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# SHORT TERM OUTCOME IN PRIMARY UNCEMENTED TOTAL HIP ARTHROPLASTY IN FEMORAL NECK FRACTURE

Orthopaedics

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KEYWORDS

**Introduction:**

Total hip arthroplasty, touted as operation of the century [1], refers to the surgical replacement of both the components of the hip joint, acetabulum and the proximal femur, using synthetic implants of varied design and composition with varied surgical approaches and techniques to give the patient a new well-functioning, painless, mobile and stable hip. Total hip arthroplasty (THA) is one of the most commonly performed and successful operations in orthopaedic surgery in terms of clinical outcome implant survivorship, and cost-effectiveness. This has been verified in numerous long-term studies that have reported clinical success rates in excess of 90% after a minimum of 10 years' follow-up. These studies used surrogates for clinical success rates that included patient satisfaction, pain reduction, functional improvement, and the absence of further surgery.[2,3,4,5]

Total hip arthroplasty can be primary, the procedure being performed as the first modality of treatment in a certain condition; or revision, when the surgical procedure is done for a failed primary procedure; or a conversion arthroplasty which means some other primary procedure like osteosynthesis or hemi-arthroplasty is converted to total hip arthroplasty. A study by Mahomed et.al.[6] determined that primary THA was performed three to six times more often than revision THA in US Medicare population

One of the commoner indications for a THA, following arthritis of the hip joint from various causes, is a displaced intracapsular fracture neck of the femur. Hip fractures are an extremely common occurrence in the older population and comprise 20% of workload in an Orhtopaedic setup.[7] In 1998 it was estimated that 280,000 hip fractures occurred in the U.S. By 2040 it is estimated that 500,000 will occur annually in the U.S., costing a projected $16 billion per year.[8]

Approximately 95-97% of these fractures occur in the older adult population. Most of these fractures occur at the femoral neck and about 85% of these fractures are displaced.[9] The treatment of displaced fractures of the femoral neck with reduction and internal fixation has significant rates of both non-union and osteonecrosis. A meta-analysis by Lu-Yao determined the rate of non-union to be 33% (95% CI, 23%-37%) and an osteonecrosis rate of 16% (95% CI, 11%-19%).[7] Hence treatment by primary THA in acute displaced neck of femur fracture has been advocated in selected group of patients, i.e. physiological age more than 60 years, no or insignificant cognitive dysfunction and community ambulation prior to injury.

The prosthetic hip is available in numerous designs and materials but in general can be divided into cemented and uncemented/cementless implants. Though cemented implants are still popular, lately the uncemented prosthesis have gained popularity.[10]

**Potential advantages of cementless over cemented total hip arthroplasty are:**

1. Avoidance of the so called, bone cement implantation syndrome (BCIS), characterized by hypoxia, hypotension or both and/or unexpected loss of consciousness occurring around the time of cementation, prosthesis insertion or reduction of the joint.[11]
2. Significantly reduced risk of aseptic loosening (especially of the acetabular component[12]) and hence reduced revision rates. [13,14]
3. Reduced risk of infection.[15]

**Advantages aside, cementless total hip arthroplasty is not without potential pitfalls which include:**

1. The need for restricted weight bearing 6-12 weeks.
2. Higher incidence of thigh pain.[16]
3. Risk of femur fracture, especially in Dorr Type C femurs.[17]

**Material and Methods:**

The present study was a hospital based prospective study conducted on the patients admitted in the Post Graduate Department of Orthopaedics of SKIMS Medical College Hospital, Srinagar, J&K, India. The type of implant used in all the cases was, for purposes of homogeneity and to eliminate any implant-related confounding factors, a partially porous coated with tapered femoral stem, with steel-polyethylene interface. The size of the head and polyethylene liner was chosen between 28 and 36 mm based on intra-operative stability and soft tissue tension achieved. We included thirty patients of 55-80 years of age, both genders with recent (4 weeks old) trauma with displaced transcervical and subcapital (Garden stage II, III and IV) fracture neck of femur with good bone stock in femori (Dorr A and B)[18]. Patients with any medical contraindication to major surgery, patients with lower than normal life expectancy because of cancer, severe inflammatory disease or cardiopulmonary disease, patients with polytrauma, patients with pre-existing osteoarthritis, rheumatoid arthritis and poor bone stock( Dorr C femori) were excluded.

