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Case Report

The Dorsal Bunion Diagnosis, Evaluation and Management: About A Case Report and Review of the Literature

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Abstract: Of all the misalignments of the first ray of the foot, the dorsal bunion is the least known. The dorsal bunion deformity consists of the elevation of first metatarsal head, plantar flexion contracture at the first metatarsophalangeal joint, and dorsiflexion contracture of the tars-metatarsal joint. The deformity presents most commonly after clubfoot treatment but can also be a sequela of various neuromuscular foot conditions, including poliomyelitis and cerebral palsy. We report two case of dorsal bunion. A 30 year-old man and a 14 year-old girl, the both are an iatrogenic pathology secondary to a clubfoot surgery. Treated by different surgery technique and the results were satisfied in the two cases. The dorsal bunion results from a musculo-ligament imbalance at the level of the first ray, which involves 4 muscles: the long fibular, the flexor of the hallux, the anterior tibial and the triceps sural. The flexibility of the navicular-cuneate and cuneo-metatarsal joints also plays an important role. It was Lapidus who coined the term "dorsal bunion" and developed an operative technique that bears his name. Several interventions have been proposed in the literature, the majority of which stem from Lapidus's intervention.

Keywords: Diagnosis, clubfoot treatment, dorsal bunion, unloaded foot.

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INTRODUCTION

Dorsal bunion (DB) is a rare deformity of the great toe consisting of first metatarsal head elevation, plantar flexion contracture at the first metatarsophalangeal joint, and dorsiflexion contracture at the tarsometatarsal joint (figure 1) [1]. The deformity presents most commonly after clubfoot treatment but can also be a sequela of various neuromuscular foot conditions, including poliomyelitis and cerebral palsy [2,3]. The deformation is apparent in the unloaded foot but becomes accentuated when the patient is walking or weight-bearing. The complaints are aesthetics, pain and walking instability. We report a case of DB occurring after clubfoot treatment with a brief review of literature.

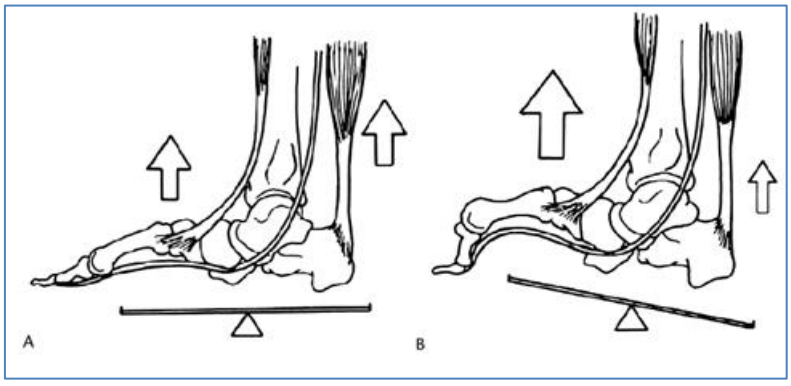

Fig-1: A, Normal foot showed balance of muscle pulling. B, The drawing showed weak Achilles tendon function with compensation of flexor hallucis longus function and overpulling of anterior tibial tendon. It causes flexion deformity of the first metatarsophalangeal joint, and elevation of metatarsal head resulted in dorsal bunion [1].

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CASE REPORT

We report the case of a 30 years old doctor, previously treated surgically for a congenital clubfoot at age of 18 months (figure 2).

