

*Research Article***Cemented versus cementless Bipolar Hemiarthroplasty in treatment of Fracture neck of Femur.**

**Ahmed O. Youssef , Mohamed Y. Hasan,
Assem M. Nour El-den and Mahmoud A. Anwar.**

Department of Ophthalmology, El-Minia Faculty of Medicine

Abstract

Osteoporotic fragility incidence of fractures continues to increase along with an aging global population. Decision making for Selecting adequate treatment is very important to avoid complications hip fractures, including femur neck fractures, may lead to complications such as chronic pain, disability, low quality of life, high morbidity and mortality rates, and other. In this retrospective comparative study of 20 cases of BHA (10 cemented, 10 cementless) done in Minia University Hospital from 2017 to 2019 confirmed the following: 1- No fixed preoperative guidelines to be followed for all cases in spite of preoperative planning either clinical or radiological. Intraoperative decision either cemented or cementless is mandatory. 2- Time to surgery and duration of operation are important to minimize postoperative complications. 3- Lateral approach was used in all cases using the implant from the same company. Follow up of the cases (average 11 months): Functional using Harris Hip Score (cemented 77, cementless 72) Pain assessment using VAS (cemented 2.4, cementless 3.2). Radiological assessment (1 cementless case with vertical subsidence more than 5 mm). Complications (one cemented case developed infection and cured, one cemented case developed pulmonary embolism and treated and one cementless case developed inguinal and thigh pain). Discussion of our results were described and analysis of all criteria was done comparing cemented and cementless group. Comparison between our results and other schools of medicine (Swedish, Korean, Turkish) was done and it was comparable except in the following (no periprosthetic fractures in our study, VAS was high in Korean group, no infection in Swedish group).

Keywords: Osteoporotic fragility, Hemiarthroplasty, cementless case

Introduction

In the treatment of older patients with displaced femur neck fracture, bipolar hemiarthroplasty (BHA) is a more commonly accepted treatment, compared with internal fixation, because this modality offers advantages including earlier ambulation, a lower probability of reoperation and better functional outcomes.^(1,2)

The choice of surgical treatment for displaced femoral neck fractures in adults remains as controversial now. The aim of treatment of displaced femoral neck fracture in patients is to enable them to walk soon on a stable and painless hip. According to the method of implant fixation, hemiarthroplasty prosthesis can be divided into 2 different types : cemented and uncemented hemiarthroplasty.⁽³⁾ Bipo-

lar hemiprostheses is composed of three parts:

The stem, the head and the outer shell. The primary design goal of restoration of the geometry and bearing quality of the hip joint, leads to the recognition that all bipolar devices involve two primary components (femoral and outer shell), each assembled from three elements.

On the femoral side, the femoral component consists of the following:

- An element to restore the articulating surface property and geometry of the femoral head the articulation element).
- An element to anchor (fix) the restored surface to the proximal femur (the fixation element).
- An element to couple to couple the articulation element and the fixation element, and to maintain an appropriate

structural relationship between them (the structural element). Similarly, on the outer shell side, the acetabular component consists of the following:

- An element to restore the articulating surface property and geometry of the acetabular socket (the articulation element).
- An element to couple the articulation element and the fixation element, and to maintain an appropriate structural relationship between them (the structural element).⁽⁴⁾

Patients and Methods

This retrospective study in Minia University Hospital included a total of twenty patients aged 60 years and over who underwent BHA for treatment of displaced femoral neck fractures (ten cases cemented & ten cases cementless), ethics committees approved the study, in the period from 2016 to 2019.

Inclusion criteria:

- 1- Trauma cases of Fracture neck of femur.
- 2- Timing :within 2 week .
- 3- patients with the ability to ambulate without assistance before injury.
- 4- patients over 60 years old.

Exclusion criteria:

- 1- Advanced Osteoarthritic changes .
- 2- Neglected fractures.
- 3- Pathological fractures.
- 4- Complex fractures.
- 5- Neuromuscular disorder.

Dorr femoral bone classification:

Type (A): narrow canal with thick cortical walls (champagne flute canal).

Type (B): moderate cortical walls.

Type (C): wide canal with thin cortical walls (stove- pipe canal).

Cementless stems were used in Dorr type A femur and cemented stems were used in Dorr type C femur.

For patients with Dorr type B femur, both types of stem were used depending on patients age and bone quality according to femoral cortical thickness.

Cortical thickness was measured based on cortical index ratio (CTI) of the proximal femur introduced by Nash and Harris.

The cortical thickness index was defined as the ratio of cortical width minus endosteal width to cortical width at a level of 100 mm below the tip of the lesser trochanter .

Higher values indicated thicker cortices⁽⁵⁾.

Approach

In all cases we use Lateral approach.

we use Cemented and Cementless BHA form the same company.

A modified Hardinge approach was used under spinal or general anesthesia.

2 GM IV antibiotic (3rd generation cephalosporin) was given before surgery.

Institutional permission was granted for the use of relevant medical records and anesthetic data.

During the study period, on institutional guidelines on the choice of cemented or cementless stems were in place.

Patient age, sex, number of associated comorbidities, duration of operation in each group, and prefracture ambulatory status were all retrieved. General health status was defined by the number of major comorbidities including diabetes mellitus, congestive heart failure, cardiac arrhythmias, ischemic heart disease, previous cerebrovascular accidents, and renal disease.

