International Journal of Medical Science in Clinical Research and Review
Online ISSN: 2581-8945
Available Online at http://www.ijmscrr.in Volume 7|Issue 01 (January-February)|2024 Page: 127-131

Original Research Paper

Surgical Treatment of Severe Idiopathic Flexible Flatfoot ByMosca Technique in child Patients

Authors:
Amel Djerbal[1, 2*], Samir Tebani[1, 2], Lamya-Nawel Benamer[1, 3], Souhila Sadat[1, 2], Dalila Zeghdoud[1, 2], Yousria Akloul[1, 2], Reda Harrar[1, 2]
[1]*Faculty of Medicine, University of Algiers I, Algeria*
[2] *Orthopedic and Traumatology Department, SalimZemirli specialized Hospital, Algeria*
[3]*Obstetrics and Gynecology Department, Kouba public Hospital, Algeria*
Corresponding Author:
Amel Djerbal

Article Received: 02-January-2024, Revised: 22-January-2024, Accepted: 12-February-2024

ABSTRACT:
Introduction: Extra-articular osteotomies, also known as functional surgery, are the treatment of choice for this painful Severe Idiopathic Flexible Flatfoot (SIFFF), which cause functional discomfort that can compromise sporting activities and the wearing of street shoes. The aim is to refine the surgical procedure, make it more effective and improve the final result, both aesthetically and functionally. We propose a less aggressive surgical strategy for immature bones that are still growing. **Methods**: We conducted a prospective study, from 2013 to 2017, of 21 patients (36 feet) withsevere idiopathic flexible flatfoot (SIFFF)and symptoms, operated on using the Mosca technique. Clinical evaluation was made according to the American Orthopedic Foot and Ankle Society (AOFAS). Radiographic evaluation was made using anteroposterior and lateral weight-bearing radiographs of the feet to evaluate: talonavicular coverage, talocalcaneal angle, calcaneal pitch, talohorizontal angle, and lateral talo-first MTT angle, **Results**: The short-term results of our series treated using the MC1 procedures were good and excellent both radiographically and functionally. The complete disappearance of pain, the deepening of the medial arch, the correction of the valgus of the hindfoot, the disappearance of the medial and plantar prominence of the head of the talus and the ease with which the foot can be put on testify to the reliability of this surgical procedure. Residual calcaneocuboid subluxation remains frequent but has no functional repercussions. **Conclusion**: The new therapeutic approach for idiopathic, symptomatic SIFFF in children and adolescents respects the growth and joint mobility of the foot. Corrective extra-articular osteotomies associated with soft tissue procedures are used in order to preserve joint growth and mobility.

Keywords: severe idiopathic flexible flatfoot, Mosca technique, soft tissue procedures, calcaneocuboid subluxation

INTRODUCTION:

Flat foot is characterised by the reduction, effacement or even inversion of the medial arch of the foot when standing. The idiopathic form is often referred to as static flat foot or flexible flat foot, because the deformity is apparent on the weight-bearing foot, whereas it disappears completely on the non-weight-bearing foot.It is a morphological description resulting from particular relationships between several bones in the foot.

A loaded flatfoot involves, plantar flexion of the talus, excessive eversion of the calcaneus, abduction of the naviculum on the head of the talus, which is in plantar flexion, a mediotarsal break with a reduction in the medial arch, a lateral column of the foot shorter than the medial column, supination of the forefoot in relation to the hind foot. In addition to the obvious collapse of the medial arch, the clinician will therefore appreciate the obligatory valgus of the hindfoot, and the more or less obvious abduction and supination of the forefoot in relation to the hindfoot. The consultant's role is to confirm the idiopathic nature of the condition, to determine the spontaneous evolution and to detect significant deformities, which are rare but require appropriate treatment.X-rays are insufficient and can only define the static relationships between the bony elements [1].FFF (flexible flatfoot) is asymptomatic and rarely a cause for concern. FFF-TAC, on the other hand, is often responsible for the loss of bone. FFF is asymptomatic and rarely a cause for concern. On the other hand, FFF-TAC often cause pain and impair function [2]. Surgical treatment of idiopathic flat foot is indicated only after failure of well-managed conservative treatment. Functional surgery is the treatment of choice for these painful feet, which cause functional discomfort that can compromise sporting activities and the wearing of street shoes.Te most common operations performed are arthroereisis, lateral calcaneal lengthening osteotomy, and triple arthrodesis[3–4].Soft tissue

