



Case report

Retained talus post salvage talectomy in a child with rigid equinovarus foot: A case report and literature review^{☆,☆☆}Thamar S. Alhussainan, Abdullah Y. Al-Marshad^{*}, Omar A. Al-Mohrej

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ABSTRACT

Introduction: Salvage Talectomy is a considered treatment for rigid equinovarus foot deformity that has different surgical techniques.**Case:** This study reports on a 16-year-old girl with global developmental delay and bilateral rigid equinovarus feet. Underwent bilateral staged limb salvage talectomy.**Discussion:** Surgical technique in talectomy being crucial as a means of avoiding remnants of the talus or cartilage. Surgical steps necessary for removing the talus as one piece and avoiding a piecemeal talectomy.**Conclusion:** A principal reason for the failure or relapse of a talectomy is incomplete excision of the talus, resulting in a recurrence on the left side because of the retained talus. However, in this case study, this was successfully avoided by means of a technically revised talectomy.

1. Introduction and importance

Clubfoot is a common, complex, three-dimensional deformity comprising adduction, supination, cavus, and equinus, as well as contractures of the surrounding soft tissues [1,2]. Generally, clubfoot may be idiopathic [3], which is its most common form, or non-idiopathic, which is associated with neuromuscular and genetic diseases [4]. Atypical clubfeet may be categorized according to two groups, with the first group consisting of feet with soft tissue laxity, present in conditions such as connective tissue disorders or trisomy [1,2], and the second group consisting of feet with tight soft tissues that are unresponsive to non-operative measures, such as neurological feet [5].

Clubfoot is primarily treated using a Ponseti casting, which is a highly effective treatment modality, particularly for congenital, idiopathic clubfeet, and which dramatically diminishes the need for surgical intervention [6]. It may even be used when conservative treatment has failed, as long as the child is below two years of age [6]. However, it remains the case that certain instances require surgical management due to the high recurrence rate associated with this treatment; the risk of overcorrection using this treatment is also substantial [7].

Numerous corrective procedures have addressed equinovarus deformity, particularly with regard to atypical clubfoot, which is

associated with a high recurrence rate [8,9]. Additionally, resistant equinovarus rigid foot deformity may develop in the wake of multiple surgical interventions [8]. Therefore, talectomy is proposed as an intervention to decrease recurrence rates and subsequent surgical interventions.

Astragalectomy (Talectomy) has been adopted as a primary or salvage procedure for rectifying equinovarus feet due to rigid clubfoot deformity in arthrogryposis and myelomeningoceles, with satisfactory outcomes [8–10]. As Menelaus explained, the indicators for a talectomy's appropriateness are badly deformed equinovarus feet, very rigid feet, and the child's inability to stand for a significant period of time [10]. The purpose of correcting hindfoot equinus and hindfoot varus is to provide laxity, thus avoiding the tension caused by these deformities [10]. Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

2. Case presentation

When the child was eight years old, presenting neglected bilateral clubfeet and a developmental delay. She was the product of preterm

^{*} There are no patient details (name or medical record number), or institution name included in the figures. ^{**} We Thank Mr. Mohammed Alkharaiji for his invaluable support, Encouragements and many discussions in this case report.

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pregnancy at 30 plus weeks of gestation; there was a history of placenta previa and neonatal intensive care unit (ICU) admission with a weight of 1.4 kg.

On examination, the patient had no dysmorphic facial features apart from posteriorly rotated ears. Clinical examination revealed a pectus carinatum and thoracolumbar scoliosis, as well as bilateral rigid equinovarus feet. Functionally, the child walked on the dorsum of the feet and was a limited community walker. No arthrogryposis or other congenital anomalies were present. She had neither active dorsiflexion nor eversion and mostly presented with underlying neurologic abnormalities. Radiologically, the patient presented with thoracolumbar scoliosis and bilateral cavus of both feet.

