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Evaluation of Some Treatment Options Inlate and Neglected Hip Fractures Using the Modified Harris Hip Score

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Abstract

Background: The choice of the appropriate operative intervention in patients with late and neglected hip fracture continuous to be a huge dilemma for orthopedic surgeons. **Purpose:** To evaluate the satisfaction or otherwise of some treatment options using the modified Harris-hip score (HHS) in resource poor setting. **Materials and Methods:** A retrospective cross-sectional study conducted at ATBUTH, Bauchi. Data of 60 patients over the age of 18 years with hip fractures (femoral neck, intertrochanteric and sub trochanteric fractures) who had operative intervention between 1st September 2019 and 31st August 2020 with cannulated screws, Proximal femur lock compression plate (PFLCP), cementlessor cemented bipolar hemiarthroplasty (BHA). **Results:** The mean age of studied patients was 65.7 ± 16.1 years, with age ranging from 19 - 101 years. M:F ratio was 1.2:1 across all age groups and 1:1.4 amongst those >60 years. 51 patients (85%) presented > 1 week after injury with 24 patients (40%) sustaining hip fractures from low energy trivial indoor fall and 28 patients (46.7%) mostly younger sustaining fractures from high energy motor vehicular accident (MVA). The prevalence rate for femoral neck, intertrochanteric and subtrochanteric fractures were 32 (53.3%), 17 (28.3%) and 11 (18.3%) respectively. From the data retrieved, 21patients (35.0%), 17 patients (28.3%), 20 patients (33.3%) and 2 patients (3.3%) had PFLCP, cemented BHA, cementless BHA and cannulated screw fixation respectively. Most (66.7%) of those who had PFLCP achieved satisfactory radiologic union and there was also 94.1% and 85% satisfactory outcome rate amongst the patients with cemented BHA and cementless BHA respectively. Irrespective of the operative intervention method at 1 year follow-up, there was a statistically significant improvement in post-operative HHS (P value 0.02), with 83.4% having good to excellent results. **Conclusion:** There is hig-

hrate of late and neglected hip fracture in our environment. Satisfactory outcome with statistically significant improvement in Post-operative HHS was achieved in patients treated for hip fractures.

Keywords

Hip Fracture, Late and Neglected, BHA, PFLCP, Cannulatedscrew, Outcome Measures, HHS

1. Introduction

The choice of a satisfactory treatment option for hip fractures in a developing country like ours still remains a huge dilemma, especially when patients present late. The absence of a working health insurance system or sometimes poor coverage implies that these patients pay for surgical treatment from out of pocket and this makes it difficult to afford this care and thus they resort to other means of treatment and hence late presentation to the hospitals with various complications. Significant number of our patients present with hip fracture non-union following traditional bone setters (TBS) intervention. Hip fractures therefore represent enormous socioeconomic challenge and a huge medical problem and gap for Orthopedic surgeons to find the cheapest and most effective way to treat them [1].

Internal fixation using dynamic hip compression screw or cephalomedullary locking nail is considered the standard of care for most intertrochanteric fractures [2], with overall failure rates cited between 3% and 12% in the elderly [3]. Some authors suggested that the use of intramedullary devices had no significant advantage over extramedullary devices, especially in cases with highly comminuted fractures at the site of nail insertion and the lateral femoral wall both of which are considered major risks related to higher failure rates [2] [3] [4].

The proximal femoral locking compression plates (PFLCP) is considered an alternative fixation method for most complex extracapsular proximal femoral fractures and even led to excellent results for management of unstable fractures [5] [6].

The goal standard for the surgical treatment of femoral neck fracture differs amongst various age groups with internal fixation and femoral head preservation is believed to be the preferred treatment with no consensus regarding the most appropriate modality of treatment [1]. The treatment must be selected individually based on the fracture pattern, displacement, pre-injury activity level, mental status of the patient, the quality of the bone and joint, the amount of independence of the patient in activity of daily leaving(ADL) and their general health [7].

Hip replacement arthroplasty (partial or total) has also emerged as the most viable treatment option and a broader consensus has been reached as regards its benefits which allow immediate weight bearing, early restoration of premorbid

activity and enhanced quality of life in elderly patients [8].

The purpose of this study was to evaluate the treatment options in hip fractures especially with regards to PFLCP and bipolar hemiarthroplasty (BHA) which are now popular treatment options of displaced, late and neglected hip fractures in our environment which cases have a significantly higher burden. Primary total hip replacement (THR) for trauma is exclusively reserved for hip fractures with established acetabular disease and due to its high-cost, affordability is a challenge for our patients. We hypothesized that despite the late presentation of our patients and other peculiarities in our environment both PFLCP and BHA when done for extracapsular and intracapsular hip fractures respectively offer acceptable outcome with improvement in post-operative HHS.

