HALLUX VALGUS

ESSAY

SUBMITTED IN PARTIAL FULFILMENT FOR THE DEGREE OF M.Sc. "ORTHOPAEDICS"

BY

MOHAMMED MAHMOUD AHMED GHANIM

(M. B. B. Ch.)

SUPERVISED BY

PROF. DR. MOHAMMED AHMED MAZIED

PROF. OF ORTHOPAEDIC SURGERY

DR. MOSTAFA EBRAHIM BADWI

LECTURER OF ORTHOPAEDIC SURGERY

ORTHOPAEDIC DEPARTMENT
FACULTY OF MEDICINE
AIN-SHAMS UNIVERSITY

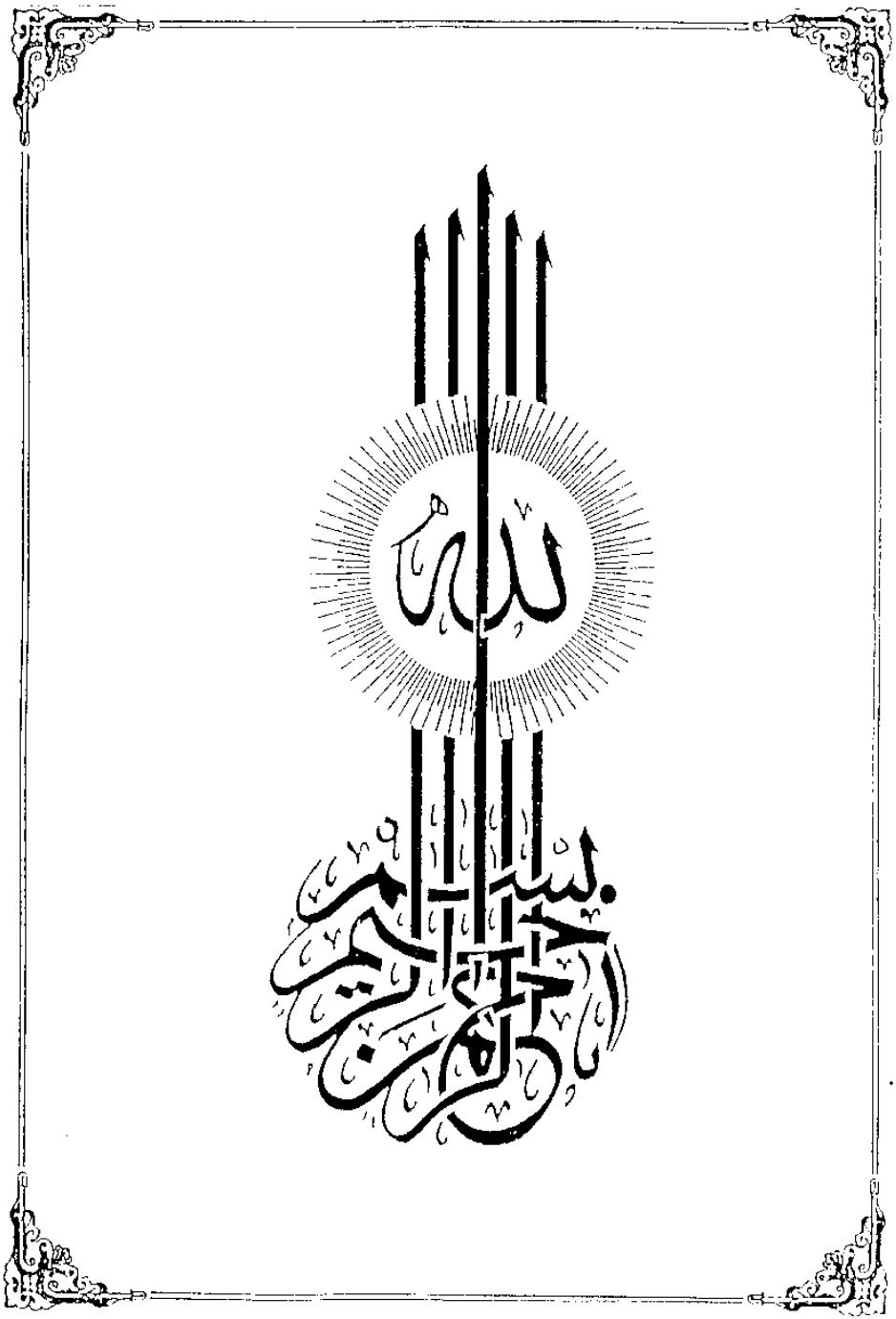
1990

ACKNOWLEDGEMENT

This work has been accomplished under the supervision of Dr. Mohammed Ahmed Mazied, Professor of orthop. Surgery Ain-Shams University and Dr. Mostafa Ebrahim Badwi, Lecture of orthopaedic surgery, Ain-Shams University.

