COMPARATIVE STUDY BETWEEN CENTRIPETAL COMPRESSION AND CONVENTIONAL TRIPLE ARTHRODESIS

Thesis Submitted for
Partial fulfilment of the M.D. Degree
In Orthopaedic Surgery

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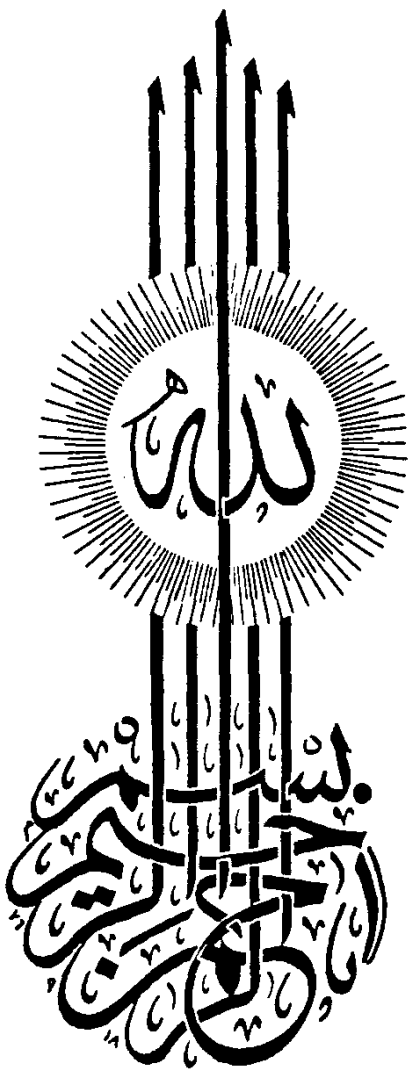
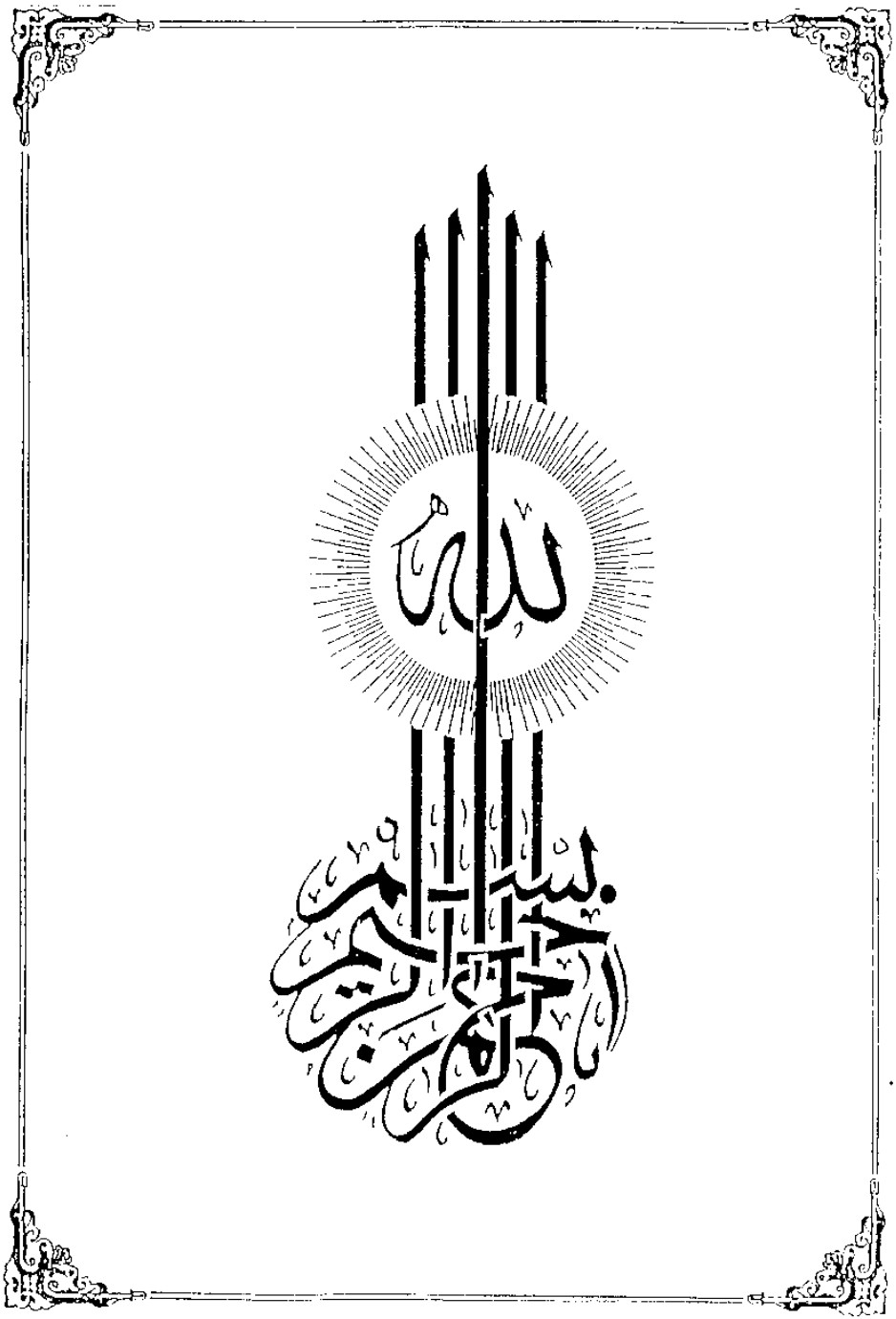
1993





