MANAGEMENT OF NON-REDUCIBLE LESSER-TOE INTERPHALANGEAL DISLOCATION: AN UNUSUAL INJURY

Interphalangeal joint (IPJ) dislocations of the lesser toes are relatively rare in clinical practice. Most of the non-reducible IPJ dislocations occur as a result of rupture and/or interposition of the plantar plate or of the collateral ligament in the joint space, thus hindering a closed reduction and, in most cases, compelling to an open reduction. A post-reduction radiological exploration is then essential in order to identify such entity and proceed consequently. In some cases, as the one introduced herewith, a misdiagnosis, along with an inadequate surgical correction may lead to recurrence of the deformity and ultimately to a salvage arthrodesis.

Introduction

Digital traumas are frequent encountered in the emergency rooms; however, they are usually considered as second-magnitude pathologies. This leads them to hold a scarcely relevant place within the therapeutic strategy, although, occasionally they may result in significant sequel, and gait difficulties. Even though non reducible dislocations of toes are rare injuries, when encountered usually involve the great toe. In a retrospective study with case reviews, Brunet et al demonstrated that half of the IPJ dislocations appeared as isolated post-traumatic deformities in the affected toe. To date only 13 IPJ dislocations have been reported in the literature, most of them occurred at the proximal IPJ, with the second toe being the one most frequently involved. Such dislocations may occur in the sagittal plane, producing a dorsal deviation of the toe; in the transversal plane, producing a medial or lateral deviation; or even in both planes, simultaneously. Most commonly published cases describe are young active individuals who sustained trauma which led to a dorsal displacement that most frequently affected the proximal IPJ. Irreducibility resulted from the interposition of injured soft tissues in the joint space. Brunet et al sustain that, virtually all traumatic dislocations of lesser interphalangeal joints require open reduction; most often, the plantar plate prevents closed treatment. In the fore mention scenario, unless adequate
surgery is performed in order to reduce the dislocation, any attempts of reduction will be ineffective as a result of the scarring produced by the soft tissues or, as in our case, of the resulting degeneration of the joint. To the best of our knowledge, there have been no reports describing recurrences of IPJ dorsal dislocations of lesser toes after open reductions.

Case report

A 20-year-old man presented with dorsal pain on his left foot October 2009. Noted was deformity in the sagittal plane and a severe functional impotence around the second toe. He reported to have been submitted to a surgical procedure after sustaining trauma in his left foot caused by an impact during a soccer match. He provided an emergency admission report from the hospital of reference, dated the 24th May 2009, indicating that the patient had presented due to pain at palpation in his second toe with associated hematoma at the traumatic site. Noted was history of hammertoe deformity (Fig.1). Based on radiologic studies, which included anteroposterior and oblique views, was the presence of a dislocation in the proximal IPJ of the second toe was noted (Figs. 2 and 3). Close reduction and bandage immobilization was attempted, however post-reduction radiographic studies revealed an incomplete reduction of the dislocation (Fig. 4). The patient was discharged and placed on Ibuprofen 600 mg every 8 hours and local cryotherapy. One month later, after an evaluation by the orthopedic surgery and traumatology outpatient department, the patient was scheduled for surgery with a diagnosis of post-traumatic hammertoe. The surgical operation involved tenodermodesis of the second toe, temporary fixation with two K-wires, inserted percutaneously across the joint. The patient reports that the fixations were removed six weeks later and that following removal of K-wires, the deformity reoccurred. A new radiographic study,
anteroposterior and oblique views revealed a dislocation of the proximal IPJ of the second toe with narrowing of the joint space. The patient reported a “pricking-type” pain after a slight palpation. A foreign body was palpated at the sub dermal level and a suspicion arose of the presence of a non-absorbable monofilament suture probably used during the procedure. Considering that his painful clinical condition handicapped the patient’s everyday activities, he was proposed a surgical procedure in order to correct the deformity and remove the suture material. The surgical intervention was performed on the 11th January 2010 and included a dorsal longitudinal incision at the level of the proximal IPJ, thus confirming the presence of a polypropylene monofilament suture, which was removed. A transversal incision was made in order to expose the IPJ and a significant joint degeneration was observed, with exposure of the subchondral bone dorsally of the head of the proximal phalanx (Fig. 5); consequently, the decision was made to proceed with arthrodesis via fixation with a K-wire. The tendon was repaired with an absorbable suture and the skin with a monofilament suture. His post-surgical evolution was favorable; the fixation was maintained for seven weeks and the desired surgical correction was attained with a normal walking pattern and the patient’s full satisfaction (Fig.6).

