Ain Shams University
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ARTHRODESIS OF THE ANKLE

Essay
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of M.Ch. Orthopaedics

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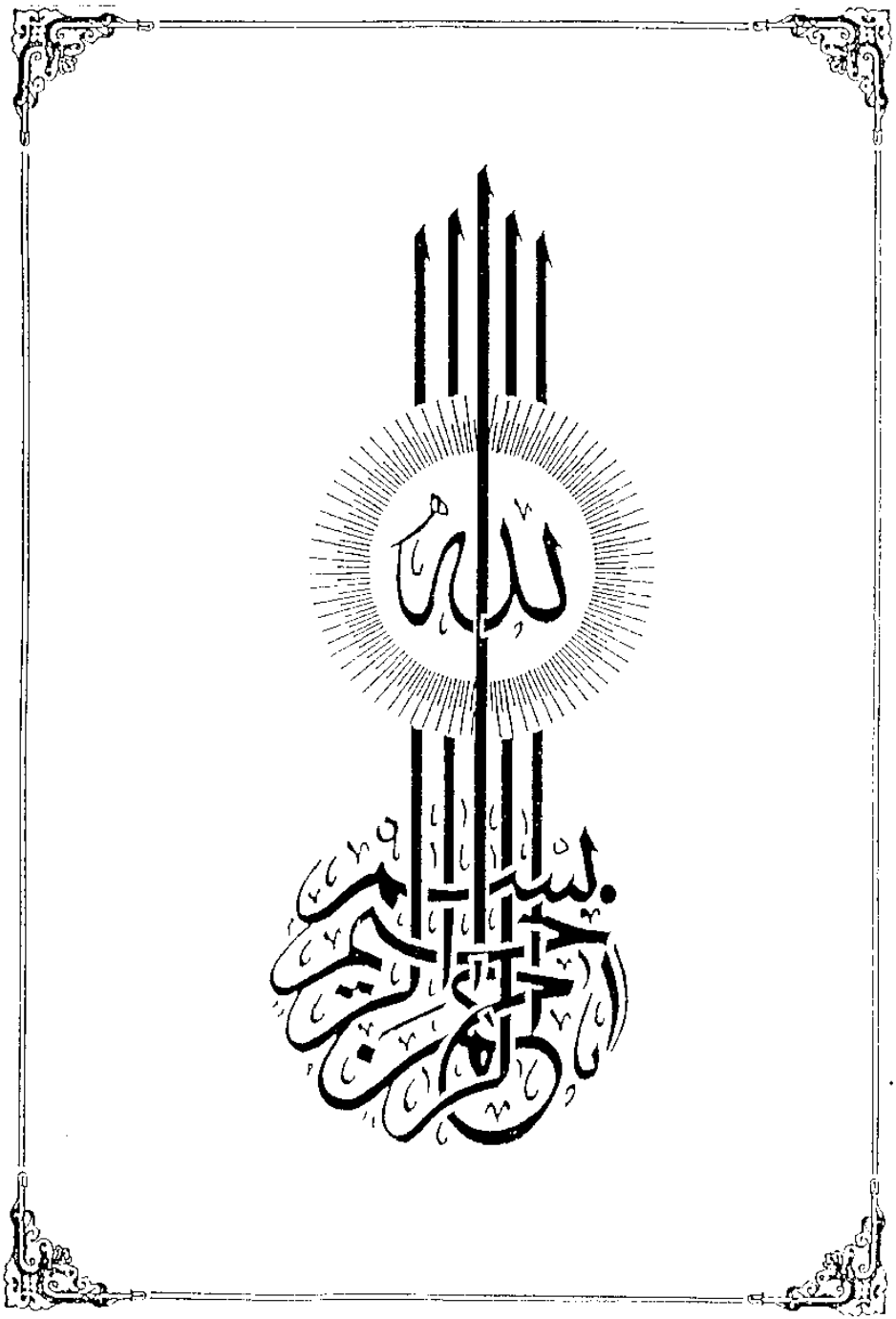
TO:

MY MOTHER AND WIFE



A C K N O W L E D G M E N T

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Hamdy Ahmed Abaid

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C O N T E N T S

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I N T R O D U C T I O N

Arthrodesis (fusion) is an operation designed to induce bony ankylosis in a joint in which motion is undesirable. The purposes are painless, immobile, and a stable joint and also to iradicate joint pathology. Now with the aid of the antibacterial agents, the joint may be opened, as much of the diseased tissue may be removed as is feasible at the time of arthrodesis.

