Abstract:
AIMS To conduct an audit and evaluate treatment procedures currently employed in treatment of AO type C distal femoral fractures and to assess outcome as measured by time to union, knee range of motion and associated complications.

METHODOLOGY- An audit of patients who were admitted with type C open distal Femoral fractures between July 2008 and October 2009 were evaluated. A total of eight open distal femoral fractures in seven patients were available for audit and assessment.

Results- Optimum results were accomplished in patients who underwent early debridement, rigid stabilisation and mobilization. Outcome parameters were suboptimal in patients who had developed postoperative infection and in those who required immobilization in view of unstable fixation.

Keyword: AO TYPE 33C, OPEN FRACTURES, DISTAL FEMUR FRACTURES, INTRA ARTICULAR FRACTURES, INTERNAL FIXATION. AN AUDIT OF THE TREATMENT PROCEDURES USED IN EVALUATING AND TREATING OPEN DISTAL FEMORAL ARTICULAR FRACTURES (AO TYPE C)

INTRODUCTION: Injuries from motor vehicle accidents account for a majority of lower limb open fractures. The evaluation and treatment of open fractures have improved over the past three decades with evolution of classification systems and specific prognosticating scoring systems. A majority of the injuries occur in a productive population and present a considerable challenge to the treating orthopaedic surgeon to ensure reduced morbidity and optimise functional outcome. Many studies have analysed prognostic factors and treatment procedures in open Tibial fractures, however studies in open distal femoral fractures are scarce. Fractures of the distal Femur which account for four percent of all Femoral fractures are serious,
complex injuries, sometimes very difficult to treat(1). They present a challenge to the surgeon in terms of appropriate implant selection and surgical technique (2)(3). These complex fractures are complicated with varying degrees of skin, soft tissue, neurovascular injury or bone loss when caused by high velocity injuries as in motor vehicle accidents. The treatment principles may vary from either early total care or to damage control, which may be followed up with staged reconstruction and rehabilitation. With early thorough debridement and in patients with no skin loss either primarily or secondarily during debridement, the presence of bleeding skin margins, the ability to approximate wound edges without tension and in the absence of peripheral vascular disease immediate skin closure is possible.(4) Aggressive early treatment as demonstrated in the Ganga hospital model though difficult to replicate in all advanced trauma centres, is probably the most ideal approach in the management of such injuries.(5)(6) (7)(8) Most studies of distal femoral fractures tend to compare outcome of one method of fixation versus another. (9)(3)(10) (11). A literature search failed to reveal exclusive studies dedicated to open distal femoral fractures alone. Though treatment protocols and fixation devices may vary in different trauma centres the rationale principle of treatment in open fractures starts with an early thorough debridement and in articular fractures, anatomic reduction, rigid stabilisation and early mobilisation. AIMS: To conduct an audit and evaluate treatment procedures currently employed in treatment of AO type C distal femoral fractures and to assess outcome as measured by time to union, knee range of motion and associated complications. METHODOLOGY: Patients who were admitted with type C open distal Femoral fractures between July 2008 and October 2009 were recruited using the inpatient list through the online clinical work station software. Details regarding the mechanism and extent of injury, surgical procedures performed, complications etc were obtained from the patient records, discharge summaries and clinical photographs. Patients who presented with closed fractures or with infections and infected non-union were excluded. The AO classification system was used to document fracture patterns of the distal femur and the Gustillo-Andersson classification was used to grade severity of the open fracture. Most patients underwent their primary surgery within a day following the injury which was performed by a consultant. The treatment procedures either used early thorough debridement followed by either definite fixation with appropriate plate and screws or minimal internal fixation to hold the articular surface with a knee spanning external fixator as a means to preserve and stabilise local soft tissues. A lateral distal Femur locking reconstruction plate was used in patients who underwent internal fixation. Minimal internal fixation was achieved with a combination of large fragment cancellous screws and k-wires along with a conventional external fixator. The construct was later converted to definite fixation usually within a period of two weeks. All patients received intravenous antibiotics following initial evaluation and resuscitation and for at least two days postoperatively. Patients who developed persisting infection postoperatively received prolonged culture specific antibiotics along with debridement, with or without antibiotic impregnated cement bead insertion. Information regarding time to primary surgery, details of primary surgery, total number of surgical procedures performed was documented. Post operative radiographs were scrutinised.
to assess accuracy of articular reduction. Audit of charts and analysis of radiologic parameters were performed by a single investigator who was not directly involved in care of patients recruited in this study. Outcome parameters analysed were knee range of movement and time to radiological union. Also presence of complications like acute postoperative infections, persisting flexion deformity of the knee, chronic osteomyelitis and decreased range of movement were analysed. In these injuries, absence of a flexion deformity, absence of a varus or valgus malalignment, with atleast 90 degree ROM with no infection post operatively would be considered an acceptable result. Documentation of measured deformity, knee range of movement and complications were by various rotating orthopaedic residents involved in the outpatient fracture clinic and were supervised by consultant. Between July 2008 and September 2009, a total of nine patients with 10 open distal femoral type C fracture were admitted for treatment. As per the AO classification system their fracture patterns were as follows.

