STUDY ON SPANNING EXTERNAL FIXATORS FOR PERIARTICULAR OPEN FRACTURES

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ABSTRACT

BACKGROUND

Open fractures which occur close to any fracture need immobilisation for the soft tissues to heal. Some open fractures are even fixed with provisional fixations to maintain the alignment of the fractures. The provisional fixation needs to be augmented with external support, which can be given by spanning external fixators across a joint.

MATERIALS AND METHODS

Our study consists of 38 open fractures of the lower limbs, which are of Gustilo-Anderson's type IIIB, an MT4 of AO-ASIF soft tissue injury classification essentially requiring open wound management as well as fracture fixation. Wound lavage and debridements are carried out till the soft tissues show granulations. The position in which joint is immobilised is functional and with access to open wound for dressings and inspection without any displacement of the fracture as well as creeping granulation tissue.

RESULTS

All the cases in our study are maintained with functional position till soft tissue cover is achieved and provisional fixation is done with definitive fixation after soft tissue cover with skin grafting.

CONCLUSION

Spanning external fixators are useful in maintaining functional positions as well as augmenting the provisional fixation of the compound fractures.

KEYWORDS

Open Fractures, Periarticular Fractures, Spanning External Fixators, Functional Position.

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BACKGROUND

Open fractures are surgical emergencies apart from managing the fractures and getting a soft tissue cover. Importance should be given to preservation of function of the limb in open fractures, which take more time to heal and before patient resumes activities. Open fractures which occur close to joint or intra articular fracture require immobilisation of the joint in the vicinity to provide stability to the tissues to heal. Tscherne suggested that we are now in the fourth era functional preservation characterised by aggressive wound debridement, definitive fracture stabilisation with internal or external fixation and delayed wound closure. Tscherne described four eras of open fracture treatment, life preservation, limb preservation, infection avoidance and functional preservation. Gustilo-Anderson's type IIIB fractures create an area, which requires thorough debridement thus creating much bigger soft tissue defects than what the patient presents with. The debridements which are carried out in periarticular fractures make the joint vulnerable to get deformed for various reasons like soft tissue imbalance, position in which the limb and joint are immobilised and of course due to the fracture.

Open wounds have been classified several ways. Gustilo and Anderson in 1976 described their treatment of 1025 open fractures with application of a grading system that offered prognostic information about the outcome of infected fractures. In 1984, this system was modified and their results were updated. The modified classification is based on the size of the wound, periosteal soft tissue damage, periosteal stripping and vascular injury. Type I open fractures have a clean wound less than 1 cm long. In type II fractures, the laceration is more than 1 cm long, but there is no extensive soft tissue damage, skin flaps or avulsions. Type IIIA open fractures have extensive soft tissue lacerations or flaps, but maintain adequate soft tissue coverage of bone or they result from high energy trauma regardless of the size of the wound. This group includes segmental or severely comminuted fractures, even those with 1 cm lacerations. Type IIIB open fractures have

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extensive soft tissue loss with periosteal stripping and bony exposure. They usually are massively contaminated. Type IIIC open fractures include open fractures with an arterial injury that requires repair regardless of the size of the soft tissue wound. This classification does not specify, which soft tissue needs repair and about functional at a joint with periarticular fracture.

The AO-ASIF group added to their extensive fracture classification a soft tissue classification scheme that closely follows that of Tscherne and Gotzen. This classification includes closed and open injuries, muscle tendon injury and neurovascular injury (Figure 1).

Prolonged time taken by the soft tissue injuries as described above is definitely going to cause stiffness and contractures to the joints, which should be avoided by maintaining functional position. Transarticular temporary stabilisations provide adequate soft tissue healing.[1] In other way, external fixation is preventing further fracture displacement and augments the stability achieved by provisional fixation done in the initial management.[2]

These injuries are often due to high velocity trauma resulting in comminution with doubtful viability and extent of soft tissue, which repeatedly require debridements. A spanning fixator will provide enough time while maintaining fracture alignment.[3]

Spanning or transarticular external fixators can be safely applied by following the basic principles of external fixation.[4] When the skin barrier is disrupted, bacteria enter from the local environment and attempt to attach.

