CASE REPORT

Complete Compound Sagittal Foot Division

RAFIK ABU-RAMADAN[1], IBRAHIM ALI FARAHAT SAAD[2], ZULFIKAR ALI QURESHI[3]

SUMMARY

This case study was carried out in the department of Orthopaedic, Prince Mitab Hospital, Sakaka, Aljouf from 23-3-2016 to 25-9-2016. An 11 years old boy reported to us with head injury (GCS 10), blunt abdominal injury and right foot complete division in sagittal plane. It is concluded that the fractures had united, the wound healed and there was no foot drop or any residual weakness of foot muscles. The patient returned to active sports. Proper antibiotic cover for a period determined by the quality of debridement plays key role in the final fate of the badly injured part.

Keywords: Sagittal foot division, Compromised vascularity, Complete recovery

INTRODUCTION

In literature there are rare reports of complete division of foot through mid axis in sagittal plane resulting in full thickness foot division, fractures of multiple bones and compromised vascularity. We report such case where immediate reconstruction resulted in spontaneous improvement in vascularity of foot. There was no neurological deficit. A review of the literature is presented. The management of open fractures is a great challenge for the orthopedic surgeon. Despite the improved surgical techniques, rates of non-union and infection are still high. Early antibiotic administration coupled with early and meticulous irrigation and debridement plays key role in reducing the rate of infection. Initial surgery should be carried out as soon as possible. All open fractures are prone to contamination from clostridium tetani. Early closure of open fracture wounds either primarily or by flaps can decrease the rate of infection. Early skeletal stabilization is necessary. These guidelines are helpful in providing optimal care to patients and ensure early return to function.

CASE REPORT

This study was carried out in the Department of Orthopaedic, Prince Mitab Hospital, Sakaka, Aljouf from 23-3-2016 to 25-9-2016. An 11 years old boy involved in RTA presented with polytrauma to emergency department. He sustained head injury (GCS 10), blunt abdominal injury and right foot complete division in sagittal plane. Ultrasound abdomen revealed minimal amount of intra-abdominal bleeding. CT brain detected cerebral oedema. The foot **i**njury comprised of complete division in sagittal plane from second web space to ankle. Radiographs showed fractures of base of second metatarsal bone, intermediate cuneiform, navicular bone, talus and distal tibial epiphysis. Close inspection of the foot revealed cut tendons including tibialis anterior, extensor hallucis longus, extensor digitorum longus of 2^{nd} – 3^{rd} toes and flexor digitorum longus. The skin was sharply divided in its full thickness from dorsal to plantar aspect of the foot with cyanosed medial flap. The peripheral circulation was impaired, pulse oximetery was 80%. Dorsalis pedis was not palpable and could not be heard with Doppler. Hb was 9 gm/dl. Pre-operative I/V ceftriaxone was given to patient. Immediate surgery was carried out. We irrigated the wound thoroughly using 3 litres of normal saline. Debridement was done and all visible foreign material in the wound was removed. After reduction fractures were fixed with K-wires followed by repair of cut multiple tendons. Skin was closed with staples. Dorsalis pedis artery pulsations became palpable and the flow confirmed by Doppler ultrasound. We classified the injury as Gustilo type three B. Below knee back slab was applied. Patient was shifted to ICU. Fall in haemoglobin was corrected by 3 units of blood transfusion. GCS improved to 15 after five days and patient was shifted to orthopedic ward. Postoperative foot X-rays showed good bony alignment and well reduced joints. The patient received I/V ceftriaxone 1 gram daily for ten days. At two weeks postoperatively patient was discharged from the hospital after removing the stitches. The first follow-up at 3 weeks after surgery showed some sloughing of the initially cyanosed medial skin flap. Check X-rays showed good position of involved foot bones and joints. Ankle-foot motion and muscle strengthening exercises were started. After six weeks postoperatively, the sloughed medial skin flap improved. X-rays of the foot showed good position of involved bones and joints with progressive healing of fractures. Ankle-foot motion improved. Patient was advised to continue non-weight bearing. At three months postoperatively CT scan was done in addition to X-rays and all the fractures including that of talus were found to have healed completely. Clinically patient was pain-free with good range of motion of foot and ankle. He was advised to start progressive

Department of Orthopaedics, Prince Mitab Hospital, Sakaka, Aljouf, Saudi Arabia
Correspondence: dr_zulfikar_ali@yahoo.com

weight bearing. At six months postoperatively the foot was completely functional and patient returned to sports (Figs.1-4).