On 1st September 2012, when the child was eight years old, she underwent a soft tissue release and primary talectomy of the right foot, with a preoperative right foot x-ray (Figs. 1, 2) and post-operative right foot x-ray (Figs. 3, 4). The patient was hospitalized for 48 h for pain relief. After three weeks, the cast was changed, the wound was inspected, and measurements were taken for her ankle foot orthosis. A follow-up foot exam concluded that there was no active dorsiflexion or plantar flexion of the foot.

On 27th October 2013, when the child was nine years old, she underwent a soft tissue release and primary talectomy of the left foot, with a preoperative left foot x-ray (Figs. 5, 6) and post-operative left foot x-ray (Figs. 7, 8). The patient was hospitalized for two days to control her postoperative pain and swelling. Subsequently, her cast was changed, and her wound was assessed after two weeks. After six weeks, the cast was removed, and measurements were taken to fit her ankle foot orthosis. She achieved full bone and ligamentous healing in the corrected position while weaning off of the ankle foot orthosis was completed. During the follow-up examination, left foot supination that was causing gait alteration was noted.

On 1st March 2015, when the child was 11 years old, she underwent a tibialis anterior resection, an anterior ankle capsule release, a soft tissue release, and an osteotomy of the first ray to address the forefoot supination. The patient was hospitalized for two days to control her postoperative pain and swelling. After two weeks, her cast was changed and the wound was inspected. During the six-week follow-up period, the cast was removed and measurements were taken to fit her ankle foot orthosis, which was then applied for three months.

On 7th October 2017, the patient underwent posterior spinal fusion and instrumentation to resolve her thoracolumbar scoliosis.

Having had her scoliosis addressed through major surgery, the patient attended her regular follow-up appointment on 23rd July 2018. She presented with recurrent left foot equinovarus deformity. Despite a radical talectomy having been performed for the patient, clinical examination showed that the patient was walking with an ankle foot orthosis, while a foot examination evidenced forefoot adduction, supination, hindfoot rigidity and hindfoot valgus. An X-ray of the left foot showed a highly unexpected return of the talus bone (Figs. 9, 10).

On 18th August 2018, when the child had reached 15 years of age, she underwent a left foot revision talectomy to address the recurrent equinovarus foot deformity. A different technique was used for this talus removal than in the previous talectomies. The post-operative management was the same as for the previous talectomies, with no immediate post-operative complications. The post-operative x-ray presented in Figs. 11 and 12 was taken after the removal of the K-wires at the six-week follow-up post-revision appointment. Procedure done by Senior Pediatric Orthopedic Consultant.

3. Clinical discussion

A talectomy is a procedure that aims to achieve a painless and



Fig. 1. Right foot x ray shows recurrent Equinovarus foot deformity post soft tissue and bony and k wire fixation



Fig. 2. Left foot x ray shows recurrent Equinovarus foot deformity post bony and soft tissue procedures and k wire fixation



Fig. 3. Post-operative right foot X-ray.



Fig. 4. Post-operative right foot X-ray.



Fig. 7. Post-operative left foot X-ray.



Fig. 5. Pre-operative left foot X-ray.



Fig. 8. Post-operative left foot X-ray.



Fig. 6. Pre-operative left foot X-ray.

plantigrade foot [8]. As Simons' article [11] has observed, a clubfoot for which non-operative treatment has failed can be corrected via extensive subtalar soft tissue release [11]. This is attained through soft tissue release of the lateral aspect of the talonavicular joint, the lateral aspect of the subtalar joint, the calcaneofibular ligament, and the talocalcaneal ligament [11]. However, full correction is not maintainable through posteromedial release, and overcorrection is a particularly significant disadvantage following extensive subtalar soft tissue release [11].

The issue of recurrence has been reported in previous literature [8,9], with the surgical technique being crucial as a means of avoiding remnants of the talus or cartilage [12]. A study by Green et al. has



Fig. 9. Follow up left foot X ray.



Fig. 10. Follow up left foot X ray.



