

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^{1,2}. Conservative management is the gold standard because these fractures generally heal rapidly and remodeling is excellent³. 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^{1,4,5}. 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^{1,5}. Financial concerns impact less severely on the patient in the Western world because of the availability of health insurance schemes in those countries¹⁻⁸. 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 researchers⁶⁻⁹. 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. Reeves⁹ and colleagues compared intra-medullary 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, Timmerman⁷ using intra-medullary nailing and Hedin¹⁰ using external fixators found that their patients spent less time in hospital compared to conservative patients. Both found the cost significantly less with Timmerman⁷ estimating theirs to be less than 50% of the conservative. In a recent prospective study, Flynn¹¹ 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 Mubarak¹² 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, anaesthesiologists, radiologists were paid separately further increasing the medical bill. This was similar to findings by Coyte¹³ 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, Bauchi state specialist hospital (BSSH), Bauchi and

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%) patients and the left in 28 (45.2%). Forty-four (71.0%) cases resulted from road traffic accidents while 17 (27.4%) were from fall from heights and one (1.6%) case of osteogenesis imperfecta with pathological fracture. 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.

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

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

Table II. Hospital Charges in various Hospitals

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

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 authors⁶⁻¹⁰. 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^{3,10}. 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% (N27, 844.00(versus N17, 315.00) more expensive than conservative treatment. Duration of hospitalization is regarded to be important in the overall cost of hospitalization of our patients a fact repeatedly pointed out in several studies.⁶⁻¹⁰ In our experience however short stay did not translate directly to cheaper cost of treatment . In our hospital

cost of admission and nursing is generally low as can be seen in table II. This is however comparatively higher in the Western practice¹⁰ and the longer the patient stays the bigger his pay for hospitalization in Europe⁶⁻⁸. The cost of materials also affects the patients cost of treatment in our environment. Plates and screws are very expensive and currently a good quality eight hole dynamic compression plate (Synthes®) will be bought at N15, 000.00(\$ 231.00) while cortical screws cost N1, 250.00(\$ 9.00) for one piece. Peri-operative treatment warrants the use of strong antibiotics to completely avoid infection in ORIF. Most commonly we use Ceftriaxone (Rocephin®) which costs approximately N2,100.00(\$25.00) per vial and when used for prolonged periods adds significantly to the patients cost of hospital stay.

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.

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