

## Comparison of Outcome Following Hemiarthroplasty for Fracture Neck Femur in Elderly between Cemented Approach and Uncemented Approach: Case Reference Study

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### Abstract

**Background:** One of major problems seen in the elderly population is fracture neck femur. Indeed, displaced femoral neck fractures greatly limit the quality of life and result in complications that are associated with relatively high incidence of morbidity and mortality. The surgical approach to treat displaced femoral neck fracture is basically of two types. The first one involves cemented hemiarthroplasty and the second one is uncemented hemiarthroplasty. No clear consensus is found in available published articles regarding which approach is better than the other in terms of outcome.

**Aim of the study:** we were aiming at investigating which surgical approach is associated with better overall outcome in terms of less post-operative pain, early full weight bearing and less need for re-operation.

**Patients and methods:** The current observational case reference study included 40 elderly patients with an age range of 71 to 85 years. They were 28 women and 12 men. Those patients were with displaced fracture of femoral neck for whom hemiarthroplasty was carried out. They categorized according to type of hemiarthroplasty into two groups. The first group included those patients treated by cemented hemiarthroplasty, whereas, the second group included, those patients treated by uncemented hemiarthroplasty. Those patients were selected from pool of patients visiting Al-Diwaniyah Teaching Hospital at Al-Diwaniyah Province, Iraq.

**Results:** Cemented approach was associated with significantly less post-operative pain, more rapid full weight bearing and less need for re-operation than uncemented approach ( $p < 0.05$ ).

**Conclusion:** Cemented hemiarthroplasty is superior to uncemented hemiarthroplasty for the treatment of displaced femoral neck fracture in the elderly.

**Key words:** hemiarthroplasty, fracture neck femur, cemented, uncemented

### Introduction

Owing to advancing medical and health facilities in most countries, the problem of geriatric associated health issues becomes increasingly recognized in developed as well as developing countries (1, 2). Orthopedic abnormalities in elderly population become increasingly common and contribute substantially to every day clinical practice. One of major problems seen in the elderly population is fracture neck femur. Indeed, displaced femoral neck fractures greatly limit the quality of life (3-5) and result in complications that are associated with relatively high incidence of morbidity and mortality (6-8).

The surgical approach to treat displaced femoral neck fracture is basically of two types. The first one involves cemented hemiarthroplasty and the second one is uncemented hemiarthroplasty (9). The advantages associated with cemented approach are lower rate of re-operation (10,11), less post operative pain (12) and faster and better regain of function (13, 14). On the other hand it has been shown in a randomized controlled

clinical trial that uncemented hemiarthroplasty is associated with better long term Harris Hip scores in comparison with cemented hemiarthroplasty (15). In addition, previous studies have linked cemented approach to “bone-cement implantation syndrome” (16, 17) in addition to the observation that elderly patients with compromised cardiovascular function suffer greater risks following cemented approach (9). The support of cemented approach is based on the recommendations issued by the American Academy of Orthopaedic Surgeons recommendations (18) and The National Institute for Health and Care Excellence guidelines in the United Kingdom (19).

However, a lot of published articles claimed that these recommendations are not strictly accepted or followed up in several regions of the world (9, 20, 21). Therefore, a lot of research work is needed in order to reach a clear consensus about the strict criteria needed to be labeled for each type of these operations. Indeed, the two key outcomes are mortality rate and need to re-operate (9). In addition, less pain and better quality of life are among aims of determining which patient is selected for which operation approach.

For our best of knowledge, no previous Iraqi study has shed light on mortality rate in association with either surgical approach in a large multicenter study with relatively long period of follow up. In the current study, we were aiming at investigating which surgical approach is associated with better overall outcome in terms of less post-operative pain, early full weight bearing and less need for re-operation in a cohort of elderly individuals who underwent cemented or uncemented femoral neck fracture hemiarthroplasty during the last 10 years in Al-Diwaniyah province, Iraq.