Fig. 1: Sharp division of foot in sagittal plane

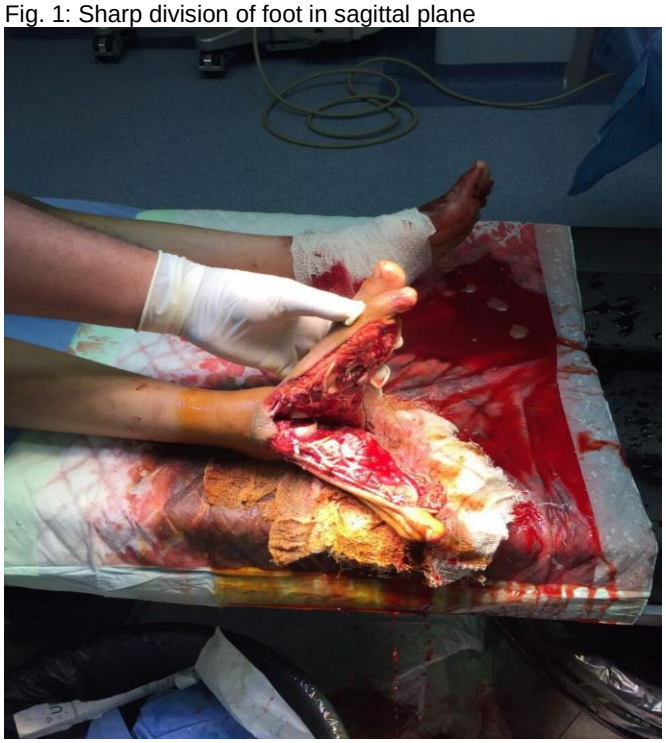


Fig. 2: K-wires entry from within-outwards through both halves of foot followed by reduction and final fixation

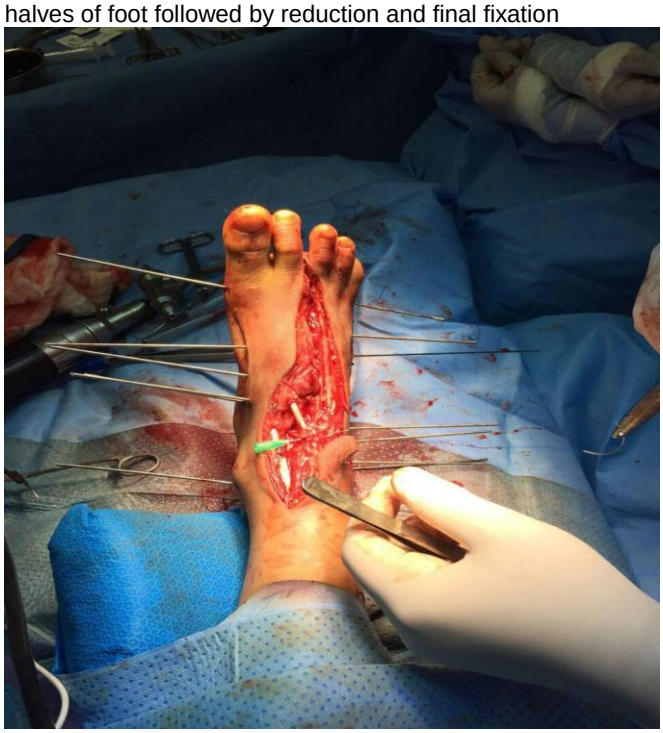


Fig. 3: The dorsal aspect of foot after internal fixation and wound closure (vascularity is intact)