All patients with fracture neck of femur and meeting the inclusion criteria were admitted in the Department of Orthopaedics and evaluated with detailed history including time and mode of injury, medical comorbidities, drug history and pre-injury ambulatory status. A thorough clinical examination was done foe general built, review of systemic examination, and hip and spine examination. Routine investigations were done, with occasional Echo in patients with suspected cardiac ailments. Radiographic examination included standard AP view of pelvis, AP and lateral (or cross table) views of the affected hip and the normal hip, and preoperative templating was done using the transparent templates supplied by the manufacturer.

We employed posterolateral (Gibson) approach in patients because of our familiarity with the approach and to exclude confounding factors related to surgical approach. Prophylactic IV antibiotics were used in all patients, started an hour prior to surgery and continued for 1-3 days based on individual risk factors. In most cases the choice remained IV Cefuroxime and IV Amikacin, except when contraindicated e.g. anaphylaxis or chronic renal disease. In those cases amoxicillin/clavulunate or clindamycin was used. Acetabulum was prepared after delivering the head and performing preliminary neck osteotomy. Acetabular shell was inserted, press fit and skeletal fixation was further secured with self-tapping, cancellous screw fixation. Next, femoral

canal was prepared using serial broaches and the size of final implant was chosen accordingly. Head of appropriate size was chosen according to intraoperative limb length, soft tissue tension achieved and on table tests for ROM and stability. A high density polyethylene liner of corresponding size was used in the acetabular shell and fixed. Meticulous layered closure was done, using suction drain in most cases, which was removed on 1st post-operative day. Prophylaxis for DVT was used in all patients according to the AAOS protocol using low molecular weight heparin (Enoxaparin) in addition to physical measures (ankle pump exercises, compression stockings etc.).[19] Patients were allowed to stand on the second post-operative day, and they progressed to full weight bearing with crutches as tolerated. They were advised to use a pair of crutches for 6 weeks and to use a cane thereafter if required.

The follow up protocol of rehabilitation was properly explained and demonstrated to the patients at each visit. Standard radiographs were taken after surgery, at 2, 4, 6, and 8 weeks, at 3, 6, and 12 months, and at 6-monthly or yearly intervals thereafter. The prevalence, location, and extent of osteolytic lesions, reactive lines, calcar resorption, pedestal formation, and cortical hypertrophy were determined from anteroposterior radiographs taken at the time of the last follow-up. The functional evaluation was done using the Modified Harris Hip score at the final follow up.[20]

**Aims and Objectives:**
To evaluate the results and functional outcome of primary uncemented THA in femoral neck fractures at a short term follow-up.

**Results:**
This study was conducted on patients with age ranging from 55 to 80 years with a mean age of 68.8 years. In our study 19 patients were females while the rest 11 were males. Sixteen (16) patients sustained a femoral neck fracture on the right side while 14 had the fracture on left side. The average duration of surgery in our study was 111 minutes with minimum being 90 minutes and maximum 130 minutes.

The minimum follow up in the present study was 28 months while the longest duration of follow up was 37 months. The average duration of follow up was 32.2 months.

We used a cementless, partially coated, metaphyseal-fit stem design in this study with size range from 4 to 12.5(4, 5, 6. 7.5, 9, 10, 11, 12.5). The hip stem had tapered wedge shape, titanium substrate, and proximally circumferential titanium porous plasma sprayed design. The most common stem sizes used were 9 and 11. In majority of our patients (26, 86.7%) the stem was placed in the central position in the medullary canal. In only 4(13.3%) patients the steam was placed in mild varus position while none had the stem in valgus.