## **Patients and methods**

The current observational case reference study included 40 elderly patients with an age range of 71 to 85 years. They were 28 women and 12 men. Those patients were with displaced fracture of femoral neck for whom hemiarthroplasty was carried out. They categorized according to type of hemiarthroplasty into two groups. The first group included those patients treated by cemented hemiarthroplasty, whereas, the second group included, those patients treated by uncemented hemiarthroplasty. Those patients were selected from pool of patients visiting Al-Diwaniyah Teaching Hospital at Al-Diwaniyah Province, Iraq.

We retrospectively collected information about those patients from their records for the last 10 years and fulfill follow up of at least 5 years. Clinically they have common form of clinical presentation such as history of fall, pain and external rotation up on examination. In this study we included patients with Garden grade IV. The diagnosis was made on clinical background and confirmed radiologically. Patients with diabetes mellitus were excluded from study. The main outcome was to compare between both groups the duration of post-operative pain, hospital stay, time interval between operation and onset of walking, weight bearing and failure and reoperation.

The surgical procedure included the following:

- Anti-biotic was given preoperatively in the form of 1 gram third generation cephalosporin.
- The position was supine.
- The approach: hip direct lateral approach “Hardinge, transgluteal approach”: The head of the femur and part of the neck “proximal part of the fracture” was removed then the proximal femur was reamed and appropriate size cemented (Thompson prosthesis) or cementless (Austin Moore prosthesis) was inserted then wound closure was done without drain.
- A second dose of antibiotic was given 12 hours after initial dose.
- 4000 IU low molecular weight heparin was given 6 hours after surgery and continued daily for 14 days.

The ethical approval of the study was issued by the ethical approval committee associated with College of Medicine. Data were collected, summarized and analyzed using statistical package for social sciences (SPSS) version 16 and Microsoft Office Excel 2007. Qualitative data were expressed as number and percentage while quantitative data were expressed as mean, standard deviation and range. Comparison of mean values between the two groups was done using independent samples t-test. The association between qualitative variables was carried out using Chi-square test. The level of significance was set at  $p \leq 0.05$  and the level of high significance was set at  $p \leq 0.01$ .

## Results

The general characteristics of enrolled patients are shown in table 1. Patients were statistically matched regarding age and gender ( $p > 0.05$ ). In all patients the clinical features included history of fall, pain and external rotation. Comparison of outcome between patients with cemented hemiarthroplasty and patients with uncemented hemiarthroplasty is shown in table 2. Post-operative pain score was significantly lower, early mobility was significantly linked and early full weight bearing was significantly limited to cemented approach, whereas, partial weight bearing and re-operation were significantly associated with cementless approach. X-ray photographs are shown in figures 1 through 4 to show cemented and cementless hemiarthroplasty.

**Table 1:** General characteristics of enrolled patients

| Characteristic       | Cemented approach<br><i>n</i> = 20 | Uncemented approach<br><i>n</i> = 20 | <i>p</i>       |
|----------------------|------------------------------------|--------------------------------------|----------------|
| Age (years)          |                                    |                                      |                |
| Mean ±SD             | 77.81 ±4.18                        | 78.04 ±3.92                          | > 0.05 I<br>NS |
| Range                | 73-85                              | 71-82                                |                |
| Gender               |                                    |                                      |                |
| Male, <i>n</i> (%)   | 7 (35.0 %)                         | 5 (25.0 %)                           | > 0.05 C<br>NS |
| Female, <i>n</i> (%) | 13 (65.0 %)                        | 15 (75.0 %)                          |                |

|                          |              |              |
|--------------------------|--------------|--------------|
| <b>Pain</b>              |              |              |
| <i>n</i> (%)             | 20 (100.0 %) | 20 (100.0 %) |
| <b>History of fall</b>   |              |              |
| <i>n</i> (%)             | 20 (100.0 %) | 20 (100.0 %) |
| <b>External rotation</b> |              |              |
| <i>n</i> (%)             | 20 (100.0 %) | 20 (100.0 %) |

