

Bipolar hemiarthroplasty for femoral neck fracture in elderly: post-operative results and complications

Surgical results of bipolar hemiarthroplasty in elderly

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Abstract

Aim: In this study, we aimed to evaluate preliminary results and determine the rate of complications of bipolar hemiarthroplasty in patients aged 65 and older. **Material and Methods:** Patients aged 65 years and older with femoral neck fractures who underwent surgery at 7A Military Hospital from September 2013 to September 2018 were included into this study. The research is a descriptive and prospective study.

Results: A total of 60 patients were studied. Aside from 1 deceased, 59 cases with 59 joints were replaced and followed up for an average of 15.3 months. Age and gender were not associated with the outcome of treatment. Implants included Zimmer 29, Serf 13, Stryker 9, and Depuy 9. There were 28 joints using cement and 32 joints cementless. The position of the stem was neutral in 54 cases, valgus in two instances, and varus in 4 cases. There were no loosen stem case. The cement technique was used in 17 cases (68%) type A and 8 cases (32%) Type B, according to Barrack classification. Clinical results according to Harris were as follows: 31 cases were very good, 12 cases were good, 5 cases were mean, and 11 cases were poor, equivalent to other authors. There were 6 cases of short limbs that reduced patient satisfaction. One case of incision infection was cleaned twice and stabilized after four weeks. One case of acetabulum worn after 32 months, but there were no clinical signs; one case dead from a stroke four weeks after the surgery without association with the operation. **Discussion:** Poor results are often caused by a combination of medical problems or aging. Early surgery provided better results than late surgery. There was no damage to blood vessels, nerves, fractures, or death during surgery. The bipolar hemiarthroplasty in the elderly group with very good and good rates accounted for a high proportion (72.88%). Early surgery was better (90%) compared to late surgery (69.38%). There were a few complications due to surgery.

Keywords

Bipolar; Elder; Femoral Neck; Fracture; Hemiarthroplasty; Hip Replacement

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Introduction

Femoral neck fractures (FNF) are common in the geriatric population and they represent a significant health care problem and have an enormous impact on health insurance costs [1,2]. The fragile physical health of this age group often leads to risks of post-operative morbidity, complications and even mortality. Bipolar hemiarthroplasty (BH) or total hip replacement is the current treatment of choice. Literature has had many reports on the outcome of the BH operation for all ages, [3-8] which generally shows favorable results, especially in comparison with other methods such as internal fixation [9]. However, there were still a few reports of results in a higher age group (aged 65 and older). A serious assessment of treatment efficiency and outcomes in this fragile population which is very demanding in techniques, skills and postoperative care, is very essential. Therefore, our research aimed at two goals: (1) Evaluation of early results and (2) Determining the rate of complications of this surgery in the elderly patient group.

Material and Methods

The institutional ethics committee approved the study.

- Subjects: Patients aged 65 years and older, who had new femoral neck fracture (≤ 4 weeks) due to trauma got surgery performed at 7A Military Hospital from September 2013 to September 2018. The study included 60 patients. In addition to 1 patient who died one month after surgery, we monitored 59 patients with 59 replaced joints. The average follow-up period was 15.3 months (3-32 months)

-Research design: Longitudinal study.

- Methods of treatment: Posterior surgery, skin incision 10-12cm long. Bipolar hemiarthroplasty with or without cement. Antibiotic prophylaxis intravenous 30 minutes before the surgery. After surgery, we continued to use prophylactic antibiotics 5-7 days, withdraw drainage after 24-48 hours, routinely guide patients to passive, active motion, and physiotherapy rehabilitation.

Results

Data distribution characteristics

- Patient characteristics: There were 35 patients from 60 to 75 years old (25 female, ten male), and 25 patients over 75 years old (19 female, six male). Average age: 74.8 (65-92 years old) Living accident 59 patients (98.3%), traffic accident 1 patient (1.7%). There were 39 cases with left fractures and 21 cases with right fractures. There were 29/59 patients with combined medical diseases accounted for 49%, including cardiovascular

disease (28.8%), diabetes (8.4%), stroke (11.9%), and both cardiovascular and diabetes (5.1%).

- Time from fracture to surgery: Time from accident to surgery and clinical results were shown in Table 1.

- Average operation time (n = 60): 76.8 minutes (55 minutes-120 minutes).

