GRADE III OPEN ANKLE FRACTURES - A REVIEW OF THE OUTCOME OF TREATMENT

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ABSTRACT

A retrospective review of fifteen patients with Grade III open ankle fractures, admitted to the Singapore General Hospital from January 1980 to December 1990 was done. Nine of the patients were males with a mean age of 47 years. Road traffic and industrial accidents accounted for 12 of the cases.

Eleven of the fractures were associated with ankle dislocation or subluxation. Eleven of the fractures were fixed with plate and screws. Two of the ankles were stabilised with Steinmann pins inserted from the calcaneum to the lower end of the tibia.

In ten cases the wounds were closed primarily or by delayed primary closure. One case required a flap to cover the defect and the rest were skin grafted. Eleven were immobilised in a plaster cast ranging from six to twelve weeks. Superficial infection was found in three cases and deep infection involving the bone and joint was present in three.

Range of motion at one year was satisfactory in eleven but poor in two. Seven patients developed osteoarthritis of the ankle and three had ankle arthrodesis for pain and instability.

Keywords: outcome of treatment, grade III open ankle treatment.

SINGAPORE MED J 1994; Vol 35: 57-58

INTRODUCTION

The treatment of ankle fractures with severe soft tissue injuries remains a difficult and challenging problem to orthopaedic surgeons. The goals in the management of open fractures are preventing wound and bone sepsis, obtaining fracture healing and achieving a return to normal function.

MATERIAL AND METHOD

A retrospective review of fifteen patients with Grade III open ankle fractures treated at the Singapore General Hospital over ten years from January 1981 to December 1990, was done. There were nine males and six females. Their age ranged from 15 to 79 with a mean of 47 years.

Road traffic accidents accounted for nine cases (60%). Three (20%) were due to industrial accidents. The injuries in all these cases were due to crushing. The remaining three were due to falls which occurred in elderly patients.

There were 14 cases of type III A and one III B open fracture.

The fractures type grading was based on the Danis and Weber's classification[1]. There were 7 type 'B' and 8 type 'C' fractures. All except 4 fractures were associated with subluxation or dislocation of the ankle joint.

Three patients had other associated soft tissue injury around the ankle. One had partially cut tendoachilles while the other two had cut anterior tibial artery.

Three other patients had associated fractures which included the tibia, pelvis, spine and forearm.

One patient had associated fracture of the talus of the same side which was undisplaced.

The remaining 8 patients had no other associated injuries.

At the Accident and Emergency Department, the ankle was examined for soft tissue injuries as well as the circulation of the foot. Parenteral gentamicin and cloxacillin were started immediately[2].

All dislocations were reduced immediately to minimise the pressure on the skin. The wound was dressed with sterile saline gauze and the ankle was then immobilised.

All patients were operated on within twelve hours and 80% of them were done within six hours of injury.

Surgery was performed with a tourniquet on the affected side. The wounds were scrubbed and lavaged with copious amount of normal saline. Swabs were taken from the wound for culture and sensitivity testing.

The key to the reduction of the ankle mortise lay in the accurate reduction and restoration of length of the fibula. The fibula was then stabilised, followed by the fixation of the medial malleolus.

X-rays were taken intra-operatively. Incongruous reduction were due to invagination of the deltoid ligament or trapped soft tissue.

About half of the fractures were associated with significant bone and articular cartilage loss which was documented

Fig 1 – Stabilisation of ankle with Steinmann pins

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intraoperatively and on X-rays. Tension band wiring was used in three cases where the fracture fragment was small. In two cases where there were severe damage to the ligaments and significant loss of bone, resulting in ankle instability, two Steinmann pins were inserted from the calcaneum to the reduced ankle joint and into the lower end of the tibia to immobilise the ankle (Fig 1).

In two cases due to severe soft tissue damage as well as a delay in the surgery, the fractures were reduced and held in plaster. One case was closed primarily while the other was left open. All wounds were examined two to three days later and repeated debridement performed when necessary. In nine cases, delayed primary suture was performed when there was no signs of infection. Two cases required split skin grafting while another two were left to heal by secondary intention. One case required an anterior tibial flap to cover the exposed ankle joint and lateral malleolus.