Discussion

In most of the non reducible IPJ dislocations reported, the main reason for irreducibility was a rupture of the plantar plate and its interposition in the joint space. After the original trauma, dorsal dislocation of the middle phalanx takes place and in turn results in weakening and or rupture of the plantar plate (most commonly in its proximal insertion), leading to its interposition in the joint and ultimately in its irreducibility. Furthermore, if the extensor mechanism is involved, the distal insertion of the plantar
plate will also be affected. Miki et al sustain that, for a complete dislocation to occur as a result of the interposition of the plantar plate, a complete rupture must take place in both the proximal and distal insertions \(^1\). Once the plantar plate is compromised, the extensor tendon exerts a deforming force because of its insertion in the middle and distal phalanges resulting in a dorsal displacement of the IPJ. Other structures may prevent the reduction of the joint, such as the collateral ligaments, which also can equally break and interpose in joint space. In this case, the lateral insertion of the short extensor of the toes may exert a deforming force towards the lateral side and this is why, in combined dislocations, the lesser toes deviate in the dorsal and lateral directions \(^13\). In our case, considering that the dislocation took place in the sagittal plane, the plantar plate interposed itself in the joint space, preventing a complete reduction of the deformity, a fact that was overlooked after the closed reduction and produced a recurrence of the deformity.

Debates have been raised questioning whether or not to perform closed reductions of these deformities systematically. Some authors suggest that most of these dislocations in the lesser toes can be easily reduced by traction and a conservative immobilization treatment \(^7,8\). On the other hand, based on the observation of the few cases appearing in the literature, open reductions are necessary \(^6,9-11\).

Tenodermodesis with fixation of the distal IPJ using K-wires has been a widely used procedure for treating mallet finger deformities associated with the rupture of the extensor and or dislocation of such \(^15,16\). Contrarily, no cases have been reported to the application of this technique for the correction of IPJ dislocations in the feet. There are very scarce references in the technical literature concerning the correction of digital foot deformities \(^17\). Commonly, dislocations are accompanied by associated injuries, such as
fractures and or joint capsule damages with extensor tendon lacerations\(^8,9\). In our case, the damaged joint capsule was accompanied by longitudinal extensor tendon laceration.

In diagnosing, radiographic anteroposterior and medial oblique views should be used, so as to obtain adequate appreciation of any phalangeal displacements, and or avulsion fractures\(^8\). A few cases of IPJ dislocations have been described in which an immediate x-ray exploration did not reveal a poor alignment but a widened joint space\(^11\).

Some authors suggest for the performance of closed reductions by means of longitudinal traction and under local anesthesia in dislocations affecting children\(^8\). However, we agree with other authors concerning the fact that closed reductions must not be performed by means of forced maneuvers that may easily intensify the lesion\(^14\). Brunet et al sustain that, almost all interphalangeal joint dislocation require open reduction principally because of an interposed unyielding plantar plate. Open management is more easily and safely accomplished through a dorsal approach; temporary pin fixation must be indicated only if the reduced joint is very unstable\(^6\). In our case, as the closed reduction was fruitless, an open reduction with a dorsal approach had to be made in order to identify and repair the broken or interposed anatomic structures that were hindering the reduction. We agree with some authors who argue that if the reduced joint appears to be very unstable, temporary transarticular pin fixation may be necessary; however, prolonged use of a pin could result in significant joint stiffness or, as in our case, result in a damaged joint\(^6,8\).

**Conclusion**

Non reducible IPJ dislocations of lesser toes are rare injuries and can be neglected by closed reduction and/or inadequate surgical treatment. Precautions should be taken, as these dislocations can hardly be visualized clinically and may go unnoticed after closed
reduction. Performance of a thorough radiological examination becomes essential in
determining whether or not the closed reduction was carried out successfully. Although
closed toe injuries in children rarely require operative treatment, severe and non
reducible dislocations in adults are indications for surgery, which should be performed
in a timely matter.
References


2. Noonan R, Thurber NB: Irreducible dorsal dislocation of the halluca


**Figure legends**

Figure 1. Photograph of the left second toe proximal IPJ dislocation. Important deformity is noted compared with the non-injured right foot.

Figure 2. Antero-posterior radiograph revealing dislocation of the middle phalanx in the proximal IPJ of the second toe.

Figure 3. Oblique radiographic projection.

Figure 4. Antero-posterior post-reduction radiological projection: incomplete reduction joint can be observed.

Figure 5. Intraoperative image showing the presence of cartilage damages affecting the proximal IPJ. Significant joint degeneration with exposure of the subchondral bone dorsally in the head of the proximal phalanx can be observed.

Figure 6. Photograph at 5 months follow-up. Adequate alignment of the second toe can be observed.