

**CALCANEAL LENGTHENING FOR
CORRECTION OF FLEXIBLE FLAT
FOOT IN CHILDREN**

THESIS

Submitted For Partial Fulfillment of MD in Orthopedic

Submitted by

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2009

ABSTRACT

The objective of this study was to evaluate the operative management of flexible flatfoot in children by calcaneal lengthening osteotomy described by Evans.

Fifteen children (11 girls and 4 boys) with average age 11 years 4 months (range, 6 years 2 months to 13 years 4 months) with 25 idiopathic symptomatic flexible flatfeet were included in this study. Clinical evaluation was made according to Dogan's scale and graded as perfect, good, fair and poor. Preoperative and postoperative radiological assessment of anteroposterior talo-first metatarsal angle (AP-T1MT), lateral Talo-first metatarsal angle (Lat. T1MT), lateral Talohorizontal angle (Lat. TH), and lateral Calcaneal pitch angle (Lat. CP) had been done for all feet. All flatfeet were corrected with modification of the calcaneal lengthening osteotomy described by Evans.

- Clinical results were perfect in 20 feet (80%), good in 4 feet (16%) and poor in 1 foot (4%). Radiological results showed improvement in 23 feet, while 2 feet showed no improvement. The improvement was significant in Lat. T1MT and Lat. CP ($P < 0.001$, < 0.001 respectively) whereas it was insignificant in AP-T1MT and Lat. TH ($P > 0.05$). There was good agreement between clinical and radiological results (Kappa test 0.64).

The results of the present study showed that a successful proposed combined procedure reliably relieves pain in symptomatic flexible flatfoot in children as young as six years old, and proved effective in addressing all components of the deformity in both hindfoot and forefoot clinically and radiographically. The need for arthrodesing procedures in adulthood can be eliminated.

Key words: Flexible flatfoot – Pes planus – Calcaneal ossteotomy - Mosca.

ACKNOWLEDGEMENT

I would like to express my sincere thanks and deep gratitude to Prof. Dr. Yehia Nour El-Deen Tarraf Professor of Orthopedic Surgery, Cairo University, for his continuous encouragement, valuable advices, and support.

I am especially grateful Prof. Dr. Naguib Basha Professor of Orthopedic Surgery, Cairo University, for his sincere guidance and supervision through this work

Gratitude is indebted to Prof.Dr. Hisham Abdel-Ghani Associate Professor of Orthopedic Surgery, Cairo University, for his sincere help and advice. Sincere thanks and regards are due to all of the staff members, head and colleagues of the Orthopedic Department of Kasr El Aini and the Orthopedic Department of Abul-Reesh Hospital, Cairo University. The facilities provided, continuous encouragement and outstanding suggestion through this work are greatly appreciated.

CONTENTS

	Page
INTRODUCTION	1
REVIEW OF THE LITERATURE	
• Embryology	5
• Functional Anatomy and Biomechanics of the Foot	8
• Pathology of Flat Foot	30
• Diagnosis of Flat Foot	43
• Treatment of Flat Foot	55
MATERIALS AND METHODS	76
RESULTS	
• Clinical Results	98
• Radiological Results	102
• Clinico-Radiological Correlation Results	107
CASE PRESENTATION	115
DISCUSSION	135
CONCLUSION	149
REFERENCES	150
ENGLISH SUMMARY	161
ARABIC SUMMARY	162

LIST OF ABBREVIATIONS

BG	Bone Graft
CP	Calcaneal Pitch
Lat.T1MT	Lateral Talo-First Metatarsal Angle
Lat.TH	Lateral Talohorizontal Angle
NSAID	Non-Steroidal Anti-Inflammatory Drugs
Pf	Post Fertilization
PTT	Posterior Tibial Tendon
ROM	Range Of Motion
T1MT	Talo-First Metatarsal
TAL	Tendo-Achillis Lengthening
TH	Talohorizontal Angle
UCBL	University of California Biomechanics Laboratory.