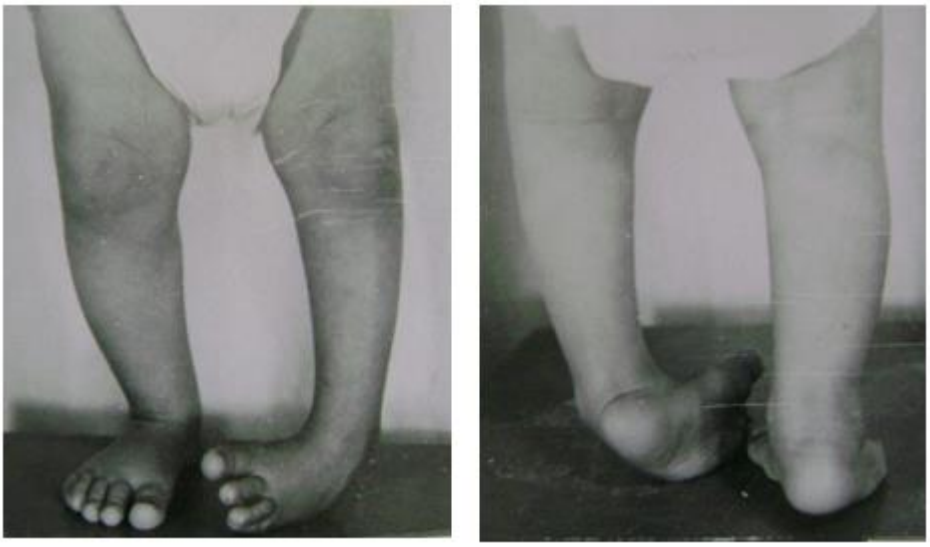

Fig-2: Congenital clubfoot at age of 12 months

He consulted 28 years after first surgery for a left calf amyotrophy and dorsal bunion deformity (figure 3). He complained of metatarsalgia and painful footwear. He was forced to change his medical speciality.

Fig-3: Dorsal bunion of the left foot

X-ray of the left foot, showed horizontal alignment of the first metatarsal, flexion of the first MTP and an extension of the IPP joint of the hallux (Figure 4).

Fig-4: X-ray of the left foot, showing the horizontal alignment of the first metatarsal, flexion of the first MTP and an extension of the IPP joint of the hallux

He had an open wedge cuneiform-metatarsal osteotomy filled with a triangle and dorsal-based iliac-crest autograft. The first cuneo-metatarsal joint arthrodesis was stabilized using a compression staple.

The flexor hallucis longus was then severed from its insertion and pulled dorsally to the neck of the first metatarsal through an oblique bone channel drilled in the shaft of this bone. He was immobilized in a caster boot for two months.

After 2 months, the patient removed the plaster, he was satisfied, the scar was clean, the morphology of the foot was normal (Figure 5).

Fig-5: Photos taken 2 months postoperatively

The X-ray, show that there was still a slight elevation of the M1 cervix (Figure 6), but this had no clinical manifestation; in addition it was very well tolerated by the patient.

Fig-6: Post-operative *x-rays taken 2 months*

DISCUSSION

The "Dorsal Bunion" is a deformation of the first radius of the foot. It was described in the first time by Lapidus [2] on 1940. It combines dorsal flexion of the first metatarsal, plantar flexion of the metatarsophalangeal (MTP), an extension of the inter phalangeal and a dorsal callus of the distal phalangeal joint.

This deformation can cause aesthetic or functional discomfort due to a conflict with the shoes and instability when walking.

The two reasons for consultation, usually associated, are aesthetics and metatarsalgia. Radiologically, the diagnosis can be confirmed on a profile foot x-ray under load when the difference in height between the lower edge of the head of the fifth metatarsal and the lower edge of the sesamoïdes reaches 5 mm.

The mechanism of the dorsal bunion depends on the musculo-ligament balance at the level of the first ray and on the flexibility of the cuneo-navicular joint and cuneo-metatarsal joints which also plays an important role. Four muscles are involved to varying degrees: the long fibular, the flexor hallucis, the tibialis anterior and the soleus muscle.

Lapidus [2] suggested that the mechanism of the dorsal bunion was a weakness of the long fibular with a strong tibialis anterior associated with an imbalance between the flexors of the hallux which are strong and the extensors, which are weak. The tibialis anterior, which is strong brings the first metatarsal in dorsiflexion especially that it is not opposed by the

weak long fibular which is a plantar flexor of the first metatarsal.

Meary [4] believed that weakness of the soleus muscle is important for the development of deformity. Mc Kay [5] found that the dorsal bunion develops when the patient tries to do plantar flexion using the hallux flexors to compensate the weakness of his soleus. He believed that the flexor hallux was the cause of the distortion.

Johnston and Roach [6] suggested that the dorsal bunion results from an imbalance between the elevation of M1 (by the anterior tibialis) and its lowering (by the long fibular) and an imbalance between the flexors of the big toe and the extensors.

According to Kuo [7], the major factors of dorsal bunion sequelae of clubfoot surgery are: weakness of the Achilles tendon, a long hallux flexor that is too powerful, an overall supination of the forefoot associated to a powerful tibialis anterior and weakness of the long fibular. A dorsiflexion correction without lengthening the long flexor of the first toe is a specific factor in the dorsal bunion following the postero-internal release surgery.

Recently, Jeffrey and Johnson [8] think that the dorsal bunion is included in a multiplanar deformation of the foot. It associates a dorsiflexion of the first ray which begins at the level of the naviculo-cunean joint with a supination of the forefoot. They think that the correction must concern the origin of the deformation and correct it in all the planes.

