

Bipolar and Unipolar Haemiarthroplasty in Fracture Neck Femur in Two Hospitals in Aden

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Abstract

Introduction: Replacement of the femoral head and neck with prosthesis offers a way to prevent complications of internal fixation in elderly patient. The study aimed to describe the distribution of neck of femur fracture according to sex and to compare patient's functional outcomes related to the type of hemiarthroplasty (HA) prosthesis used.

Methods: This is a retrospective study involved patients who have neck of femur fracture and treated by unipolar and bipolar HA at two hospitals in Aden, Yemen, between January 2013 and December 2016. Patients' files were reviewed and postoperative radiographs were retrieved. Patients were classified into unipolar and bipolar prosthesis groups. Fisher test was used and p -value < 0.05 was considered as statistically significant.

Result: The study involved 43 patients (58.1% males and 41.9% females). The mean age was 72.6 ± 4.5 years. Garden types III and IV represented 86.0%. Unipolar prosthesis was applied in 81.4% of patients distributed as follows: 9.3% were in type II, 32.6% in type III and 39.5% in type IV. Bipolar prosthesis was applied in 18.6%. No statistically significant relations between types of HA prosthesis and fracture types. There were 4.6% in fracture type II and fracture type III each, and 11.6% in type IV were operated with cemented HA prosthesis, ($p > 0.05$). Ten (23.3%) patients were complained of postoperative pain in unipolar group. Limb length shortening was in 5 patients in unipolar group. Most of the complications (32.5%) were in the unipolar group.

Conclusion: The results of the present study showed that the incidences of complications were higher in unipolar hemiarthroplasty.

Keywords: Bipolar, Unipolar, Hemiarthroplasty, Fracture Neck of Femur, Aden.

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المفصل الاصطناعي ثنائي وأحادي القطب في استبدال رأس وعنق الفخذ في مستشفيات في عدن

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ملخص الدراسة

المقدمة: استبدال رأس وعنق الفخذ مع مفصل اصطناعي يوفر وسيلة لمنع مضاعفات التثبيت الداخلي في المرضى المسنين. هدفت الدراسة لتحديد توزيع كسر عنق عظم الفخذ بالنسبة للجنس ومقارنة النتائج الوظيفية للمريض بعد جراحة تبديل المفاصل.

المنهجية: هذه دراسة إسترجاعية تشمل مرضى يعانون من كسر في عنق ورأس عظمة الفخذ وتمت معالجتهم باستبدال المفصل بمفصل أحادي وثنائي القطب في مستشفيات في عدن، اليمن، بين يناير 2013 وديسمبر 2016. تمت مراجعة ملفات المرضى واسترجاع الصور الشعاعية بعد العملية الجراحية وتصنيف المرضى إلى مجموعات إستبدال المفصل أحادي وثنائي القطب. وقد تم استخدام اختبار فيشر واعتبرت قيمة $p < 0.05$ ذات دلالة إحصائية.

النتائج: شملت الدراسة 43 مريضاً، (58.1% ذكور و41.9% إناث). كان متوسط العمر 72.6 ± 4.5 سنة. أنواع الكسور حسب تصنيف جاردن من الدرجة الثالثة والرابعة مثلوا 86.0%. تم استخدام مفصل أحادي القطب في 81.4% مريض على النحو التالي: 49.3% في النوع الثاني من الكسور، 32.6% في النوع الثالث من الكسور، 39.5% في النوع الرابع من الكسور. تم تطبيق مفصل ثنائي القطب في 18.6% من المرضى. لا توجد دلالة إحصائية بين أنواع بدلات استبدال المفصل وأنواع الكسور. كان هناك 4.6% من المرضى ذوي الصنف الثاني والثالث من الكسور و11.6% من الصنف الرابع تم إجراء العملية لها بالاستبدال بمفصل صناعي أحادي القطب مع الإسمنت. عشرة (23.3%) من المرضى عانوا من آلام بعد الجراحة في مجموعة ذوي المفاصل أحادية القطب. خمسة مرضى عانوا من قصر في الرجل من المجموعة ذوي المفاصل الأحادية. هناك قصر في طول الأطراف السفلى في 5 مرضى في مجموعة أحادية القطب. كانت أكثر المضاعفات 32.5% في مجموعة ذوي المفاصل الأحادية القطب.

الاستنتاج: أظهرت نتائج الدراسة أن المضاعفات كانت أعلى في حالات المفاصل ذوي القطب الأحادي.