Most of the soft tissue cover were performed within two weeks of injury. Early soft tissue cover of the fracture is important to reduce the incidence of infection in grade III open fractures[3,4].

All the fractures with subluxation or dislocation of the ankle joint were immobilised in a cast for six to twelve weeks. This included the two cases with no internal fixation, as well as three cases where the deltoid ligament was repaired. Post-operatively, antibiotics was continued for about one week[5,6]. In infected cases, repeat swab culture and sensitivity were taken and the antibiotics changed accordingly.

Patients were mobilised with crutches and non-weight bearing on the injured ankle until the fracture united. This ranged from six weeks to three months in our series.

RESULTS

The duration of follow-up ranged from one to three years.

Anatomical reduction of the ankle mortise was achieved in eleven cases. The assessment of reduction was based on radiographic analysis of talar tilt, talar subluxation, medial clear joint space as well as the lateral tibiofibular clear space[7,8].

Superficial wound infection was found in three cases while one patient developed osteomyelitis and two others had septic arthritis of the ankle joint.

The total range of motion of the ankle joint was assessed after one year of the injury. The total range of motion of both dorsiflexion and plantarflexion was measured. The normal range of ankle motion is 20° dorsiflexion and 40° plantarflexion, with a total range of motion of 60°. A good result is achieved if there is more than 40° of total range of ankle motion, a satisfactory result if 20° to 40°, and poor if less than 20° of total range of ankle motion is achieved. Seven patients had good range of ankle movement of more than 40° while six others had satisfactory results. Only two had 20° or less of ankle movement. Seven patients developed osteoarthritis of the ankle and all had pain on walking. Three of the patients who had osteomyelitis and septic arthritis required ankle arthrodesis for pain and instability. The other eight patients were painfree on walking.

DISCUSSION

The orthopaedic surgeons' goals are to prevent wound infection, expedite fracture healing and restore optimal function. The importance of soft issue envelope to fracture healing is well recognised.

Grade III open ankle fractures are predisposed to many complications, namely infection, delayed or non-union and amputation. There are four factors that can account for these complications: (1) soft tissue damage with resultant problems in bone coverage, (2) severe wound contamination, (3) compromised vascularity, and (4) fracture instability.

The incidence of infection in open fractures varies with the amount of soft tissue damage and grade III B wounds develop infection in 10% to 50% of patients[2].

Infection remains a major threat to the success of treatment. Forty percent of our cases developed infection, half of them superficial and the others involving the bone and joint. All the cases with deep infection ended up with arthrodesis.

A factor in reducing the infection rate in our patient was the relatively early institution of surgical debridement. All except three of our patients were operated on within six hours of injury and this early intervention greatly reduced the load of pathogens in the wounds.

Soft tissue cover around the ankle is a difficult problem due to the lack of muscle around it. Unlike the proximal two-thirds of the tibia where muscles flaps from the gastronemius and soleus can be called upon, the only option available for coverage of ankle wounds are free flaps. Only one case in our series required a flap.

Primary closure should be discouraged. Delayed primary closure should be done two to three days after the primary procedure when there is no sign of infection. Split skin graft is used for large skin defect with a well vascularised bed[9].

We believe that there are several factors that will affect the eventual outcome of grade III open ankle fractures.

Firstly, the presence of deep infection around the ankle augurs poorly for the prognosis. All our cases with deep infection ended up with arthrodesis.

Secondly, significant cartilage or bone loss resulting in loss of anatomical reduction will result in painful osteoarthritis. Every attempt must be made to achieve a congruous ankle mortise.

Eleven patients regained good to satisfactory range of motion. However, this good range of motion cannot be translated into good functional recovery as four of these patients had painful osteoarthritis and required downgrading of their employment or daily activities.

Finally, we believe that primary ankle arthrodesis should not be done in an emergency basis. Initial treatment should be directed to achieve accurate reduction of the facture as well as soft tissue management to prevent infection. Despite the severity of the injury, amputation was not considered in any of our patients.

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