Ambulatory status was classified using the Harris Hip Score . Postoperative pain was assessed using the visual analog scale with responses ranging from 0 to 10.

Post – operative program

- IV antibiotics was used (1gm 3rd generation cephalosporin) for at least 2 days.

- Suction drain removed when less than 50 ml (1 or 2 day).

- Sutures removed after 2 weeks.

Rehabilitation: by conducting quadriceps femoris muscle strengthening exercises immediately after surgery, Partial weight bearing was then allowed using a walker.

Four basic position to be avoided after hip arthroplasty, particularly for the first 3 months:

- No flexion of the hip past 90° with respect to the axis of the body.
- No adduction of the leg past the midline of the body.
- No combined extension of the hip joint with external rotation of the lower extremity.
- No flexion with internal rotation.

Results

Clinical Assessment:

Harris Hip Score (pain, limb, support, distance walked, sitting, and others) was used for clinical assessment.

Visual Analog Scale (VAS) was used for assessment of pain in the groin and thigh.

Major postoperative complications (intraoperative fractures, postoperative periprosthetic fracture, hip dislocation, pulmonary embolism, myocardial infarction, postoperative infection, reoperation, and death) were compared between the two groups.

Radiological Assessment:

For radiographic evaluation, fractures and dislocations were identified based on postoperative and follow-up simple X-rays.

The vertical subsidence of the femoral stem was measured on simple X-rays taken immediately after surgery and at final follow-up, and difference between these values were compared in each group.

The two groups (i.e., cemented versus cementless femoral stems) did not differ by age, gender, underlying disease and follow-up (**table 1**).

The duration of operation (minutes) was longer in the cemented group compared to the uncemented group (cemented group, mean 104 minutes; uncemented group, mean 93 minutes)

Upon clinical evaluation, changes in HHS indicating ambulatory status between pre- and post-fracture and VAS scores indicating inguinal and thigh pain at final follow-up were significantly different as it occurs in 2 cases of uncemented group.

Upon radiographic evaluation, the vertical subsidence of the femoral stem was measured postoperatively and at final follow-up.

Discussion

Fracture neck femur is common in the elderly. Osteoporosis, comorbidities, and increased level of minor trauma increase the incidence and complicate the treatment of such fractures. Although cemented hemiarthroplasty has been used to treat most of these cases worldwide, uncemented prostheses are gaining popularity⁽⁶⁾.

In our retrospective study of 20 cases (10 cemented, 10 cementless BHA) in treatment of traumatic fracture neck of femur in patients over 60 years, using the same company and followed up at least 6 months and compared both functional and radiological.

Decision making for using cemented or cementless has no previous guidelines but several considerations has to be put to choice either cemented or cementless⁽⁷⁾.

- 1- Preoperative general condition and associated diseases and level of activity.
- 2- Preoperative radiological evaluation of bone quality using Dorr classification So, we decided cemented BHA for cases with lower general condition (CV problems) with less level of activity and Dorr type B, C. Cementless BHA was done for cases with good general condition and Dorr type A.

In our study, there is one case with infection in cemented group due to uncontrolled DM, uncompliant patient, long time operation time although we follow up the rules to minimize infection (pre-operative control of DM by general medicine department and intra operative and postoperative prophylactic antibiotics, good sterilization, and use vancomycin impregnated cement).

Regarding complications, was have one case of infection and one case pulmonary embolism (in cemented group) and one case vertical subsidence (in cementless group) which were comparable to other groups.

Although periprosthetic fractures didn't occur in our study but occurred in other groups more in cementless group (this was explained by limited number of cases and short period follow up).

Limitations of study

- 1- Regarding number of cases: 10 cases cemented and 10 cases cementless are small number needed to be increased in comparison to other papers.
- 2- Regarding the period of follow up needed to be increased as it is only 11 months.
- 3- Regarding statistical analysis couldn't be done which is a weak point of the study due to previous 2 causes .
- 4- Measurement of intraoperative volume loss wasn't available and is necessary for comparative study.
- 5- we use only one system from same company.

Future plan (Recommendations)

- 1- Multicenter studies are better for more accurate comparison and perfect statistical analysis.
- 2- Development of new stems to fulfill all variations in the medulla and various methods of press fit cementless prosthesis.
- 3- Navigation system intraoperative is needed for more accurate preoperative and intraoperative decisions.
- 4- Laminar air flow is needed to minimize incidence of infection.

Conclusion

- 1- BHA is a standard method of treatment in fracture neck of femur in elderly due to modularity of Head and neck.
- 2- Cemented or cementless stem is still controversy.
- 3- Preoperative decision making is recommended for decided either cemented or cementless

including

- a- Preoperative general condition and underlying diseases.
- b- Dorr radiological classification and cortical thickness.

d- No fixed guidelines for choosing the implant and still intraoperative decision is a must.

- 4- Cemented BHA is preferable for older age over 70 years without major cardiovascular problems to decrease incidence of Vertical subsidence and inguinal and pain.
- 5- Cementless BHA is preferable for age less than 70 years with good bone quality can be done for high risk patients with pulmonary embolism.

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