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## Plantar Dislocation of the First Metatarsophalangeal Joint

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**Abstract-** Plantar dislocation of the first metatarsophalangeal joint is an extremely rare primary hyperflexion injury of forefoot. A 32-year-old female was admitted to our emergency with a deformity and pain on his right foot. Dislocation was caused by motor vehicle. On physical examination mild swelling of the first MTPJ and plantar dislocation of the great toe were evident. Diagnosis was made on anteroposterior, and medial oblique radiographs. They confirmed a plantar dislocation of the right first MTPJ. The patient was treated with closed reduction of the first metatarsophalangeal joint by means of distraction. Twenty months after surgery no osteoarthritic changes, no narrowing and no limitation of the first MTPJ were encountered. The clinical result was good and the patient was satisfied.

**Keywords:** *great toe, metatarsophalangeal joint, plantar dislocation.*

**GJMR-H Classification:** *NLMC Code: WE 304, WE 31*



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# Plantar Dislocation of the First Metatarsophalangeal Joint

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## I. INTRODUCTION

Dislocation of the first metatarsophalangeal joint is an uncommon injury. The anatomical complexity of the first metatarsophalangeal joint makes this injury one of a kind. Jahss [1] describes two cases in 25,000 patients (incidence of 0.008%) and Giannikas *et al.* [2] report four cases in 10,000 patients (incidence of 0.04%). The most common cause of this injury is a motor vehicle accident. Falls from heights and athletic injuries are secondary causes [1]. Most of these dislocations had been treated conservatively. We are reporting a case of isolated closed plantar dislocation of the first metatarsophalangeal joint after a classic severe primary hyperflexion injury of forefoot in a non-lactating female with no pre-existent deformities or muscular imbalances.

## II. PATIENT AND OBSERVATION

A 32-year-old female with no significant past medical history presented to the our Emergency Department with a chief complaint of a deformed and painful left first MPJ. The forefoot struck against the pedal of the motor vehicle while the body was projecting forward. Examination of the great toe revealed swelling and deformity with total functional impairment of the toe. There was no superficial laceration of the skin or neurovascular deficit. The first metatarsophalangeal joint was swollen and the axis of the great toe was altered to

hyperextension. The blood supply and sensation to the great toe were intact. The other toes had normal sensation and capillary refill. Anteroposterior and medial oblique radiographs (Fig. 1a and b) revealed the plantar dislocation of the first metatarsophalangeal joint without associated fracture (Figure 4). The tibial and fibular sesamoids were found in relatively correct anatomic position to the first metatarsal head and to one another. There were no fractures visualized on any of the views of the left foot.

Immediate closed reduction of the metatarsophalangeal joint was performed under local anaesthesia and it was successful. The proximal phalanx was grasped and hyperextended onto the dorsal aspect of the first metatarsal with strong distraction. This resulted in a relocation of the first MPJ. After reduction, the stability and the range of movement (ROM) were checked and found to be satisfactory. The length of the first ray also appeared to be restored. For additional stability, fixation of the MTP joint was performed with a below knee cast was applied. The cast were removed after four weeks and weight bearing exercises started. The patient was prescribed a regimen of physical therapy that included ultrasound, whirlpool, stretching, and strengthening exercises for the first MPJ. Her activity status was weight bearing as tolerated, with progression to normal shoe gear over the next 4 months. One year after injury, the patient was asymptomatic and had full ROM of the MTP joint. At the clinical evaluation there was no deformity of the forefoot. The patient walked without pain and performed sports activities.

## III. DISCUSSION

The plantar dislocation is an extremely rare historical event [3, 4, 1, 5]. The anatomical structures of the joint, the direction and mechanics of the trauma and the type of shoe worn at the moment of the trauma all affect the type of the first MTPJ dislocation which can occur [4, 6, 7].

As the dorsal dislocation is produced by hyperextension injury of the forefoot [1], 2, 3, 8, 9], hyperflexion injury of the forefoot is incriminated as the primary mechanism in plantar dislocation of the metatarsophalangeal joint [3, 6, 9].

Garcia Mata *et al.* [10] reported a case of plantar dislocation of the first metatarsophalangeal joint in a lactating lady following minor trauma and noted the

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presence of physiological ligamentous laxity associated with normal increase in progesterone in lactating ladies. In 1988, Biyani et al. [6] reported a case of severe open plantar pan-metatarsophalangeal joint dislocation. The mechanism of injury, which they described, was a severe hyperflexion injury following a fall from 20 feet height. We report an example of a complete dislocation of the first MTPJ which occurred in a young woman. To our knowledge, this is the fourth case in literature which was treated by closed reduction of the plantar dislocation of the MTPJ of the great toe.

The plantar dislocation of the first metatarsophalangeal joint by Prasad et al. [11] constitute high energy injuries, resulting from fall from heights and represent Grade V of kodali's [12] modification of the classification by Clanton et al. [13]. They noted asymptomatic hallux valgus later and drew attention to the inherent difficulty in the identification of potential instability even after diligent intra-operative assessment. They pointed out that neither the mechanism nor the resultant injury is representative of plantar dislocation because of the pre-existent foot drop and can only be construed as a pathological injury.

Radiographs are very useful for detecting the relationship between the heads of the joints and for excluding fractures. In cases of dislocation of the first metatarsophalangeal joint, radiographs can show signs of chronic pathology (e.g., hallux rigidus). However, there is no agreement about the study of the controlateral foot using radiographs [14]. Some authors report that sequential radiographs could be very useful for diagnosing the proximal loosening of the sesamoids [14].

Once the diagnosis is certain, the dislocation should be reduced as soon as possible. Immediate reduction of the dislocation can limit numerous complications (e.g. ecchymosis, swelling, vascular compromise of the skin, etc.). After the closed reduction of the first metatarsophalangeal, a clinical examination of joint stability is necessary. This will enable evaluation of the integrity of the ligaments (varus-valgus stress, plantar and dorsal draw) and muscular strength.

A surgical approach is only used if a closed reduction is impossible [1, 8, 15]. There are various causes for the failure of closed reduction. It can be blocked by entrapment of the metatarsal head through the 'buttonhole' of the capsule [8]. Time between injury and intervention is a factor which influences the ability to obtain closed reduction [1]. After closed or open reduction, some authors recommend percutaneous fixation with Kirschner wire in cases in which the joint is unstable [15].

Follow-up of these injuries has showed good results with very less morbidity. In the literature, in association with dislocations of MP joints, skeletal injuries are also reported: avulsion fractures of the sesamoid, fractures of proximal phalanges and metatarsal fractures. Obviously, in these cases, the

result can be different according to the severity of the fractures.

#### IV. CONCLUSION

Provided the patient presents soon after injury, closed reduction is easily performed. Proper evaluation of the clinical and radiographic evidence is essential to classify the type of MTP dislocation, which is helpful in deciding the type of reduction method required to treat this rare injury. Concomitant injuries should also be looked for while treating this injury which may aid in closed reduction.

*Competing interests:* The authors declare no competing interest.



Figure 1 : Radiographs of planto-lateral dislocation of the first metatarsophalangeal joint.



Figure 2 : Radiograph after initial reduction of the first metatarsophalangeal dislocation



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