In most patients (23) a larger 36 mm head was used while only 7 patients received the smaller 28 mm head. We used a full hemispherical, porous coated metal shell with holes for screw fixation with a highly cross linked polyethylene liner with a postero-superior lip of 10 degree. The minimum shell size was 48 mm while the maximum was 58 mm. The most commonly used shell size was 54(9 patients) followed by 52 and 56(7 patients each). In our study, the average acetabular inclination angle was 47.9degree. Out of a total of 30 cups, 16 of the cups had an inclination angle of 40-49 degrees. The maximum angle of inclination was 58 degrees and the minimum was 39 degrees.

Four patients had shortening on the operated side post-operatively, all below 1 cm. There was lengthening of the operated limb in 8 patients in our study. The mean lengthening in these patients was 0.775 cm (0.5 to 1.8 cms). The average LLD in the sample of 30 patients was 0.29 cm.

**Complications:** We noticed complications in only a few patients, all being mild and not severe enough to limit activities of daily life. We encountered persistent anterior thigh pain in three of our patients and its relation with size or alignment of the stem was insignificant. One patient had Brooker grade 1 heterotopic ossification at the final follow up and complained only of occasional mild hip pain. Persistent mild Trendelburg gait was observed in three patients possibly owing to poor compliance to rehabilitation or actual weakness of abductors caused during operative procedure. Superficial surgical site infection was seen in three patients, one being complicated by type 2 diabetes mellitus, in early post-operative period and resolved with a short course of oral antibiotics. We had no case of dislocation of the prosthesis. No lucent lines or lytic zones were seen around either the acetabular component (De Lee and Charnley zones) or the femoral stem (Gruen zones). We did not see any case of component migration or any change in the initial alignment.

| Table 1: Complications | | |
|---|---|---|
| Persistent Anterior Thigh Pain | 3 | 10% |
| Superficial Wound Infection | 3 | 10% |
| Heterotopic Ossification | 1 | 3.33% |
| Mild Trendelburg Gait | 3 | 10% |

**Outcome:** For the total score and each of the parameters, higher score implies lesser disability. In fracture neck of femur the HHS cannot be calculated pre-operatively.

**Table 2: Post-Operative scores according to the various parameters of the HHS at Final Follow Up**

| | N | Mean | Min | Max |
|---|---|---|---|---|
| Pain | 30 | 43.06 | 40 | 44 |
| Limp | 30 | 10.4 | 8 | 11 |
| Need of Support | 30 | 10.1 | 7 | 11 |
| Distance Walked | 30 | 9.8 | 5 | 11 |
| Ability to use Stairs | 30 | 3.47 | 2 | 4 |
| Activity | 30 | 3.53 | 2 | 4 |
| Sitting | 30 | 4.53 | 3 | 5 |
| Enter Public transportation | 30 | 0.77 | 0 | 1 |
| Absence of Deformity | 30 | 0.9 | 0 | 3 |
| ROM Score | 30 | 4.4 | 3 | 5 |
| Total | 30 | 90.93 | 71 | 99 |

Postoperatively the mean total score was 90.93, with 71 being the minimum and 99 being the maximum.

Results assessed by the Harris Hip Score are graded as follows: 90-100 as excellent, 80-89 as good, 70-79 as fair and less than 70 as poor. On the final follow up, majority of our patients showed Excellent results (21), while 5 showed Good, and 4 fair results. None of our patients had a Poor outcome.

| Table 3: Post-Operative HHS at Final Follow-up | | |
|---|---|---|
| Grade | Post-Operative | Percent |
| Poor | 0 | 0 |
| Fair | 4 | 13.3 |
| Good | 5 | 16.7 |
| Excellent | 21 | 70.0 |
| Total | 30 | 100 |

**Discussion:**
Total Hip Arthroplasty forms the standard of care in patients with displaced femoral neck fractures above 60 years of age, community ambulators with no or insignificant cognitive dysfunction. It provides these patients with a new prosthetic hip allowing them an opportunity to regain function and mobility as close to the pre-injury level as possible, restoring them to a good quality life for a prolonged duration following the trauma.

