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CLINICAL STUDY

Mid-term results of one-stage surgical correction of congenital vertical talus

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Abstract: *Objective:* Congenital vertical talus is a rare condition but a well-known cause of severe rigid flatfoot in children. The aim of this study was to evaluate the mid-term clinical and radiological results of one-stage surgical correction in children with congenital vertical talus.

Methods: Five feet in three children diagnosed with congenital vertical talus who had undergone surgical correction were followed up for a mean period of seven and half years. During this period they were clinically evaluated for subjective complaints and objective findings focused on the range of movement at the ankle joint, position of the hindfoot, and weight-bearing ability of the treated extremity. They were also evaluated on the basis of radiographs of foot and ankle made in standard projections.

Results: All the children had a good functional range of movement and normally shaped foot. The range of movement remains restricted and decreased during the follow-up period without causing any functional disability. All radiological measurements were within normal limits. There was no evidence of necrosis of talus.

Conclusion: We recommend operative treatment for congenital vertical talus by the end of first year of age. The range of movement remains restricted and seems to decrease during follow-up, which had a little effect on the functional outcome of the ankle joint *(Fig. 3, Tab. 1, Ref. 18)*. Full Text (Free, PDF) *www.bmj.sk.*

Key words: foot, talus, congenital vertical talus.

Congenital vertical talus, also known as congenital convex pes valgus, is a rare condition but a well-known cause for severe flatfoot in children. It is characterized by distinct clinical and radiological features. Typically congenital vertical talus presents as valgus position of the foot with equinus of the heel, and abduction and dorsiflexion of the forefoot. This combination produces a "rocker-bottom" deformity with a concave lateral border of the foot. The head of the talus forms a prominence in the middle of the convex medial border of the foot. Above all, the deformed foot is rigid at the subtalar joint, and on weight-bearing, the lack of molding of the foot to the ground is a prominent feature. It is this rigidity of the foot in true congenital vertical talus which is responsible for its notorious lack of response to manipulative treatment (1, 2). The radiograph is characteristic, at early age showing not only the curved outline of soft tissue of the sole and dorsiflexsion of forefoot, but also a vertical talus, lying parallel with the longitudinal axis of tibia and the calcaneus in equnius. The navicular remains dislocated dorsally on the neck of talus, when the foot is manipulated in extreme plantar flexion.

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Methods

Between October 2000 and November 2001 three children had undergone surgical correction of congenital vertical talus at our institution. Two cases were bilateral. One child with unilateral congenital vertical talus was initially treated conservatively for congenital dislocation of hip, the other child with bilateral vertical talus had congenital heart disease and bilateral upper-limb anomalies. No child had neurological disorder (myelomeningocele, neurofibromatosis, and arthrogryposis). One of the patients with bilateral congenital vertical talus was referred late to our hospital at the age of 4 years. Prior to the referral, he was treated conservatively; the details of it are not known. The other two patients were initially treated conservatively with a cast for a period of 3 months, following which they were advised to use an orthosis and underwent rehabilitation. This was done in order to stretch the contracted soft tissues before surgery. The navicular remained dorsally displaced in relation to the talus on lateral radiograph prior to surgery in maximum plantar flexion in all the cases. The mean age at the time of operation was 32 months.

Surgical correction was done as a single-stage procedure using a Cincinnati incision (3). The sural nerve and the short saphenous vein were isolated and protected. The heel cord was lengthened with a Z-plasty (the distal cut was placed laterally at its calcaneal insertion). The posterior tibial neurovascular structures were then dissected and freed, beginning proximal to the

Tab. 1. Clinical outcome pre and postoperatively, with footprint analysis following surgery.

Patient	Associated problems	Range of movements												Footprint analysis
		Pre-op 2000-01			2003			2006			2008			
		D	P	V	D	P	V	D	P	V	D	P	V	
Left	None	20	45	10	20	30	N	15	20	5	15	20	5	2° flatfoot
Right		20	45	10	20	30	N	15	20	5	15	20	5	
Left	Congenital heart disease	20	30	10	15	20	5	10	15	5	10	15	5	1° flatfoot
Right	Radial head dislocation Glenoidal aplasia	30	30	10	20	20	5	15	20	5	15	20	5	
Left	DDH Ligamentous laxity	20	70	5	15	50	N	15	50	N	15	50	N	1° flatfoot

D – dorsiflexion, P – plantar flexion, V – valgus of the calcaneus.

