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Functional outcome and health related quality of life after dual mobility cup total hip replacement for displaced femoral neck fractures in middle aged Egyptian patients

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ABSTRACT

Aim: This study was done to assess the functional and clinical results after one year of cemented THR with dual mobility cup for the treatment of fracture neck femur in active middle-aged patients in Egypt (Middle Eastern population).

Patients and methods: This study included 31 patients (32 hips) with displaced femoral neck fractures that were admitted to El Hadara University Hospital, Alexandria, Egypt. Their mean age was 66.4 ± 5.9 years. Fifteen patients were females. All the patients were treated with total hip replacement using a cemented dual mobility cup (Ecofit® 2 M, Implantcast GmbH, Germany) total hip replacement through the standard posterior approach. Functional assessment was done using Harris Hip Score (HHS), SF-36 questionnaire for health related quality of life (HRQoL) with assistance of a physiotherapist.

Results: The mean HHS improved over the follow up period from 79.04 ± 7.9 at 12 weeks to an average of 92.8 ± 11.1 at 1 year follow up. HRQoL measures showed a pattern of initial drop at 3 months postoperatively, then a steady rise to be restored at 1 year as compared to the preoperative baseline measures. There were no dislocations encountered in this series over one year follow up. The following complications were encountered; 1 deep infection, 2 deep vein thrombosis, 2 heterotopic ossifications, and 1 patient died within one year after surgery.

Conclusions: Dual mobility cup total hip replacement is an acceptable method for treatment of displaced femoral neck fracture in active middle aged patients in Egypt as it provides pain relief and good function without compromising the stability.

Introduction

Hip fractures are the most common type of fragility fractures encountered in clinical orthopaedic practice [1]. These injuries account for more morbidity, mortality and healthcare costs than any other fragility fractures [1–3].

The current evidence suggests that better functional outcomes are achieved when total hip replacements are used as compared to hemiarthroplasty, however the mortality rates and rates of secondary procedures are similar. Since many trials comparing both approaches have been limited by methodological issues, a large multicenter randomized trial (HEALTH) trial is currently being conducted to compare the outcome of total hip replacement and hemiarthroplasty in patients 50 years or older with displaced femoral neck fractures [4].

Despite the good results for THR in treatment of femoral neck fractures in the middle aged population, the risk of dislocation is the main concern for most orthopaedic surgeons [5–10]. It has been reported in the meta-analysis by Iorio et al. that the average dislocation rate is 10.7% when THR is utilized for treatment of femoral neck fractures [11].

The dual mobility cup, developed by Professor Gilles Bousquet and the engineer André Rambert at the end of the 1970s, was innovative in the field of total hip replacement. It associates two articular surfaces: one with a larger diameter situated between a

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metallic cup and a polyethylene insert, thus utilizing the concept of using a large head size, and the other one with a smaller diameter situated between the femoral head and the retentive polyethylene insert. This results in higher range of motion, with reduced dislocation rates [12,13].

The current literature suggests that dual mobility cups designs have evolved over the years, which improved their performance and longevity. However, long-term clinical and retrieval studies are still needed to fully understand the wear potential and pattern of these newer designs [14].

This study was done to assess the functional and clinical results of dual mobility cup in active middle aged patients with femoral neck fractures.

Patients and methods

The study was approved from local ethics committee of Alexandria University, Egypt and an informed consent was taken from every patient submitted to the study. It included 31 patients (32 hips) with displaced femoral neck fractures that were admitted to El Hadara University Hospital, Alexandria, Egypt. Their mean age was 66.4 ± 5.9 years. Fifteen patients were females. One of the female patients had a fracture on one side, and sustained another fracture on the contralateral side 3 months after the surgery for the initial fracture.

During history taking an assessment of the pre-injury mobility and dependence level using the Katz ADL index [15] as well as the cognitive state using the Short Portable Mental State Questionnaire (SPMSQ) [16] was performed. 7 patients were diabetic, 4 were hypertensive, 2 patients were hepatitis C positive. The ASA score was determined. Ceder classification [17] was used to categorize patients involved in this cohort, where Ceder A and B means patient is healthy, or has a disease that will not affect rehabilitation respectively.