2. Methodology

The study was a single center retrospective cross sectional study conducted at Abubakar Tafawa-Balewa Teaching Hospital (ATBUTH), a tertiary referral center located in North-eastern Nigeria. A one (1) year retrospective data of all skeletally matured patients that presented with any of the hip fractures (femoral head, neck, intertrochanteric or sub trochanteric), and had surgical treatment was collected and analyzed.

A formal ethical approval was obtained from the ethics committee following which all patients that have met the inclusion criteria and presented between 1st September 2019 to 31st August 2020 were identified from the records department of the hospital. Inclusion criteria include; skeletally matured patients, who were either pre-fracture independent community ambulant or community ambulant with assisted devices, with either late hip fracture presentation (>72 hours from injury) or neglected (presenting after 1 month of fracture) [6]. Only the record of patients whom have consented for operative treatment and a follow-up of 1 year were included.

Patients whom are medically not fit for surgery or declined surgery and those requiring primary THR because of co-existing acetabular disease were excluded from the study. The data collection form for the study included, patients' demographics**,** the fracture data which included; mechanism of injury, hip affected, fracture site, duration before presentation, and pre/post-operative Harris Hip Score(HHS). Hip fracture was defined by the clinical and radiological evidence of fracture line. The radiological diagnosis of the hip fracture, choice of operative intervention (PFLCP, cannulated screws, cemented or cementless bipolar hemiarthroplasty) were all retrieved.

SURGICAL APPROACHES All operative interventions were performed by the orthopaedic surgeons in the unit. Exposure of the hip was performed using either the direct lateral or the antero-lateral approach with spinal anesthesia or epidural. BHA for neglected displaced femoral neck fractures in the elderly was either cemented or uncemented depending on the preoperative and intra-operative assessment of the Dorr status of the femur. Meticulous tissue dissection and

handling was done and femoral stem prepared in a standard fashion.

Proximal femur locked plate fixation for intertrochanteric and subtrochanteric fractures utilized a proximal femur plate with 3 proximal holes at 135 degrees, 120 degrees and 95 degrees for 6.0 mm locking screw fixation into the femoral head and neck. The distal holes for femoral shaft fixation were fixed using 4,5 mm non-locking or 5,0 mm locking screws the lateral subvastus approach to the proximal femur was employed.

Cannulated screws in an inverted triangle technique were inserted in those with incomplete transcervical femoral neck fracture, under C-arm image.

Surgical wound was irrigated with at least 2 L of saline in all cases where surgery time exceeds 90 minutes and active redivac drain inserted. All Patients received 1.5 gram of ceftriaxone/sulbactam at the point of subarachnoid block (SAB)| or epidural anaesthesia and intravenous antibiotics were continued for at least 72 hours after surgery and oral 3rd generation quinolones (levofloxacin) subsequently for 10 days.

Postoperatively high-risk patients received subcutaneous clexane 40 - 80 iu daily for at least 72 hours and subsequently oral dabigatran (pradaxa), 110 mg daily for 1 month. Functional exercises of the lower extremities were commenced 48 hours after surgery including isometric muscle contraction and relaxation, abduction, and hip and knee extension not exceeding 90˚. Activity intensity and frequency were determined based on individual tolerance. Following a satisfactory post-operative x-ray assessment patient who had BHA were guided to walk with aids on partial weight bearing. Patients were informed of the risk factors for postoperative dislocation of hip joints such as excessive internal and external rotation, excessive flexion, flexion adduction, internal rotation, and other special positions.

Patients who had fracture fixation with PFLCP or cannulated crews were mobilized with bilateral axillary crutches on non-weight bearing until radiological union was achieved. After discharge Patients underwent follow-up at 6 weeks, 3 months, 6 months and 1 year.

3. Outcomes

The primary outcome measure was hip joint function according to the post-operative HHS done at 1 year follow-up. The secondary outcomes considered were; radiologic union, Mechanical implant failure/non-union, and varus collapse.

All data were analyzed using SPSS 23 software. Categorical data was presented as descriptive statistic and chi square test to test for statistical significance of the variables against outcome measures and Post-op HHS. Continuous data were described as mean and standard deviation with t-test for statistical significance at 95% confidence interval and at a P-value of 0.05.