**n**: number of cases; **SD**: standard deviation; **I**: independent samples t-test; **C**: chi-square test; **NS**: not significant at  $p > 0.05$

**Table 2:** Comparison of outcome between patients with cemented partial hemiarthroplasty and patients with uncemented partial hemiarthroplasty

| Characteristic                        | Cemented approach<br><i>n</i> = 20 | Uncemented approach<br><i>n</i> = 20 | <i>P</i>       |
|---------------------------------------|------------------------------------|--------------------------------------|----------------|
| Post-operative pain                   | 3.46 ±2.19                         | 5.19 ±1.92                           | < 0.05 I<br>S  |
| Onset of walking (hour)               | 27.28 ±5.71                        | 36.17 ±6.09                          | < 0.05 I<br>S  |
| Full weight bearing within 24 hour    | 20 (100.0 %)                       | 0 (0.0 %)                            | < 0.01 F<br>HS |
| Partial weight bearing within 6 weeks | 0 (0.0 %)                          | 20 (100.0 %)                         | < 0.01 F<br>HS |
| Re-operation                          | 0 (0.0 %)                          | 7 (35.0 %)                           | < 0.01 F<br>HS |

**n**: number of cases; data were expressed as either *n* (%) or mean ±standard deviation; **I**: independent samples t-test; **F**: Fischer exact test; **S**: significant at  $p \leq 0.05$ ; **HS**: highly significant at  $p \leq 0.01$



**Figure 1:** An x-ray showing cementless hip hemiarthroplasty in 77 years old female



**Figure 2:** An x-ray showing cementless hip hemiarthroplasty in 80 years old male



**Figure 3:** An x-ray showing cemented hip hemiarthroplasty in 79 years old female



**Figure 4:** An x-ray showing cemented hip hemiarthroplasty in 81 years old female



**Figure 5:** An x-ray showing cementless hip hemiarthroplasty in 78 years old female with failure

## Discussion

In the current study and after a period of follow up of three years for each patient, we found no re-operation in the group treated by cemented approach while in the uncemented approach the rate of re-operation was 35.0 %. Indeed this observation is consistent with previous reports (9). Actually, re-operation is a very unwanted outcome in such elderly individuals and choosing the appropriate surgical approach of cemented hemiarthroplasty will ensure very low risk of re-operation. Therefore, we highly recommend the previous advice of the American Academy of Orthopedic Surgeons (18) and The National Institute for Health and Care Excellence guidelines in the United Kingdom (19) in preferring cemented approach. In addition, we found significantly less pain score and better quality of life in association with cemented approach since full weight bearing was achieved within 24 hours, whereas, full weight bearing was not achieved until 6 weeks post-operatively in association with cementless approach.

One of the limitations of the current study was that the study was retrospective one and randomization was not achieved, thus bias in the results cannot be excluded. However, based on our clinical experience, most patients with cemented approach achieved better results in comparison with patients with cementless approach. Another limitation is the relatively small sample size which may reduce the statistical power of the study; however, in Iraq, probably this is the first study to compare 20 patients with cemented approach to 20 patients with cementless approach.

It should be kept in mind that in the current study, adjustment for age, gender and comorbidities was assured and therefore this can solidify the results of the current study. Indeed our findings are in line with multiple previous studies that favor cemented approach over cementless approach (10, 11, 22-25).

One previous report has raised the issue of higher infection rate in association with cementless approach in comparison with cemented approach (25). We did not notice such an observation and we mentioned the use of prophylactic antibiotics for all patients enrolled in our study. Previous studies have compared mortality rate between the two approaches and found significant difference with this regard (9, 22, 24). However, one previous study has shown superiority favored by cemented approach (26). In our study, mortality in association with operation and or its related complications has not been recorded. On the other hand, higher mortality rate have been linked to cemented approach by some previous authors (10, 22, 27, 28).

**Conclusion:** Cemented hemiarthroplasty is superior to uncemented hemiarthroplasty for the treatment of displaced femoral neck fracture in the elderly.

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