A preoperative SF-36 questionnaire was filled by each patient to represent a baseline of the Health related quality of life (HRQoL) for postoperative comparison and evaluation.

Patients with cognitive dysfunction, previous hip surgeries, non- united femoral neck fractures, neuromuscular disorders, associated fractures or amputations, inflammatory arthropathies or pathological femoral neck fractures were excluded from the study.

All the patients were treated with total hip replacement using a cemented dual mobility cup (Ecofit® 2 M, Implantcast GmbH, Germany) through the standard posterior approach. Intra-osseous repair of the external rotators and the capsule was done in all cases. Physiotherapy was initiated as per a modified protocol used in Brigham and Women's hospital, Boston, USA for rehabilitation of hemiarthroplasty and total hip replacements [18].

Patients were reviewed after 2 weeks for wound check and removal of sutures. Patients were assessed by physiotherapists at 6 weeks. Subsequent combined follow up with orthopedics were at 12 weeks, 16 weeks, 6 months, and 1 year with check X-rays to detect any complication.

Outcome measures

The primary functional outcome was assessed using Harris Hip Score (HHS) [19], with assistance of physiotherapists to avoid bias. This was done at 12, 16 weeks, 6 months and 1 year.

Secondary outcome measures included detailed analysis of the range of motion by the physiotherapist, in addition to SF-36 questionnaires which were filled by the patients on the same visits. The RAND method was used for analysis of the SF-36 scores as a measure of HRQoL [20–22].

Statistical analysis

SPSS Version 24 [IBM SPSS Statistics for Mac, Version 24.0. Armonk, NY: IBM Corp] was used to generate descriptive statistics for the data collected.

The data was assessed for normality using the Shapiro Wilk test and found to be non-normally distributed. Non-parametric tests were therefore utilized in the subsequent analysis.

Harris Hip Scores at the intermediate time points (12 weeks, 16 weeks, 6 months) were compared with the Harris Hip Score at 12 months using the Wilcoxon Signed Ranks test

Spearman Correlation co-efficient was used to assess the effect of age on the final HHS, and the selected parameters of the HRQoL measurement.

Results

Table 1 summarizes the baseline data for the patients involved in this study.

The mean operative time was 137.7 min (S.D 18.5 min). The average blood loss was 757.7 ml (S.D 251 ml) and this was associated with an average hemoglobin reduction of 1.39 g/dl (S. D 0.76 g/dl).

The HHS showed continuous improvement against time from 79.04 (SD ± 7.9) at 12 weeks to an average of 92.8 (SD ± 11.1) at 1 year follow up (Fig. 1). Comparing the final HHS at 1 year to each interval point (12,16 weeks and 6 months) has shown that the increase in the HHS was statistically significant over the follow up period (Wilcoxon Signed Ranks test, p = 0.000, 0.000, 0.002 respectively).

The mean range of motion achieved is summarized in Table 2, with comparison to normal values for hip range of motion described by Roaas and Anderson [23].

The RAND method was used to evaluate the HRQoL and comparing the results to the preoperative baseline. The changes in the physical activity, role limitation due to physical functioning and the general health are summarized in Table 3 and Fig. 2.

It was noticed that the HRQoL measures dropped to below the preoperative baseline at 3 months. The preoperative HRQoL were restored at 1 year follow up, with even some improvement in the mean scores.

It was found that the age of the patients had no statistically significant effect on the final HHS at 1 year of follow up. Likewise, there was no statistically significant effect on the physical role, limitation due to physical functioning or the general health at 1 year of follow up. These results are summarized in Table 4.

Table 1
Baseline data for all patients (n = 31).

Mean age in years (range)	66.4 (55–79)
Mean cognitive function	
SPMSQ score (range)	9.3 (7–10)
Gender	
Number of Female (%)	15 (48.4)
Activity of daily living	
Mean Katz index (range)	5.8 (4–6)
Comorbidities	
Ceder Aor B (%)	31 (100)
ASA grade (number/%)	
1	4/12
2	15/47
3	13/41
4	0/0
Preop HRQoL mean values (±SD)	
Physical function	70.4 (±29.6)
Role limitation due to physical level	62.5 (± 38.2)
General health	67.7 (± 23.5)

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