الكلمات المفتاحية: ثنائي القطب، أحادي القطب، استبدال المفصل، كسر عنق الفخذ، عدن.

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Introduction

Fracture of the neck of femur is among the most serious medical problems affecting older group [1]. The incidence of fracture of the neck of femur increases dramatically after the age of 70 years. Furthermore, the overall number is increasing because of increase in the mean age of the population [2,3].

Replacement of the femoral head and neck with prosthesis offers a way to prevent complications of internal fixation and is therefore an attractive alternative in the elderly patient [4,5]. A hemiarthroplasty (HA) is generally considered to be sufficient for the most elderly patients with lower functional demands [6,7]. There are two different types of HA: unipolar and bipolar. The theoretical advantage of the bipolar HA is a reduction of acetabular wear due to the dual-bearing system. On the other hand, a potential disadvantage is the risk of polyethylene wear that may contribute to mechanical loosening over time and there is also a risk of inter-prosthetic dissociation in certain bipolar HAs necessitating open reduction [8]. The development of bipolar HA was based on the clinical experience with limited success of unipolar prosthesis due to progressive acetabular erosion and protrusion [4].

Fracture of the neck of femur is a common surgical condition. However, little is known about its epidemiology in Yemen. In addition, there are no published articles found in the Website had studied this health problem.

The present study aimed to describe the distribution of neck of femur fracture according to sex and to compare patient functional outcomes related to the type of hemiarthroplasty prosthesis used (unipolar or bipolar).

Methods

This is a retrospective study involving 43 patients who have neck of femur fracture and treated by unipolar and bipolar HA done by the same surgeon (the author) at Al-Salam Hospital and Al-Gamhoria Teaching Hospital, in Aden, Yemen, between January 2013 and December 2016.

Patients' files were reviewed to retrieve postoperative radiographs and classify the patients into either the unipolar or bipolar prosthesis groups. Demographic, characteristics data and follow up results were obtained from patients' charts. The collected data were tabulated and statistical analysis was done by estimating frequencies, means and standard deviations. Fisher test was used and p -value <0.05 was considered as statistically significant. The statistical software package SPSS version 17 was used.

Results

The study involved 43 patients (58.1% males and 41.9% females) with a male to female ratio of 1.4:1. The age was ranged between 65–82 years. The mean age of patients was 72.6 ± 4.5 years (72.1 ± 4.1 years for males and 73.2 ± 5.1 years for females). Patient aged less than 75 constituted 69.8% years whereas those ≥ 75 were 30.2%.

The right-side neck femur fracture was found in 51.2% and the left side fracture in 48.8% of patients.

Fourteen percent of patients were in Garden type II, 39.5% in Garden type III and 46.5% in Garden type IV as shown in Table 1.

Table 1: Characteristics and Clinical Findings of the Study Patients (n=43)

Variables	No.	%
sex		
Female	18	41.9
Male	25	58.1
Age (years)		
Range:	82 – 65	
Mean (all patients)	72.6 ± 4.5	
Mean (males)	72.1 ± 4.1	
Mean (females)	73.2 ± 5.1	
Age group (years)		
< 75	30	69.8
≥ 75	13	30.2
Side		
Right	22	51.2
Left	21	48.8
Garden type		
II	6	14.0
III	17	39.5
IV	20	46.5

Table 2 summarizes the distribution of HA prosthesis and method of implant fixation related to fracture types in which 9.3% of patients were in type II, 32.6% in type III and 39.5% in type IV were operated with unipolar prosthesis. In addition, there

were 4.6% in type II, 7.0% in type III and 7.0% in type IV were operated with bipolar prosthesis.

There was no statistically significant difference with regard to HA prosthesis and fracture types. There were 4.6% patients in fracture type II, and type III each and 11.6% in type IV were operated with cemented HA prosthesis and the rest with non-cemented HA prosthesis. Such differences were statistically insignificant.

Table 3 shows that 76.7% of patients operated with HA prosthesis did not complain of pain and the rest (23.3%) complained of post operation pain. Pain was encountered more among patients who operated with unipolar prosthesis. Of them, 9.3% complained of thigh pain, 7.0% of hip and thigh-hip each. In addition, walking in the first 2 days postoperatively was found in 18.6% of patients who operated with bipolar HA prosthesis, whereas 69.8% of patients were postoperatively able to walk within the first 1 to 2 days of bipolar HA. Leg length shortening was 1 centimeter in 7.0% of patients and 1.5 centimeter in 4.6% of patients treated with unipolar HA prosthesis. However, no statistically significant relation was found between each of pain, walk within the first 1 to 2 weeks and limb shortening and the type of HA prosthesis.