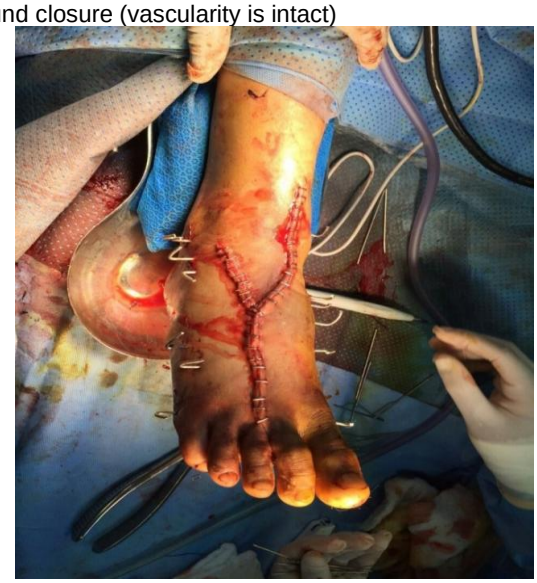
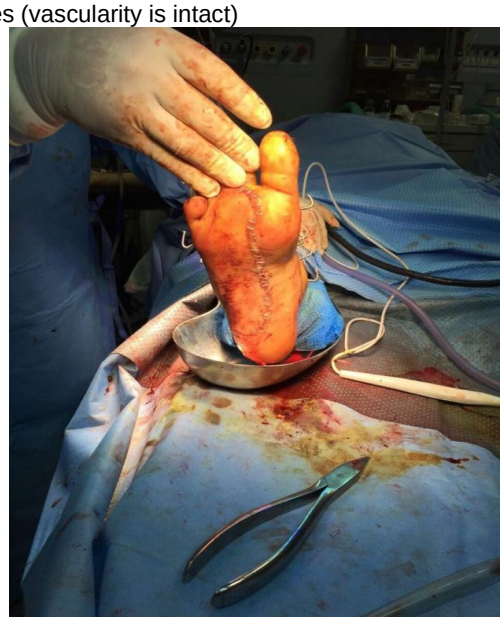


Fig. 4: The plantar aspect of foot after wound closure with staples (vascularity is intact)



DISCUSSION

When open fractures are encountered then the operating surgeon needs to classify the injury in operation theatre at the conclusion of initial debridement and irrigations. Two important classification systems exist i.e. Gustilo classification (primary classification system) and mangled extremity severity scale (MESS[1,2,3,4].

The first one focuses on the energy of the fracture, soft tissue damage and the degree of contamination. The second classification system – the MESS – enables the surgeon to decide amputation versus limb salvage in complex lower limb trauma[4]. It correlates well with the treatment of

major limb trauma. Score of equal to or greater than 7 predicts amputation with 100% accuracy[4,5-13].

All open fractures are contaminated. The common practice is early administration of antibiotics ideally within 3 hours of injury and this reduces the risk of infection six fold[14,15]. Use of local antibiotics plays key role in presence of extensive contamination. Antibiotic bead pouch construct is made of antibiotic powder and polymethylmethacrylate (PMMA) cement. These construct can be made in operation theatre and are also available in market. The possibility of clostridium tetani infection should also be kept in mind.[16] Prophylaxis and treatment for tetanus should be considered for every patient with an open fracture. Initial debridement should be carried out within first six hours after the injury if operating room and surgeons are available and physiologic status of patient permits[17]**.** Type 3 injuries with vascular damage and/or faecal or soil contamination demand more emergent surgery. The initial debridement includes thorough and sequential assessment of skin, fat, fascia, muscle, bone and vascularity. In case of delay sterile/antiseptic coverage and provisional splinting should be done while attempting to restore bone length, rotation and alignment. The antiseptic covering should be retained until patient is shifted to operation theatre. Any attempt to remove the dressing is likely to increase the infection rate[18,19]. There are different options for wound closure e.g. primary closure, split thickness skin grafting and free or local muscle flaps. Immediate closure means wound closure at the time of first surgery i.e. within first six hours. Early closure is within 24-72 hours and delayed or late closure extends beyond 72 hours. We prefer primary closure of type 1, 2 and few selected type 3A fractures. Early skeletal stabilization facilitates improved access to soft tissues surrounding the injury and is helpful in patient's early return to normal function[20].

Foot drop is defined as a significant weakness of ankle and toe dorsiflexion. The dorsiflexors include tibialis anterior, extensor hallucis longus and extensor digitorum longus. These muscles help the body clear the foot in swing phase of patient's gait. Weakness in these muscles results in an equinovarus deformity. Foot drop can be found in association with dorsiflexor injuries, peripheral nerve injuries, stroke, neuropathies, drug toxicities or diabetes[21].