surgical procedures have also been reported, but when they are performed alone, they lead to unsatisfactory results [1]. Evans, more than forty years ago[5], introduced the lateral column lengthening for the treatment of severe symptomatic flatfoot and proposed a calcaneal lengthening osteotomy for its correction. More recently, Mosca elaborated a modification of this technique, proposing an opening wedge osteotomy with a trapezoidal, tricortical iliac crest wedge [4].

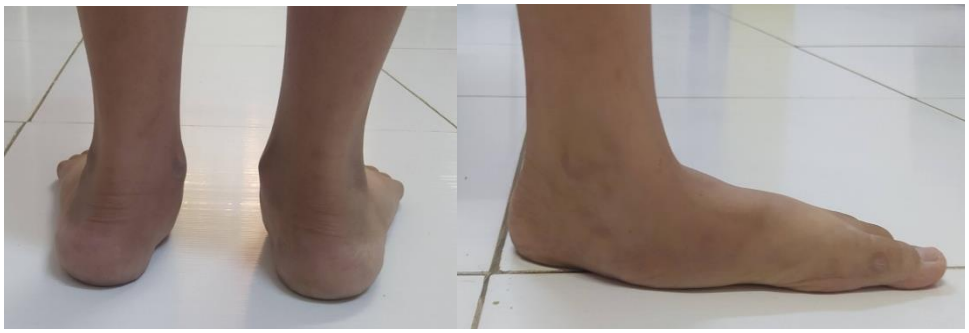
The aim of this study was to report the short-term results in a series of 21 patients (36 feet) with severe symptomatic flexible flatfoot, treated surgically using the Mosca technique combined with a first cuneiform osteotomy (MC1) and a soft tissue procedure.

MATERIALS AND METHODS:

We reviewed 21 patients affected by severe idiopathic symptomatic flexible flatfoot, surgically treated by lateral column lengthening according to Mosca procedure combined with a first cuneiform osteotomy (MC1) and a soft tissue procedure associated to the tibialis posterior tendon and talonavicular joint capsule strain and lengtheningoftheAchillestendon. Twenty three patientsweremale, and 13 were female. The mean age of the patients at surgery was 11.17 years (range: from 9 to 13.29 years); 15 cases were operated bilaterally, for a total of 36 feet. In all our patients treated bilaterally, we performed the two procedures at different times, with a distance between the two operations that ranged from 3 months to 6 months. Regarding the clinical evaluation before surgery, all patients had a medial longitudinal arch abnormally depressed or absent with a normal subtalar joint mobility and analysis of plantar impressions under load (podoscope). The reducibility of the foot deformity is rigorously assessed compartment by compartment, the tibio-talar joint (Achilles tendon) in particular dorsal flexion by correcting valgus and blocking the hindfoot in a neutral position to assess the retraction of the TA, the midfoot joint and its valgus for the Court Fibular (CF) tendon, and the Tibialis Posterior (TP) tendon and the forefoot joint for supination and pronation (Figure 1). The surgical procedure involved a calcaneus lengthening osteotomy or Mosca combined with a pronation osteotomy of the cuneiform (MC1). The incision was made with an oblique direction over the sinus tarsi towardsthe inferior border of the calcaneus. External incision below the lateral malleolus to the base of the fourth metatarsal, osteotomy in the tarsal sinus perpendicular to the axis of the calcaneus 15mm from the calcaneocuboid joint line, Placement of an arthroplasty pin stabilising the calcaneocuboid joint up to the calcaneal osteotomy line to avoid any dorsal subluxation of the calcaneocuboid joint, then placement of two temporary pins on either side of the osteotomy. A Méary retractor pressed against them opens the osteotomy site, thus facilitating the interposition of an autologous trapezoidal tricortical cancellous cortical iliac graft (the large external base). Osteosynthesis using a Blount staple is preferred to pins because it allows the osteotomy site to be kept open in the event of graft lysis. A second incision was made along the medial border of the foot. associated with lengthening of the Achilles tendon and the short fibular using the Vulpus technique, talonavicular capsuloraphy and transposition of the posterior tibialis anteriorly on the medial cuneiform. A plantar-based subtraction and pronation osteotomy of the first cuneiform to correct supination of the forefoot. After surgery, a non weight bearing below the knee cast was applied for 6 weeks. Loading was only authorised after removal of the cast at 6 weeks. All patients were evaluated clinically, analyzing the preoperative function of the foot in comparison to the follow-up examination, using the American Orthopedic FootandAnkleSociety(AOFAS)[6], and, only at follow-up. Radiographic examinations postoperatively and at the last follow-up included anteroposterior and lateral views of both feet to assess the talocalcaneal divergence (TCD), the talonavicular coverage angle, the talus-M1 angle or Méary angle, the calcaneal pitch and the angle of the talus with the horizontal (talus-horizontal). Consolidation or not of osteotomies, integration or not of interposing cortico-cancellous grafts. (Figure 2) Calcaneocuboid subluxation, joint relationships of the torsional moment and their modifications. Growth disorders of the talar dome or navicular: ossifications, deformities and osteonecrosis. Signs of osteoarthritis of the torsional moment.