The mean age of our study is comparable to other studies conducted on patients with diagnosis of femoral neck fractures primarily because it's a disease of the elderly (Lizaur[21], Cossetto[22], Lobodo[23], Klein[24], Kim and Oh[25]). Our study is comparable to Hailer et. al.[10] and Rivera et. al.[26] in showing a female preponderance.

Limb length discrepancy is a common cause of patient dissatisfaction following total hip arthroplasties [27]. In our study we had lengthening of the affected limb in 26.7% of the cases and shortening in 13.3%. The average lengthening in those patients was 0.775 cm (0.5 to 1.8 cms). The limb length discrepancy was deemed insignificant. The literature shows varied reports on post-operative limb length discrepancy following total hip arthroplasty. Kim et al.[28] reported a 19% incidence of lengthening in 42 patients with a unilateral total hip replacement. The average lengthening was 0.5cms in their study. Williamson and Reckling[29] reported a 27% incidence of patients requiring shoe lift of the contralateral side. Konyves and Bannister[27] reported a 62% lengthening, 29% shortening and only 6% limb length equality in their study.

Anterior thigh pain has been reported to be a common complication in a cementless stem. Archibeck et al.[30] reported an incidence of mild to severe anterior thigh pain of 9%. They found thigh pain to be related to the size of the stem. Kim et al.[28,31] in two separate studies reported the incidence of anterior thigh pain to be 10% and 11.4% respectively.

| Table 4: Comparison of Complications | |
|---|---|
| Study | Incidence of Anterior Thigh Pain |
| Kim et. al. (1993)[32] | 25% |
| Archibeck et al. (2001)[30] | 9 % |
| Kim et al. (2003)[28] | 10 % |
| Klein, Parvizi (2006)[24] | 3.5 % |
| Cawley et. al. 2011[33] | 5 % |
| Kim et al. (2011)[31] | 11.4 % |
| Kim and Oh 2012[25] | 16 % |
| Han, Yang, Lee 2012[34] | 10 % |
| Present Study 2016 | 10 % |

The Harris Hip Score was graded into excellent, good, fair or poor, as described by Marcheti et al.[35]In our study, excellent or good results were obtained in 86.7% of the patients. The average HHS score at the final follow up in our patients is comparable to most studies done previously.

| Table 5a: Average Post-operative HHS in various studies | | | | | |
|---|---|---|---|---|---|
| Study | Kim et. al. 1993[32] | Han, Yang, Lee 2012[34] | Kim and Oh 2012[25] | Rivera et. al. 2015[26] | Present Study 2016 |
| Avg Harris Hip Score | 92 | 88 | 86.5 | 81.14 | 90.1 |

The average HHS score at the final follow up in our patients is comparable to most studies done previously.

| Table 5b: Average post-operative HHS | | | | | |
|---|---|---|---|---|---|
| Study | Kim 1993[32] | Archibeck et al. 2001[30] | Kim et al. 2003[28] | Han, Yang, Lee 2012[34] | Present Study |
| Result | 75% Excellent 19% Good 6% Fair | 72%Excellent 14% Good 9% Fair 5% Poor | 43% Excellent 52% Good 5% Fair | 57% Excellent 22% Good 11% Fair 10% Poor | 70% Excellent 16.7% Good 13.3% Fair |

Our results are consistent with those of Kim 1993[32] and Archibeck 2001[30] who showed an excellent and good outcome in more than 90% of their patients.

## Conclusion:

With the increasing life expectancy and growing population of older people, femoral neck fractures are a very common occurrence in orthopaedic trauma. There is a growing debate of the management of such fractures in younger patients, but there is a more or less consensus that patients with physiological age of 60 years or more, with good pre-injury ambulatory capacity and none or insignificant cognitive dysfunction, total hip replacement is the treatment of choice. Total hip replacement can be cemented, uncemented or hybrid. We used the uncemented prosthesis in our study. Even though we witnessed few complications too, our study has shown favorable results in primary THA in acute fracture neck of femur.

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