ACKNOWLEDGEMENT

I would like to express my deepest gratitude for the continuous help and encouragement offered by **Professor Dr. Mohamed El-Ghwaby**, Professor and Chairman of Orthopaedic Surgery, Ain Shams University. He helped me to get a better standing of the subject, was very kind with me throughout this work and devoted much of his precious time for meticulous guidance that made this thesis possible.

I am very grateful to Professor **Dr. El-Sayed Wahb**, Professor of Orthopaedic Surgery, Ain Shams University, for his continuous help and supervision.

I am heartly thankful to Professor Dr. **Hussein El-Khateeb**, Professor of Orthopaedic Surgery, Ain Shams University, for his encouragement and support and for his guidance in supervising and making this work in the present picture.

It is my pleasure to say: Thank you very much for every member of Orthopaedic Department, Faculty of Medicine, Ain Shams University, for their compotent help and cooperation.

Atef M.F. El-Beltagy

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INTRODUCTION

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In *1921* ***Hoke*** described the first triple arthrodesis. Later in the same year Dunn described his operation for balancing the paralytic foot. In this procedure the navicular was excised and the head of talus was fused to the cuneiform bones.

In *1923* ***Edwin W. Ryerson*** of Chicago described the classic triple arthrodesis. In this operation, the subtalar, talo-navicular and calcaneocuboid joints are fused in the corrected position ***(Peter, 1986)***.

Many modifications of classic triple arthrodesis - but its main idea and purposes unchanged - have been developed to cover the needs to stabilize feet and to improve end results by decreasing the avoidable postoperative complications.

Centripetal compression triple arthrodesis ***(El-Ghawaby, 1978)*** was introduced to avoid pseudoarthrosis and under correction. Other conventional methods of fixation like staples, K. wires were used also.

The aim of this work is to study the results of triple arthrodesis by the conventional method and by the

centripetal compression, and to compare the results with other published series using the classic triple arthrodesis.

The work has been started by study of the surgical anatomy and biomechanics of the foot, then the review of literatures, and the indications and different methods of triple arthrodesis. This is followed by the operative details of each procedure.

ANATOMY

SURGICAL ANATOMY OF THE FOOT

The human foot is well adapted to provide a variety of functions. It provides a base of support of sufficient dimensions to give the stability necessary to maintain the upright position without undue muscular effort. It provides adequate flexibility for accommodation to uneven ground and for absorption of the shock of the body weight. In walking, by becoming rigid, it also acts as a lever during push-off ***(Morris, 1977)***.

SKELETON OF THE FOOT

The foot consists of seven articulated tarsal bones inter locking firmly with five metatarsals. These in turn articulate with the phalanges of the toes. Two bones are of great importance viz, the talus and the calcaneus.

The Talus:

The talus is the main connecting link between the foot and the leg bones. It forms the dome of the medial longitudinal arch of the foot. The superior surface of the body

is the trochlea which articulator with the tibia and fibula to form the ankle joint. Its plantar surface articulates with the calcaneus to form the subtalar joint. The neck of the talus is constricted inferiorly, laterally and superiorly and roughed by ligamentous attachments and vascular foramina. The rounded head has continuous articular facet for the navicular anteriorly, the spring ligament inferiorly, the sustentaculum tali postero-inferiorly and the deltoid ligament medially **(Fig. 1)**. The talus has no muscular or tendinous attachments and hence it cannot move by itself.It is connected to the adjacent bones by articular capsule, ligaments and synovial membrane only.

