

Distraction Osteogenesis for Brachymetatarsia by Using Internal Device

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Summary: Congenital brachymetatarsia most commonly involves the fourth ray and may be combined with metacarpal shortening. Now, many reports demonstrated the usefulness of distraction osteogenesis for lengthening of the metatarsals by using an external distraction device. In this article, we treated shortening fourth metatarsal by bone lengthening using the internal distraction device. This technique has some advantages over the method of external distraction. (*Plast Reconstr Surg Glob Open* 2017;5:e1381; doi: 10.1097/GOX.0000000000001381; Published online 25 July 2017.)

Brachymetatarsia may be caused by a congenital defect or it may be an acquired condition. It most frequently involves the fourth metatarsal.¹ Several surgical options have been described for the treatment of brachymetatarsia. Gradual lengthening of the metatarsals has become popular²⁻⁴ when more than 10 mm of metatarsal lengthening is required, since Skirving and Newman⁵ reported the use of gradual metatarsal lengthening.

Although the external distraction device is the most common for gradual metatarsal lengthening, there are several disadvantages, such as long-term exposure of the device on the foot, screw-track infection, and visible scarring at the screw-track.⁵⁻⁷ However, there are few articles on using an internal device for metatarsal distraction.⁸

In this article, we have successfully achieved metatarsal distraction using an internal device and obtained a good cosmetic result.

CASE REPORT

The patient is a 16-year-old woman with bilateral brachymetatarsia of the fourth metatarsal. She had already undergone left metatarsal distraction by using an external device. During the 7-month consolidation period, she felt inconvenienced because she could not wear shoes in everyday life. Also, because of the screw-track infection, the

regenerative bone did not have sufficient thickness. She and her family strongly desired to perform the right metatarsal distraction by internal device.

The skin was incised 2 cm along the metatarsal bone. After installing the internal device (NAVID system, Medical U&A, Osaka, Japan) on the periosteum of metatarsal bone, the periosteum was longitudinally incised. Then the metatarsal was osteotomed and periosteum was closed. The Z-plasty lengthening of the extensor digitorum longus tendon was not performed. The device was covered by skin, and only the shaft for extending the device was exposed between fourth and fifth toe.

Seven days later, the distraction was initiated at a rate of 0.5 mm per day.

Distraction was stopped on the 30th day when lengthening of 15 mm was achieved. To discontinue distraction, the exposed part of the rod was cut close to the skin, and the remaining part was left in place for another 6 months. There was neither infection nor neurovascular complication during the consolidation period. Then, good regenerative bone was recognized by radiographic evaluation, and the distractor was removed under general anesthesia. One year after the surgery, there were no fractures nor relapse, and good osteogenesis was obtained (Fig. 1).

DISCUSSION

The treatment for brachymetatarsia, the callus distraction using external device, is more popular than 1-stage lengthening. There are few articles describing the internal device for callus distraction.⁸ Compared with the external device, the internal device has some advantages as follows: the patients can put on socks and shoes during the consolidation period. Because of that, the consolidation period can prevent reshortening after removal of the device.