- Number of blood transfusion patients (n = 60): There were 14 patients requiring blood transfusions (23.3%) and 46 patients without transfusions (76.7%). The amount of blood transfusion was from 250ml to 700ml.

- Characteristics of artificial joints: Artificial joints of many different manufacturers, including Zimmer (29 patients, 48.3%), Serf (13 patients, 21.7%), Stryker (9 patients, 15%), Depuy (9 patients, 15%). Arthroplasty with cement was 28 cases (patients over 70 years of age accounted for 92%), and cementless 32 cases (patients over 70 years accounted for 71%). The average diameter of an artificial head (n = 60) was 43.85mm (39-53mm).

Treatment results:

The average hospitalization time after surgery (n = 60) was 14.9 days (8-45 days). There was 1 case of incision infection. There were 6 cases of patients (n = 60) had uneven limbs, of which five patients had <0.5 cm short, and one patient 0.5-1cm short. In X-ray after surgery, there were 54 cases (90%) with neutral stem position (n = 47), 2 cases (3.3%) with valgus, and 4 cases (6.7%) with varus. No cases of fractures took place. Quality of cement after the surgery according to Barrack (n = 25) were as follows: Type A 17 patients (68%), and type B 8 patients (32%).

Long term results

The total amplitude movement of replaced hips is shown in Table 2.

There were 50/59 (84.8%) replaced joints with the amplitude of movement > 1600

Pain level is shown in Table 3.

So there were 54/59 cases (91.5%) with no pain or minor pain that did not affect exercise and did not require pain medication. The general results, according to Harris, were shown in Table 4.

* Total patients with very good and good scores were 42, accounting for 72.9%.

* The average Harris score was 82.6 (40-97 points)

* Most patients were satisfied with the surgical results

Results by groups with combined medical conditions or not.

There were 24 patients with associated medical diseases before hospitalization, one case that had a second stroke four

Table 1. Time from fracture to surgery and clinical outcome

Time / Result	Poor, Average	Good, Very good	Total
<1 week	01 (5.3%)	18 (94.7%)	19
2-4 weeks	11 (33.3%)	22 (66.7%)	33
4-6 weeks	04 (57.1%)	03 (42.7%)	07
Total	16 (27.1%)	43 (72.9%)	59

Table 2. Total amplitude movement of replaced hips (n = 59)

Total range	Number of patients	Percentage %
211° - 300°	31	52.5
161° - 210°	19	32.2
101° - 160°	8	13.6
61° - 100°	1	1.7
Total	59	100

weeks after surgery was not assessed. Details of results were listed in Table 5.

Complications

- During operation complications and later complications: 01 postoperative infection.
- Long term complications: Worn acetabulum: 01 patient. There was no case with loosening stem, fracture around the artificial joint, or dislocated joints.
- Death: There was one death from a stroke after four weeks of surgery

Discussion

Results related to gender. According to some authors, after 50 years old, the rate of hip fracture in women is 3-4 times higher than that of men. In our study, the ratio of women to men was 2.5 / 1. The ratio is quite consistent with the frequency of fractures from other authors. However, this only partially shown that the frequency of femoral neck fractures was different between men and women. The treatment results were the same for both sexes. This result is similar to the report of others. [3,4,6].

Results related to the time of surgery: Radcliff et al., (2006) [5] reported that patients who had surgery earlier (before four days) had better results than those who had surgery late. Beaupre et al. (2005) [10] had similar comments, as well. In our study, among patients who had surgery early within one week, there was one patient with average results and 18 patients with good and very good results (94.74%). Among patients who were operated later (1-4 weeks), there were 11 patients with average results and 22 patients with good and very good results (66.67%). Those who had surgery further later (4-6 weeks) were 04 patients with average results and 03 patients with good and very good (42.86%). This result showed that the earlier surgery, the better the results ($p = 0.01 < 0.05$ is statistically significant). However, it was also possible that patients with good condition and no medical conditions could have an earlier operation schedule. This result also confirmed that patients with medical conditions had worse results.

Results related to age and medical conditions: Age is an important factor to consider in order to designate appropriate treatment for patients with femoral neck fractures. Results of the two older and younger age groups did not differ much, while there were differences between the groups with and without medical diseases. This indicated that age was not a contraindication to surgery. Among 23 patients with combined medical conditions, the very good and good results were in 13 cases (54.17%), average and poor in 10 cases (45.83%). The average and poor result groups were often associated with a combination of medical conditions ($p = 0.007 < 0.05$), especially stroke. This comment is similar to that of Gjertsen et al. (2008) [6].

