



International Journal of
**Current Pharmaceutical & Clinical
Research**



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AN ALTERNATIVE TO OPEN FRACTURE PRIMARY PLATING

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ABSTRACT

A large challenge for orthopaedic surgeons is the management of open fractures because it involves not only treating the contaminated soft tissues of the skin, muscles and neurovascular structures, but also treating the contaminated fracture underneath. It is possible to solve many problems with primary internal fixation if it is done correctly. A fracture treated with internal fixation remains in a good position, making it easier and more effective to treat soft tissue injuries. A study involving 10 patients with skeletal maturity was conducted. A study of all open fractures occurring within 12 hours of trauma was carried out. A splint was then applied to the injured part in order to prevent further damage from being caused by the displacement of fracture fragments. In the operating room, wounds were debrided under aseptic conditions before internal fixation. According to the results, 30% of Grade I cases showed good soft tissue healing. Within the first four months of diagnosis, two cases of grade I united of the upper limb. During the past six months, there was one grade III case of upper limb union. Within a 5-month period, three of the 6 cases of lower limb unions were united, and four were united within a 6-month period, out of 6 cases altogether. There was one case of a grade III fracture of the tibia that showed delayed union, in which bone grafting was required. Based on the study, we conclude that early rehabilitation and skilled management of the injured limb are key to a successful compound fracture treatment.

Key words: Plating, rehabilitation, soft tissue injuries, complications, injured, open fractures

INTRODUCTION

Among all injuries, open fractures require the greatest degree of clinical judgment and generate the greatest amount of controversy. As a result of the contamination of soft tissue involving skin, muscles, and neurovascular structures as well as the contamination of the underlying fracture, management of open fractures poses one of the greatest challenges to orthopedic surgeons. [1-3, 5]. Open fracture treatment has changed dramatically as orthopedics progresses rapidly. Our observation was that primary internal fixation can solve many of the complications of fracture disease when performed meticulously and carefully after debridement and cleaning. [9] If done properly, primary internal fixation can resolve many problems.

An internal fixation system maintains the fracture alignment in a good position so that soft tissue injuries can be handled effectively and easily. Deformities can also be

prevented by using internal fixation.

A clean field can be used for reconstruction and grafting immediately or later. [5]. Based on our findings, we propose that early internal fixation with plate provides sufficient stability to support the healing of wounds and fractures while allowing initial joint function and rehabilitation to begin. We aimed to evaluate the effects of early aggressive wound management on fracture healing and fracture stability, as well as hospitalization and rehabilitation time and costs for complex open fractures.

MATERIALS AND METHODS

During the study, 12 patients of either sex were selected from emergency and OPD departments of the orthopaedic department. The clinical, radiological, and pathological examinations of each patient were conducted.

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A selection criterion should be used

1. Lower and upper extremity fractures with an open fracture.
2. The earliest possible presentation is within 12 hours after the trauma, preferably within 8-9 hours.
3. Patients with skeletal maturity.

Exceptions to the rule

1. In patients with trauma that has occurred within the last 12 hours.
2. An external fixator was initially used to treat patients.
3. Growth plate-opening patients.

One female patient was among the cases with the majority of patients between the ages of 20 and 40 years [Table 1]. Among the cases in the series, the majority (5 cases 41.7%) were fractures of the tibia, followed by fractures of femur (3 cases in each group) and fractures of radius-ulna (1 case). 6 cases were grade 1 while 4 were

grade 2 and 2 were grade 3. Out of 12 cases, 6 were grade 1, 4 were grade 2, and 2 were grade 3. There were 4 upper extremity cases and 8 lower extremity cases out of 10 cases. As soon as the patient was brought to the emergency department, the patient was managed. Following a thorough history taking, these patients underwent general, local, and systemic examinations. Our classification of open fractures is based on the severity of soft tissue and skeletal injuries and mechanism of injury. [10] A thorough examination was done of the affected extremity and wound to determine the extent of skin loss, contamination, exposed bone, and neurovascular damage. Following the wound cleaning, the injured part was splinted to prevent further damage caused by movement of fracture fragments. Prior to first handling the patient, a culture of the wound was taken, followed by the administration of appropriate broad-spectrum antibiotics. Patient immunization status was determined by injectable analgesics, tetanus toxoid, and gamma globulin 500 units injections. A definitive procedure was performed in the operating room after the wound had been covered for some time.

