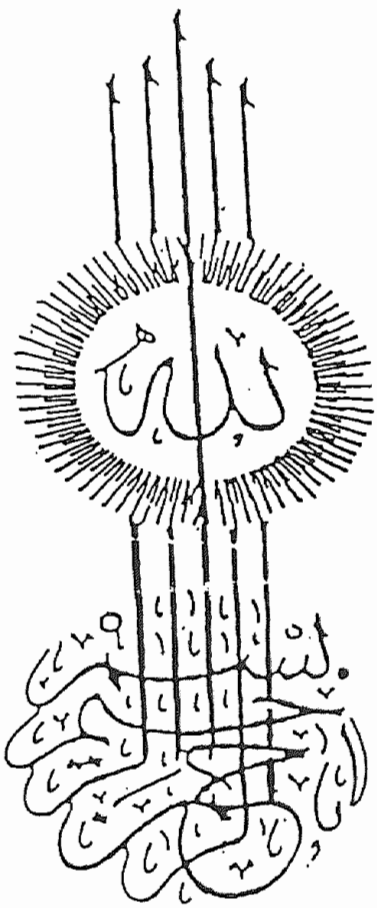

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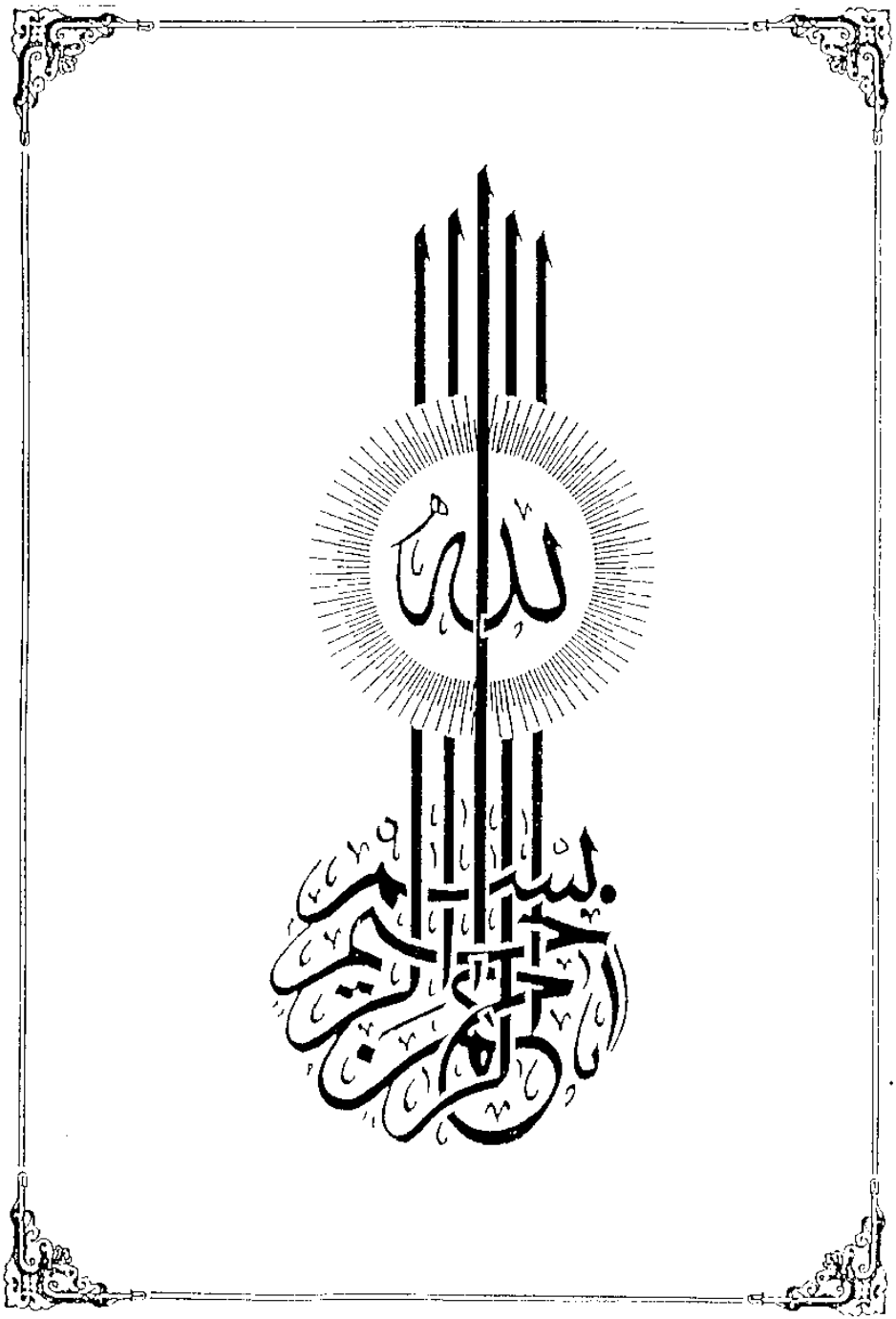

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Injuries of Tendoachilles

Contents

Introduction

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Achilles tendon is one of the strongest tendons of the body . The soleus and gastrocnemius muscles act together on the achilles tendon as antigravity muscles. In standing it contracts alternatively with extensor muscles of the leg to maintain balance .