Fig. 11. Post-revision left foot X ray.

reported on 34 ft among 18 children with arthrogyriposis who underwent talectomies, stating that there were recurrences among those between two and six years of age; the recurrence occurred in seven feet, with four having remaining tali which were subsequently removed through revision operations [12]. Of the 28 ft operated on with talectomy as a means of addressing the equinvarus rigid deformity, four feet had poor results, with post-operative X-rays evidencing retained pieces of talus that required further revision surgery, as per Dias et al. [9]. Removing the talus in multiple pieces by biting it through multiple osteotomies can potentially result in the rapid development and



Fig. 12. Post-revision left foot X ray.

remodeling of a new talus bone, which takes its shape in its previous anatomical location, thus resulting in deformity recurrence.

Bosse believed that atypical clubfeet necessitate following a different treatment strategy from that typically used [13]. He argued that rigid arthrogyriposic clubfoot has an especially high recurrence rate irrespective of the treatment plan being adopted, and no definitive procedure without a relapse rate is known [13]. In our case, we believe that if a relapse of rigid foot deformity follows talectomy, then revision talectomy represents a valid intervention, taking into consideration the surgical steps necessary for removing the talus as one piece and avoiding a piecemeal talectomy.

Ponseti et al. have emphasized that early treatment to correct the deformity is the most effective method for maintaining the foot's proper development [14]. They evaluated 94 severe congenital clubfeet treated non-operatively, with recurrence necessitating further treatment arising in 53 ft [14]. The relapsed feet underwent soft tissue procedures [14]. The relapse rate was 28 %, with 1 % having poor functional outcomes [14]. We are documenting the case provided here to propose the consideration of talectomy as a bony procedure in the event of other treatment modalities' failure, especially for atypical clubfeet. Furthermore, if relapse arises, revision talectomy should be considered, and care must be taken during the necessary surgical steps to ensure the talus' complete removal, thus diminishing the recurrence rate [15].

4. Conclusion

The Surgical technique is critical for successful Talectomy. As reported, one of the causes of recurrence is remnant cartilage. The subtalar joint's exposure is a critical stage during the surgery, with the talus' removal in one piece being preferable to avoid remnant cartilage or pieces of talus, which is a risk when the talus is removed piecemeal. In our case, the talus' remodeling following talectomy caused recurrence,

which is correlated with the piecemeal method of the talus' surgical removal.

Funding

None.

Ethical approval

The study was approved by institutional review board in accordance with the national committee of bio ethics guidelines.

Consent

Written informed consent was obtained from the patient's parent for publication of this case report and accompanying images. A copy of the written consent is available for review by the editor-in-chief of this journal on request.

Author contribution

Abdullah Al-Marshad contributes the paper with writing the paper and data analysis.

Thamer Alhussainan contributes the paper with Supervision, data analysis and interpretation.

Omar Al-Mohrej contributes the paper with data collection, data analysis and interpretation.

Registration of research studies

Not required.

Guarantor

Abdullah AlMarshad.

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Declaration of competing interest

None.