Table 1: Age and sex incidence

Total no.	Sex		Age in years				
	Male	Female	11-20	21-30	31-40	41-50	More than 50
10	8	2	2	2	3	2	1
100%	80%	20%	20%	20%	30%	20%	10%

Before internal fixation, wound debridement was performed under aseptic conditions in the operating room. I removed all tissue that was grossly contaminated or was questionable as to viability. Based on consistency, contractility, colour and bleeding ability, Scully et al. [11] evaluated muscle viability. The extent and location of the wound influenced the choice of surgical exposure for internal fixation. The following three approaches were used to manage soft tissue.

1. An incision that includes a wound
2. A broad skin bridge with a good blood supply is created by making an incision at a distance from the wound.
3. In order to apply the fixation device, an incision outside of the wound area is made through the wound.

The cases were satisfactorily reduced and fixed by extending the wound or cutting through the wound without extending it. Eight cases were treated with separate

incisions for separate reduction and internal fixation since site and size of wounds were not appropriate. The wounds of six cases of grade 1 were closed with primary closure. In two cases, delayed primary closure was performed, while in two other cases, the skin was grafted later on after the operation. One grade three case was closed by skin grafting and another by musculocutaneous rotation flap. The grade 3 cases were not closed.

Continuing the conversation

Regular follow-up calls were made after patients were discharged from the hospital. Every fortnightly, the patient was called to inspect the wound and undergo any necessary soft tissue reconstruction. The patient was contacted once a month after the soft tissue healing had been completed. In general, patients were followed up for at least six months, and for up to 18 months in some cases. Following each follow-up, both clinically and radiographically, bone healing progress was monitored and further movements of the limb recommended.

Table 2: In the event that fracture stabilization by primary plating doesn't work, wound management should be performed

	No. of cases (%)	Gr. I (%)	Gr. II (%)	Gr. III (%)

An end to the primary process	3 (30)	4 (40)	—	—
Closure delayed by P.	1 (10)	—	1 (10)	—
A skin graft is performed after the wound is left open	1 (10)	—	1 (10)	1 (10)
Closure of the primary school	3 (30)	1 (10)	—	—
Anatomical flap of the pedicle muscle	1 (10)	—	—	1 (10)
Secondary healing is left to take place	1 (10)	—	1 (10)	—
Total	10 (100)	5 (50)	3 (30)	2 (20)

Results evaluation based on the following features, the results were assessed:

1. Healers of soft tissues and bones,
2. Osteomyelitis, a form of infection in the soft tissues,
3. The ability to move joints without pain,
4. Deficiency of length and deformity.

Excellent, good, satisfactory, or poor results can be categorized.

1. Excellent

- a. Infection-free healing of soft tissues
- b. The union of the bones should occur within a reasonable timeframe (within six months)
- c. Joint movement that is painless
- d. Deformities or shortenings are not present

2. Good

- A. The healing of soft tissues with or without infection within 3 weeks, if infection is present
- b. A normal time frame for bone healing
- c. Limited range of motion - less than 25%
- d. There are no deformities or shortenings

3. Satisfactory

- a. Healing of soft tissues, with or without infection, within 6 weeks if it is present
- b. Osteomyelitis does not appear chronic
- c. Exceeds 50% of an individual's normal range of motion.
- d. Delay in union of bones (6-9 months)
- e. A reduction in length if less than 2 cm is present.
- f. An acceptable cosmetic and functional deformity is present

4. Poor

- a. An infection or osteomyelitis that persists and/or is chronic
- b. False arthrosis/nonunion

- c. Movements with less than 50% range of motion
- d. At least two centimeters of shortening.
- e. Unacceptable deformity from both an aesthetic and functional perspective

For the purpose of evaluating and assessing the effectiveness of this procedure, all the different parameters were carefully recorded, regularly, and during regular follow-up visits.

RESULTS

Primary plating osteosynthesis was performed on 10 patients with compound injuries. In the first grade, there were 5 cases, in the second grade, there were 3 cases, and in the third grade, there were 2 cases. Five cases from grade 1 displayed good soft tissue healing, with three showing good results and two showing fair results. There was a good result in one case in grade II, two fair results in two cases, and a satisfactory result in one case in grade II. There was one case of grade III where the result was satisfactory while there was one case where the result was poor.

Grade I cases heal within three weeks of surgery. Grade II healed in two cases within three weeks. There were no wounds that healed faster than 6 weeks in grade 3. An infection took more than 3 months to heal in one grade III case and one grade II case. On the other hand, of 4 cases of grade I union in the upper limb, 2 (50%) joined within four months. In 6 months, one upper limb with grade III unity was reported. Three cases and four cases of lower-limb unions occurred within five months and six months, respectively. As a result of a delayed union of a grade III fracture of the tibia in one case, bone grafting was required. There were no cases of infection in grade I injuries. The superficial infection rate was 16.67% in two of the four cases of grade II. There were 2 cases of grade III, one with superficial infection and one with chronic osteomyelitis. A total of three of the ten cases had

infections. There were three cases of superficial infection (25%) and one case of deep infection.

