Functional Outcome of Cementless Total Hip Replacement in Avascular Necrosis Head of Femur.

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ABSTRACT

Objective: To determine the early functional outcome of cementless total hip replacement (THR) in patients with avascular necrosis head of femur.

Methods: This descriptive study was conducted in Department of Orthopedic Surgery Unit I Services Hospital Lahore from 5th August 2018 to 10th September 2021. All adults patients of both gender with avascular necrosis of head of femur fulfilling the inclusion criteria were operated with cementless total hip replacement (THR). Post operative functional outcome at 3, 6 and 12 months was determined with Harris Hip Score(HHS) and compared with pre operative HHS. *P* value was calculated with paired t-test. *P* value < 0.05 was considered significant. HHS was graded excellent (90 to 100), good (80 to 90), fair (70 to 80) and poor (<70).

Results: The total number of patients in our study was 83. Male patients were 64(75.3%) and female 19(22.4%). Mean age was 45.30 ± 9.12 years. Right sided THR was done in 45(52.9%) and left in 38(44.7%) patients. The pre-operatively mean HHS was 41.58 ± 10.36. Post operative mean HHS at 3, 6 and 12 months was 56.86 ± 9.14, 73.16 ± 8.21 and 85.55 ± 5.30 respectively (p < 0.05) Excellent functional outcome at one year was noted in 59 (71.08%) patients, good in 19 (22.89%) and fair in 5 (6.o2 %) patients.

Conclusion: Excellent and good early functional outcome was achieved in majority of our patients who were treated with cementless total hip replacement for avascular necrosis head of femur in our series. We therefore recommend cementless total hip replacement as treatment of first choice in middle aged patients suffering from avascular necrosis of head of femur.

Keywords: Avascular necrosis, Cementless, Harris Hip score, Osteonecrosis, Total hip Replacement.

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INTRODUCTION

Avascular necrosis (AVN) or osteonecrosis of the head of femur is one of the most common cause of pain in younger adults between the third and fifth decade of their lives.[1,2] The incidence of AVN is approximately 10,000 to 20,000 new cases every year in the United States.[3] The pathogenesis of AVN involves compromised blood supply to the head of femur initially followed by collapse of femoral head and destruction of the hip joint. Following a variable time of ischemia of the head of femur, necrosis of the osteocytes, adipocytes and hematopoietic cells occurs which are responded with repair and remodeling.[4] The surrounding viable bone with an intact blood supply causes resorption of the dead bone leading to weakening of the subchondral bone and development of osteoarthritis.[5] The aetiology of avascular necrosis can be traumatic or atraumatic. Microthrombi, fat embolism and intraosseous extravascular compression can cause intravascular occlusion of femoral blood supply following trauma.[6] Atraumatic causes are often associated with genetic predisposition and exposure to multiple risk factors including use of corticosteroid and alcohol abuse, haemoglobinopathy, Gaucher's disease, and coagulopathies.[7] There is 50% chance of patients

presenting with bilateral AVN of hip joints in cases of non traumatic causes of AVN.[8] Initial presentation can be asymptomatic and diagnosis and staging often require MRI.[9]

Although different treatment options such as stem cell transplant and core decompression[10] have been attempted for early AVN, the definitive treatment of advanced AVN of femoral head supported by empirical evidence till date is Total Hip Replacement (THR).[11] The early functional outcome of THR in AVN, however is still debated, especially when published data suggested increased need for early revision surgeries of the hip.[12]

In our institution AVN head of femur is usually treated with THR but the type of prosthesis (cemented or cementless) in middle aged patient is usually selected as per surgeon's preferences, expertise and economic feasibility of the patient. The objective of our study was to determine the early functional outcome of cementless total hip replacement (THR) in patients with avascular necrosis head of femur. We hoped that the results of this study will help us to formulate standard guidelines for the treatment of AVN femur in middle aged patients in our institution.

METHODS

We conducted this descriptive study in Department of Orthopedic Surgery Unit I Services Hospital Lahore from 5th August 2018 to 10th September 2021. All adult patients of both gender with pain hip joint and unilateral AVN (Ficat and Arlet Stage III and IV)[9],[13] femur head were enrolled in this study. Patients with systemic or local infection and revision arthroplasty were excluded. The study protocols were approved by the Ethical Committee of our hospital. Informed written consent was obtained from all the participants of this study. In the included subjects complete history and physical examination was done. All the relevant investigations (radiographs, MRI, bone scan) were ordered. Harris Hip Score (HHS)[14] was calculated for each patient pre- operatively. All the patients underwent primary cementless THR of the affected side using Lateral Harding approach. All the surgeries were performed by the same orthopedic consultant having appropriate expertise and experience in Hip arthroplasty. The prosthesis used was hydroxyapatite coated titanium Acetabulum shell with screw holes and Ultra High Molecular Weight Polyethylene (UHMWP) cup liner with extended posterior wall. The femoral component was a Muller type cementless stem with proximal hydroxyapatite coating. Appropriate pre-operative, peri-operative and post-operative antibiotic were administered as per specified hospital protocol. Low molecular weight Heparin was administered subcutaneously as a prophylaxis for Deep venous thrombosis in each patient for one week followed by oral aspirin 150mg per day for 28 days. Post-operatively each patient was given a rehabilitative plan and was mobilized on 1st post-operative day under the supervision of a qualified physiotherapist. After discharged from the hospital patients were called for follow up at two weekly intervals until 3 months and then once a month for 12th months. At each follow-up clinical and radiological assessment was done and functional outcome was determined using the Harris Hip Score. HHS was graded excellent(90 to 100),good(80 to 90), fair(70 to 80) and poor(score <70). Radiographic assessment of femoral component of THR was carried out as per Lins and Barnes,[15] acetabular component as per Engh and Massin[16] and Heterotrophic ossification as per Brooker and Bowerman criteria.[17]

All the data was collected in a predesigned proforma and analysis was done with SPSS version 27. Quantitative variables were presented as mean±SD and categorical variables were expressed as frequencies and percentages. Paired t-test was used to assess the difference between the means Harris Hip Score at 3, 6 and 12 months. P-value of < 0.05 was taken to indicate a statistically significant difference. The data was presented in table where necessary.