CONCLUSION

In this case immediate surgery was done on the injured foot with primary wound closure and early bony stabilization. The injury was sharp and clean. We did not use local antibiotics. Regular follow-up was done. At final follow-up all fractures had united, the wound healed and there was no foot drop or any residual weakness of foot muscles. The patient returned to active sports. Immediate surgery in such cases gives excellent results depending upon the pattern of injury thereby restoring vascularity of the part and providing good functional results. Proper antibiotic cover for a period determined by the success of debridement plays key role in the final fate of the badly injured part.

REFERENCES

1. Gustilo RB, Anderson JT. Prevention of infection in the treatment of one thousand and twentyfive open fractures of long bones:Retrospective and prospective analyses. J Bone Joint Surg Am. 1976;58:453–8.
2. Gustilo RB, Mendoza RM,. Problems in the management of type III (severe) open fractures: A new classification of type III open fractures. J Trauma. 1984; 24: 742–6.
3. Tscherne H, Oestern HJ. A new classification of softtissue damage in open and closed fractures. Unfallheilkunde. 1982;85:111–5.
4. Johansen K, Daines M, Howey T, Helfet D, Hansen ST., Jr Objective criteria accurately predict amputation following lower extremity trauma. J Trauma. 1990;30:568–72.
5. Helfet DL, Howey T, Sanders R, Johansen K. Limb salvage versus amputation: Preliminary results of the Mangled Extremity Severity Score. Clin Orthop Relat Res. 1990;256:80–6.
6. Slauterbeck JR, Britton C, Moneim MS, Clevenger FW. Mangled extremity severity score: An accurate guide to treatment of the severely injured upper extremity. J Orthop Trauma. 1994;8:282–5
7. Durham RM, Mistry BM, MazuskiJE, Shapiro M, Jacobs D. Outcome and utility ofscoring systems in the management of the mangled extremity. Am J Surg. 1996;172:569–73.
8. O'Sullivan ST, O'Sullivan M, Pasha N, O'Shaughnessy M, O'Connor TP. Is it possible to predict limb viability in complex Gustilo IIIB and IIIC tibialfractures? A comparison of two predictive indices. Injury. 1997;28:639–42.
9. Fagelman MF, Epps HR, Rang M. Mangled extremity severity score in children. J Pediatr Orthop. 2002;22:182–4.
10. Sharma S, Devgan A, Marya KM, Rathee N. Critical evaluation of mangled extremity severity scoring system in Indian patients. Injury. 2003;34:493–6.
11. Elsharawy MA. Arterial reconstruction after mangled extremity :Injury severity scoring systems are not predictive of limb salvage. Vascular. 2005;13:114–9.
12. Togawa S, Yamami N, Nakayama H, Mano Y. The validity of the mangled extremity severity score in the assessment of upper limb injuries. J Bone Joint Surg Br. 2005;87:1516–9.
13. Rush RM, Jr, Kjorstad R, Starnes BW, Arrington E, Devine JD, Andersen CA. Application of the Mangled Extremity Severity Score in a combat setting. Mil Med. 2007;172:777.
14. Patzakis MJ, Wilkins J. Factors influencing infection rate in open fracture wounds. Clin Orthop Relat Res. 1989;243:36.
15. Patzakis MJ, Wilkins J, Moore TM. Considerations in reducing the infection rate in open tibialfractures. Clin Orthop Relat Res. 1983;178:36–41.
16. Bleck TP. Clostridum tetani (Tetanus) In: Mandell G, Douglas R, Bennett J, editors. Principles and Practice of Infectious Diseases. 6th ed. Philadelphia:Churchill Livingstone; 2005.
17. Pollak AN. Timing of debridement of open fractures. J Am Acad Orthop Surg. 2006;14:S48–51.
18. Browner BD. Skeletal trauma:Basic science, management, and reconstruction. 3rd ed. Philadelphia: Saunders; 2003.
19. Tscherne H, Gotzen L. Fractures with soft tissue injuries. Berlin; New York: SpringerVerlag; 1984.
20. Pape HC, Krettek C. Damage control orthopaedic surgery. Unfallchirurg. 2003;106:85–6.
21. Pritchett JW. Foot drop. Medscape 2016.