A rapid and successful fusion however still is more likely in the non-tuberculous patient because the bones and soft tissues about the joint are usually healthier.

Arthrodesis of the ankle means bony fusion of the lower tibia & fibula with the talus. Function of the ankle after fusion depends on the position of the foot, fusion in calcaneous will result in a stiff beg leg gait, with lack of push-off. Too much equinus will produce a halting gait in which the stance phase is not completed. The foot is kept infront of the body & walking is accomplished in short steps, the arthrodesed foot being pushed ahead & the opposite foot being brought up from the rear thus if the foot has normal joint mobility, much balance, it has been found that an ankle fused at neutral or with very slight degrees of equinus (five degrees) will function better than one in marked equinus or calcaneous. The motion in the midtarsal joint will allow sufficient drop of the forefoot to compansate for heel hieght & the added range of

dorsiflexion will allow a more elastic gait. Patient can walk without a limp, run, jump & pursues all activities & occubations without disability, provided that the gait is not affected by any other deformity of the extrimity.

The foot that stabilized before or during ankle fusion will have less forefoot mobility than one in which ankle alone is fused.

ANATOMY

ANATOMY OF THE ANKLE JOINT

The ankle joint is a ginglymous or a hinge joint. The lower end of the tibia and its malleolus, the malleolus of the fibula and the inferior transverse (tibiofibular) ligament enter into its formation and together form a mortice for reception of the talus. The line of the joint can be gauged from the anterior margin of the lower end of the tibia, which can be felt through the skin in the living subject when the overlying tendons are relaxed. The articular surfaces are covered with hyaline cartilage. The trochlear surface of the talus which is convex from before backwards and gently concave from side to side, is wider infront than behind and the articular surface of the tibia is reciprocally shaped. The articular surface for the medial malleolus is restricted to the upper part of the medial surface of the talus which is triangular in shape, is concave from above downwards and adapt itself to the articular surface of the medial malleolus, which is convex from above downwards.

The bones are connected by the following ligaments:

1. Articular capsule. (fibrous capsule).
2. Deltoid ligament.
3. Anterior and posterior talofibular ligaments.
4. Calcaneo-fibular ligament.

Fibrous capsule:

The fibrous capsule surrounds the joint. It is thin and membraneous infront and behind, and is attached, above to the borders of the articular surfaces of the tibia and malleoli, below it is attached to the talus close to the margins of the trochlear surfaces exept infront, where it is attached to the dorsum of the neck of the talus at some distance infront of the superior articular surface. It is supported on each side by strong collateral ligament.

The posterior part of the capsule consists principally of transverse fibers. It blinds with the transverse ligament and is thickened laterally, where it reaches as far as the malleolar fossa of the fibula.

The synovial membrane:

Lines the capsule and clothes the intercapsular portion of the neck of the talus. In addition it may pass upwards for a short distance below the syndesmosis ligament.

The deltoid ligament:

Is a strong triangular band, attached, above to apex and the anterior and posterior borders of the medial malleolus. It consists of two sets of fibers, the anterior (tibio-navicular) pass forwards to be attached to the tuberosity of the navicular bone and immediatly behind this they blind with the medial margin of the planter calcaneo-

navicular ligament.

The middle fibers (tibio-calcanian) descends almost perbendicularly and are fixed to the whole length of the susttentaculum talie of the calcaneus. The posterior fibers (posterior tibio-talar) pass backwards and laterally to be attached to the medial side of the talus and its medial tubercle.

The deep fibers (anterior tibio-talar) are well developed and are fixed above to the tip of the medial malleolus and below to the non-articular part of the medial surface of the talus. The deltoid ligament is crossed by the tendons of the tibialis posterior and flexor digitorum longus.

The anterior talo-fibular ligament:

Pass from the anterior margin of the fibular malleolus and forwards and medially to the talus, where it is attached infront of the lateral articular facet and to the lateral aspect of the neck.