RESULTS:

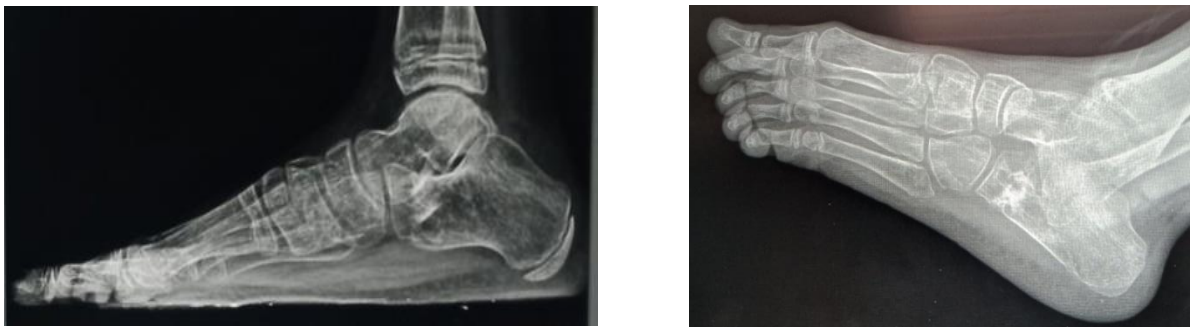
All patients were reviewed after a mean follow-up of 2 years (from 1to 4 y). According to the AOFAS system [6], the average preoperative score was 40 points (from 30 to 50 points), whiletheaveragescoreatfollow-upimprovedto 88 (from 78 to 90 points). Pre-operative and post-operative AOFAS score significantly improved, this score was significantly higher in all patients ($p<0.0001$). Complete correction of foot morphology with disappearance of hindfoot valgus and midfoot abduction deformity in all patients, total indolence in all patients and easy to put on shoes without wear.At radiographic examination, nonunion of the calcaneal osteotomy was never observed, and the tricortical bone graft was always remodeled. We found significant differences in all of the 5 radiographic measurements: anteroposteriortalo calcaneal angle (22.76 ± 3.94, $P=0.001$) and talonavicular coverage (22.9 ± 5, $P<0.002$).and lateral talo-first MTT angle (11.93 ± 1.9, $P<0.02$) and talohorizontal angle (20.21 ± 3.93, $P<0.001$), and calcaneal pitch (21.35 ± 2.53, $P<0.001$). Calcaneocuboid joint subluxation was observed in 18feet (50%).