Table 2: HA Prosthesis and Method of Implant Fixation Related to Fracture Types *

Variables	Garden types							
	Type II (n=6)		Type III (n=17)		Type IV (n=20)		Total (n=43)	
	No.	%	No.	%	No.	%	No.	%
Hemiarthroplasty prosthesis								
Unipolar	4	9.3	14	32.6	17	39.5	35	81.4
Bipolar	2	4.6	3	7.0	3	7.0	8	18.6
Method of implant fixation								
Cemented hemiarthroplasty	2	4.6	2	4.6	5	11.6	9	20.9
Uncemented hemiarthroplasty	4	9.3	15	34.9	15	34.9	34	79.1

* All percentages were taken from the total 43

Table 3: Postoperative Findings According to The Type of HA Prosthesis

Findings	Hemiarthroplasty prosthesis					
	Bipolar (n=8)		Unipolar (n=35)		Total (n=43)	
	No.	%	No.	%	No.	%
Pain						
No pain	8	18.6	25	58.1	33	76.7
Thigh	0	0.0	4	9.3	4	9.3
Hip	0	0.0	3	7.0	3	7.0
Thigh hip	0	0.0	3	7.0	3	7.0
Waking within 1 to 2 days						
Yes	8	18.6	30	69.8	38	88.4
No	0	0.0	5	11.6	5	11.6
Limb shortening						
One centimeter	0	0.0	3	7.0	3	7.0
One and half centimeter	0	0.0	2	4.6	2	4.6
No shortening	8	18.6	30	69.8	38	88.4

Most of the complications shown in Table 4 were recorded with the unipolar group when compared to only 4 patients (9.3%) of bipolar group. The complications that were found included 2.3% deep infection in the unipolar HA group, superficial infections: 2.3% in the bipolar HA group and 4.6% in the group of unipolar HA. Furthermore, 16.3% developed acetabular erosion; all

were in the unipolar HA group and 2 patients complained of dislocation – one in each group of HA. In addition, Table 4 reveals 2.3% post-prosthetic fracture in the bipolar HA group and 4(9.3%) cases loosening (3 in the unipolar HA group and 1 in the bipolar HA group). The difference between values showed no statistically significant ($p > 0.05$).

Table 4: Results and Complication Related to Type of HA Prosthesis

Results & Complications after 3 months	Hemiarthroplasty prosthesis				Total	
	Bipolar		Unipolar		No.	%
	No.	%	No.	%		
Superficial infection	1	2.3	2	4.6	3	7.0
Deep infection	0	0.0	1	2.3	1	2.3
Acetabular erosion	0	0.0	7	16.3	7	16.3
Dislocation	1	2.3	1	2.3	2	4.6
Fracture	1	2.3	0	0.0	1	2.3
Loosening	1	2.3	3	7.0	4	9.3
None	4	9.3	21	48.8	25	58.2
Total	8	18.6	35	81.4	43	100

Discussion

Femoral neck fractures are frequent injuries in the patient population of every trauma center and have a high incidence in the general population. Paralleling trends of demographic forecasts, their incidence will continue to rise in the future [9]. Especially in the elderly, femoral neck fractures represent a significant health care problem and have enormous impact on health insurance costs. Therefore, the appropriate treatment of femoral neck fractures is mandatory. Today, surgery is the mainstay of care [10].

There were male's preponderance observed in this study with a male female ratio of 1.4:1. This gender variation is in line with the results obtained by Elsayed *et al* [11] from Egypt with male to female ratio of 2.75:1. Likewise, Daniel *et al* [12] from Nigeria reported a male to female ratio of 1.9:1. In contrast, Shekhar *et al* [13] from India reported male to female ratio of 1:2 and Pillai *et al* [14] from Scotland found a male to female ratio of 0.1:4.

In the present study, the age of patients ranged between 65 – 82 years and the mean age of patients

was 72.6 ± 4.5 years. The highest percentage of patients aged less than 75 years. Shekhar *et al* [13] reported a mean age of 78.2 years which is higher than our finding. In contrast, the mean age of patients in the present study is higher than other studies, from Egypt at 60 years [11], Iraq at 64.6 years [15], and India at 70.5 years [16].