Blood supply of the Talus: **(Fig. 2)**

Haliburton et al (1958) reported that the talus is supplied with blood by the three main arteries of the lower leg, the anterior tibial, the posterior tibial and the peroneal arteries, through a periosteal vascular network, which covers all of the Cartilage - free surfaces, and by two discrete vessels: the artery of the tarsal sinus and the artery of the tarsal canal.

Mulfinger and Trueta (1970) added the intraosseous arterial pattern. The head of the talus takes its blood

supply via two sources; its superomedial half by branches from the anterior tibial artery, and the inferolateral half by branches from the artery of tarsal sinus.

The body of the talus is supplied by the artery of the tarsal canal to its middle and lateral thirds, the deltoid branches to the medial third, the anastomotic network in the tarsal sinus to its inferolateral aspect and finally the posterior periosteal network to the posterior tubercle region ***(Mulfinger and Trueta, 1970)***.

Dislocation of the talus ruptures these vessels, and since no muscle or tendon is attached to the talus to carry blood to the dislocated bone, a avascular necrosis is almost the rule after reduction of the dislocation ***(Last, 1984)***.

The Calcaneus:

The calcaneus is the largest of the tarsal bones and it is the first to ossify. It is a rectangular block of bone, characterized by the sustentaculum tali, a shelf that projects from the upper border of its medial surface. The articular surfaces are on the anterior half of the superior surface. There are 3 facets; Posterior, middle and anterior facets. The posterior is the largest and articulates with the inferior facet of the talus. The middle one is situated

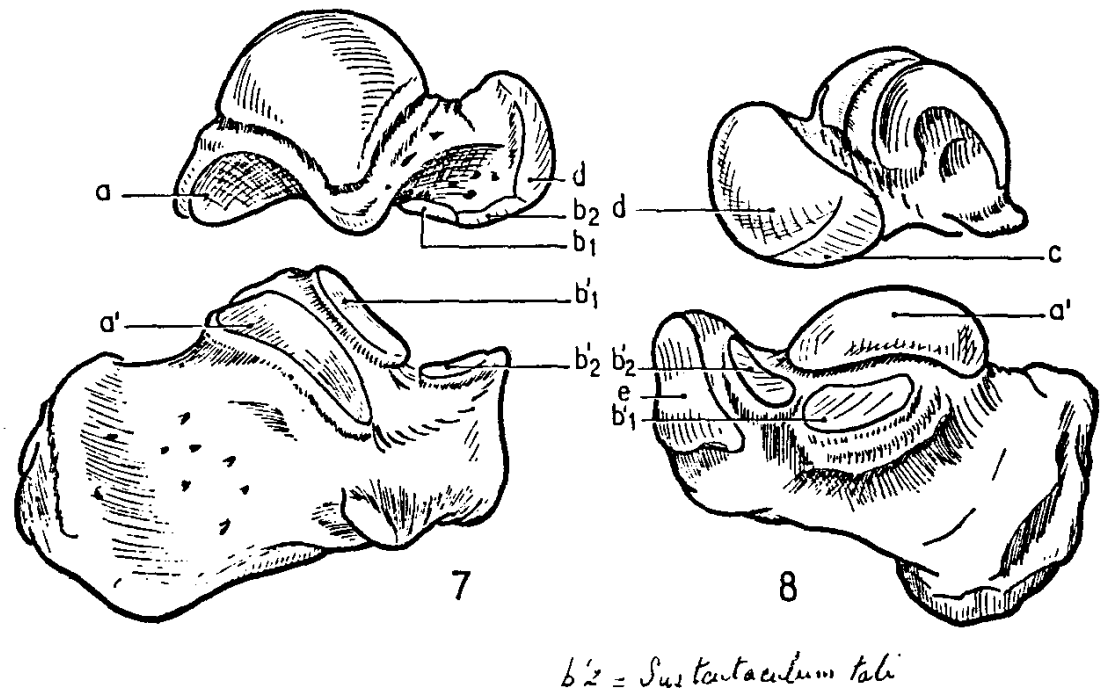

Fig. (1): Talo-calcanean joint: the articular surfaces

(After Kapandji: The physiology of joints, Churcill Livingstone, 1970)

on the sustentaculum tali and articulates with the talar head. The anterior facet is small and frequently confluent with the middle one. Between the middle and the posterior articular facets, lies the sulcus calcanei. This forms with the sulcus tali, the tarsal canal which opens laterally as the sinus tarsi.

The anterior surface of the bone bears a saddle shaped facet which articulates with the cuboid bone; the calcaneo-cuboid joint.

