Original Article

Cost of treatment of paediatric femoral shaft fractures: compression plating versus Conservative treatment

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ABSTRACT
Objective: Economic considerations are an essential part of good surgical practice especially in the face of ever rising cost of health care in a depressed economy. This paper compares the cost effectiveness of compression plating and traction in paediatric femoral shaft fractures.

Methods: A-ten-year comparative multi-centre study in which children 5-16 years who had open reduction and internal fixation (ORIF) with dynamic compression plates were compared with children who had conservative management by traction. A cost analysis was done using duration of hospitalization and direct cost as economic indices. Patients were matched for age, sex, area and type of fracture, cause of injury (one case of osteogenesis imperfecta is on record) and indication for surgery.

Results: Thirty-one patients who had ORIF and 31 matched controls were recruited from a pool of 775 children who sustained femoral fractures over the study period. There were 42 (67.7%) males and 20 (32.3%) females. Forty-seven (71.0%) resulted from road traffic accidents, 17 (27.4%) from fall from heights and one (1.6%) pathological fracture from osteogenesis imperfecta. The right femur was affected in 34 (54.8%) and the left in 28 (45.2%) cases. The commonest type of fracture was oblique in 30 (48.4%), transverse in 19 (30.6%) and spiral in 13 (21.0%) patients. The mean duration of hospital stay for ORIF was 3.9(±1.7) and 6.4(±1.2) weeks for the conservative group (p<0.001). The mean cost of treatment was N27,844.00 (±7,600) ($206.03) for ORIF and N17,315.60 (±5,300) ($123.70) for the conservative group (p<0.001).

Conclusion. The cost of open reduction and internal fixation with dynamic compression plates and screws is 38% more expensive than conservative treatment using traction in spite of the longer duration of hospitalization. This is accounted for by the cost of implants and antibiotics.

Key words: Pediatric Femoral shaft, dynamic compression plate, traction, cost,

Introduction

Femoral shaft fractures are quite common in children and adolescents. Conservative management is the gold standard because these fractures generally heal rapidly and remodeling is excellent. More recently however, orthopaedic and trauma surgeons prefer operative treatment of childhood fractures because of reduction in duration of hospitalization, early mobilization, early discharge home to the usual environment and return to school especially in the older children. The treatment for each child however should be individualized and depends on the location and nature of the fracture, age of the patient, associated injuries, capabilities and choices of the surgeon, and parent’s preferences. Financial concerns impact less severely on the patient in the Western world because of the availability of health insurance schemes in those countries. With worsening global economy and the poverty inherent in low earning economies in the third world countries, economic considerations have always remained a major determinant factor in the choice of treatment. Cost analytical studies of various treatment modalities have been published by several researchers. They documented that the most
important factor contributing to the cost of treatment was the duration of hospitalization. This is significantly less in operative than conservative management. Reeves and colleagues compared intramedullary nailing with traction followed by casting in a series of adolescent femoral fractures and found that the traction group had a mean duration of 26 days compared to nine in the operative group. They also found that the cost of non operative treatment was 46% higher than operative even when the cost of removal of the implant was considered. Similarly, Timmerman using intra-medullary nailing and Hedin using external fixators found that their patients spent less time in hospital compared to conservative patients. Both found the cost significantly less with Timmerman estimating theirs to be less than 50% of the conservative. In a recent prospective study, Flynn found that the cost of treatment with elastic medullary nails and other conservative treatment modalities were essentially similar but was quick to point out that patients’ recovery milestones like discharge, mobilization and return to full activity were achieved faster in the operative than with the use of traction and spica. Newton and Mubarak analysed the billing records of 58 children and adolescents who had early spica casting, skin traction, skeletal traction, home traction, and intramedullary rodding and concluded that the medical charges were lowest for the early spica group ($5,494) and highest for the skeletal traction ($21,093) and intramedullary rodding ($21,359) group. In their billing systems however, in addition to the medical charges to the hospital, physicians comprising the orthopaedists, anesthesiologists, radiologists were paid separately further increasing the medical bill. This was similar to findings by Coyte who found in his analysis that treatment with spica and traction was cheaper at his centre than external fixation. He attributed this to the cost of the fixator, additional operating room staff cost and other professional and technical fees payable. Cost analytical studies of treatment in Nigeria has not been fully documented in comparing the costs of various treatment modalities in childhood and adolescent femoral shaft fractures. Compression plating is the more common method of internal fixation in this country when compared to flexible intra-medullary nails and the method of choice of the authors. In this paper, we have compared the cost of compression plating and conservative treatment in the management of femoral shaft fractures in children and adolescents. The direct cost and duration of hospitalization will be used as the economic indices.