(a) (b)

(C)

Figure 1: Clinical aspect of an 10-year-old boy with bilateral painful idiopathic flexible flatfoot (a)and (b). At radiographic examination, Meary'sangle measured 26 ° of the right foot (c). a surgical Mosca procedure was proposed



(a) (b)

Figure 2: Same patient of Figure 1,The patient was surgically treated by Mosca procedure bilaterally with an interval of three months. Te radiographic examination of the right foot, performed in lateral view 3 months after surgery, showed good lengthening of the calcaneus with the presence of the tricortical bone graft (a). 3 years later, the graft was perfectly remodeled in the calcaneal bone with the maintenance of calcaneal lengthening (b).

DISCUSSION:

Flexible idiopathic flatfoot which is under-estimated in children and adolescents in our highly demographic country, is a daily reason for consultation because of the deformity of the foot and its unsightly appearance, is usually painful, but uncommon in comparison to other congenital, pediatric, orthopedic diseases [7–8]. However, in some cases, especially in adolescents, flexible flatfoot may cause pain and disability, and surgery may be indicated when conservative treatment fails [9]. In severe idiopathic symptomatic adolescent flatfoot, Talocalcaneal relocation or repositioning by opening the tarsal sinus and interposing plastic or metal material (arthrorise) [10,11] is not without complications such as expulsion or intolerance of the material and the risk of necrosis of the talus or hindfoot". Good results have been reported in the literature for the correction of flexible flatfoot in growing children with arthroereisis of the subtalar joint [12, 10, 13], but pain at the level of the sinus tarsi is a possible complication of these techniques, and a second surgery for implant removal may be required [1,14,15]. For this reason, we preferred Mosca surgical procedures instead of arthroereisis in our series of child and adolescent patients. Evans [5] believed that the lateral column in flatfeet was shorter than the medial column and first proposed a calcaneal lengthening osteotomy for the correction of valgus

deformity, without an opening wedge osteotomy. This concept was elaborated by Mosca [1, 4] that published a modified technique utilizing a trapezoidal, tricortical iliaccrest wedge to perform both an opening wedge and a distracting osteotomy and reported correction of all components of the deformity. Te calcaneal lengthening osteotomy for the surgicaltreatment of severe symptomatic idiopathic flexible flatfootwas later used by other authors with satisfactory results.Dogan et al.[16], in a series of 13 patients (25 feet) treatedfor flexible pesplanovalgus by calcaneal lengtheningosteotomy, reported that foot pain was eliminated in allpatients but one. Moraledaet al.[17] also reported good clinical and radiographic results in a series of 21 children (33 feet) with symptomaticflexible flatfoot surgical treatment with a calcaneal lengthening osteotomy. More recently, Kumar and Sonanis [18] reported a systematic review on lateral column lengtheningperformed in adolescent pesplanovalgus deformity. In our cohort of 36 feet treated with the MC1 procedure, with an average follow-up of 2 years and extremes of 1 and 4 years, 35 (97%) had excellent or very good clinical and radiological results, with complete disappearance of pain, deepening of the medial arch, correction of valgus of the hindfoot and easy fittingMarengo et al. [19] reported the clinical andradiological outcome of calcaneal lengthening osteotomyfor flatfoot deformity of various etiologies in 27 skeletallyimmature patients (38 feet). Clinical outcome was satisfactory in 89% of cases, and all radiographic parametersimproved significantly. Tey concluded that calcaneallengthening osteotomy is not contraindicated in symptomatic flatfoot of different etiologies, except neuromuscular disease-related flatfoot that can affect bone qualityand reduce foot flexibility. They also reported that calcaneocuboid joint subluxation is frequently observed but haslittle functional impact as it tends to remodel over time.Similar to other CT studies that analyzed the results oftreatment of the congenital clubfoot [20], Canavese et al.[21] published a study on postoperative CT-scan 3D reconstruction of the calcaneus following lateral calcaneallengthening osteotomy performed in 14 children (20 feet) affected by symptomatic flatfoot with different etiologies.This study showed that subtalar anatomy presented significant anatomical variations among these examined patients; however, clinical evaluation at follow-up showedsatisfactory outcome in 80% of cases. Calcaneal lengthening for flatfoot deformity in patients with cerebral palsyhas also been reported with good results [22]. Andreacchioet al. [23] concluded that calcaneal lengthening is a successful treatment for flexible planovalgus foot deformity inambulatory children with spastic CP. Regarding otheretiologies, Mosca and Bevan [24] reported good results forcorrecting deformity and relieving pain in rigid flatfeet of 8patients (13 feet), affected by talocalcaneal tarsal coalition,treated by calcaneal lengthening osteotomy with gastrocnemius or Achilles tendon lengthening. Guha andPerera [25] reported that calcaneal lengthening osteotomy may be performed even in the correction of adult flexibleflatfoot, but they concluded that an essential prerequisitefor using this technique is the absence of arthritis of thesubtalar joint.Our short term results in a group of childrens surgically treated for severe symptomatic idiopathic flexibleflatfoot by the Mosca technique, in association with astrain of the tibialis posterior tendon and joint capsule,confirmed the good results reported by the afore mentioned studies.