The posterior surface of the calcaneus has a smooth upper part for the tendo calcaneus.Its lower part, convex,is grooved longitudinally for the attachment of the posterior fibres of the plantar aponeurosis **(Fig. 1)**.

The Tarsal Canal:

It is a cylindrical canal formed by the semilindrical grooves etween the articular surfaces of the talus and the caneus. It measures about 5mm in diameter and about 1.5cm long. I perforates the tarsus from the posteromedial to the aterolateral region and opens abruptly into the funnel-shaped arsal sinus. It contains the interosseous talo-calcaneal ligaments; the anterior and the posterior, and the artery of the tarsal canal. The fibres of the ligaments

PLATE (1)

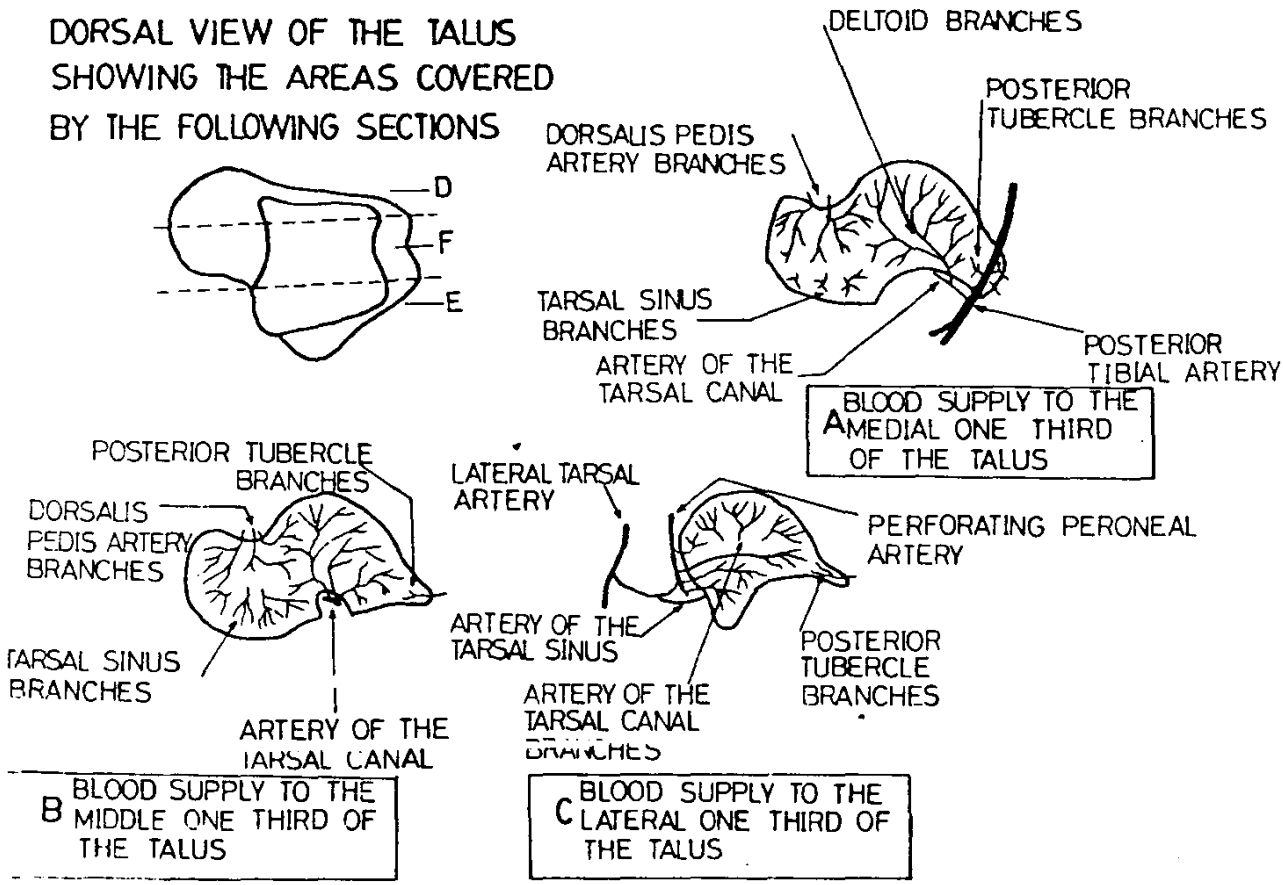

Diagram to show the blood supply to the talus in sagittal sections.

Fig. (2): Diagram to show the blood supply to the talus