During walking they provide necessary whip-like contraction that aids rapid propulsion.

Among the first authors who studied this subject are Quenu and Stoianavitch 1929 and Lawrence, et al., 1955.

Today, rupture of achilles tendon is a common athletic injury.

Most often the rupture is unilateral and it is most frequently observed in middle aged athlets. In this study we discuss the anatomy of achilles tendon, its relation to gait mechanism and patholgy of this lesions.

Also the methods of Conservative and surgical management of injured achilles tendon will be discussed showing advantages and disadvantages of each.

Anatomy of Achilles Tendon

Gross antatomy of the achilles tendon

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The tendocalcaneus is a flexible fibrous tissue that offers great resistance to a pulling force. It is composed of closely packed parallel collagen fibres which are as long as tendon .

The tendo calcaneus is the thickest and strongest human tendon .It is about 15 cm long and has a straight line course.It begins near the middle of the leg,its anterior surface receives fibres from soleus,almost at its lower end.It becomes gradually more rounded towards a level of about 4cm above the calcaneus,below this it expands to be attached to the posterior surface of the calcaneus at mid-level **(Romanes 1967)**.

The achilles tendon carries the insertion of triceps surae into the foot . It is inserted into the rough area on the lower part of the posterior surface of the calcaneus.As it approaches its point of anchorage,the tendon fans out and caps the smooth upper area of the posterior surface of the calcaneus . As this surface is convex from side to side and ,to a lesser degree from top to bottom , the tendenous hood covering it bears a concave face on its anterior aspect . The hood slopes in a lateral direction where it is thicker. Because of this thickened lateral expansion of the tendon and the prominant superolateral angle of the calcaneus the heel appears more promenant at this site .

A bursa lies between this tendenous hood and the smooth upper portion of the posterior surface of the calcaneus . This is the retro-calcaneal or pre-achilles bursa. Another bursa lies between the terminal segment of the achilles tendon and the skin behind ,this is sub-cutaneus bursa **(Jahss,1982).**

The attachement of achilles tendon in the part of the calcaneus which protrudes posteriorly gives excellent leverage to the triceps surae muscles. Their large cross-section which far exceeds that of all the other ankle muscles combined , is also an indication of the functional demand placed on the triceps surae muscle , as the main plantar-flexor of the foot . **(kapandji,1970). (Plate 1).**

The soleus:

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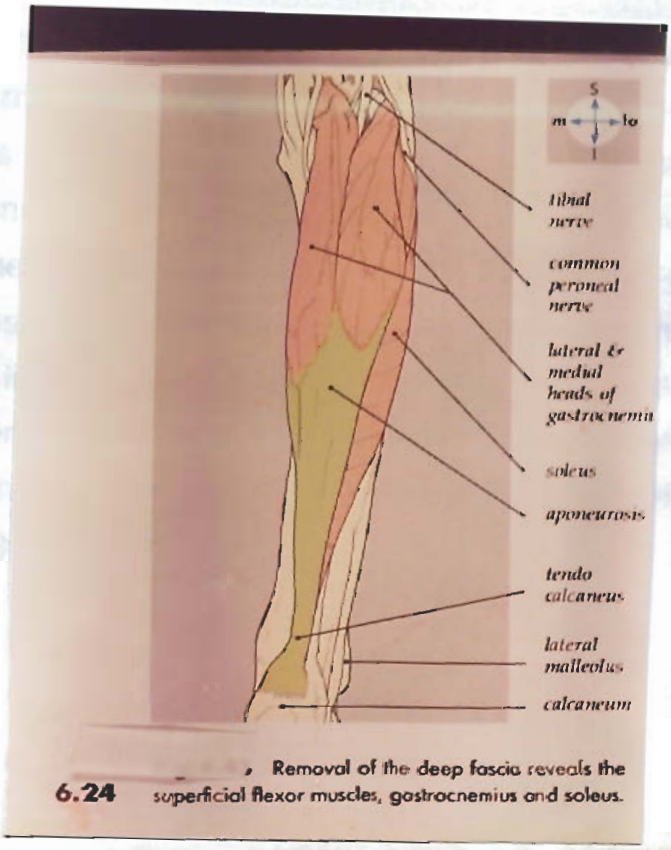
The soleus is a broad flat muscle situated immediately deep or anterior to gastrocnemius .It arises from the back of the head and the upper fourth of the posterior surface of fibula,from the soleal line and the middle third of the medial border of tibia ,and from a fibrous band between the tibia and fibula which arches over the popliteal vessels ,and tibial nerve. This origin is aponeurotic **(Warwich&William,1978).**