LIST OF FIGURES

		Page
Fig. 1:	Embryo week 6.0 pf. Lateral View.	6
Fig. 2:	Embryo week 8.0 pf. Frontal View.	6
Fig. 3:	Torsional Development of the Medial Column of the Foot.	7
Fig. 4:	Ligaments of the medial aspect of the foot.	14
Fig. 5:	Oblique section of left intertarsal and tarsometatarsal articulations, showing the synovial cavities	14
Fig. 6:	The joints in the foot with major functional significance during walking (black areas) Ligaments of the medial aspect of the foot.	15
Fig. 7:	Skeleton of medial aspect of foot..	15
Fig. 8:	Skeleton of lateral aspect of foot.)	15
Fig. 9:	Windlass mechanism.	16
Fig. 10:	Initial contact posture of the ankle and alignment of the vector.	19
Fig. 11:	Loading response pattern of motion, muscle control and vector alignment at the ankle.	20
Fig. 12:	Mild stance pattern of motion, muscle control and vector alignment at the ankle.	20
Fig. 13:	Mild stance advancement of the vector over the foot as the ankle dorsiflexes.	21
Fig. 14:	Terminal stance pattern of motion, muscle control and vertical alignment at the ankle.	21
Fig. 15:	Terminal stance dorsiflexion lever arm of the body vector.	22
Fig. 16:	Pre-swing pattern of motion, muscle control and vector alignment at the ankle	23
Fig. 17:	Initial swing pattern of motion, muscle control and vector alignment at the ankle.	23
Fig. 18:	Mild swing limb advancement (arrow) continues the demand on the tibialis anterior	24
Fig. 19:	Terminal swing advancement (arrow) of the tibia also presents a demand for tibialis anterior support of the foot	24
Fig. 20:	Loading response, subtalar action	25
Fig. 21:	Midtarsal joint reactions. Talonavicular and calcaneal cuboid joint axes (dotted lines) parallel with subtalar valgus. The joint axes converge with subtalar varus .	27

Fig. 22:	Metatarsophalangeal joint motion during stance. Shaded toe indicates area of motion)	27
Fig. 23:	The three anatomic regions of the foot	33
Fig. 24:	Hyperpronation of the Foot	37
Fig. 25:	Local examination	47
Fig. 26:	Clinical examination of the foot begins with nonweightbearing inspection	48
Fig. 27:	Anteroposterior talus-first metatarsal angle	52
Fig. 28:	Lateral talus-first metatarsal angle	53
Fig. 29:	Weight-bearing lateral radiograph showing the measurements used in the assessment of the results	53
Fig. 30:	Wall exercises for calf stretching	60
Fig. 31:	Towel-gathering exercise and Towel-stretch exercise	60
Fig. 32:	the UCBL orthosis, used in the treatment of flatfoot	61
Fig. 33:	Soft molded insert with arch support and medial heel "wedge" to invert the hindfoot	61
Fig. 34:	Modified Evans osteotomy	72
Fig. 35:	Bone graft in the osteotomy site, which produces realignment of the midtarsal joint	73
Fig. 36:	Sitting position: with the child seated and legs dangled, the normal arch contour returned	85
Fig. 37:	Weight bearing position: All patients showed flattening of the medial longitudinal arch	85
Fig. 38:	The flattened medial longitudinal arch were correctable with passive dorsiflexion of the big toe	86
Fig. 39:	Heel valgus and the flattened medial longitudinal arch were correctable with standing on tip toes	86
Fig. 40:	Illustrations for the calcaneal lengthening in correcting valgus deformity of the hindfoot	93
Fig. 41:	Dorsal view showing correction of all components of the deformity with the trapezoid-shaped graft in place	94
Fig. 42:	Preoperative Clinically (Case Report 1)	117
Fig. 43:	Preoperative Radiologically (Case Report 1)	117
Fig. 44:	Post-operative left foot clinically (Case Report 1)	119
Fig. 45:	Post-operative left foot radiologically (Case Report 1)	119
Fig. 46:	Preoperative Right Foot Clinically (Case Report 2&3)	123
Fig. 47:	Preoperative Right Foot Radiologically (Case Report 2&3)	123

Fig. 48:	Post-operative right foot clinically (Case Report 2&3)	124
Fig. 49:	Post-operative right foot radiologically (Case Report 2&3)	124
Fig. 50:	Pre-operative Left Foot Clinically (Case Report 2&3)	125
Fig. 51:	Pre-operative Left Foot Radiologically (Case Report 2&3)	125
Fig. 52:	Postoperative right foot (18 months) and postoperative left foot (6months) clinically (Case Report 2&3)	126
Fig. 53:	Postoperative Left foot radiologically	126
Fig. 54:	Pre-operative Left and right Feet Clinically	130
Fig. 55:	Post-operative left foot clinically	131
Fig. 56:	Postoperative Right Foot 2 months. Postoperative Left Foot 13 months	132
Fig. 57:	Postoperative Right Foot 6 months. Postoperative Left Foot 17months	132
Fig. 58:	Preoperative X-ray Right and Left feet (Case Report 5&6)	133
Fig. 59:	Postoperative X-ray Right and Left feet (Case Report 5&6)	134
Fig. 60:	Postoperative Left Foot 6 months. Preoperative Right Foot	137