Many clinical syndromes related to the dorsal bunion have been described in the literature. The most common is the paralytic foot, especially that of poliomyelitis, spina bifida, Charcot Marie Tooth.

Among the etiologies of the dorsal bunion, the congenital clubfoot operated by a postero-internal release is the most described because of its frequency and its iatrogenic nature. Supination of the forefoot may be at the origin of the dorsal bunion [9].

In case of hallux rigidus, to have an analgesic position, the patient keeps his big toe flexed and his forefoot supine. Over time, it loses the extension of the first phalanx of the big toe and develops a dorsal exostosis at the head of the first metatarsal [9].

Other clinical syndromes may also be involved in the dorsal bunion such as the sequelae of hallux valgus surgery and the dislocation of Lisfranc [9].

Congenital malformations of the first ray can also be the cause of this deformation, the brevity of the first metatarsal, ancestral foot, metatarsus varus primus [10].

Many surgical techniques have been reported to treat this deformation. Hohmann from 1934 [11] proposed a simple resection of the dorsal exostosis or the base of the phalanx. This technique ended in failure since it did not consider the cause but treated only the morphological consequence.

In 1940, Lapidus [1] described a procedure for patients with poliomyelitis that combined arthrodesis of the first metatarsal cuneiform joint, capsulorrhaphy of the first metatarsophalangeal joint, transfer of the flexor halluces longus to the distal end of the first metatarsal, and the tibialis anterior tendon posteriorly to the tibialis posterior tendon. He stressed that correction of the faulty first metatarsal position is important when correcting the dorsal bunion deformity. He performed this procedure in 6 patients between 1932 and 1939 with encouraging results.

Hammond [12] described a procedure using a cortical bone graft for a first metatarsal cuneiform joint arthrodesis. The insertion of the tibialis anterior is transferred to the middle of the foot without transferring the flexor halluces longus. McKay [5] suggested the transfer of flexor hallucis brevis to the first metatarsal head to produce plantar flexion of the metatarsal. The interphalangeal joint is arthrodesed.

In his textbook, Tachdjian [13] described the technique of flexion osteotomy at the base of the first metatarsal bone with transfer of the flexor halluces longus to the metatarsal head.

Mestdagh in 2004 [10] reported a series of dorsal bunion which were treated with a surgical technique associating plantar wedge resection of the base of the first metatarsus; distal disinsertion and unwinding of the long flexor of the hallux below the base of the first metatarsus and then reinsertion on a distal dorsal capsular flap of the metatarsophalangeal joint; distal anterior tibialis tendon disinsertion and posterior tibialis tendon tenodesis.

Adrien in 2005 [9] used the Lapidus technique and transferred the anterior tibialis to the cuboid. The correction was satisfactory.

Jeffrey and Johnson [8], in 2007, developed a technique which combines arthrodesis of the navicular bone and the first cuneiform, interposition of a triangular cortical graft with dorsal base to correct dorsiflexion of the first ray and interposition of a tri-cortical graft between the first and second cuneiform to correct the supination of the medial column.

Yong [15] in 2007 recently reported a series of 33 dorsal bunion deformities operated by the Reverse Jones technique, associating a metatarsal osteotomy in 18 cases and a transfer of the anterior tibialis in 12

cases. He did not report a recurrence at the level of the 18 feet which had a metatarsal osteotomy and he noted 5 recurrences, requiring surgical repetitions, at the level of the other 15 feet.

CONCLUSION

The "Dorsal bunion" is a deformation of the forefoot, which generally reflects a complex muscular imbalance of the first ray. The analysis of these possible muscular paralyzes and the state of the tarso-metatarsal and metatarsophalangeal joints is essential to properly establish the appropriate surgical strategy. The arthrodesis is usually indicated for fixed deformations. Tarsectomy should be reserved for severe global forefoot supination. For the other forms of dorsal bunion, there are several techniques whose indication is discussed case by case based on a good clinical, radiological analysis and an understanding of the etiopathogenesis of the deformation.

Competing interests

The authors declare no competing interests.

Authors' contributions

Ameni Ammar and Oussama Abcha have participated in all phases of this study during proposal preparation, data collection, data analysis and manuscript writing. Amal Abayed and Sandra Ben Youssef have participated in the manuscript writing. Mourad Jenzri, Mohamed Samir Daghfous and Omar Zouari contributed in the manuscript revision. All the authors read and approved the final version of the manuscript.

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