RESULTS

We operated 83 patients with cementless THR for AVN in our series. Male patients were 64(75.3%) and female 19(22.4%). Mean age was 45.30 ± 9.12 years(range 38 to 58 years). Right sided THR was done in 45(52.9%) and left in 38(44.7%) patients. The possible aetiology of AVN was atraumatic causes in 58(69.87%) and traumatic in 25(30.12%) patients. Steroid intake was reported in 47(56.63%) patients, previous pregnancy in 5(6.02%) and alcohol intake in 2(2.41%) and no cause in 4(4.81%). Previous fixation included cannulated screws in 16(65%) patients and Dynamic hip screws in 9(25%) patients. Core decompression was documented in 7(12.06%) patients. The mean pre operative HHS was 41.58±10.362 and increased significantly to 85.55±5.299 at one year (Table I) Excellent functional outcome at one year was noted in 59 (71.08%) patients, good in 19 (22.89%) and fair in 5 (6.02 %) patients. Stratification of data in terms of age, gender, side and aetiology of AVN did not show

any significant difference in HHS(p>0.05). Superficial surgical site infection was documented in 3(3.61%) patients and resolved with dressing and antibiotics. Limb length discrepancy of 1 cm was noted in 2(2.40%) patients. No femoral or acetabular loosening and heterotrophic ossification was noted. No revision surgery or mortality was documented in our series.

Table I: Pre operative and post operative Harris Hip Score (HHS).

Pre operative HHS	HHS at 3 months	HHS at 6 months	HHS at 12 months	*P* value
41.58±10.362 (range 20 to 68)	73.52±5.819 (range 58 to 86)	78.11±5.6019 (range 64 t0 92)	85.55±5.299 (range 68 to 95)	0.001

DISCUSSION

In this study we treated 83 patients of AVN hips with cementless THR and the functional outcome improved from mean pre operative HHS of 41.58±10.362 to 85.55±5.299 at one year follow up. Furthermore excellent functional was noted in 59 (71.08%) patients, good in 19 (22.89%) and fair in 5 (6.02 %) patients. Our results are consistent with previous studies in literature. Karimi[18] treated 30 patients with mean age 43.9±6.7 years and achieved mean HHS of 99.2%. The HHS was 100% in 27(90%) patients,96% in 2(7%) and 83% in 1(3%) patient. Excellent outcome was noted in 29(97%) and good outcome in 1(3%) patient as per modified Harris Hip score. Celebi and Muratli[19] treated 25 patients with mean age 39.6 years with cementless THR for AVN. The mean follow up period was 63.9 months. They noted that HHS was increased from 41.5 to 87.1(P<0.001).These authors recommended cementless THR in younger patients with AVN head of femur. Cheung[20] treated 117 AVN hips and 65 Non AVN hips with cementless THR and followed for 14.7 years. Cheung noted excellent functional outcome in both groups without any significant difference in implant survival and complication rates. Osawa[21] compared the results of cementless THR in AVN with THR osteoarthritis and at 10 years follow up noted no significant difference in terms of HHS ,prosthesis survival and complication rates. El-Etewy and Megahed[22] treated 24 patients of traumatic AVN hips with cementless THR. The mean age was 38 years. HHS score improved from 40(pre operative) to 80(at three years follow up).These authors noted excellent HHS in 6(25%) patients, good in 14(58.33%),fair in 3(12.5%) and poor in 1(4.16%) patient.

In our study no major complication like loosening or stem migration was noted.This can be attributed to the shorter follow up period of one year in our study. Contrary to our study Radl[23] reported higher migration rate and failure rate of cementless femoral stem in AVN and advocated closed monitoring of cementless stems. Hungerford[24] treated 158 AVN femoral heads with cementless THR and noted HHS 84±15 at mean follow up peroid of 103 months. The revision rate was 8.9%(n=14) mainly for loosening or osteolysis.

We could not find any significant difference in HHS with regard to aetiology of AVN. Similar observations were noted by Dudkiewicz[25] He performed cementless THR in 74 patients and cemented in 10 patients with mean age 47.6±21 years. The mean follow up period was 5.6 years. The aetiology of AVN was steroids, trauma, idiopathic and others. The mean pre operative HHS was 28.5±4.5 and increased to 86±10 at 5.6 years follow up. The final outcome was not affected by the aetiology of AVN. However steroid induced AVN had lower implant survival period than others.

The limitations of our study were descriptive design, small sample size and short follow up period. We recommend further studies to confirm our results.

CONCLUSION

Excellent and good early functional outcome was achieved in majority of our patients who were treated with cementless total hip replacement for avascular necrosis head of femur in our series. We therefore recommend cementless total hip replacement as treatment of first choice in middle aged patients suffering from avascular necrosis of head of femur.

Conflict of Interest: None

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