Fixed forefoot adduction after clubfoot surgery

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ABSTRACT

Objectives: Studying the causes of residual forefoot adduction deformity after surgical treatment of congenital clubfoot and their management.

Methods: Revision surgery was carried out by the author for 12 patients (13 feet) in King Khalid University Hospital, Riyadh, Kingdom of Saudi Arabia, during the period between January 1997 to December 1998.

Results: In 12 out of 13 feet, K-wire was not used to fix the navicular bone in its reduced position during primary surgery. In all cases, the navicular was found displaced during revision surgery.

Conclusion: Revision of soft tissue surgery with relocation of the navicular bone improves the outcome of patients with residual fixed forefoot adduction after congenital talipes equinovarus surgery.

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The goal in management of congenital clubfoot congenital talipes equinovarus, (CTEV) is to obtain a functional, pain-free, normal looking, plantigrade foot that has good mobility and does not require modified shoes.[1-3] When surgery is indicated this goal can be achieved by releasing all components of the deformity simultaneously and restoring the tarsal bones to their normal anatomic position.[4,5] Orthopedic surgeons are well aware of the distressing resistance to correction, and the tendency towards recurrence seen in some cases of CTEV.[6-8]

Recurrent deformities that are frequently addressed in the literature are equinus, abnormal rotation at the talocalcaneal joint, heel varus and mid foot cavus.[5,9,10] Residual or recurrent forefoot adduction attracted little attention as it is one of the less disabling features and it has been suggested that spontaneous correction could eventually occur.[11,12] Fixed forefoot adduction, which often results from bony deformity or joint contracture, should be differentiated from dynamic deformity. Dynamic forefoot deformity usually corrects spontaneously with maturation.[13] Many authors noticed that ignoring forefoot adduction deformity during the initial surgery, or its recurrence continues to cause a significant problem and is associated with a high rate of additional corrective surgery in many cases at a later stage.[6,14,15] Talonavicular subluxation singly or in combination with metatarsus varus is responsible for many cases of fixed forefoot adduction deformity.[4-16,14] avascular necrosis (AVN) of the navicular bone could contribute to its subluxation and to the imbalance between an elongated lateral column and a shortened medial column.[15]

The aim of this paper is to study cases with residual fixed forefoot adduction deformity after primary surgical treatment of CTEV that needed revision surgery.

Methods. All cases with residual fixed forefoot adduction deformity that needed surgical correction after a primary surgery for idiopathic CTEV during the period January 1997 through to December 1998 were prospectively studied. Patients with clubfeet associated

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with arthrogryposis; neuromuscular disease or chromosomal abnormalities were excluded. The structures released, and the type and duration of internal fixation used in the primary and the revision surgery were noted. Patients' assessment included clinical and radiological evaluation of the fixed forefoot adduction, measuring the degree of forefoot adduction, and assessing the presence of AVN of the navicular bone and its relation to the head of the talus, and the presence of metatarsus varus and its contribution to the deformity.

Results. Twelve patients with 17 idiopathic CTEV feet were studied. Thirteen of the 17 feet underwent revision surgical correction for fixed forefoot adduction. There were 9 males and 3 females. The mean age at the time of the primary surgery was 11.5 month (range from 7-18 months). All patients had primary standard postero-medial release and were subjected to a similar postoperative casting program. The mean age at the time of revision surgery was 4 years 3 months (range 2.5 to 7 years). The mean follow up after the revision surgery was 3.75 years (range 3-4.5 years) Of the total 17 feet K-wires were used in 5, one of which had residual fixed forefoot adduction deformity. During early follow up after the primary surgery the correction of the forefoot was satisfactory in 9 out of the 13 feet that ended with residual fixed forefoot adduction, while in four feet the adduction deformity was evident early after primary surgery. In the revision surgery the navicular bone was found displaced in all feet (dorsally in 6 feet, medially in 3 feet and dorso-medially in 4 feet). During the revision surgery, medial release was performed in all feet, reducing the navicular bone and fixing it with a K-wire. An additional lateral release with cuboid wedge resection was performed in 8 feet. Metatarsal osteotomy was performed in one foot in a 7-year-old child. A split transfer of tibialis anterior tendon was performed in one foot, and peroneal tendon plication in another foot.

At the final follow up, 10 feet were fully corrected. Three had partial correction of the forefoot adduction but were mobile and painless and could be fitted well in normal shoes.

Discussion. The incidence of residual fixed forefoot adduction after surgical treatment of CTEV varies in the literature from 17-79%.[16,17] Undesirable compensation of this deformity by outward rotation at the ankle has been reported to occur which might lead to lateral knee and ankle pain.[11,14] In CTEV deformity, the navicular bone is displaced medially around the head of the talus and frequently articulates with the medial malleolus. During surgical treatment of CTEV, the unreleased structures become a tethering factor, which together with medial and downward deviation of the neck of talus may cause the navicular bone to be resistant to reduction and vulnerable to subluxation. The ball and socket nature of the talonavicular joint facilitates this displacement, which usually occurs dorsally or medially, or both.[6,18]

Many authors believe that uncorrected calcaneocuboid relation could produce residual fixed forefoot adduction deformity, and therefore recommend full release of the calcaneocuboid joint during the primary surgery.[4,5] This study showed that residual or recurrent fixed forefoot adduction in surgically treated CTEV could be secondary to navicular bone subluxation. Subluxation occurs due to incomplete release during initial surgery, failure to maintain the navicular bone in its reduced position or as a result of AVN. This finding led the author to believe that the term fixed forefoot adduction should be replaced with fixed midfoot adduction, as the deformity occurs at the talonavicular level which is part of the midfoot. The term forefoot adduction, which is usually a secondary deformity, should be preserved for deformities occurring at the level of the forefoot (tarso-metatarsal joints and the metatarsal bones). Diagnosis of residual fixed midfoot adduction is easy clinically and radiologically. However, assessment of the cause of the deformity is difficult due to the absence of significant ossification of the navicular bone until around the age of 3 years. Magnetic resonance imaging may be helpful to document subluxation of the non-ossified navicular in the early postoperative period. This will help in the decision of revision surgery that is needed in the author's opinion in all cases with navicular subluxation. In addition, lateral cuboid closing wedge osteotomy could be performed in cases with elongated lateral column with or without medial cuneiform opening wedge osteotomy.[15]

It is the author's opinion that the diagnosis of navicular subluxation in residual fixed midfoot adduction is an indication for revision surgery. Earlier correction, before bony changes get advanced, usually gives better results. Correction of navicular subluxation needs a complete release of the talonavicular, naviculocuneiform and naviculocuboid joints. In some cases, release of the calcaneocuboid joint and planter fasciotomy is essential to achieve complete reduction of the navicular bone. Once soft tissue release is achieved with bony realignment, the talonavicular articulation should be fixed in its anatomic position using a K-wire for a minimum period of six weeks with casting. Two K-wires may be used if the talonavicular joint surfaces are not compatible. The calcaneocuboid joint might also need a fixation with a K-wire if its release was part of the operation. In older children, the author agrees with McHale and Lenhart[5] that closing wedge cuboid osteotomy added to the soft tissue release is a simple procedure to correct residual fixed midfoot adduction when soft tissue release alone is not sufficient to fully correct the deformity.

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