Recent Trends in Surgical Management of Flexible Pes Plannus

Essay

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List of Abbreviation

ACFAS	: American College of Foot and Ankle Surgeons
AN	: Accessory Navicular
CP	: calcaneal pitch
CVT	: congenital vertical talus
EMG	Electromyography
FDB	: Flexor Digitorum Brevis
FDL	: Flexor Digitorum Longus
Mp Joint	: Metatarsophalengeal joint
NC joint	: Naviculocuneform joint
PTT	: Posterior Tibial Tendon
PTTD	: Posterior Tibial Tendon Deficiency
TAT	: Tibialis Anterior Tendon
T-H	: talohorizontal angle
T-I MT	: talo-first metatarsal angle
TN	: Talonavicular
TP	: Tibialis Posterior
TTP	: Tendon of the Tibialis Posterior
UCBL	: University of California Biomechanics Laboratory


بسم الله الرحمن الرحيم
قَالُوا سُبْحَانَكَ
لاَ عِلْمَ لَنَا
إِلاَّ مَا عَلَّمْتَنَا
إِنَّكَ أَنتَ
الْعَلِيمُ الْحَكِيمُ
صدق الله العظيم
الآية (32) سورة البقرة

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INTRODUCTION

Approximately 20 percent of all musculoskeletal complaints are related to the foot and ankle, which is not surprising if one considers the functions of the foot:

- It provides a stable base on which the body can stand.
- It acts, as a rigid lever to propel the body forward during walking.
- It provides shock absorption for the force generated during walking and running (approximately two to six times individuals body weight) [(1)]

Flatfoot is the term used to describe a weight-bearing foot shape in which the hind foot is in valgus alignment, the mid foot sags in a planter direction with reversal of the longitudinal arch and the forefoot is supinated in relation to the hind foot. Flexibility refers to the mobility of the subtalar joint and the longitudinal arch and the ability of both to reverse their malalignment. [(2)]

Flatfoot may exist as an isolated pathology or as part of larger clinical entity. These entities include generalized ligamentous laxity, neuralgic and muscular abnormalities, genetic condition, syndromes and collagen disorders. Pediatric flatfoot can be divided in to flexible and rigid categories. Flexible flatfoot is characterized by a normal arch during non-weight bearing and a flattening of the arch on stance. Flexible flatfoot may be asymptomatic or symptomatic.[(3)]

The asymptomatic flexible flatfoot may be physiologic or non-physiologic. Most flexible flatfoot is physiologic, asymptomatic and requires no treatment. Physiologic flexible flatfoot follows a natural history of improvement over times. Periodic observation may be indicated to monitor for signs of progression. Treatment generally is not indicated. [4]

Non physiologic flexible flatfoot is characterized by progression over time. The degree of deformity is more severe in non-physiologic than in physiologic flexible flatfoot, the amount of heel eversion is excessive, the talonavicular joint is unstable. Additional findings include tight heel cords and gait disturbance. Periodic observation is indicated in non-physiologic flexible flatfoot. Patients with tight heel cord may benefit from stretching. Orthoses may also be indicated. [3]

Unlike physiologic and asymptomatic non physiologic flexible flatfoot, symptomatic form of flexible flatfoot produce subjective complaints, alter function and produce significant objective findings.

These include pain along the medial side of the foot, pain in the sinus tarsi, leg and knee. Decrease endurance, gait disturbance, prominent medial talar head, everted heel and heel cord tightness. [5]

Initial treatment includes activity modifications and orthoses. Stretching exercises for equinus deformity can be performed under physician or physical therapist supervision. Non-steroidal anti-inflammatory medications may be indicated in more severe cases. Comorbidities, such as obesity,

ligamentous laxity, hypotonia, and proximal limb problems, must be identified and managed, if possible. If there is a positive clinical response and symptoms are resolved, observation and orthoses (when appropriate) are instituted. If clinical response is not satisfactory, reassessment and additional work up are indicated. When all nonsurgical treatment option have been exhausted, surgical intervention can be considered. [3]

Options for surgical treatment vary from simple soft tissue procedures to calcaneal osteotomy, subtalar extra articular arthrodesis and triple arthrodesis. [6]

Calcaneal lengthening operation was first identified by Evans and was introduced as an option for calcaneovalgus deformities due to various etiologies, instead of triple arthrodesis. [7]

The Evans calcaneal osteotomy is currently the premier procedure for lateral column lengthening of flexible flatfoot deformity. It withstood the test of time, providing itself as an effective procedure for correction of pediatric flexible flatfoot.

Current understanding of the osteotomy has allowed the Evans calcaneal osteotomy to become a useful tool in the correction of the adult flexible flatfoot as well. [8]

Chapter (1)

ANATOMY

Introduction

The diagnosis and treatment of foot and ankle injuries require knowledge of anatomy, gait and biomechanics. The human foot combines mechanical complexity and structural strength. The ankle serves as foundation, shock absorber and propulsion engine. The foot can sustain enormous pressure (several tons over the course of a one-mile run) and provides flexibility and resiliency.