My thanks and greatfulness are due to their valuable assistance and endless copperation. They were too kind and generous towards me during the accomplishment of this work They were always avilable whenever; I need them.

Finally; I wish to thank all the members of ortho-paedic surgery department, Ain-Shams University.



CONTENTS

INTRODUCTION

Introduction

Cal Heuter, (1871), First introduced the term hallux valgus when he described this deformity as abduction contracture in which the great toe turned away from the median plane of the body. (Schwartz and Hurley, 1987).

Haines et al. (1964) defined hallux valgus as a static partial dislocation or subluxation of the great toe to a lateral or valgus attitude involving the head of the first metatarsal, the base of the first proximal phalanx and the soft tissue structures surrounding the first metatrsophalangeal joint.

Hallux valgus is the commenst deformity of the forfoot. It is a static partial dislocation or subluxation of the great toe to a lateral or valgus attitude. It involves all the oseous and soft tissue structures comprising and surrounding the first metatarsophalangeal joint. It is characterised by valgus (abduction) of the great toe and varus (adduction) of the first metatarsal. This deformity is by far the most commonly classified as " Bunion". It is the most disabling and most complex problem among the morbidities of the great toe joint (Du Vries, 1973).

Aply, (1982), also stated that hallux valgus is the commonest of foot deformities and probably of all musculoskeletal deformities.

A number of factors, both extrinsic and intrinsic, have been considered to be responsible for the development of various painful disorders of the forefoot, especially hallux valgus. Deformities at first consisting solely of functional, or postural adaption may later develop into a structural deformity. The exterinsic factors implicated generally are associated with foot wear, e.g., high-heeled, pointed, tight or badly fitting shoes but trauma can also play a role . Intrinsic factors include congenital foot deformities and neuro-muscular and rheumatic diseases. These factors often

favor the development of similar painful deformities of the foot (Turan, 1989).

Many different surgical procedures have been described for hallux valgus, Kelikian (1965), lists more than 130 operations for the condition in adolescents. (Ramanathan and Heywood-Waddington, 1988).

There is no one surgical procedure which is a cure for all of the patients who present themselves with symptomatic hallux valgus which has failed to respond to conservative mangement. (Giannestras, 1973) .

The aim of this work is a details study for all problems of hallux valgus, concerning the modern aspects of etiology, pathology, biomechanics, clinico-radiological review and treatment. Also it introduces a review of operative results providing some guides as to the best operative results for the correction of the defermity in different age and different degrees in order to present an objective assessement of the operations in current use.

CHAPTER 1

ANATOMY

Anatomy of big toe

The big toe has certain anatomic characteristics that are very different. It is more developed; it has only two phalanges; and it is articulated by the metatarsal head protected in its lower part by the glenosesamoid system, which produces a visible print on touching the ground surface. This is why the plantar print of the big toe shows signs of continuation from the metatrsal print. (Viladot 1982).

I. Osteology:

(1) The first metatarsal:

It is the shortest and thickest of the metatarsal bones. The proximal articular surface is kideny shaped and articulates with the medial cuneiform, its circumference is grooved for the tarsometatarsal ligament, medially it gives insertion to the tendon of the tibialis anterior, while laterally its plantar angle presents a rough oval prominence for the insertion of the peroneus longus tenden. On the lateral side of the base there is a pressure facet caused by contanct with the second metatarsal. The lateral surface of the shaft is flat and gives origin to the medial head of the first dorsal interosseous muscle. The head of the first metatarsal is large, convex and articulating with the concave proximal articular surface of the proximal phalanx, on the plantar aspect of the first metatarsal head there is a median elevation separating two grooved facets on which two sesamoid bones contained in the tendon of the flexor hallucis brevis glide. The first metatarsal unlike the other

four, has an epiphysis at the proximal end which unites about the age of 17-20 years. with the second metatarsal forms an angle of about 5 degrees, a divergence of 10 degrees or more between the two bones is considered outside normal limits and known as metatarsus primus varus. (Giannestras, 1976).

(2) The phalanges:

There are two phalanges in the hallux, their shafts are compressed from side to side, convex dorsally and concave on the plantar surface.

The proximal phalanx have a concave articular facet on its proximal end to articulate with the convex head of the first metatarsal. Distally, the head of the proximal phalanx have a trochlear articular facet for the base of the distal phalanx. The base of the proximal phalanx of the big toe receives on its medial side the insertion of the abductor hallucis and the medial tendon of the flexor hallucis brevis are inserted. On the dorsal aspect of the base of the proximal phalanx, the tendon of the extensor hallucis brevis is attached. The base of the distal phalanx of the big toe gives attachment on its plantar aspect to the tendon of the flexor hallucis longus and on its dorsal aspect to the extensor hallucis longus. (Jaffe and laitman, 1982).