Results related to artificial joint type: For femoral hip fractures in older people (≥ 65 years old), if choosing unipolar hemiarthroplasty, the probability of failure is very high. Therefore, Giliberty (1985) [7] and Raia FJ [11] recommends bipolar hemiarthroplasty (BH) for these patients. We also choose BH for most patients older than 65 with hip fractures. Many studies showed that bipolar joints caused less wear on

the acetabulum than the unipolar joints [8]. In our opinion, if the patient's life expectancy is not much, the treatment requirements are not high, it is possible to use unipolar joints with low cost with acceptable clinical results. However, due to the current objective conditions, the adequate provision of the head and stems of the unipolar joints are incomplete, making it difficult to apply for patients.

Results related to joints with or without cement: Most studies have shown that the results of cement and cementless groups did not differ in terms of postoperative complications, duration of surgery, degree of blood loss and mortality, but the cementless group had higher postoperative pain rate [12]. Our study included 28 cases with cement and 31 cases without cement; the results showed no difference ($p = 0.4$). It may be

Table 3. Pain severity

Level	Quantity	Percentage %
No pain	32	54.2
Yes, but not significantly	22	37.3
Yes, take moderate pain medication	3	5.1
Moderate pain, strong pain medication	2	3.3
Severe pain, limited movement	0	0
Disabled, complete loss of function	0	0
Total	59	100

Table 4. Clinical results according to Harris (n = 59)

Level	Number of patients	Percentage %
Very good (90-100p)	31	52.5
Good (80-89p)	12	20.3
Average (70-79p)	5	8.6
Poor (under 70p)	11	18.7
Total	59	100

Table 5. Results by groups with combined medical conditions or not

Results	Patients with medical diseases	Patients without medical diseases
Very good (90-100p)	7 (30.4%)	25 (69.5%)
Good (80-89p)	6 (26.1%)	4 (11.1%)
Average (70-79p)	2 (8.7%)	4 (11.1%)
Poor (under 70p)	8 (34.8%)	3 (8.3%)
Total	23	36

thanks to our carefully right fit considered for each case. In 28 (41.66%) cases using cement, the majority were elderly patients (> 70 years old, accounted for 92%). Although the results of Barrack's assessment were 17 cases (68%) type A and 8 cases (32%) type B, the clinical results were not different.

Results related to incision: All our surgeries were posterior approach. This approach was thought to have more hip dislocation [13]. However, our study on 60 follow-up cases for a long time had not found a case of dislocated. Some authors believed there was a correlation between infection rate and posterior or lateral incision [14]; however, in our results, the infection rate was quite low, with only 1/60 patients. Therefore, we believe that for the BH, a posterior incision is also a good approach.

Results related to the stem position: In the research group, there were 2 (3.33%) valgus cases, 4 (6.66%) varus cases, and 54 cases with neutral positions. The valgus or varus position in the long term will adversely affect the results such as dislocations, broken cement, looseness, acetabulum worn-out. In our study, the follow-up time was still short, so we did not see any difference in the outcome of neutral and non-neutral cases.

Blood transfusion: A hip replacement is a major operation, which can cause a lot of blood loss. There were 14 patients (23.33%) who needed a blood transfusion, and 46 patients (76.67%) did not need it. The amount of blood transfusion depended on the patient's condition and the level of blood loss during surgery. The maximum number of blood transfusions was 700 ml, indicating that the demand for blood transfusions during surgery was not much.

Clinical results

-Our overall results according to Harris: Good and very good accounting for 43/59 patients (72.88%). This outcome is not significantly different ($p > 0.05$) than the study of Rae et al. (1989) on 98 patients, 64.80% [15] and Maini et al. (2006) on 270 patients, 65.20% [16], and is marginally not significantly different ($p = 0.0531$) than of Nham (2007) on 40 patients, 89.20% (Nham SD. Evaluation of bipolar hemiarthroplasty results (Master Thesis). Hanoi: Hanoi Medical University; 2007. (in Vietnamese).

The key indicators of Harris are the degree of pain relief and the ability to walk that had reached a reasonably high score after BH.

