Outcome of Cemented Bipolar Hemiarthroplasty in Elderly Patients with Unstable Inter-Trochanteric Hip fracture

Abstract
Background: Hip fracture in the elderly is associated with a high mortality rate, imposing considerable burden to healthcare system. This study aimed to evaluate the functional score of Harris Hip Score (HHS) in elderly patients with intertrochanteric fracture treated by bipolar hemiarthroplasty.
Methods: This study was conducted on 40 patients (mean age of 78.21 years) with unstable intertrochanteric fracture after surgery using cemented bipolar hemiarthroplasty. The cases were assessed in terms of radiographic and clinical evaluation. Harris Hip Score (HHS) questionnaire was filled for all the patients.
Results: Four patients had incomplete follow-ups and 5 patients had deceased. The HHS score was excellent for 6, good for 14, fair for 7, and poor for 4 patients. The mean HHS was 85.12 (good).
Conclusion: Performing surgery with cemented bipolar hemiarthroplasty in older patients with unstable intertrochanteric fracture would lead to acceptable clinical and functional results with earlier ambulation, and HHS score of 85.12.
Keywords: Intertrochanteric Fracture, hemiarthroplasty, arthroplasty, bipolar, Hip

Received: 7 months before printing; Accepted: 1 month before printing

Introduction

Intertrochanteric fractures are the most common type of hip fractures in the elderly. Due to increased life expectancy and improved health care in communities, the incidence of these fractures is expected to increase from 1.6 million fractures in 1990 to about 4.6 million by 2050\(^{1,2}\). Intertrochanteric fractures are often comminuted and unstable in the elderly due to osteoporosis. Therefore, internal fixation or proximal femoral nail (PEN) are not appropriate treatment methods for this type of fractures. While it is typically suggested to use a dynamic hip screw (DHS) for these individuals, there is a high risk of screw cut out, collapse, shortness of limb, failure and need for correction due to the low bone quality\(^{3-6}\).

On the other hand, these patients often have underlying diseases due to their old age, which increases the risk of reoperation. A method, by which these individuals can experience from non-ambulatory to complete weight bearing, is required since partial weight bearing is practically impossible in these patients. Lack of early weight bearing after surgery will result in primary complications, including atelectasis, pneumonia, bed sore, urinary tract infection (UTI), deep venous thrombosis (DVT), as well as a higher level of morbidity and mortality\(^{5-7}\). With regards to the above - mentioned issues and since better outcomes have been obtained in the patients treated with cemented or uncemented calcar-replacement hemiarthroplasty, the current trend moves toward using this treatment method for the elderly patients with unstable fractures. While the clinical and functional results and post-surgical radiographic evaluations have been different among the studies, most have reported proper clinical and functional outcomes of the cemented bipolar method. Nevertheless, little research has been conducted to follow up
patients in a long time. This study aimed to report the results of a longer follow up of patients with intertrochanteric fractures treated with cemented bipolar method, evaluated HHS at follow up. This descriptive and retrospective research was conducted in Imam Khomeini Hospital in 2016. After receiving approvals from the ethics committee of Ahwaz Medical University (code of ethics: IR.AJUMS.REC.1396.21), 40 patients aged above 60 years with unstable intertrochanteric fractures and osteoporosis (confirmed by Singh index) were treated with the cemented bipolar method in two orthopedics centers during 2011-2014 based on Osteosynthesefragen (AO)/Orthopaedic Trauma Association (OTA)\(^8\). Surgery was performed by two orthopedic surgeons. Cemented bipolar prosthesis (Omnifit starker/NJ/USA) was used for all the cases using tension band wiring (TBW) of the greater and lesser trochanters and cemented calcar-replacement femoral stems. Inclusion criteria were: Age over 60 years, unstable intertrochanteric fractures (A2 and A3 OA/OTA, types) and severe osteoporosis (grades 1, 2, 3, and 4 of Singh). Exclusion criteria were: Stable fractures, intact lesser trochanter, multiple trauma cases, previous hip fracture on the contralateral side, and pathologic fractures. The Patients lost to follow-up were eliminated from the research. In general, the patients were followed up for 10-36 months, when they all underwent clinical examination and radiological assessment. The patients completed the self-reporting Harris Hip Score (HHS). This scoring system is based on issues of pain, distance of walking, need for ambulatory aids, putting on shoes and socks, and ability of navigating on different levels and using public transport. The numerical value of the score points of 90-100 would be considered “excellent”, 80-90 “good’, 70-80 fair and below 70 would be poor\(^9\). Surgery failed when there was a lack of ability to walk, being non-ambulatory or when prosthesis subsidence existed.