CONCLUSION:

The new therapeutic approach for Severe Idiopathic Flexible Flatfoot (SIFFF), in children and adolescents respects the growth and joint mobility of the foot. Corrective extra-articular osteotomies with Evan-s–Mosca surgical procedure associated soft tissue procedures are used in order to preserve joint growth and mobility.

REFERENCES:

[1]V. S. Mosca, “Flexible flatfoot in children and adolescents,”Journal of Children’s Orthopaedics, vol. 4, no. 2, pp. 107–121,2010.

[2] R. I. Harris and T. Beath, “Hypermobile flat-foot with shorttendoachillis,” Te Journal of Bone & Joint Surgery, vol. 30,no. 1, pp. 116–150, 1948.

[3] P. Angus and H. Cowell, “Triple arthrodesis. a critical longterm review,” Te Journal of Bone and Joint Surgery. BritishVolume, vol. 68-B, no. 2, pp. 260–265, 1986.

[4]V. S. Mosca, “Calcaneal lengthening for valgus deformity ofthe hindfoot. results in children who had severe, symptomaticflatfoot and skewfoot,” Te Journal of Bone & Joint Surgery,vol. 77, no. 4, pp. 500–512, 1995.

[5] D. Evans, “Calcaneo-valgus deformity,” Te Journal of Boneand Joint Surgery. British Volume, vol. 57-B, no. 3, pp. 270–278, 1975.

[6]H. B. Kitaoka, I. J. Alexander, R. S. Adelaar et al., “Clinicalrating systems for the ankle-hindfoot, midfoot, hallux, andlesser toes,” Foot & Ankle International, vol. 15, no. 7, pp. 349–353, 1994.

[7] S. J. Kumar, J. T. Guille, M. S. Lee, and J. C. Couto, “Osseousand non-osseous coalition of the middle facet of the talocalcaneal joint,” Te Journal of Bone & Joint Surgery, vol. 74,no. 4, pp. 529–535, 1992.

[8] P. Farsetti, R. Caterini, V. Potenza, and E. Ippolito, “Developmental dislocation of the hip successfully treated by preoperative traction and medial open reduction: a 22-year meanfollowup,” Clinical Orthopaedics and Related Research,vol. 473, no. 8, pp. 2658–2669, 2015.