II. The Joints

(1) The first tarsometatarsal joint:

The first metatarsal articulates proximally with the medial cuneiform bone forming the first tarsometatarsal joint

which is a synovial joint of plane variety and has seperate capsule and synovial cavity, while the lateral four joints communicate with each other. The joint is stabilized like the other tarsometatarsal joints by dorsal, planter and interosseous cuneometatarsal ligaments. The dorsal ligament is the articular capsule between the medial cuneiform and first metatarsal, the plantar ligament is a strong longitudinal band and the first interosseous cuneometatarsal ligament is the strongest and passes from the lateral surface of the medial cuneiform to the adjacent angle of the second metatarsal. Unlike the other tarsometatarsal joints, the first has wide range of free movements of active dorsiflexion, plantarflexion and passive rotation, these movements are part of the normal gait activity. (Davies and Davies, 1964).

(2) The first intermetatarsal joint:

It lies between the first and second metatarsals, there is no connection between the two bones but a small bursa is often present between the lateral side of the base of the first metatarsal and the medial side of the shaft of the second metatarsal (Davies and Davies, 1964).

(3) The first metatarsophalangeal joint-sesamoid complex:

(A) The first metatarsophangeal j.: (Fig. 1,2)

The m.p.Joints are of the ellipsoid varity. They are formed by reception of the round heads of the metatarsal bones in shallow cavities on the base of the proximal phalanges. They lie 2.5 cm proximal to the webs of the toes. The articular

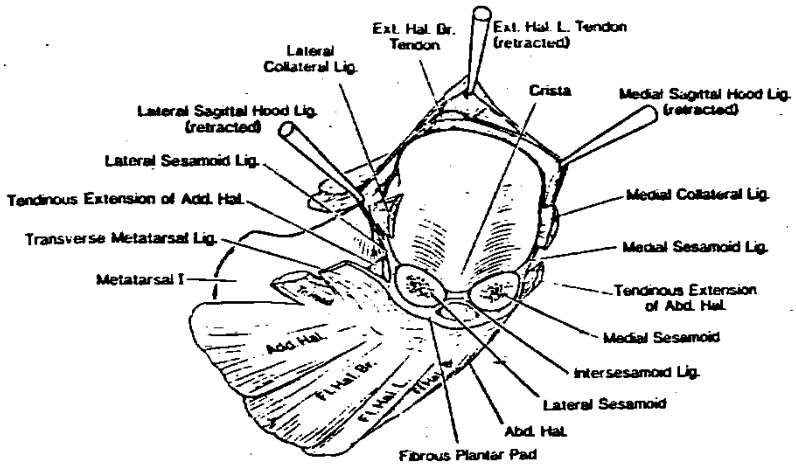
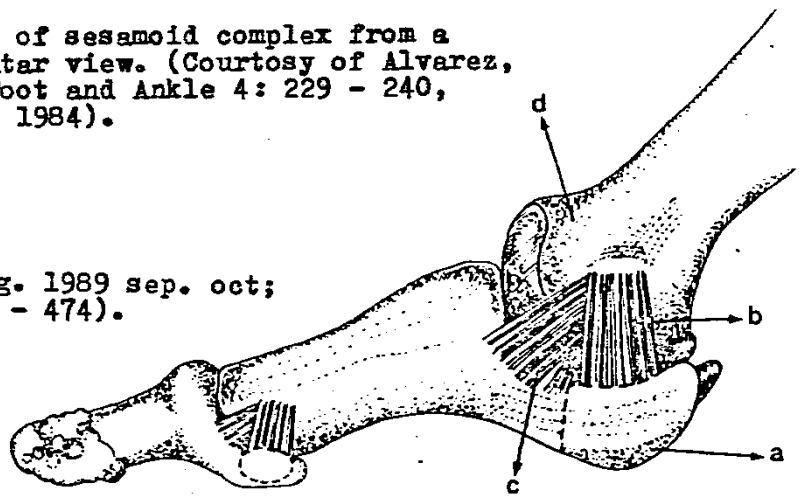
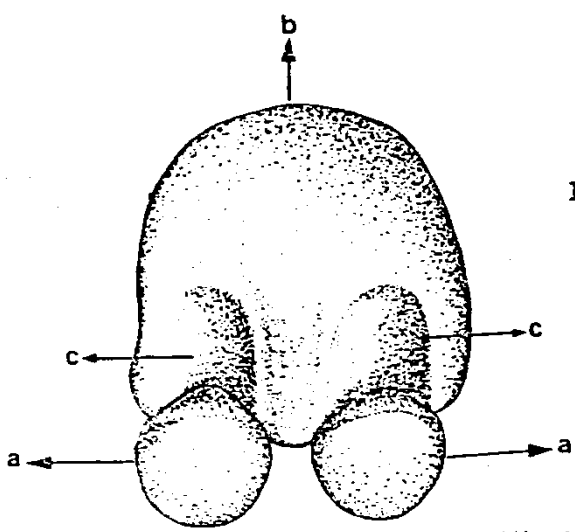


Fig. 1. Line drawing of sesamoid complex from a lateral plantar view. (Courtosy of Alvarez, R., et al: Foot and Ankle 4: 229 - 240, Mar., - Apr. 1984).