medial malleolus and proceeding distally beneath the abductor hallucis into the plantar surface of the foot. Thereafter the posterior capsule of the ankle joint was widely divided so that the entire ankle mortise could be visualized. Only a small portion of the talus was visible initially in the lateral aspect of the ankle joint. The subtalar joint was identified most readily by completing the capsulotomy of the ankle joint and dividing the posterior talofibular ligament. The calcaneus was in close proximity to the fibula and actually beneath it. The contracted calcaneofibular ligament was isolated and divided. The capsule of the subtalar joint was opened widely, both posteriorly and laterally. It was necessary to perform a capsulotomy of the calcaneocuboid joint to permit the correction of dorsal subluxation. The peroneal tendons required lengthening because their contracture limited the correction of eversion of the subtalar joint. The tendon of the tibialis posterior was followed distally to help in identifying the dorsally dislocated navicular. The posterior tibial tendon was dissected and divided at its insertion to the navicular. The plantar calcaneonavicular ligament was identified and divided distally. The abnormal talonavicular joint was identified, and the capsule was opened by T-shaped incision. This capsule was generally thickened on the dorsum and attenuated on the plantar surface. A circumferential capsulotomy (the transverse limb of the T) was done to expose the talar head. A retrograde dissection was then performed over the head and neck of talus inferiorly. A small longitudinal dorsal incision was used to allow tenotomy of the extensor digitorum longus only in the unilateral case. Longitudinal arch was molded, the forefoot was manipulated into plantar flexion and inversion. Navicular and head of talus were corrected into anatomic position, and realignment proceeded with the insertion of the Kirschner wire drilled in retrograde fashion into the talus, navicular, medial cuneiform and first metatarsal bone. After careful talonavicular capsuloplasty the plantar calcaneonavicular ligament was sutured to the base of the first metatarsal. The posterior tibial tendon was advanced distally and sutured to the inferior surface of the medial cuneiform. The anterior tibial tendon was transferred and fixed to the inferomedial aspect of the talonavicular joint. Postoperatively, the Kirschner wire was retained for a period of 6 weeks and the foot was immobilized in a plaster cast for 3 months.

The mean follow-up was seven and half years (7 to 8) and the mean age at review 10 years (9 to 12). The clinical evaluation included subjective complaints and objective findings focused on the range of movements in the ankle joint, position of the hindfoot and weight-bearing ability of the treated extremity. The radiographs of the foot and ankle were made in standard projections.

Results

All the children were able to do their regular activities without any complaints. They were able to wear normal shoes with insoles, had a good functional range of movement and the foot was of normal shape.

Fig. 1. Lateral radiograph at the time of presentation showing talus in the vertical position.

Fig. 2. Lateral radiograph following surgery showing talus in the corrected position.

During the follow-up, it was observed that the range of movements remained restricted. However, it seems to have decreased during the follow-up period and does not cause any kind of functional disability (Tab. 1). The patients developed varying degrees of flexible flatfoot during the follow-up and were advised to wear insoles. All the patients were able to stand on tip-toes and on their heels. No child required further surgery after the initial surgical correction.

All radiological measurements were within the normal range. Irregularity of the talonavicular joint was common but there was no evidence of necrosis of the talus (Figs 1–3).

No statistical analysis could be derived due to small number of patient, due to rarity of the condition.

Discussion

Congenital vertical talus was first described by Henken in 1914 (4). The incidence of it is unknown. Osmond-Clarke encountered one child with congenital vertical talus for every 120 with congenital talipes equinovarus (5). Boys are affected more often than girls with up to 71 % of cases being bilateral (4, 6, 7). At least 50 % of the cases are associated with other abnormalities of the central nervous system or musculoskeletal system (7).

Its etiology is not known exactly. The condition may occur as an isolated primary deformity or in association with abnormalities of the central nervous system and musculoskeletal system. It is proposed that neuromuscular imbalance, i.e. weak tibialis posterior muscle and strong evertors, is responsible for congenital vertical talus in myelomeningocele (8). Due to high incidence of abnormalities of the central nervous system in reported cases of congenital vertical talus it is necessary to rule out such anomalies (arthrogryposis multiplex congenita, talipes equinovarus, pollex varus, dislocation of hip, and neurofibromatosis) prior to accepting the condition as an isolated primary deformity

Fig. 3. Lateral radiograph seven years following surgical correction, talus is without evidence of avascular necrosis.

(8). It can also be due to anomalies associated with autosomal trisomy, occurring with both trisomy 13–15 and trisomy 18 (9, 10). Heredity may be a factor. Familial incidence in parents and child has been observed (4, 11). Primary isolated form is probably the result of arrest of prenatal development of foot (5). According to Lichtblau, congenital vertical talus can be classified as teratologic, neurogenic and acquired (12).