The great bulk of the soleus muscle lies between two aponeurotic lamellae. The anterior lamella slopes downwards and posteriorly to join the posterior lamella.The posterior lamella lies superficially and it is continued at its lower end into the tendocalcaneus.

Plate (2)



6.24 Removal of the deep fascia reveals the superficial flexor muscles, gastrocnemius and soleus.

The soleus is supplied by two separate branches of the tibial nerve (S1,2), one from above the muscle in the popliteal fossa and one on its deep surface in the calf **(Williams and Richard,1984).**

The gastrocnemius muscle:

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It is the most superficial muscle of the superficial group of the posterior crural muscles of the leg and forms the belly of the calf . It arises by two heads which are connected to the condyles of the femur by strong, flat tendons. The medial and lateral heads also arise from the subjacent part of the capsule of the knee joint **(Warwich&William,1978).**

The two heads converge to lie side by side , where the broad bellies of the muscle have a dense aponeurosis beneath them .The medial head is longer at each end , it extends below the lateral head .The flat aponeurosis blends with that of soleus at the lower border of the lateral head . In the midline it blends with soleus aponeurosis by a criss-cross exchange of fibers . The medial half of the aponeurosis is separated from soleus down to the heal , and the slender tendon of the plantaris lies between . The aponeurosis forms with that of soleus , the tendo-calcaneus **(Williams,and Richard 1984) .**

Tim O"brien noted that the gastrocnemius aponeurosis forms two types of junctions with that of soleus . In type **(1)** junction,the gastrocnemius aponeurosis remained separate from that of soleus to a point approximately twelve centimeters proximal to calcaneal insertion .At that point the two apneuroses join to form the combined achilles tendon .In type **(2)** junction , no separate gastrocnemius aponeurosis was identifiable and the muscle is inserted directly into the soleus aponeurosis . At a point **10** cm proximal to the calcaneus , the tendon forms a composite structure **(O'brien,1984)** .The gastrocnemius and plantaris are innervated by the tibial nerve **(s1,2) (Warwich & William 1978). (Plate 2)**

The plantaris muscle :

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The plantaris is vistigial muscle showing the short belly and long tendon characteristic of phylogenetic degeneration .It arises from the shaft of the femur at the lower part of the lateral supracondylar line.It lies edge to edge with the lateral head of gastrocnemius . Its slender tendon runs deep to the medial head of gastrocnemius and soleus, to the calcaneus at the medial side of the tendocalcaneus .The tendon is flat as it lies sandwiched between the two aponeuroses, but it can be unravelled and proves to be a wide ribbon twisted spirally upon itself It is innervated by the tibial nerve **(s1,2) (Williams & Richard 1984) .**

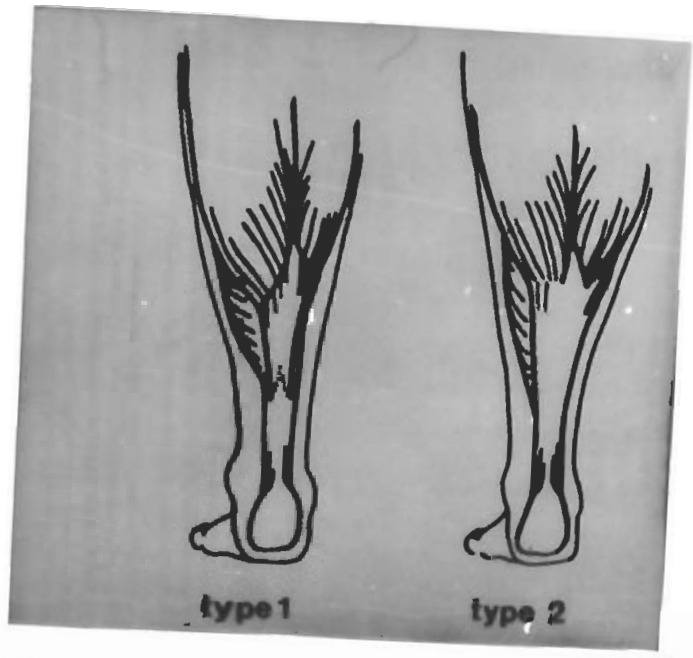

Plate 2: J.B. and J. Surg. Vol 66-A No. 7, 1984

Actions and biomechanics of superficial group of the posterior crural muscle of the leg :