The posterior talo-fibular ligament:

It runs almost horizontally from the lower part of the lateral malleolar fossa to the lateral tubercle of the posterior process of the talus. It is strong and deeply seated.

The calcanio-fibular ligament:

Is a strong cord, running from the depression infront of the apex of the fibular malleolus, downwards and backwards to a tubercle on the lateral surface of the calcanius it is crossed by the tendons of the peroneus longus and peroneus brevis. The foregoing three ligaments, together form or constitutes the lateral ligament of the ankle joint.

Relations:

The tendons, vessels and nerves in relation to the joint:

1. Infront, from the medial side, tibialis anterior, extensor hallucis longus, anterior tibial vessels, deep peroneal vessels, extensor digitorum longus and peroneus tertius.

2. From behind, from the medial side: Tibialis posterior, flexor digitorum longus, posterior tibial vessels, tibial nerve, flexor hallucis longus, and in the groove behind the fibular malleulus the tendons of the peroneus longus and brevis.

The artries supplying the joint are derived from the malleular branches of the anterior tibial and from the peroneal.

The nerves are derived from the deep peroneal and tibial nerves.

Blood supply to the ankle joint:

The artries around the ankle joint anastomose freely with one another and form network below the corresponding malleoli. The medial network is formed by the anterior tibial artery, the medial tarsal branches of the dorsalis pedis artery, the calcanian and malleolar branches of the posterior tibial artery, and branches from the medial plantar artery.

The medial malleolar network:

Is formed by the anterior medial malleolar branch of the anterior tibial artery, the medial tarsal branch of the dorsalis pedis artery, the perforating and calcanian branches of the peroneal artery, and twigs from the medial plantar artery.

1. The anterior medial branch of the anterior tibial artery; this branch arises about 5 cm. above the ankle joint, and pass behind the extensor hallucis longus and tibialis anterior tendons to the medial side of the joint where it anastomoses with branches of the posterior tibial artery and medial plantar artery.

2. As the dorsalis pedis crosses the navicular bone the medial tarsal branches arises which are 2-3 branches. They join the medial network.

3. The malleolar branch of the posterior tibial artery is

a small branch which winds around the medial malleolus.

4. The calcanian branches of the posterior tibial artery arises from the artery just before its division, they pierce the flexor retinaculum and are distributed on the fat and skin behind the tendocalcaneus & about the heel to the muscles on the tibial side of the sole of the foot, anastomosing with the peroneal and medial malleolar arteries & on the back of the heel with calcanian branches of the peroneal artery.

The lateral malleolar network:

1. Anterior lateral malleolar branch of the anterior tibial artery, pass behind the tendons of extensor digitorum longus, peroneus tertius, it supply the lateral side of the ankle & anastomoses with the perforating branches of the peroneal and with the ascending twigs from the lateral tarsal artery.

2. The lateral tarsal branch of dorsalis pedis artery: It arises from the dorsalis pedis just as the latter crosses the navicular bone. It passes laterally undercover of the extensor digitorum brevis, it supply this muscle & anastomoses with the branches of the arcuate & anterior tibial malleolar & lateral plantar arteries & with the perforating branches of the peroneal artery.

3. Peroneal artery and its perforating branches and calcanian branches: Arises from the posterior tibial about

2.5 cm. below the posterior border of the popliteus, it passes obliquely toward the fibula & descends along the medial crest of that bone, contained in a fibrous capsule between the tibialis posterior and flexor hallucis longus or in its substance, it then runs behind the tibiofibular syndesmoses & divides into calcanian branches which ramify on the lateral & posterior surfaces of the calcaneus. Its upper part is covered by the solius and the deep transverse fascia of the leg, its lower part by the flexor hallucis longus.

Perforating branches of the peroneal pierses the inter-ossius membrane of the leg, about 5 cm. above the lateral malleolus and reaches the front of the leg, where it anastomoses with the anterior lateral malleolar artery, it then descends infront of the tibiofibular syndesmoses with the lateral tarsal artery.

A communicating branch arises from the peroneal artery about 5 cm. above the lower end of the tibia & joins the communicating branch of the posterior tibial artery.

Calcanian branches of the peroneal:

Passes to the lateral side of the heel & communicates with the anterior lateral malleolar artery & on the back of the heel, with the calcanian branches of the