C1-0

C2-6

C3- 4

And as per the Gustillo Anderson system the distribution of patients were as follows.

Type III A - 5

Type III B - 3

Type IIIC - 2

The average age of the patients was 33.2 (17 to 66). Of the nine patients, seven were men and two were women. Seven of nine patients had associated injuries. The most common of which were open patellar and tibial injuries. A compilation of patient profiles, treatment procedures and outcome parameters are given in Table no. 1.

One patient had sustained bilateral open distal femur fractures following a fall from a height; all other patients had sustained injuries following motor vehicle accidents. One patient with a type III C injury required an above knee amputation. One patient was lost to followup after the first surgery. A total of eight open distal femoral fractures in seven patients were available for audit and assessment. RESULTS All fractures had united at the time of followup. Recovery of knee range of motion was variable. All patients with decreased knee ROM were advised surgical intervention (quadricepsplasty or knee arthrolysis) to improve knee range of motion. By stating that absence of a flexion deformity, atleast 90 degree of knee ROM with no infection post operatively to be an acceptable result only three patients had an optimal result. All three patients had an early debridement, anatomical reduction of the articular surface with supervised knee range of motion exercises. None of these patients had any postoperative wound complications or infections.

All three patients who developed early postoperative infection had a poor outcome either with joint stiffness or presence of a flexion deformity. None of these patients had active osteomyelitis at their last followup. In these open injuries, early infection is most likely due to a delayed time to debridement or an inadequate debridement. And as compared to patients with similar injuries who underwent treatment without wound complications, the outcome was compromised. The experience of the surgical team and availability of a plastic surgeon for early reconstructive intervention significantly affect the morbidity of these injuries. Debridement in type III B injuries may
often be compromised when the treating surgeon is

<table>
<thead>
<tr>
<th>S. No</th>
<th>Side</th>
<th>Nature of injury</th>
<th>Surgery</th>
<th>Total Radiological Flexion (PRORO)</th>
<th>Acute Cholecystectomy</th>
<th>Infinitin of ureteric stent (if present)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3m</td>
<td>RT III Cleft</td>
<td>MIF</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3m</td>
<td>RT III C</td>
<td>ORIF</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3m</td>
<td>RT III C</td>
<td>STSG</td>
<td>26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2m</td>
<td>RT III C</td>
<td>ORIF</td>
<td>3 13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1e</td>
<td>RT III C</td>
<td>MIF/IM</td>
<td>1 13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>1e</td>
<td>RT III C Shaft</td>
<td>MIF/IM</td>
<td>1 13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>1m</td>
<td>RT III C</td>
<td>ORIF</td>
<td>6 9 5 90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>1m</td>
<td>RT III C</td>
<td>MIF/Orthofix</td>
<td>5 13 60</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

An Initiative of The Tamil Nadu Dr M.G.R. Medical University
University Journal of Surgery and Surgical Specialities
concerned with soft tissue closure. In two patients who had a suboptimal outcome in terms of decreased knee movement and flexion deformity but did not show any evidence of infection in the postoperative period or on subsequent followup, the cause of suboptimal outcome is probably a combination of severity of the initial injury and delayed mobilisation due to inadequate stabilisation. The primary surgical procedure is often influenced by the overall condition of the patient and availability of theatre time.

TYPE IIIC Distal Femur fracture. Post debridement, internal fixation and vascular repair.
At nine months, good radiological union

Drawbacks Newer scores i.e. the Ganga hospital scoring system were not widely used when these patients had presented for treatment. Documentation of open injuries in this institution now includes the scoring system for all open injuries at presentation. All outcome parameters were measured by various observers and documentation of these parameters was not verified at the time of this audit. In conclusion, the treatment procedure in open distal femoral fractures depends on several factors which vary from presence of associated injuries, experience of the treating surgeon and access to an experienced plastic surgical team. The most important component of treatment is a satisfactory early debridement and anatomic reduction of the fracture. Further reconstructive and rehabilitative interventions in a timely manner are important in optimising the overall functional outcome.

References

1 LARSK OLMER, KRISTERW UL


5 A philosophy of care of open injuries based on the Ganga hospital score.