The key feature of the pathological anatomy is dorsal dislocation of the talocalcaneonavicular joint with equinus of the hindfoot leading to the vertical orientation of the talus. The proximal articular surface of the navicular faces plantarwards articulating with the dorsal surface of the talus. The whole hindfoot is in equinus. There is shortening of the long tendons on both the dorsal and lateral aspects of the foot. There is also displacement of the tibialis posterior and peroneal tendons anterior to the axis of the ankle so that they act as midfoot dorsiflexors on the plantar flexed hindfoot. There is shortening of the ligaments on the dorsal and lateral aspects of the foot with stretching of those on the plantar and medial aspects.

Talipes calcaneovalgus and fibular hemimelia should be differentiated in newborn. Os tibiale externum, peroneal spastic foot in tarsal coalition and accentuated flatfoot with shortening of the Achilles tendon are other entities to be considered as the differential diagnosis in walking age (13).

Congenital vertical talus does not delay walking, and if any delay is present then the underlying cause must be identified before treatment (14, 15). Surgical treatment is the accepted treatment of congenital vertical talus but the timing and the precise procedure are debatable (1, 5, 6, 7, 16, 17).

We would recommend operative treatment when the operation described above becomes feasible, it means at the end of first year of age. We believe that the sooner this deformity is corrected fully, the less remodeling of the talus is needed. The talus is already deformed at birth, and early full reduction may facilitate remodeling (18). Clinical and radiological follow-up during one to seven and half years shows satisfactory shape of the foot and a nearly normal alignment of the tarsal bones after this operation. The children are able to wear normal shoes with insoles due to varying degree of flexible flatfoot and lead an active life. The range of movement remains restricted, and seems to decrease in the years after the operation, but this restriction appears to have little effect on the functional ability of the children.

References

1. Eyre-Brook AL. Congenital vertical talus. J Bone Joint Surg (Brit) 1967; 49-B: 618—627.

2. Lloyd-Roberts GC, Spence AJ. Congenital vertical talus. J Bone Joint Surg (Brit) 1958; 40-B: 33—41.

3. Crawford AH, Marxen JL, Osterfeld DL. The Cincinnati incision: A comprehensive approach for surgical procedures of the foot and ankle in childhood. J Bone Joint Surg (Amer) 1982; 64-A: 1355—1358.

4. Lamy L, Weissman L. Congenital convex pes valgus. J Bone Joint Surg (Amer) 1939; 21-A: 79—91.

5. Osmond-Clarke H. Congenital vertical talus. J Bone Joint Surg (Brit) 1956; 38-B: 334—341.

6. Harrold AJ. Congenital vertical talus in infancy. J Bone Joint Surg (Brit) 1967; 49-B: 634—643.

7. Dodge LD, Ashley RK, Gilbert RJ. Treatment of the congenital vertical talus: A retrospective review of 36 feet with long-term follow up. Foot Ankle 1987; 7: 326—332.

8. Drennan JC, Sharrard WJW. The pathological anatomy of convex pes valgus. J Bone Joint Surg (Brit) 1971; 53-B: 455—461.

9. Towns PL, Dettart GK, Hech F, Manning JA. Trisomy 13—15 in a male infant. J Pediat 1962; 60: 528—532.

10. Uchida IA, Lewis AJ, Brown JM, Wang HC. A case of double trisomy no: 18 and triple X. J Pediat 1962; 60: 498—502.

11. Tachdjian MO. The Foot and ankle. 2557—2577. In: Tachdjian MO (Ed). Pediatric orthopedics. Philadelphia: W.B. Saunders Company, 1990.

12. Dungl P. Noha (The Foot). 1093—1096. In Dungl P (Ed). Orthopedie. Grada publishing, 2005.

13. Kokavec M et al (Eds). Vybrané kapitoly z detskej ortopédie 1. diel. Martin; Osveta, 2003.

14. Fixsen JA. Congenital vertical talus. The Foot 1996; 6: 116—119.

15. Kokavec M, Makai F, Švec A, Olos M. Možné komplikácie v liečbe detského ortopedického pacienta a ich prevencia — vlastná skúsenosť. Detský lekár 2002; 4: 6—8.

16. Colton CL. The surgical management of congenital vertical talus. J Bone Joint Surg (Brit) 1973; 55-B: 566—574.

17. Wirth T, Schuler P, Griss P. Early surgical treatment for congenital vertical talus. Arch Orthop Trauma Surg 1994; 113: 248—253.

18. Patterson WR, Fitz DA, Smith WS. The pathologic anatomy of congenital convex pes valgus. J Bone Joint Surg (Amer) 1968; 50-A: 458—466.

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