4. Results

The records of 60 patients whom have satisfied the inclusion criteria and have

maintained regular follow-up for at least 1 year as of the time of this study were retrospectively analyzed. The mean age of study participants was 65.7 ± 16.1 years with age ranging from 19 – 101 years. Males accounted for 55.0% of patients with a M:F ratio of 1.2:1 (Table 1). Sixty (60) % of the patients with hip fractures were older than 60 years with the age range of 61 - 75 years accounting for the highest number (Table 1).

The duration of hip fractures from time of trauma correlates with the socioeconomic status of those patients, as majority 34 (56.6%) presented with neglected hip fractures i.e presentation more than 4 weeks from the time of injury (Table 1) and this number rises to 51patients (85%) when presentation beyond 1 week was considered. Twenty-four patients (40%), sustained hip fractures from trivial low energy fall, while 28 patients (46.7%) mostly younger sustained theirs

Table 1. Perioperative variables.

	MALE (N = 33)	FEMALE (N = 27)	Total
AGE (years) Mean 65.7 ± 16.1 (%)			
16 - 30	2 (3.3)	0 (0)	2 (3.3)
31 - 45	8 (13.3)	2 (3.3)	10 (16.6)
46 - 60	8 (13.3)	4 (6.6)	12 (20)
61 - 75	7 (11.6)	12 (20)	19 (31.6)
76 - 90	7 (11.6)	8 (13.3)	15 (25)
>90	1 (1.6)	1 (1.6)	2 (3.3)
Durationat presentation (%)			
<1week	7 (11.6)	2 (3.3)	9 (15)
1 - 4 weeks	6 (10)	11 (18.3)	17 (28.3)
4 - 12 weeks	14 (23.3)	6 (10)	20 (33.3)
>12 weeks	6 (10)	8 (13.3)	14 (23.3)
Mechanism of injury (%)			
RTA	20 (46.4)	8 (10.7)	28 (46.6)
Trivial indoor fall	10 (10.7)	14 (17.8)	24 (40)
Outdoor fall	3 (7.1)	5 (7.1)	8 (13.3)
Radiologic diagnosis			
Femoral neck fracture	18 (30)	14 (23.3)	32 (53.3)
Intertrochanteric fracture	9 (15)	8 (13.3)	17 (28.3)
Subtrochanteric fracture	6 (10)	5 (8.3)	11 (18.3)
Operative treatment			
PFLP	12 (20)	9 (15)	21 (35)
Cementless BHA	13 (21.6)	7 (11.6)	20 (33.3)
Cemented BHA	6 (10)	11 (18.3)	17 (28.3)
Cannulated screws	2 (3.3)	0 (0)	2 (3.3)

from high energy MVA (table 1). Femoral neck fractures were the most common seen in 32(53.3%) patients followed by intertrochanteric fractures (28.3%) and subtrochanteric fractures (18.3%) (Table 1). Age-related femoral and intertrochanteric fractures in patients >60 years rises to 88%.

The options of surgical operative treatment depending on the radiologic diagnosis of the hip fracture were PFLPin 21patients (35.0%), cemented BHA in 17 patients (28.3%), cementless BHA in 20 patients (33.3%) and cannulated screws 2 patients (3.3%) (Figure 1). PFLP was the treatment of choice in all subtrochanteric fractures and most intertrochanteric fractures (Figure 2b). Thirty-seven patients (61.6%) had cemented or cementless BHA (Figure 2a), which was reserved for all patients with neglected femoral neck fractures > 60 years and some intertrochanteric fractures (Figure 1).

Fourteen patients (66.7%) out of the 21 that had PFLP achieved satisfactory radiologic union, while 4 patients (19.0%) had implant failure/non-union. Despite vascular collapse with limb length discrepancy (LLD), union was achieved in 3 patients (14.3%) (Table 2). Sixteen patients (94.1%) and 17 patients (85%) reported satisfactory outcome amongst the cemented and cementless BHA respectively, with 4 patients requiring revision surgery (Table 2).