**Methods**

The prosthesis size and level of offset of femoral neck were estimated before the surgery, using templating of the fractured hip and the opposite side. All patients underwent surgery in a lateral position under spinal anesthesia using the modified Hardinge approach. An anterior capsulotomy was performed, and the fracture anatomy was evaluated in terms of the number of pieces. Great effort was dedicated to maintaining the greater trochanteric fragments connections to each other and their attachment to the hip abductors. The proximal femur was exposed, after removing the head and neck, next the broaching of the canal was done. After trial reduction, proper head and neck were selected for restoring the length of the limb and sufficient soft tissue tension. In the end, the greater trochanter pieces were fixed along with their connected abductors using wiring. Afterwards, cement was injected after ensuring the connection of the greater trochanter pieces. In the next stage, prosthesis (Omnifit starker/NJ/USA) was placed, and in addition, the calcar region was reconstructed by cement mantle. Following that, any type of cement in the middle of the broken pieces was carefully extracted. Finally, the wound was closed in separate layers. DVT prophylaxis with enoxaparin for a period of two weeks, and antibiotic for 24 hours post surgery were administered. The patients were asked to walk on the first day or 48 hours after the surgery if tolerated. Weight bearing and walking with a walker were encouraged. After confirming the ability of patients to walk, they were discharged from the hospital with clinic follow-up appointments.
Results

In this descriptive, retrospective research, 40 patients above 60 years of age, who had intertrochanteric hip fractures treated with cemented bipolar hemiarthroplasty, were followed up. In total, four patients did not refer for follow-up and five patients had died (two patients within the first six months and three during the first year after the treatment). However, the cause of death was reported to be cardiovascular problems and was not related to the surgery and its outcomes. In total, 31 patients (14 males and 17 females) with mean age of 78.21 years (63-93 years) were enrolled in the research. The mean duration of follow-up was 29.85 months (10-36 months).

Treatment failure was reported in patients who remained non-ambulatory and/or had painful loosening and prosthesis subsidence ≥5 mm. 3 non-ambulating cases consisted of one case of dialysis and two cases of uncontrolled diabetes, which experienced painful loosening and prosthesis subsidence. Patients underwent surgery in a mean of 5.2 days after admission (3-15 days). At the end of the follow-up, HHS of six patients was excellent, whereas it was good, fair and poor for 14, 7, and 4 other participants, respectively. In this regard, mean HHS was 85.12 (good) (Table 1).

<table>
<thead>
<tr>
<th>Table 1. HHS of Patients</th>
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<tbody>
<tr>
<td>Number of Patients</td>
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<tr>
<td>6 (19.35%)</td>
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<tr>
<td>14 (45.16%)</td>
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<tr>
<td>7 (22.58%)</td>
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<td>4 (12.9%)</td>
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<td>Mean HHS Score: 85.12 (good)</td>
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Discussion

The present retrospective research was conducted on 31 patients (14 males and 17 females) with mean age of 78.21 years (63-93 years), who were treated with cemented bipolar hemiarthroplasty and followed up for a mean duration of 29.85 months (10-36 months). Currently, osteosynthesis and internal fixation (DHS, PFN, Gamma Nail) have been introduced as proper treatment methods for stable intertrochanteric hip fractures. However, previous studies have shown that this method is associated with a high mortality rate and several complications, including collapse, shortness of the limb, and screw cutout\(^{10,11}\). These findings are in line with the results obtained by Kayali et al. (2006), Sinno et al. (2010) and Shetty et al. (2017)\(^{3,5,12}\).

Therefore, treatment of unstable fractures in the elderly by internal fixation is not an appropriate method of choice due to osteoporosis and low bone quality of these individuals. As a result, treatment with hemiarthroplasty is recommended for these patients\(^{10,11,13}\). In two separate clinical trials, Hasankhani (2014) and Emami (2013) compared the two methods of bipolar replacement and DHS plate fixation methods. According to their results, there was a significantly higher risk of early postoperative problems caused by non-ambulatory and the device problems in the DHS group, compared to the bipolar group. Therefore, the bipolar method was introduced as a more appropriate alternative to treat unstable fractures in the elderly\(^{10,11}\).

In addition, the two methods of PEN and bipolar methods were compared in another clinical trial conducted by Shetty et al. (2017) on 25 patients divided into two groups. These researchers reported that HHS and early weight bearing were significantly higher in the bipolar group, compared to the PEN group, in which a higher level of device failure and early and late complications caused by non-ambulatory status was observed\(^{14}\). In a research by Rodop et al. (2002), 54 patients were followed up for a mean duration of 22 months. According to these researchers, the HHS was excellent in 14, good in 11, fair in 3, and poor in 3 patients. In the mentioned study, there was no report of dislocation or loosening. However, there was one case of
acetabular erosion, four cases of nonunion of the greater trochanter, and five cases of leg length discrepancy (LLD). In addition, seven patients passed away during the first four months after the surgery and one case had deep infection after a year. Furthermore, complete weight bearing was accomplished by 33 patients in the first postoperative week\(^{(15)}\).