Complications

- Uneven limbs: We have six real short limb cases; all were not detected during the surgery. It was only discovered by X-ray, so it could not be corrected. By Harris standards, only when uneven is more than 3.2 cm will it be meaningful. A re-operation to correct the limb was not necessary because it may increase the risk of joint instability. It is difficult to assess the length of limbs during surgery accurately. To minimize this risk, it is necessary to measure and calculate well in advance and during surgery, reasonable adjusting between the need to restore limb length and ensure joint stability.

- Infection: It is a scary complication of both orthopedic surgery in general and BH in particular. In our study, there was one 84-year-old female patient got incision infection on the 5th day after surgery. We have treated as follows: suture removing, incision opening twice for cleaning, changing bandages daily,

and providing antibiotics according to high-dose and long-term antibiotic plans. After four weeks, the incision was stable. Infection rates vary significantly according to surgical conditions and reports of different authors such as Charnley (1-2%), Schippinger G (4%), Dennis K. (1%). Compared to other authors, our 1.7% infection rate is not high and is acceptable.

- Acetabulum wear: The acetabulum wear rate for the first two years ranges from 0% -5% [10]. There are many different factors that cause early wear. Clinical symptoms are a pain in the groin area, buttocks, and increased pain in movement. We had a 72-year-old female patient, who after 32 months of follow-up, showed signs of 1-2 level wear on X-ray, but no clinical signs were recorded. In this case, we have not found any factors that cause the wear and have not yet intervened, although Bose et al., (1995) [17] advised that if the X-ray showed signs of wear, it should be operated early, without waiting until the patient felt the pain.

- Stem loosening: According to some authors: the loosening rate ranges between 0-2.5% after three years. According to Maini et al., (2006) [16], the speed of the loosening can increase by about 1% per year. Factors that lead to looseness maybe not wholly removal of the porous bone of the greater trochanter and in the medullary cavity, the cement around the stem is irregular and does not ensure a thickness of 2 -3 mm, the stem is not in the right position or not held firmly during the cement process, so the cement, grips, and bones do not stick well together. In our study, there was no case of stem loosen.

- Joint instability (dislocated and semi-dislocated). According to other authors, this complication rate of BH is about 1.2% -3.4% [18]. There are many causes of dislocations such as soft tissue imbalance, stem looseness, uneven limbs, too large or too small head compared to acetabulum, worn acetabulum, worn Polyethylene lining, the stem stuck in the head, and especially the patient performed bad postures, etc. We did not experience this complication because before surgery, we focused on balancing the muscles during the surgery (carefully stitching the rotating muscle group, pear-shaped muscle) and carefully instructing patients on the positions they should not do.

- Calcification around the hip joint: Some authors had complications of calcification around the hip. We have not encountered any of these complications. Some of our colleagues who often perform BH also did not encounter this complication. Therefore, we believe that this complication is infrequent, especially for elderly patients.

- Death: Hip replacement surgery is generally a significant surgery. In elderly patients, the risk of death during hospitalization is probable. The death rate during hospitalization of a hip replacement surgery is 1-20% [19]. We had 1 case (1.7%) of death 28 days after surgery. This patient was hospitalized in poor health conditions and previously stroked. After stable medical treatment, we proceeded to joint replacement for the patient. On the 6th day after the surgery, the perception of patients worsened, and confusion appeared. CT scan showed cerebral infarction. After ten days of improvement (Glasgow = 8-9 points), the patient was discharged and died four weeks after the surgery. Because the total patient's condition before surgery was not good, it is difficult to know whether the cause of death, in this case, is directly related to the surgery. In our

opinion, it may not be relevant. In the absence of surgery, the patient might still die from the existed diseases and pain at the fracture.

Conclusions

Studying of 59 elderly patients with early femoral neck fractures who admitted to 7A Military Hospital from September 2013 to September 2018, with an average follow-up time of 15.31 month, average age 74.8, we draw the following conclusions:

-The good and very good level accounted for the majority (72.9%); the average level accounted for 8.5%, and the poor accounted for 18.7%. The earlier surgical group gave better results. Average and poor results were often seen in the group with many combined medical diseases. The satisfaction rate of patients was high; the quality of life after surgery was greatly improved.

- Uncommon complications:

+ Superficial infections: 1/60 incisions accounted for 1.7%

+ Uneven limbs (less than 1cm) 10.7%

+ Acetabulum wear: 1/59 joints accounted for 1.7%, starting to appear after 32 months

+ Death rate within the first month after surgery: 1.7%, which was not related to the surgery.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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Conflict of interest

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