54 patients (90.0%) had a poor pre-operative HHS of <70 before surgery, and

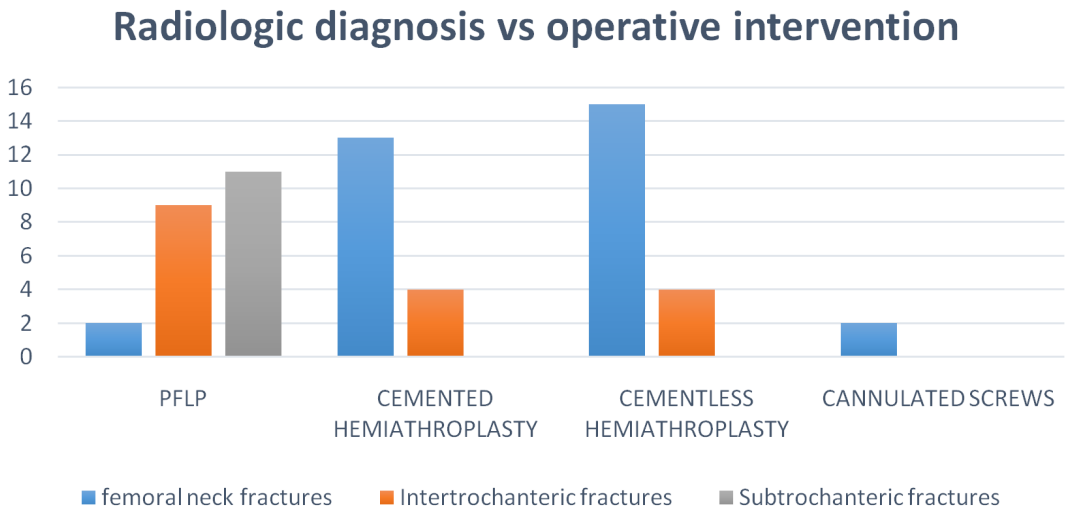

Figure 1. Radiologic diagnosis vs. operative intervention cluster chart.

Table 2. Outcome measures for the operative intervention options.

OPERATIVE INTERVENTION	RADIOLOGIC UNION/SATISFACTORYFOR FIXATION	IMPLANT FAILURE/NON-UNION	RADIOLOGIC UNION WITH VARUS	REVISION SURGERY for bha	SATISFACTORY FOR BHA
PFLP	14 (66.7%)	4 (19.0%)	3 (14.3%)	-	-
CEMENTED BIPOLAR	-	-	-	1 (5.9%)	16 (94.1%)
CEMENTLESS BIPOLAR	-	-	-	3 (15%)	17 (85%)
CANNULATED SCREWS	2 (100%)	0	0	-	-

irrespective of the operative intervention method at 1 year follow-up there was a statistically significant improvement (P value 0.02, df 9) with 50 patients (83.4%) having good to excellent post-operative HHS (Table 3).

5. Discussion

The choice of surgical treatment option and the outcome of such intervention has become a huge dilemma for Orthopedic surgeons in our environment due to late and neglected presentation including local peculiarities hinging on affordability and accessibility of care.

The mean age of the study participants was 65.7 ± 16.1 years with males accounting for 55.0% and a M:F ratio of 1.2:1 which is in tandem with studies that included hip fractures from both high energy (MVA) and low energy (trivial indoor fall) mechanism. Daniel *et al.* [9] reported a mean age of 69.7 ± 15 years and Shah *et al.* [10] showed that M:F ratio could be as high as 16:4. Amongst those who sustained hip fractures from low energy trivial indoor fall, the M:F ratio was 1:1.4 with 58.3% being women and this is comparable with studies on osteoporotic hip fractures by lee *et al.* [11] and Frihagen *et al.* [8]. Most femoral neck and intertrochanteric fractures in the elderly from this study resulted from a trivial indoor fall, while 80%of similar fractures in the young were from MVA with similar results echoed by Ravi *et al.* [12] and Lee *et al.* [11].

51 patients (85%) of the studied population presented with hip fractures > 1

Table 3. Cross tabulation of Operative intervention and Post-operative HHS.

	POST-OPERATIVE HHS				
OPERATIVE INTERVENTION	<70 (poor)	70 – 79 (Fair)	80 - 89 (Good)	>90 (Excellent)	P-Value(chi square)
PFLCP	1	3	6	11	0.02 Df 9
Cannulated screws	1	0	0	1	
Cemented bipolar HA	1	1	14	1	
Cementless bipolar HA	2	1	8	9	
N	5 (8.3%)	5 (8.3%)	28 (46.7%)	22 (36.7%)	