MATERIALS AND METHODS

Our study is done with open fractures of Gustilo-Anderson type IIIB and AO/AISF MT4 soft tissue injuries with the following inclusion criteria.

Inclusion Criteria

Periarticular fractures of the tibia, fibula with ankle instability, deformity, exposed or breached joint capsule, retained toe movements and equivocal toe blanching.

Exclusion Criteria

Open fractures with vascular injury, any other associated injuries in the same limb and near total amputations. We have included the cases presented to GGH, Guntur, treated by Department of Orthopaedics from January 2007 to December 2016. Altogether, 38 cases are taken into the study with malleolar fractures, pylon fractures, fractures of calcaneum with soft tissue breach equal to Gustilo-Anderson type IIIB and AO/AISF MT4.

All the cases in our study are evaluated in the emergency department for life-threatening injuries. They are all sufficiently stabilised. They are investigated for their fitness to undergo an emergency procedure. The soft tissue wounds are covered with sterile dressings and limbs were elevated. Empirical antibiotics are given with injections cefuroxime and gentamycin.

Under anaesthesia, the wounds are thoroughly irrigated with 6 to 9 litres of normal saline as irrigating fluid. The soft tissue with no attachments are trimmed till fresh bleeding is encountered. All the planes of the soft tissue breach are bluntly explored to evacuate all the blood clots. The foreign material if any is evacuated. The functional position of ankle is maintained throughout the external fixation. In order to achieve this position, the foot Shanz pins are applied first through the neck of the first metatarsal and then through the calcaneum/cuneiforms. Another set of 2 or 3 Shanz pins are applied to anteromedial aspect of middle one third of tibia. Both are connected by a spanning clamp in one or two planes depending on the stability required.

The patient is continued on same antibiotics for another two days. Repeat debridement is undertaken with a gap of 48 hours to ensure that the edges of the soft tissue breach are not getting necrosed. Once the viability of reaming soft tissue cover is confirmed, provisional fixation is done with K wires. This opportunity is taken to reassess the alignment for a congruous ankle joint.

These wounds are observed till creeping granulations are seen. The possibility of fasciocutaneous flaps is thoroughly assessed before opting for a split skin graft. The provisional fixations are converted as malleolar screws, cancellous screws, rush nails before the soft tissue cover. The spanning fixators are removed at an average time of 7-9 weeks.

RESULTS

The outcome in our study was assessed in terms of soft tissue healing and maintenance of functional position at the ankle joint. All the cases are monitored for soft tissue healing with appearance of granulation tissue. The creeping granulation on an average took 15 days to cover the breached site. Through this expected time, daily saline dressings are done with care of pin track site and intact skin. All the cases in our study showed functional position of the ankle due to prolonged immobilisation.[5] The definitive fixation also requires the same duration of immobilisation. The toe movements are preserved and patients are advised non-weightbearing movements at the ankle for four weeks followed by toe touching and partial weightbearing. Average retained ROM at ankle joint is 40 degrees arc of dorsi and plantar flexion, 10 degrees of inversion and eversion.

Superficial infections and Pin site infections were commonly found in the study. The pin site infections are frequently seen in the foot. Out of 38 cases 27 cases showed superficical infections at the compound wound site, and they were managed with repeat debridements and Eusol dressings. The pin site infections were treated with regular dressings. The loosening of the pins was seen in 31 cases at the foot at an average time of 6 weeks. The soft tissue breach required split skin grafting in 31 cases and 7 cases required fasciocutaneous flaps. Functional position at the joints is retained in all the cases at the removal; of spanning fixator.

Type of Fracture	Number
Bi-malleolar	17
Pylon	12
Calcaneum	9

Table 1. Fracture Distribution

Open Wound	Number
Medial aspect	5
Lateral aspect	9
Posterior aspect	3
Multiple planes	21

Table 2. Open Wound

Figure 1. Open Wound and Fractures

Figure 2. Spanning Fixator and Wound Healing

CONCLUSION

Spanning or transarticular external fixators provide ample stability at the open fracture site and also at the joint in the vicinity. This is more advantageous in terms of maintaining the joint involved in the periarticular fractures with a functional position. The area where other methods of soft tissue cover are not possible due to the issues of stability and inaccessibility. Spanning fixators are providing functional position in which split skin grafting can be done.

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