There were two cases in which range of motion around the adjacent joint was restricted by 10-25%. In the majority of the cases, there was no loss of range of movement around the adjacent joint. There was only one case where the free range of motion was limited by more than 25%.

DISCUSSION

The present study addresses infection, soft tissue damage, bone healing, and joint function as they relate to primary plating osteosynthesis in the management of open fractures. [2-5, 7, 8]. This series consisted of 9 cases

involving 80% males and 20% patients between the ages of 20 and 40. It is very likely that the male and young age dominance is due to the fact that in Indian social structures, males specifically in this age group are more likely to suffer from road, as well as other environment-related accidents. There are 10 cases in the series who report being unable to communicate and get to the hospital within 3-12 hours after being injured. There were only two patients from urban areas who were able to reach the hospital within three hours. There were 75 percent of cases where first aid was not provided or in which unsterile dressings were applied.

Table 3: An infection that has been established

Level	Cases of infection reported		Infections of the soft tissues at the surface	Symptoms of a deep osteomyelitis infection
	No.	%		
I (5)	—	—	—	—
II (3)	2	20	2	—
III (2)	1	10	1	1
Total (10)	3	30	3 (30%)	1 (10%)

One patient developed infection out of 9 patients (90%) in our series within 9 hours. As early as possible after fracture fixation and soft tissue management, preferably within nine hours, can significantly reduce infection chances. According to a study, [10] adequate debridement is an essential component of infection prevention.

A single internal fixation, according to Hampton [14], facilitates painless wound care without compromising a reduction if infection does occur. Based on Holstad's assessment of primary osteosynthesis [15], it can immobilize fragments adequately to prevent infection. He compared results of 202 cases of open fractures of long bones in which 122 cases were treated conservatively and 78 cases treated by osteosynthesis.

Conservatively treated patients had a higher rate of complications. Out of 10 patients treated with primary plating osteosynthesis, four developed infections, three superficially and one deeply. Three cases with implants in position were successfully controlled by sterile dressings and antibiotics. It was, however, possible to control the infection after the implant had been removed in one case. Antibiotic prophylaxis in parallel series is not clearly superior, according to Rittmann and Matter (1977). Under high prophylactic doses of penicillin and streptomycin, only deep soft tissue infections are reduced. There is a recommendation to use systemic antibiotics before and after surgery [16]. A positive impact of antibiotic prophylaxis in open fractures has been demonstrated [13]. Qualifying conditions include

Infections are caused by organisms that are resistant to antibiotics. Initially, the vaccine should cover all common pathogens, and then it should be based on sensitivity and culture.

Regardless of the type of soft tissue injury, Chapman and Mahoney (1979) [1] advocated leaving all wounds open for secondary or primary closure to be considered after initial treatment. All wounds caused by open fractures, regardless of severity, should be left open, according to Matter and Ritman (1977). No necrosis or infection developed in any of the six cases treated with primary closure with drainage tubes. Soft tissue in two cases was well healed within three weeks after a drainage tube was inserted following a delayed primary closure. We left one muscle pedicle flap open for each grade III case to allow for subsequent skin grafting and skin grafting.

The best environment for fracture healing is provided when an open fracture is converted into a closed fracture as early as possible. A clean wound without necrotic tissue and a tension-free closure are prerequisites for delayed primary closure.

In clean cases of grade, I injury, all wounds should be left open. If necessary, drainage tubes can be used to close the wound, if necessary. Acute inflammation subsides during the 5th to 7th days following surgery, and infection, if it exists, becomes observable. When possible, we will be able to decide whether to delay primary closure or leave the wound open for debridement, secondary suturing, skin grafting, or muscle pedicle flaps.

CONCLUSION

As a conclusion of the study, the key to treating compound fractures is the judicious selection of cases, the careful management of the injured limb, and the onset of early rehabilitation. Open fractures are often complicated by infection, which determines their outcome. A primary

or delayed primary closure should be used in lesions of grade I and grade II that are clean or minimally contaminated. Skin grafting or secondary healing should be used in grade III lesions. In cases of open fractures,

antibiotic prophylaxis is definitely beneficial. Infections can be cured, and early joint rehabilitation can be achieved through early plating.

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