The gastrocnemius and soleus together form a tripartite muscular mass which shares the tendocalcaneus and hence, it is sometimes termed the triceps surae . The muscles of the calf are the chief plantar flexors of the foot and the gastrocnemius is a flexor of the knee, they posses a considerable power and are usually of a large size(**Joseph, Nightingale &Williams,1955) (Quoted by Brunnsten,S.,1977) .**

The three muscle bellies show unequal degrees of shortening Plate 3 **(Fig a)**, the soleus **(cs) 44 mm** the gastrocnemius **(cg) 39 mm** .The effeciency of the biarticular gastrocnemius depends closely on the degree of flexion of the knee. When the knee is extended the gastrocnemius is passively stretched and it works at its best advantage .On the other hand when the knee is flexed the gastrocnemius is maximally slackened and it looses all its effeciency , thus the soleus is the only active muscle but its power would be inadequate in walking , ridding, or jumping .Any movement leading to simultaneous extension of ankle and knee i.e climbing,promotes the action of gastrocnemius. The gastrocnemius provides propelling force in walking and running **(Kapandji,A 1970) .(Plate 3)**

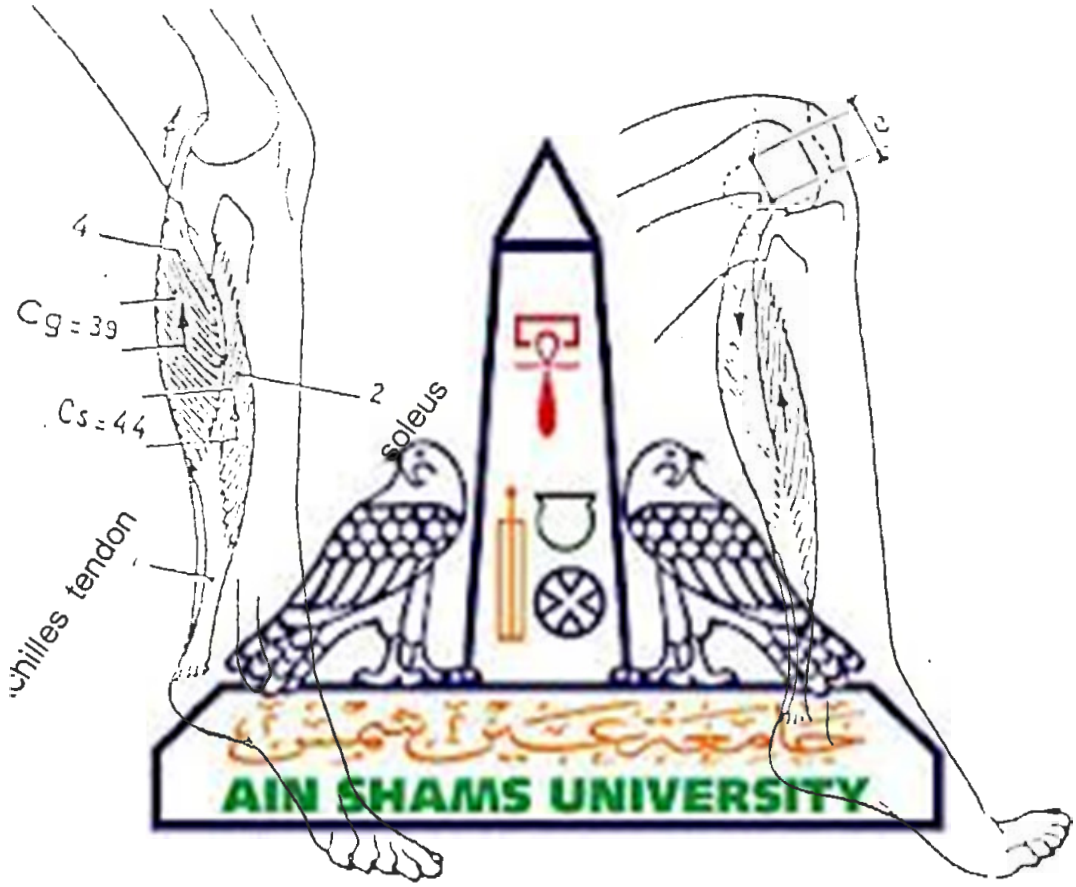

Fig.(a)

Fig.(b)

Plate 3: Kapandji, A. (1970)