In the present study, HHS was reported excellent, good, fair, and poor for 6, 14, 7, and 4 patients, respectively. In addition, 21 patients walked in the first week. However, five patients passed away one year after the surgery. Our findings confirmed the results obtained by Rodop, and lack of similarity in some results may be due to a different number of patients and longer duration of follow-up in the current research\(^{(7)}\). In 2012, Bassiony et al. performed a retrospective research to follow up 24 patients with unstable intertrochanteric hip fractures for a mean duration of 22 months (18-36 months). In the mentioned research, mean HHS in a year was reported at 85, and full weight bearing was accomplished by all patients within the first two postoperative days.

In addition, there was no case of dislocation, loosening, deep infection, revision and filler, and a low number of early postoperative outcomes were detected. In total, three patients, who underwent cemented bipolar hemiarthroplasty with calcar replacement, passed during the follow-up. Our findings are in line with the mentioned research in terms of the HHS. However, the difference between these two studies was application of cemented bipolar hemiarthroplasty without calcar replacement in the present study\(^{(16)}\). In a clinical trial, Cankaya (2013) followed up 86 patients with unstable intertrochanteric hip fractures for duration of 32-38 months. In the mentioned research, patients were divided into cemented and cementless groups. According to the results, subjects treated with cemented bipolar were able to walk sooner, compared to the other group. On the other hand, the postoperative early complications were less in the cementless group. While the mortality rate in a short duration was significantly higher in the cemented group, no significant difference was observed between the groups in long term.

In general, both groups were homogenous in terms of clinical and functional aspects. According to the mentioned researcher, cementless prostheses were associated with a lower mortality rate and early postoperative complications, compared to the cemented method\(^{(17)}\). In the present study, we were forced to use cemented prosthesis due to the osteoporotic intertrochanteric hip fractures of patients and lack of using calcar replacement prosthesis. However, there was a low rate of early postoperative complications and no report of mortality. Comparison of our findings with results obtained by previous studies revealed that use of cemented prosthesis without calcar replacement was associated with relatively acceptable clinical and functional outcomes. In a retrospective research, Singh (2014) followed up 25 patients treated with a cemented bipolar prosthesis for a mean duration of 12 months. In the mentioned study, mean HHS in a year was reported at 78.86. In addition, all of the participants accomplished full weight bearing on the first postoperative week, and there was no case of dislocation, loosening, non-union, deep infection, and revision. There were some cases of grade I bedsore, which improved with care. In the mentioned research, visual analogue scale (VAS) and lower extremity functional scale (LEFS) were applied and the functional results and mobility of patients in the LEFS questionnaire were similar to HHS\(^{(18)}\). This lack of consistency in results might be due to short follow-up and retrospective nature of the mentioned research. However, our findings were more efficient, compared to the study by Singh based on HHS range. In another retrospective research, Thakkar (2015) followed up 48 patients with unstable intertrochanteric fractures for a mean duration of 54 months.
(12-84 months). In this study, subjects were treated with cemented bipolar technique along with cortical strut allograft from femoral head and neck and maintaining calcar. In the mentioned research, 11 patients passed and three participants were not followed up. According to the results, mean HHS of patients, who were followed up for six months, was 96.84. In this regard, 13 subjects had excellent HHS, whereas 13, 7, and 2 patients had good, fair, and poor HHS, respectively. Moreover, all patients were able to walk on the third postoperative day, and there was no report of dislocation, loosening, and, deep infection.

Furthermore, there was one case of bedsore, one case of nonunion of the greater trochanter, one case of LLD below one centimeter, and two cases of revision, one of whom underwent total hip replacement after 48 months. Bone grafting failed in just two patients and stem displacement or subsidence was observed. On the other hand, 32 patients experienced complete union\(^{(19)}\). In this regard, our findings are consistent with the results of the mentioned research. However, the difference between the two studies was related to the duration of follow-up and use of a more modern technique (cortical strut allograft from femoral head and neck) by Thakkar. While calcar of patients was maintained in the current research, strut allograft was not used. One of the major drawbacks of the present study was its retrospective nature. Other limitations included non-randomized evaluation of patients and lack of willingness of few cases for cooperation, which led to sample loss.

### Conclusion

Treatment of unstable intertrochanteric fractures in elderly patients is still a debatable subject. Patients treated with the cemented bipolar technique show acceptable clinical and functional outcomes with lesser need for re-operation compared to fixation techniques with their high fixation failures in unstable the fixation of the unstable intertrochanteric fractures. This method prevented early or late mortality of these patients, who often have underlying diseases. One of the strengths of the research was long-term following up of patients. It is recommended that a cohort retrospective research be conducted on larger sample sizes and during a longer follow up to achieve a unified result on treatment of the elderly patients with unstable intertrochanteric fractures.

### Acknowledgements

This article was extracted from an Orthopedic Thesis Residency with project number of U-96002 related to the Jundishapur University of Medical Sciences. Hereby, we extend our gratitude to Ms. Samaneh Rashidi for assisting us in performing the study.

### References