References

- [1] A.K. Walling, The adult clubfoot (Congenital pes Cavus), *Foot Ankle Clin.* 13 (2008) 307–314, <https://doi.org/10.1016/j.fcl.2008.02.002>.
- [2] Z. Miedzbrodzka, Congenital talipes equinovarus (clubfoot): a disorder of the foot but not the hand, *J. Anat.* 202 (2003) 37–42, <https://doi.org/10.1046/j.1469-7580.2003.00147.x>.
- [3] I.V. Ponseti, J. Campos, Observations on pathogenesis and treatment of congenital clubfoot, *Clin. Orthop. Relat. Res.* 84 (1972) 50–60, <https://doi.org/10.1097/00003086-197205000-00011>.
- [4] M.B. Dobbs, J.A. Morcuende, C.A. Gurnett, I.V. Ponseti, Treatment of idiopathic clubfoot: an historical review, *Iowa Orthop J.* 20 (2000) 59–64.
- [5] P.J. Moroney, J. Noël, E.E. Fogarty, P.M. Kelly, A single-center prospective evaluation of the ponseti method in nonidiopathic congenital talipes equinovarus, *J. Pediatr. Orthop.* 32 (2012) 636–640, <https://doi.org/10.1097/BPO.0b013e31825fa7df>.
- [6] J.A. Morcuende, L.A. Dolan, F.R. Dietz, I.V. Ponseti, Radical reduction in the rate of extensive corrective surgery for clubfoot using the ponseti method, *Pediatrics* 113 (2004) 376–380, <https://doi.org/10.1542/peds.113.2.376>.
- [7] H.J.P. Van Bosse, S. Marangoz, W.B. Lehman, D.A. Sala, Correction of arthrogryptic clubfoot with a modified ponseti technique, in: *Clinical Orthopaedics and Related Research*, 2009, pp. 1283–1293, <https://doi.org/10.1007/s11999-008-0685-6>.
- [8] J. Legaspi, Y.H. Li, W. Chow, J.C.Y. Leong, Talectomy in patients with recurrent deformity in club foot, *J. Bone Jt. Surg. Ser.B* 83 (2001) 384–387, <https://doi.org/10.1302/0301-620X.83B3.11051>.
- [9] L.S. Dias, L.S. Stern, Talectomy in the treatment of resistant talipes equinovarus deformity in myelomeningocele and arthrogryposis, *J. Pediatr. Orthop.* 7 (1987) 39–41, <https://doi.org/10.1097/01241398-198701000-00008>.
- [10] M.B. Menelaus, Talectomy for equinovarus deformity in arthrogryposis and spina bifida, *J. Bone Jt. Surg. Ser. B* 53 (1971) 468–473, [https://doi.org/10.1016/0022-3468\(72\)90188-1](https://doi.org/10.1016/0022-3468(72)90188-1).
- [11] G.W. Simons, Complete subtalar release in club feet. Part I. A preliminary report, *J. Bone Jt. Surg. Ser. A* 67 (1985) 1044–1055, <https://doi.org/10.2106/00004623-198567070-00008>.
- [12] A.D.L. Green, J.A. Fixsen, G.C. Lloyd-Roberts, Talectomy for arthrogryposis multiplex congenita, *J. Bone Jt. Surg. Ser. B* 66 (1984) 697–699, <https://doi.org/10.1302/0301-620x.66b5.6389557>.
- [13] H.J.P. Van Bosse, Challenging clubfeet: the arthrogryptic clubfoot and the complex clubfoot, *J. Child. Orthop.* 13 (2019) 271–281, <https://doi.org/10.1302/1863-2548.13.190072>.
- [14] I.V. Ponseti, E.N. Smoley, The classic: congenital club foot: the results of treatment, *Clin. Orthop. Relat. Res.* (2009) 1133–1145, <https://doi.org/10.1007/s11999-009-0720-2>.
- [15] R.A. Agha, T. Franchi, C. Sohrabi, G. Mathew, A. Kerwan, A. Thoma, A.J. Beamish, A. Nouredin, A. Rao, B. Vasudevan, B. Challacombe, B. Perakath, B. Kirshtein, B. Ekser, C.S. Pramesh, D.M. Laskin, D. Machado-Aranda, D. Miguel, D. Pagano, F. H. Millham, G. Roy, H. Kadioglu, I.J. Nixon, I. Mukherjee, J.A. McCaul, J. Chi-Yong Ngu, J. Albrecht, J.G. Rivas, K. Raveendran, L. Derbyshire, M.H. Ather, M. A. Thorat, M. Valmasoni, M. Bashashati, M. Chalkoo, N.Z. Teo, N. Raison, O. J. Muensterer, P.J. Bradley, P. Goel, P.S. Pai, R.Y. Afifi, R.D. Rosin, R. Coppola, R. Klappenbach, R. Wynn, R.L. de Wilde, S. Surani, S. Giordano, S. Massarut, S. G. Raja, S. Basu, S.A. Enam, T.G. Manning, T. Cross, V.K.L. Karanth, V. Kasivisvanathan, Z. Mei, S.C.A.R.E. The, Guideline: updating consensus surgical CAsE REport (SCARE) guidelines, *Int. J. Surg.* 84 (2020) 226–230, <https://doi.org/10.1016/j.ijsu.2020.10.034>.