Fig. 2. (J. Foot Surg. 1989 sep. oct; 28 (5) : 471 - 474).



A lateral drawing of the great toe:
a, sesamoid *b*, ligament of medial sesamoid; *c*, collateral ligament; *d*, head of first metatarsal.



The first metatarsal head and the sesamoid bones:
a, sesmoids; *b*, first metatarsal head; *c*, articular surfaces of the metatarsal head for the sesamoids.

Fig. 3. (J. Foot Surg. 1989 sep. oct; 28 (5) : 471 - 474)

surfaces cover the distal and plantar surfaces of the heads of the metatarsal bones but do not extend on their dorsal surfaces. The ligaments of the joint are; the fibrous capsule, plantar, deep transverse metatarsal and collateral ligaments. The fibrous capsules surround the joints and are attached to the margins of the articular surfaces. Dorsally they are thin and may be separated from the tendons of the long extensors by small bursae. They are in separatable from the deep surfaces of the plantar and collateral ligaments. (Haines and McDougall 1954).

The metatarsophalangeal joint of the great toe differs from the joint of the other toes partly by the presence of the two sesamoid bones. The head of the metatarsal has a large, rounded, cartilage-covered, articular surface that is wider than the articular surface of the proximal phalanx. On its plantar surface there are two groove, for articulation with the sesamoids, separated by a rounded, cartilage-covered ridge. The cartilaginous surface overlaps onto the outer and inner aspects of the bone. The bone narrows from the joint head, but bears a pair of epicondyles to which the joint ligaments are attached. The basal articular surface of the proximal phalanx is elliptical and concave. The shaft has a swollen base which receives the muscular and ligamentous attachments. (Turan 1989).

From each shoulder of the metatarsal there, passes, on either side of the joint, a fan-shaped mass of ligamentous fibers. A strong band, the collateral ligament, runs distally

and plantarwards to the base of the phalanx, while another equally strong fans out to reach the margin of the fibrous pad and sesamoid bones. The two bundles are joined by intermediate fibers, but it seems best to name them separately, and since the fibres attached to the pad hold the sesamoids in their grooves, they may be called the ligaments of the medial and lateral sesamoid. They form an essential part of the mechanism of normal joint and are altered in hallux valgus. (Haines and McDougall, 1954).

(B) The sesamoid bones: (Fig. 1,2,3)

The metatarsal condyl does not put its pressure directly on the floor, but through the sesamoid pad structure. This forms a protective support for the metatarsals that is of basic importance for the biomechanics of the foot. Hohmann say, that the sesamoid pad structure acts like a shoe that nature would have created for the support of the first metatarsals'. (Viladot 1982).

Sesamoid bones are ovoid in shape and are very much like seeds, from which the word " sesamoid" is derived. They are Frequently incompletely ossified and contain varying amounts of cartilage or fibrous tissue. The sesamoids are embedded in tendons, positioned near articulations and where the tendon is acutely angled. The surface of the sesamoid that articulates with bone is covered with cartilage. The medial and lateral sesamoids of the flexor hallucis brevis are always present. The medial sesamoid may be multipartate, while the lateral one is usually undivided (Jaffe and laitman, 1982).

The sesamoid bones which resemble coffe-beans are embeded in the firm, volar, tendenous plantar pad, that is attached to the base of the phalanx. The sesamoid bones articulate with the dorsal aspect of the plantar pad and with the plantar aspect of the metatarsal head. In the plantar pad there is a groove, in which the long flexor tendon of the great toe runs and is held in place by its fibrous tunnel. During stance, the sesamoid bones transmit pressure from the skin to the head of the metatarsal, relieving the tendons of the overloading.

The two tendons of the flexor hallucis brevis muscle attach to the two sesamoid bones before inserting on the medial and lateral margins of the proximal phalanx, some of the abductor and adductor muscle fibres and a strong band of the planter aponeurosis also insert on the sesamoid bones. (Turan 1989).

The ossification occures from the ages of 9:11 and takes place earlier in girls than in boys (Viladot 1982).

The embryologic dissection have revealed that the sesamoids become identifrable as undifferentiated connective tissue within the tendon of flexor hallucis brevis by the eighth week of foetal life.

During the twelfth week of gestation chondrification begins, but ossification will not occure until appoximately the eight year of life.

There are multiple ossification centers, and they may or may not coalesce, thus, bi., tri., or even quadripartite