

## SURGICAL TREATMENT OF CLEFT FOOT USING DOUBLE OPPOSING Z-PLASTY

### KARŞI YERLEŞİMLİ Z-PLASTİ İLE YARIK AYAK ONARIMI

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#### ABSTRACT

Cleft foot deformity may clinically be seen in a wide spectrum of presentations, ranging from skin cleft to several ray deficiencies of the central region of the forefoot. The typical cleft foot is characterized by the congenital absence of one or several median rays, with normal rays bordering the cleft. Unless treated surgically, two pincer-like deformities will appear at the distal end of the foot as the child grows. The primary objectives for reconstruction of cleft foot are closing the cleft to a certain level, maintaining a symmetrical foot, and preserving the position of the border rays to prevent collapse and valgus deformities of the toes.

A simple surgical approach to reconstruct cleft foot using double opposing Z-plasty in a patient with bilateral cleft feet is reported here.

**Key words:** Cleft foot, surgical treatment, double opposing Z-plasty

#### ÖZET

Yarık ayak klinik olarak, basit cilt yarığında ayağın santral yerleşimli parmaklarının yokluğuna dek çeşitlilik gösterebilmektedir. Tipik olan formunda I. ve V. parmaklar mevcut olup bu parmaklar arasında kalan parmakların bir ya da daha fazlası mevcut değildir. Olgular cerrahi olarak tedavi edilmezlerse ayaklarda zamanla kerpetene benzer bir görünüm oluşur. Cerrahi tedavide amaç; yarığı belli seviyelere dek kapatmak, simetrik bir ayak oluşturmak ve I. ve V. parmakların pozisyonlarını korumasını sağlayarak valgus deformitesini önlemektir. Bu sunumda, bir ayağında santral yerleşimli üç parmağı, diğer ayağında ise santral yerleşimli iki parmağı olmayan ve iki taraflı yarık ayak deformitesi "double opposing z-plasty" yöntemini kullanılarak düzeltme yapılan olgu sunulmaktadır.

**Anahtar kelimeler:** Yarık ayak, cerrahi tedavi, karşı yerleşimli Z-plasti

#### CASE

A boy was referred to our unit, when he was a newborn, with the diagnosis of bilateral cleft lip and palate, bilateral cleft hand and feet and bilateral naso-lacrimal deformities. He was operated for cleft lip at 3 months, cleft palate at 12 months, and cleft hand and feet at 18 months.

He had 3 central ray deficiencies in the right foot and 2 central ray deficiencies in the left one. There was also a complete syndactyly between the 4th and 5th toes in the left foot and hallux valgus deformity in the right side (Fig.1).

Roentgenograms revealed four metatarsals for both feet (Fig.2).

The main complaint of the patient's family was difficulty in finding appropriate shoes since the patient's feet were wide.

The patient was treated surgically using double opposing Z-plasty for both feet at the same session.



Figure 1. Preoperative appearance of the cleft feet

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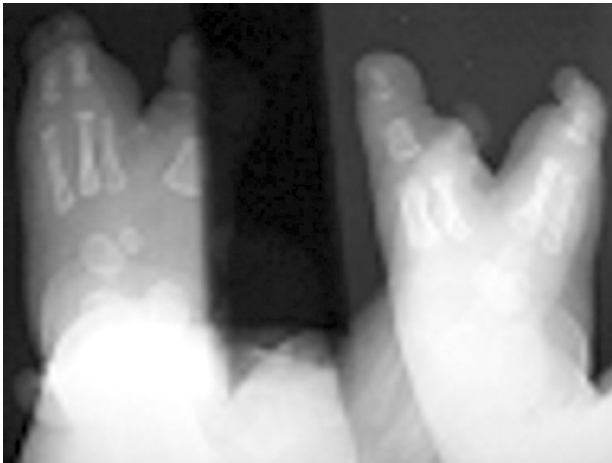


Figure 2. Preoperative roentgenogram of the feet



Figure 3. Outlining the cleavage area and the opposing Z-plasties on both the dorsum and sole of the foot

### SURGICAL TECHNIQUE

The cleft was manually closed by grasping the foot with one hand, and then a sterile ink marker was applied to outline the margins of the cleft on both sides, the dorsum and the sole of the foot. The cleft was opened so that the ink marker would outline the rhomboid shaped skin that was going to be excised. Care was taken to protect the neurovascular structures while skin and subcutaneous tissue were being excised. A double opposing Z-plasty was planned on both the plantar and dorsal sides of the foot (Fig. 3). After elevating the flaps, Etibond (Ethicon®, 2/0) was inserted through the holes drilled on adjacent metatarsals (the first and third metatarsal heads) as a retention suture to decrease the distance between the metatarsal bones, thus the width of the forefoot.

Capsular releases of interphalangeal joints and intramedullary K-wire fixation of the first ray was performed for correction of the valgus deformity on the right side (Fig. 4)



Figure 4. Postoperative roentgenogram of the feet. Note the right first toe in the corrected position



Figure 5. Postoperative appearance of the cleft feet

After achieving hemostasis, flaps were transposed to their new locations. Complete syndactyly in the left 4th web was corrected at the same session. Defects created after syndactyly correction were repaired with the full thickness skin graft harvested from the rhomboid skin excision. Splints were applied for 6 weeks and the patient was allowed to walk after the splints were removed. Function was considered sufficient when the child could ambulate and wear shoes. No custom-made shoes were needed. A good cosmetic foot appearance was achieved using double opposing Z-plasty (Fig. 5). After a 3.5 years of follow-up, the patient had no complaints related to walking and the shoes were fitting well.