Patients And Methods

This is a ten-year study (January 1995-December 2004) carried out in four hospitals namely Jos University Teaching Hospital Jos (JUTH); Federal Medical Center Gombe (FMCG), Gombe state, Bimma Hospital and Orthopaedic center (BHOC), Bukuru, Plateau state. Children and adolescents aged 5-16 years who had open reduction and internal fixation (ORIF) with dynamic compression plates were manually matched for age, sex, area and type of fracture, source of injury except for the one case of osteogenesis imperfecta and indication for and period of surgery, with children who had conservative management by traction. A cost analysis was done using duration of hospitalization and direct cost as economic indices. Direct cost here implied the cost of admission, operations, drugs, dressings and radiographs. Patients receipts for payment of hospital Bills were summed up in calculating the final bill at discharge after completion of treatment. Patients treated for other injuries and complications that might increase cost were excluded. The duration of treatment is the time from operation to becoming fully weight bearing. Duration of hospitalization is considered here to be the interval between surgery or application of traction/casting to the time of discharge from the hospital. Each patient had four plain radiographs taken; at presentation, immediate post-operation; six and twelve weeks post surgery. Data analysis was done using Epi-info 2005 version 3.3.2 statistical software. Variables were presented as means with standard deviations and percentages where applicable. Tests of statistical significance was done using the student’s t-test for comparing means and chi-square for proportions. Probability values less than 0.05 were considered significant.

Results

Sixty-two patients treated over the ten year period met the inclusion criteria. Thirty-one patients who had ORIF and 31 matched controls who were treated conservatively using either skin or skeletal traction were recruited from a pool of 775 children and adolescents who had femoral shaft fractures. There were 42 (67.7%) males and 20 (32.3%) females with a mean age of 12.1(±3.3) years. (see table I.) The right femur was more frequently injured in 34(54.8%) children and adolescents who had femoral shaft fractures. The commonest fracture type was oblique in 30(48.4%), transverse in 19(30.6%) and spiral in 13(21.0%) cases. The mean duration of hospital stay for the operative cases was 3.9 (±1.7) and 6.4 (±1.2) weeks for the conservative group (p<0.001). The mean cost of treatment was N27, 844.00 (±7,600.00) ($206.03) for patients treated by ORIF and N17, 315.60 (±5,300.00) ($123.70) for conservative management (p<0.001). See table II
Table I. ORIF VS Conservative Treatment.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>*ORIF</th>
<th>Conservative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>Age (years)</td>
<td>12.1 (±3.3)</td>
<td>12.1(±3.3)</td>
</tr>
<tr>
<td>M/F ratio</td>
<td>1.8:1</td>
<td>2.4:1</td>
</tr>
<tr>
<td>+DOHS (weeks)</td>
<td>3.9 ±1.7</td>
<td>6.4 ± 1.2</td>
</tr>
<tr>
<td>Cost of treatment</td>
<td>N 27,844.00 (±7,600)</td>
<td>N17, 315.60 (±5,300)</td>
</tr>
</tbody>
</table>

*ORIF=Open Reduction and Internal Fixation  +DOHS= Duration of hospital stay

Table II. Hospital Charges in various Hospitals

<table>
<thead>
<tr>
<th>SERVICE</th>
<th>JUTH</th>
<th>BIMMA</th>
<th>FMCG</th>
<th>BSSH</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1995-2000</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Admission per diem</td>
<td>50</td>
<td>500</td>
<td>nil</td>
<td>nil</td>
</tr>
<tr>
<td>X-rays per study</td>
<td>250</td>
<td>NA</td>
<td>250</td>
<td>nil</td>
</tr>
<tr>
<td>Operation fees</td>
<td>1,500</td>
<td>5,000</td>
<td>1,500</td>
<td>nil</td>
</tr>
<tr>
<td>Anaesthesia fee</td>
<td>1,000</td>
<td>2,500</td>
<td>1000</td>
<td>nil</td>
</tr>
<tr>
<td>Plate/screws</td>
<td>3,500</td>
<td>8,500</td>
<td>+NA</td>
<td>+NA</td>
</tr>
<tr>
<td><strong>2000-2004</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Admission per diem</td>
<td>100</td>
<td>1000</td>
<td>150</td>
<td>nil</td>
</tr>
<tr>
<td>X-rays per study</td>
<td>500</td>
<td>1000</td>
<td>800</td>
<td>500</td>
</tr>
<tr>
<td>Operation fees</td>
<td>5,000</td>
<td>10,000</td>
<td>10,000</td>
<td>nil</td>
</tr>
<tr>
<td>Anaesthesia fee</td>
<td>*5,000</td>
<td>5,000</td>
<td>5,000</td>
<td>3,750</td>
</tr>
<tr>
<td>Plate/Screws</td>
<td>*15,750</td>
<td>19,000</td>
<td>15,750</td>
<td>15,750</td>
</tr>
</tbody>
</table>

NA= Not available
nil= No charges for the service
*money sited in the Nigerian Naira.

Discussion:

In this study, we have demonstrated that patients who were treated by open reduction and internal fixation of paediatric femoral fractures with dynamic compression plates and screws had a shorter duration of hospitalization when compared with conservative management (3.9 versus 6.4 weeks). This has been similarly reported by other authors. Comparatively our patients spent more time in the hospital post-operative. The often quoted duration of hospital stay in other studies ranges from 5-13 days. The longer stay in our experience may be accounted for by the inability of our patients to acquire crutches for early mobilization and also the relative dearth in dedicated occupational therapists. Operative treatment was 38% more expensive than conservative treatment. Duration of hospitalization is regarded to be important in the overall cost of hospitalization of our patients and the cost of implants and antibiotics also affects the patients cost of treatment in our environment.

Conclusion:

We conclude that operative treatment of paediatric fractures is far more expensive in spite of the shorter duration of hospitalization. This is may be due to the cost of implants and antibiotics.

Acknowledgment

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References