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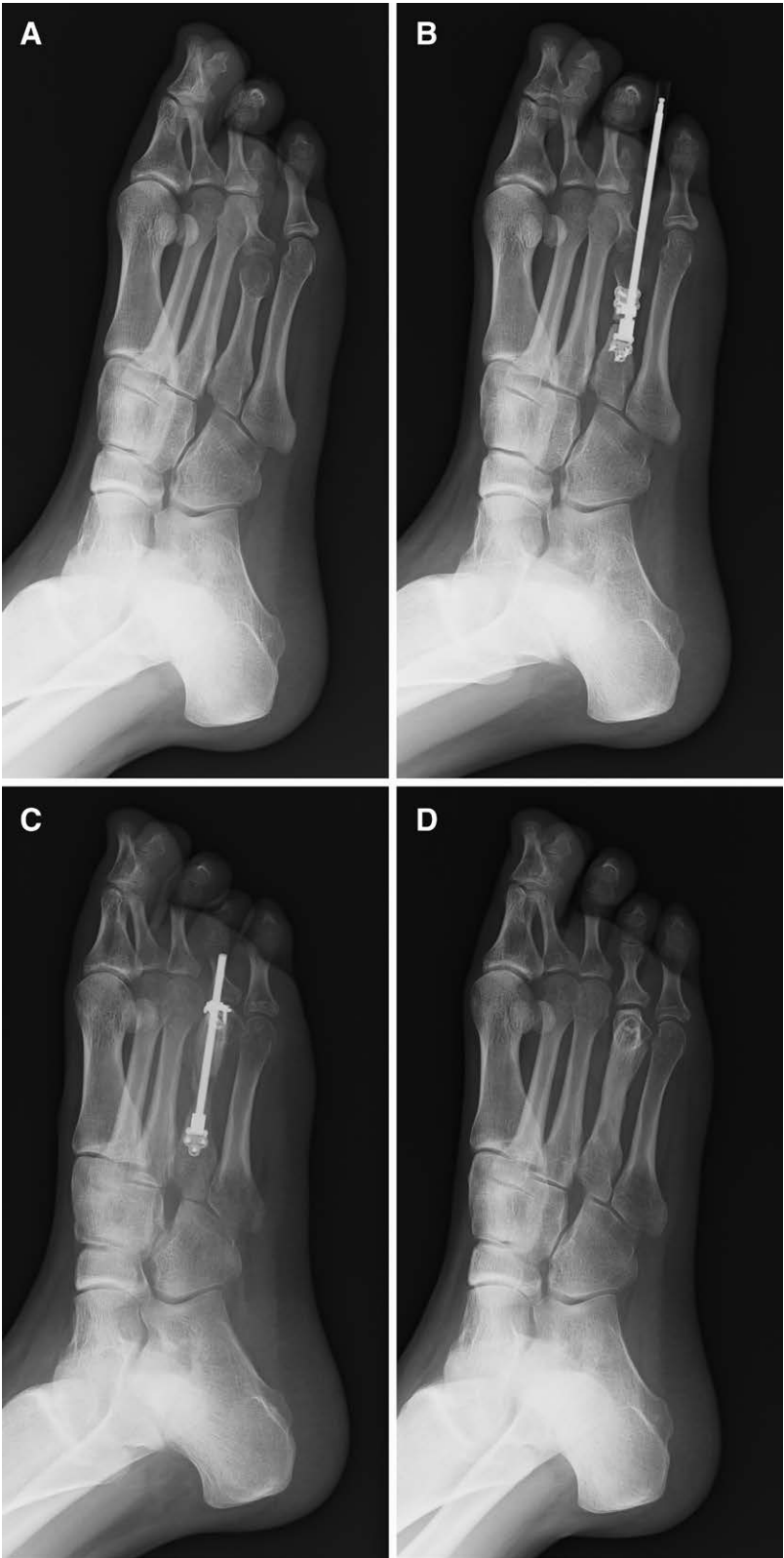


Fig. 1. A 16-year-old female with brachymetatarsia of fourth toe. Preoperative view (A), postoperative view before the distraction (B), postoperative view during consolidation period (C), and postoperative view 1 year after removing the device (D).

However, one of the disadvantages of the internal device based on the previous literature was the strength of the device. Callus fracture and breakage of the device because of the slender rod was reported. Compared with the previous device, the rod of the device used in this article is thick and strong.

Previous articles also described that damage to the periosteum with an internal distraction device is larger than that of an external device. They had installed the internal device not on the periosteum, but directly on the metatarsal bone; however, we did not think that the internal device should be installed on the metatarsal bone. We placed the device on the periosteum. The screw for the internal device is much smaller than that for the external device, and we believe the damage to the periosteum with an internal device is less than that of an external one.

However, the disadvantage of our method is the removal of the internal device. Although it was easy because it was installed on the periosteum, the external was much easier to remove than the internal device. But the internal device could prevent the visible scar at the screw-track.

CONCLUSIONS

In conclusion, the procedure of callus distraction using the internal distraction device obtained a good cosmetic result and had many advantages, such as daily life of the patient during consolidation period, the prevention of resorption, reshortening, and fracture.

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