LIST OF TABLES

	Page
Table 1: Differential Diagnosis	54
Table 2: Distribution of the flatfoot cases according to sex	78
Table 3: Distribution of the age of flatfoot cases according to age and sex	79
Table 4: Distribution of the flatfoot cases according to operation side	80
Table 5: Distribution of the sex of flatfoot cases according to operation side	81
Table 6: Distribution of the age of flatfoot cases according to operation side	82
Table 7: Clinical evaluation scale	85
Table 8: Pre-operative (AP T1MT) antero-posterior talo-first metatarsal angle	88
Table 9: Pre-operative (lat. T1MT) lateral talo-first metatarsal angle	89
Table 10: Pre-operative (Lat.TH) lateral, talohorizontal angle	89
Table 11: Pre-operative (Lat.CP) lateral calcaneal pitch angle	89
Table 12: Distribution of the flatfoot cases according to operative procedures	93
Table 13: Post-operative clinical evaluation scale for all patients	100
Table 14: Distribution of the sex of flatfoot cases according to the complication of operation	101
Table 15: Distribution of the age of flatfoot cases according to the complication of operation	102
Table 16: Weight-bearing antero-posterior talo-first metatarsal angle	104
Table 17: Weight-bearing lateral talo-first metatarsal angle	105
Table 18: Weight-bearing lateral, talohorizontal angle	106
Table 19: Weight-bearing lateral calcaneal pitch angle	107

Table 20: Weight-bearing antero-posterior talo-first metatarsal angle versus clinical	109
Table 21: Weight-bearing lateral talo-first metatarsal angle versus clinical	110
Table 22: Weight-bearing lateral talo-horizontal angle versus clinical	111
Table 23: Weight-bearing lateral calcaneal pitch angle	112
Table 24: Clinical results versus radiological results	113
Table 25: Radiological and Clinical Results of the Patients	114
Table 26: Pre and Postoperative Angles Measurement of Left Foot	118
Table 27: Pre and Postoperative Angles Measurement of Right Foot	121
Table 28: Pre and Postoperative Angles Measurement of Left Foot	122
Table 29: Pre and Postoperative Angles Measurement of Left Foot	128
Table 30: Pre and Postoperative Angles Measurement of Right Foot	129

LIST OF GRAPHS

	Page
Graph 1: Distribution of the Flatfoot Cases According to Sex	78
Graph 2: Distribution of the Age of Flatfoot Cases According to Sex	79
Graph 3: Distribution of the Flatfoot Cases According to Operation Side	80
Graph 4: Distribution of the sex of flatfoot cases according to operation side	81
Graph 5: Distribution of the age of flatfoot cases according to operation side	82
Graph 6: Distribution of the flatfoot cases according to operative procedures	93
Graph 7: Post-operative clinical evaluation scale for all patients	100
Graph 8: Distribution of the sex of flatfoot cases according to the complication of operation	101
Graph 9: Distribution of the age of flatfoot cases according to the complication of operation	102
Graph 10: Weight-bearing antero-posterior talo-first metatarsal angle	104
Graph 11: Weight-bearing lateral talo-first metatarsal angle	105
Graph 12: Weight-bearing lateral, talohorizontal angle	106
Graph 13: Weight-bearing lateral calcaneal pitch angle	107
Graph 14: Weight-bearing antero-posterior talo-first metatarsal angle versus clinical	109
Graph 15: Weight-bearing lateral talo-first metatarsal angle versus clinical	110
Graph 16: Weight-bearing lateral talo-horizontal angle versus clinical	111
Graph 17: Weight-bearing lateral calcaneal pitch angle	112
Graph 18: Clinical results versus radiological results	113

LIST OF CHARTS

		Page
Chart 1:	<i>Diagnosis of Pediatric flatfoot</i>	55
Chart 2:	<i>(CHART 2): Treatment of Flatfoot</i>	58
Chart 3:	<i>(CHART 2): Treatment of Flatfoot</i>	59

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 an individual's body weight) (1).

Flatfoot is the term used to describe a weight-bearing foot shape in which the hindfoot is in valgus alignment, the midfoot sags in a planter direction with reversal of the longitudinal arch, and the forefoot is supinated in relation to the hindfoot. 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 a larger clinical entity. These entities include generalized ligamentous laxity, neuralgic and muscular abnormalities, genetic conditions and syndromes, and collagen disorders. Pediatric flatfoot can be divided into flexible and rigid categories. Flexible flatfoot is characterized by a normal arch during nonweightbearing and a flattening of the arch on stance. Flexible flatfoot may be asymptomatic or symptomatic (3).

The asymptomatic flexible flatfoot may be physiologic or nonphysiologic. Most flexible flatfeet are physiologic, asymptomatic, and

require no treatment. Physiologic flexible flatfoot follows a natural history of improvement over time. Periodic observation may be indicated to monitor for signs of progression. Treatment generally is not indicated (4).

Nonphysiologic flexible flatfoot is characterized by progression over time. The degree of deformity is more severe in nonphysiologic 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 nonphysiologic flexible flatfoot. Patients with tight heel cords may benefit from stretching. Orthoses may also be indicated (3).

Unlike physiologic and asymptomatic nonphysiologic flexible flatfoot, symptomatic forms 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; decreased endurance; gait disturbances; prominent medial talar head; everted heels; 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-ups are indicated. When all nonsurgical treatment options 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 the flexible flatfoot deformity. It has withstood the test of time, proving itself an effective procedure for the 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).