[9] J. V. Basmajian and G. Stecko, “Te role of muscles in archsupport of the foot,” Te Journal of Bone & Joint Surgery,vol. 45, no. 6, pp. 1184–1190, 1963.
[10] V. Pavone, A. Vescio, C. A. Di Silvestri, A. Andreacchio,G. Sessa, and G. Testa, “Outcomes of the calcaneo-stopprocedure for the treatment of juvenile flatfoot in young athletes,” Journal of Children’s Orthopaedics, vol. 12, no. 6,pp. 582–589, 2018.
[11]C.Indino,J.H.Villafañe,R.D’Ambrosietal.,“Effectivenessofsubtalararthroereisis with endorthesis for pediatric flexibleflat foot: a retrospective cross-sectional study with final follow up at skeletal maturity,” Foot and Ankle Surgery, vol. 26, no.1,pp. 98–104, 2020.
[12] S. Giannini, F. Ceccarelli, M. G. Benedetti, F. Catani, andC. Faldini, “Surgical treatment of flexible flatfoot in children,”Te Journal of Bone and Joint Surgery-American Volume,vol. 83, no. suppl. 2, pp. 73–79, 2001.
[13] D. Y. Chong, B. A. Macwilliams, T. A. Hennessey, N. Teske,and P. M. Stevens, “Prospective comparison of subtalararthroereisis with lateral column lengthening for painfulflatfeet,” Journal of Pediatric Orthopaedics B, vol. 24, no. 4,pp. 345–353, 2015.
[14]C. Faldini, A. Mazzotti, A. Panciera, F. Perna, N. Stefanini, and S. Giannini, “Bioabsorbable implants for subtalararthroereisis in pediatric flatfoot,” Musculoskeletal Surgery,vol. 102, no. 1, pp. 11–19, 2018.
[15] A. Bernasconi, F. Lintz, and F. Sadile, “Te role ofarthroereisis of the subtalar joint for flatfoot in children andadults,” EFORT Open Reviews, vol. 2, no. 11, pp. 438–446,2017.
[16] A.Dogan, G. Zorer, E. I. Mumcuoglu, and E. Y. Akman, “Acomparison of two different techniques in the surgicaltreatment of flexible pesplanovalgus: calcaneal lengtheningand extra-articular subtalar arthrodesis,” Journal of PediatricOrthopaedics B, vol. 18, no. 4, pp. 167–175, 2009.
[17] L.Moraleda, M. Salcedo, T. P. Bastrom, D. R. Wenger,J. Albiñana, and S. J. Mubarak, “Comparison of the calcaneocuboid-cuneiform osteotomies and the calcaneal lengtheningosteotomy in the surgical treatment of symptomatic flexibleflatfoot,” Journal of Pediatric Orthopaedics, vol. 32, no. 8,pp. 821–829, 2012.
[18] S. Kumar and S. V. Sonanis, “Lateral column lengthening foradolescent idiopathic pesplanovalgus deformity-systematicreview,” Journal of Orthopaedics, vol. 14, no. 4, pp. 571–576,2017.
[19] L. Marengo, F. Canavese, M. Mansour, A. Dimeglio, andF. Bonnel, “Clinical and radiological outcome of calcaneallengthening osteotomy for flatfoot deformity in skeletallyimmature patients,” European Journal of Orthopaedic Surgery& Traumatology, vol. 27, no. 7, pp. 989–996, 2017.
[20] P.Farsetti, F. De Maio, L. Russolillo, and E. Ippolito, “CTstudy on the effect of different treatment protocols forclubfoot pathology,” Clinical Orthopaedics and Related Research, vol. 467, no. 5, pp. 1243–1249, 2009.
[21] F.Canavese, A. Dimeglio, and F. Bonnel, “Postoperative CT-scan 3D reconstruction of the calcaneus following lateralcalcaneal lengthening osteotomy for flatfoot deformity inchildren.is the surgical procedure potentially associated withsubtalar joint damage?” Foot and Ankle Surgery, vol. 24, no. 5,pp. 453–459, 2018.
[22] A. M. Aboelenein, M. L. Fahmy, H. M. Elbarbary,A. Z. Mohamed, and S. Galal, “Calcaneal lengthening for thepesplanovalgus foot deformity in children with cerebralpalsy,” Journal of Clinical Orthopaedics and Trauma, vol. 11,no. 2, pp. 245–250, 2020.
[23] A. Andreacchio, C. A. Orellana, F. Miller, and T. R. Bowen,“Lateralcolumnlengthening astreatmentforplanovalgusfootdeformity in ambulatory children with spastic cerebral palsy,”Journalof Pediatric Orthopaedics, vol. 20, no. 4, pp. 501–505,2000.
[24]V. S. Mosca and W. P. Bevan, “Talocalcaneal tarsal coalitionsand the calcaneal lengthening osteotomy: the role of deformity correction,” Te Journal of Bone and Joint Surgery American Volume, vol. 94, no. 17, pp. 1584–1594, 2012.
[25] A. R. Guha and A. M. Perera, “Calcaneal osteotomy in thetreatment of adult acquired flatfoot deformity,” Foot andAnkle Clinics, vol. 17, no. 2, pp. 247–258, 2012.