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Great toe transposition in a complex foot injury

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Abstract : Complex foot injuries often lead to dilemma in decision making concerning adequate soft tissue cover and bony stability, especially when there are one or more toes to be preserved. We present a case report of a complex foot injury with soft tissue loss over the first Meta Tarso Phalangeal (MTP) joint and bone loss of distal third first MetaTarsal(MT) and adjacent proximal third of first proximal phalanx with a viable great toe. The objective was to preserve the great toe. And to attain soft tissue cover over the MTP joint with osseous stability of the great toe. We could attain both the objectives by transposing the great toe onto the second metatarsal. We could obtain soft tissue cover and bone stability by arthrodesing the proximal phalanx of the great toe to the second metatarsal. Above all preserving the great toe and providing a relatively better cosmetic outcome in the young individual.

Keyword : Great toe, Transposition, Foot injury.

Introduction

Foot injuries are common in Motor Vehicle Accidents (MVA). Data from trauma registries suggest that foot and ankle injuries account for 8-12% of all moderate or serious injuries sustained in frontal collisions1,2,3. In India foot injuries were reported in 7.4% of patients following trauma4. The most common mode of injury was due to MVA (74%) and fall from height accounted for 20% of the injuries. The average age reported was 30 years (Range 10-81 years). There is lack of adequate epidemiological studies to depict the exact burden of foot injuries in India. Crush injuries of the foot following high speed collisions are difficult to treat as they end up with soft tissue and bone defects. Soft tissue cover over the distal aspect of the foot is difficult to attain. Local rotation flaps are not ideal in view of the associated extensive local degloving. Regional pedicled flaps like the sural artery flap might not succeed because of the extensive arc through which they have to be rotated through to provide forefoot cover. Combined soft tissue loss and bone loss as is often the case in these injuries, are difficult to treat. They commonly end up requiring a free flap, the expertise and facilities for which, may not be available at all trauma centres. The importance of the toes in ambulation is distribution of forces from the metatarsal heads when the heel is off the ground5. Hence it is important to preserve the toes and metatarsals for both biomechanical and cosmetic reasons. We present a case with combined soft tissue loss and loss of the first metatarsophalangeal joint wherein the big toe was transposed onto the 2nd metatarsal and managed successfully without a free flap.

Case report

In the month of July 2013, a 22 year old gentleman presented with a crush injury to his right foot following a high velocity MVA involving his 2 wheeler. On examination at the emergency department 4 hours following injury, he had an open first metatarsophalangeal (MTP) joint injury with fractures and bone loss of the proximal phalanx and the metatarsal (MT) of the first ray. He also sustained open fracture dislocations of the second and third MTP joints. The 2nd and 3rd toes had no capillary refill and no sensations. There was soft tissue loss of the dorsum of the first ray. Fig 1 (a), (b); Fig 2 (a), (b).

Fig 1(a)

Fig 1 (b)

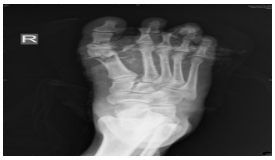

Fig 2 (a)

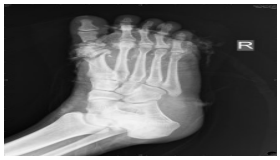

Fig 2 (a)

Following primary debridement of the wound the 2nd and 3rd toes were amputated at the MTP level and 1.8 mm Kirschner wire (K wire) fixation of the first MTP joint was done. Fig 3 (a), (b); Fig 4 (a), (b)

Fig 3 (a)

Fig 3 (b)

Fig 4 (a)

Fig 4 (b)

Post debridement the local flaps which were transposed to cover the first MTP joint necrosed leaving the distal third of the first metatarsal (MT), first MTP joint and proximal third of first proximal phalanx devoid of soft tissue cover along with bone loss of the first metatarsal. Patient was then taken for a second debridement. Initially the wound was redebrided and devitalised necrotic bone segments were excised. Post debridement there was complete soft tissue loss over the first ray from the level of distal third of the first metatarsal to the proximal third of the first proximal phalanx with bone loss of the metatarsal. This large defect could not be closed by docking the proximal phalanx to the distal third of the first metatarsal. Moreover the first MTP joint was not salvageable. The options, at this point were amputation of the first ray leaving a foot without the first 3 toes or preserving the first toe without any bony attachments as the bone defect was too large for the first toe to be telescoped onto the remnant of the first metatarsal. It was essential to salvage the big toe, as sensations were intact, capillary refill was good, and the medial bridge of skin was intact. Hence the decision was made to transpose the big toe at the level of the proximal phalanx onto 2nd metatarsal with an aim to arthrodese it to the second MTP joint. Fig 5 (a) (b). The head of the second metatarsal was osteotomised and the proximal phalanx of the first ray was fixed to the second metatarsal with two 2 mm threaded k wires.

Fig 5 (a)

Fig 5 (b)

As the big toe was lateralised we could attain soft tissue closure. Also the width of the web space defect created by amputation of the 2nd and 3rd toes was reduced. Osseous stability was attained by arthrodesing the proximal phalanx of the first ray to the 2nd metatarsal. The remnant of the first metatarsal was smoothened and osteotomised obliquely to avoid any pressure point medially over the foot. The rest of the raw area on the dorsal and plantar aspect of the foot was then skin grafted. Thus by preserving the toe both osseous stability and soft tissue closure over the critical area in the distal third of the dorsum of the foot was obtained. The patient was followed up regularly in the outpatient services and he was allowed to ambulate non weight bearing with axillary crutches. Kirschner wires were removed at 3 months post surgery. At 4 months post surgery he was ambulating full weight bearing without crutches and a near normal gait with great toe assisting in the push off. Fig 6 (a) (b) (c) (d) .Follow up radiographs also showed union at the arthrodesis site. Fig 7 (a), (b)

Fig 6 (a)

Fig 6 (b)

Fig 6 (c)

Fig 6 (d)

Fig 7 (b)

Fig 7 (b)

Complex injuries of the foot are difficult to treat and often end up in amputation of the forefoot. But when there are toes that are salvageable, it's paramount to preserve them. Biomechanics of the foot are altered by toe amputations. Toes help in the push off phase of the gait cycle and the presence of the big toe especially is very vital in ambulation. The primary function of the toes is to increase the weight bearing area so that when the heel is raised, the body weight is distributed from the metatarsal heads to the toes. Hence 40% of the body weight is borne by the toes in final stage of forefoot push off and most of this is on the great toe. Ctercteko et al (1981) found that 70% of normal toe loading is taken through the great toe5. The amputation of big toe does not cause any gait disturbances but causes disturbance in the load distribution of the foot 6. The cosmetic aspect of this particular foot injury must be emphasised as it led to a reasonably good cosmetic outcome as compared to a foot with first, second and third toes missing. Paolo Sassu et al presented a case report of second toe transfer to the first ray post great toe traumatic amputation7. There are no other case reports reporting a transfer of the first toe to the second in literature. More long term follow up will be required of this particular patient to assess his gait pattern and residual disability.

Conclusion:

Great toe transposition onto second metatarsal was a novel idea to get soft tissue cover over the first MTP joint and get a stable bony fixation, which apart from the better cosmetic outcome also enables good load distribution of the foot by preserving the big toe.

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