The study revealed that neck femur fracture was 51.2% in the right side and 48.8% in the left side. This finding is similar to what was reported by Buord *et al* [17] from France in which they found right side injury in 50.9% of patients, and the left, in 49.1%.

In this study, the unipolar HA were predominant (81.4%). Similarly, Ayhan *et al* from Turkey [18] reported predominance of unipolar HA group (56.2%). Also, in our study the unipolar HA were applied as follows: 9.3% in patients with Garden type II, 32.6% in patients with Garden type III and 39.5% in patients with Garden type IV. There were 8 patients operated by bipolar HA and were distributed as follows: 4.6% of patients in type II, 7.0% in type III and

7.0% in type IV. There was no statistically significant relation between HA prosthesis and fracture types. Shetty *et al* [19] reported that most of the patients were from category III or IV (87.5%) as per Garden's classification. This finding is to some extent similar to our result.

The choice between a unipolar and a bipolar HA is controversial and difficult to make. The best treatment for displaced fracture neck of femur is still inconclusive and management should be tailored to suit individual patient's need. Studies have shown internal fixation to be inferior to arthroplasty for the treatment of displaced femoral neck fractures in terms of mobility, functional outcome and risk of reoperation [20].

Hemiarthroplasty is most frequently performed for displaced femoral neck fractures. Considerable debate still exists in the choice between unipolar and bipolar designs. The design of the bipolar implant allows for interprosthetic movement between the inner and outer head. This theoretical mechanical advantage results in minimal acetabular erosion without risking dislocation, ideal for the younger and active patients. Indeed, some studies have shown a later onset of acetabular erosion and greater hip range of movement, [21] in patients with bipolar implants. However, some studies have not demonstrated superior functional outcome of bipolar hemiarthroplasty compared with their unipolar counterparts [22,23].

In the present study, 76.7% operated patients with HA prosthesis did not complain of pain. Pain was found only among patients of unipolar HA group. Prasad *et al* [24] reported in

their study that they found 13.3% of pain with unipolar group when compared to 6.7% of bipolar group.

The study indicated that limb length shortening of 1 centimeter happened in 7.0% of patients and of 1.5 centimeter in 4.6% of patients treated with unipolar HA prosthesis. No statistically significant relation was found between limb shortening and HA prosthesis. Shetty *et al* [19] reported that limb length discrepancy was observed in 13.3% of patients with unipolar HA prosthesis as compared to none in bipolar HA group. Limb length discrepancy was more pronounced in unipolar HA group, possibly due to factors related to alignment of the prosthetic stem, length of head offset and calcar seating. On the other hand, Krishna *et al* in India [4] observed limb length discrepancy in 1 case out of 20 in unipolar HA group while none was seen in bipolar HA group. However, limb length discrepancy did not exceed 1-2 cm in either of the group of patients resulting in no or very slight limping [19].

Shetty *et al* [19] mentioned that implant loosening was observed in 20% of patients with unipolar HA prosthesis. In the current study, most of the complications (32.5%) were recorded in the unipolar group when compared to only 9.3% of the bipolar group. Likewise, Krishna *et al* [4] mentioned that most of the complications (41.7%) were recorded with the unipolar group, compared to 11.6% of patients.

The complications that were encountered in the present study included 2.3% of deep infection in the group unipolar HA, 3 superficial infections: 2.3% in the group of

bipolar HA and 4.6% in the group of unipolar HA. It was observed also 16.3% of acetabular erosion (all in the unipolar HA group). In addition, 9.3% of patients had loosening – 3 in the unipolar HA group and 1 in the bipolar HA group. In a related context, Jain *et al* [25] reported that 2 instances of superficial infection were present, 1 in unipolar and 1 in bipolar. One instance of deep infection was found in unipolar. The most common complication seen was superficial disease. One patient had dislocation in the bipolar group.

Inngul from Sweden [21] observed an increased number of patients in the unipolar group, compared to the bipolar group, with acetabular erosion at the early follow-ups with a significant difference at 12 months.

Conclusion

Hemiarthroplasty is the optimal treatment for elderly patients with femoral neck fractures and produce satisfactory results. The incidence of complications was higher in unipolar hemiarthroplasty.

The disadvantage of bipolar HA prosthesis is being more expensive. In our setting, there is much cost difference between the two bipolar and unipolar HA prostheses. Therefore, unipolar hemiarthroplasty remains a popular choice.

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