### DISCUSSION

Cleft foot deformity is an extremely rare deformity (1/90,000). Generally one or more toes and parts of their metatarsals are absent and often the tarsals are abnormal. Clinical presentation can be associated with cleft lip, cleft palate, cleft hand and nasolacrimal deformities as occurred in this case (1,4,7,8).

Based on a study of the roentgenographic characteristics of cleft feet, Blauth-Borisch classified the deformities into six types based on the number of metatarsal bones pre-

sent. Types I and II are cleft feet with minor deficiencies, both having five metatarsals. The metatarsals are all normal in type I and partially hypoplastic in type II. The number of metatarsals decreases progressively: type III, four metatarsals; type IV, three metatarsals; type V, two metatarsals; and type VI, one metatarsal (3).

Two additional forms were identified: cleft foot with central polydactyly, called polydactylous type, and monodactylous foot with the lower-leg diastasis or tibial aplasia or both, described as diastatic type (8).

Abraham et al. described a simplified clinical classification on which they based treatment recommendations. Type I has a central ray cleft or deficiency (usually second or third rays or both) extending up to the mid-metatarsal level without splaying of medial or lateral rays. Type II has a deep cleft up to the tarsal bones with forefoot splaying. Type III is a complete absence of the first through third or fourth rays (1).

This patient had type III deformity according to Blauth-Borisch's classification and type II deformity according to Abraham's classification.

The indications for surgical treatment are to improve both shoe wear and cosmetic appearance of the foot. Since the degree of deformity in cleft foot varies from one patient to another, there is no standard surgical procedure defined for cleft foot surgery. Therefore, the treatment should be determined according to the degree of malformation, which may range from observation, simple cleft closure with preservation of toes, to an unavoidable ablation of toes, or reconstruction of missing toes (1,2,5,6,7).

In Blauth-Borisch types I -II and in Abraham type I, very little surgery may be necessary. Simple closure of the clefts is the appropriate operative procedure for treatment of cleft foot deformity with no or one central ray deficiency, where the forefoot is narrow and the toes tend to overlap. However, if a cross-bone exists, it is helpful to remove this to decrease the width of the foot (1,8).

In Blauth-Borisch types III, IV, V, and Abraham type II with two or several central ray deficiencies, closure of the cleft using triangular or rectangular flaps by syndactylizing the cleft with hallux valgus correction if needed has been suggested. Metatarsal osteotomies are combined with closure of the cleft. K-wire fixation, removal of useless metatarsals, and holding the remaining metatarsal with a ligament are helpful additional techniques (1,8).

We have also made use of the triangular flaps in the repair of the cleft in this case.

In Blauth-Borisch types V and VI cases, more complicated foot surgery may be necessary. Heel-cord lengthening, osteotomies of the navicular and cuboid, excision of prominent bony masses, or even tendon transfers may become necessary. In Abraham type III, surgical correction is not recommended (1,8).

Therefore, the great toe pronation and its overriding on the adjacent ray can lead to subtle difficulties with shoe wear, a special effort was made to correct moderate to severe hallux valgus. Great toe valgus is corrected by performing lateral capsulotomies in either the deformed interphalangeal joint, as in this case, or the metatarsophalangeal joint (1).

In conclusion, a simple and practical approach to the management of typical cleft foot using double opposing Z-plasty is reported. Using this technique, cleft foot is easily closed, forefoot's width maintained, and as the tissue tension is distributed in different directions widening of the cleft and hypertrophic scarring were avoided. For the reasons mentioned above, this technique is recommended as a functionally and aesthetically pleasing method in the management of appropriately selected patients with cleft foot.

## REFERENCES

1. Abraham E, Waxman B, Shirali S, Durkin M. Congenital cleft foot deformity treatment. *J Pediatr Orthop* 1999; 19: 404-410.
2. Agarwal R. Repair of cleft earlobe using double opposing Z-plasty. *Plast Reconstr Surg* 1998; 102: 1759-1760.
3. Blauth W, Borisch NC. Cleft feet: proposals for a new classification based on roentgenographic morphology. *Clin Orthop* 1990; 258: 41-8.
4. Kocaoglu M, Goksan SB, Yazicioglu O, Yavuzer Y, Aritamur A. A unilateral atypical cleft foot. *Foot* 1993; 3:209-211.
5. Sumiya N, Onizuka T. Seven years' survey of our new cleft foot repair. *Plast Reconstr Surg* 1980; 65: 447-459.
6. Sunagawa T, Kimori K, Ikuta Y, Ishida O, Tani Y. Microvascular toe transfer for cleft foot plasty: eight year follow-up. *J Reconstr Microsurg* 2002; 18: 83-85.
7. Tani Y, Ikuta Y, Ishida O. Surgical treatment of the cleft foot. *Plast Reconstr Surg* 2000; 105: 1997-2002.
8. Wood VE, Peppers TA, Shook J. Cleft foot closure: a simplified technique and review of the literature. *J Pediatr Orthop* 1997; 17: 501-504.