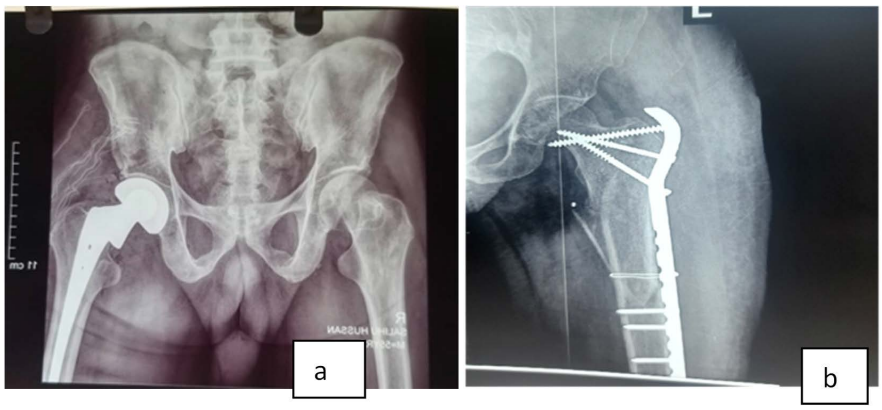

Figure 2. Radiographs showing Uncemented BHA and PFLCP.

week from injury and this is comparable to another Nigerian study by Daniel *et al.* [9] in which 71.4% presented after 3 weeks. The high rate of late and neglected hip fractures in our environment can be traced to the low socioeconomic status of our patients with issues of lack of affordability and also the influence of traditional bone setters with further complications.

The study showed the rate of femoral neck fracture across all age group at 53.3% irrespective of the mechanism of injury followed by intertrochanteric and subtrochanteric fractures at 28.3% and 18.3% respectively with age specific rate of femoral and intertrochanteric fractures in those older than 60 years rising to 88.8% comparable to results reported by Pillai *et al.* [13] and Zelenska *et al.* [14]

The preponderance for cemented and cementless bipolar hemiarthroplasty (**Figure 2a**) in patients with hip fractures which accounted for 61.6% and 75.5% respectively of total operative interventions in those >60 years is similar to studies by Frihagen *et al.* [8] and Rogmark *et al.* [15]. The absence of THR as a primary operative intervention is based on the fact that elderly patients with hip fractures and co-existing acetabular disease were excluded from this retrospective analysis, more affordability is a challenge with the poor socioeconomic status of our patients and lack of health insurance making such operative intervention not frequently done. PFLCP was the operative intervention in all patients <60 years with subtrochanteric and intertrochanteric fractures. Ravi *et al.* [12], in a prospective study of 21 patients with extracapsular proximal femur fractures, showed that fixation option using PFLCP resulted in 18 patients (86%) having good to excellent outcome. Dhamangaonkar *et al.* [5] and Lee *et al.* [11] have reported similar utilization of PFLCP for subtrochanteric and intertrochanteric hip fractures. The lower rate of cannulated screw fixation in this study can be attributed to the high number of patients (75%) that presented > 1 week from injury and were likely to have displaced and complicated fractures thereby ruling out such treatment option. This study did not set out to evaluate other treatment options such as cephalomedullary nails and DHS.

Amongst those who had cemented and cementless BHA, 94.1% and 85% respectively, reported satisfactory outcome with a statistically significant improvement in post op HHS at 1 year similar to other studies by Parker *et al.* [7] and Fihargen *et al.* [8]. While Frihargen *et al* in a study of bipolar cemented BHA outcome in 110 patients reported a 49.5% significant improvement in post-op HHS at 1 year, Palanisamy *et al.* [16] reported a 90.9% recovery to pre-injury function at 1 year similar to our study.

Satisfactory radiologic union was achieved in 66.7% of PFLP similar to the report by Shah *et al.* [10] and by extension 14.3% had varus malunion bringing the overall union rate amongst those that had PFLCP to 81% similar to Lee *et al.* [11], who reported a radiologic union of 84.6%.

6. Conclusion

The choice of treatment options in low to middle income countries where patients

present with late or neglected hip fractures will continue to be a subject of intense research. Within the limitation of a retrospective study, our results showed the common operative intervention choices in our environment. These treatment options in addition to being affordable, also resulted in satisfactory outcomes with statistically significant improvement (P value = 0.02) in Post-operative HHS.

There is a need for an extensive Nigeria randomized controlled prospective study, into the socioeconomic burden and the outcome of treatment options such as Cannulated screw, DHS, PFN and THA amongst others in late and neglected hip fracture presentation.

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Conflict of Interest

The authors declare that they have no conflict of interest.

Ethical Approval

Ethical approval was obtained from the ethical board of Abubakar Tafawa-Balewa University Teaching Hospital, Bauchi to obtain the data of patients who have undergone surgical treatment for hip fracture and the study was in absolute compliance. The human data were handled in compliance with the declaration of Helsinki.

Author Contribution

All authors have been directly involved with the various aspects of the study. We attest to the fact that all authors have participated in the research, read the manuscript, attest to the validity and legitimacy of the data.

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Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author.

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