The foot and ankle contain:

- 26 bones (One-quarter of the bones in the human body are in the feet.).
- 33 joints.
- More than 100 muscles, tendons and ligaments.
- A network of blood vessels, nerves, skin and soft tissue.

These components work together to provide the body with support, balance and mobility. A structural flaw or malfunction in any one part can result in the development of problems elsewhere in the body [(1)].

Ankle Joint

The ankle-joint is a ginglymus or hinge-joint. The structures entering into its formation are the lower end of the tibia and its malleolus, the malleolus of the fibula and the transverse ligament, which together form a mortise for the reception of the upper convex surface of the talus and its medial and lateral facets (figure 1).

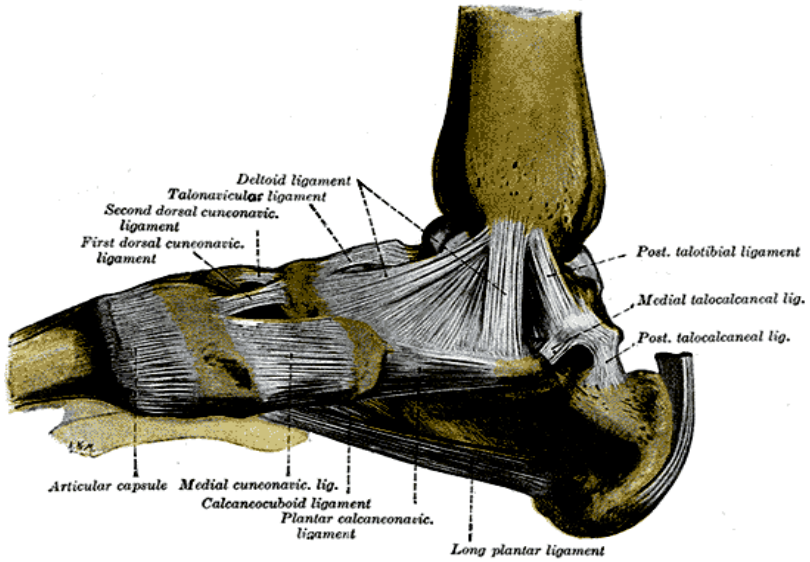

Figure (1): Ligaments of the medial aspect of the foot [(2)].

The range of movement varies in different individuals from about 50° to 90°. The transverse axis about which movement takes place is slightly oblique. The malleoli tightly embrace the talus in all positions of the joint, so that any slight degree of side-to-side movement which may exist is simply due to stretching of the ligaments of the tibiofibular syndesmosis and slight bending of the body of the fibula. [(2)]

Intertarsal Articulations

Talocalcaneal Articulation: the articulations between the calcaneus and talus are two in number, anterior and posterior. Of these, the anterior forms part of the talocalcaneonavicular joint. The posterior or talocalcaneal articulation is formed between the posterior calcaneal facet on the inferior surface of the talus and the posterior facet on the superior surface of the calcaneus. It is an arthrodial joint and the two bones are connected by an articular capsule and by

anterior, posterior, lateral, medial and interosseous talocalcaneal ligaments (figure2).

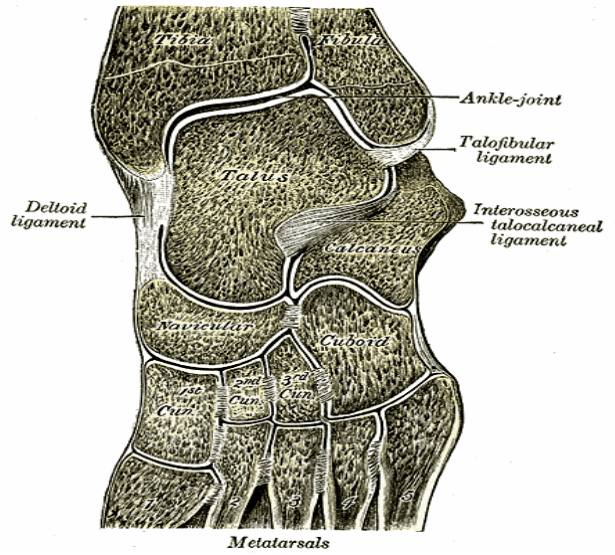

Figure (2): Oblique section of left intertarsal and tarsometatarsal articulations, showing the synovial cavities [(2)].

Movements: The movements permitted between the talus and calcaneus is limited to gliding of the one bone on the other backward and forward and from side to side. [(2)]

Talocalcaneonavicular Articulation: This articulation is an arthrodial joint, the rounded head of the talus being received into the concavity formed by the posterior surface of the navicular, the anterior articular surface of the calcaneus, and the upper surface of the planter calcaneonavicular ligament. There are two ligaments in this joint: the articular capsule and the dorsal talonavicular.

Movements: This articulation permits of a considerable range of gliding movements and some rotation; its freeble construction allows occasionally dislocation of the other bones of the tarsus from the talus. [(2)]