Original Article

A Retrospective Observational Study to Compare the Outcome of Various Treatment Modalities of Idiopathic Avascular Necrosis of Hip

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Abstract

Background: Avascular necrosis (AVN) of hip of the femoral head is increasingly seen in young age, disabling them in their productive years of life. Available treatment options need to be evaluated. **Aim:** The aim was to compare the outcome of various treatments at different stages of AVN hip. **Materials and Methods:** A retrospective observational study was done in patients with idiopathic AVN hip, who had undergone different treatment modalities. The data of the included patients at different time intervals were compared. All patients were graded with the help of Harris Hip Score (HHS), and their outcome was evaluated. **Results:** The age distribution of patients showed that nearly 80% of them were below the age of 50 years. The patients were presenting more often in Ficat and Arlet stage 4 compared to earlier stages. The patients in stage 1 were treated by core decompression alone, which produced good-to-excellent results in 4 of 7 (57.1%) patients. Patients in stage 2 and 3 were treated by core decompression with fibular bone grafting and had good-to-excellent results in 6 of 8 (75%) patients. In stage 4 of disease, cemented total hip replacement (THR) was done, and it produced good-to-excellent results in 13 of 15 (86.6%) patients. **Conclusion:** In the early stage of disease, core decompression with and without bone grafting produced satisfactory results. In an advanced stage of AVN, THR is an excellent treatment option.

Keywords: *Avascular necrosis of hip, core decompression, total hip replacement*

Introduction

Avascular necrosis (AVN) of the femoral head causes death of the osteocytes and articular cartilage resulting in joint destruction.[1,2] It occurs in younger age individuals causing a significant disability.[3] The management of AVN depends on the age of the patient, size of the lesion, and stage of the disease.[4] Core decompression in FICAT Stage 1 has shown good results.[4,5] In more advanced stages, bone grafting is needed.[4] In stages with collapse of the femoral head, a total hip replacement (THR) produces good results.[5] This study was done to evaluate the role and outcome of various treatment modalities available in each stage of the disease.

Materials and Methods

This retrospective and observational study was conducted in the department of orthopedics after the approval of the institutional ethics committee. Written informed consent was taken from all patients for use of their data for research purpose.

Inclusion criteria

All the patients who had presented in the outpatient department (OPD) or emergency unit of the hospital with age ≥18 years with idiopathic AVN hip and/or patients with an X-ray/magnetic resonance imaging (MRI) suspect AVN hip were included in this study.

Exclusion criteria

All patients with traumatic AVN hip or any potential known risk factor of secondary AVN hip, with age <18 years, and patients who refused to give consent were excluded from the study.

Data collection

All the data were collected from patients' records. A retrospective reviewing of medical records of patients with AVN hip was done. The record of patients operated in 1 year (from February 2019 to January 2020) was checked, and all the patients satisfying the inclusion criteria

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were included in the study. All the data collected were from indoor files, which were stored in the central record room of the hospital, and follow-up data were taken from OPD slips of the patients.

A preoperative X-ray (B/L hip with pelvis in AP view and frog-leg lateral view) and MRI had been done with routine investigations for all patients. Staging of patients had been done according to the Ficat and Arlet classification for AVN hip, which is based on radiographic investigations and clinical features. It classifies patients into four stages, with stages 1 and 2 being early stages of AVN with limited radiographic findings but clear clinical picture. Stages 3 and 4 are late stages with the destruction of the femur head seen on X-ray.[6]

Based on the stage of disease, age of patient, and size of lesion, these patients had been treated with various methods such as core decompression, core decompression with fibular bone grafting, and cemented THR. The patients had been assessed at the time of presentation, followed by assessment at 3 weeks, 6 weeks, 3 months, 6 months, and 1 year after surgery. All the follow-up data were collected from OPD slips of the patients.

Outcome measures

The data collected were assessed with the help of the Harris Hip Score (HHS) and graded according to the score. HHS is a standardized score for hip disability, which measures patient's pain, ability to do activities of daily living, and range of motion at hip joint. According to the HHS as described by Harris, there should be an average increase of 20 points in pre and postoperative HHS to consider the treatment as effective.[7] The outcome of these patients based on the HHS value was compared and evaluated.

Statistical analysis

The data obtained were expressed in percentages. The HHS was calculated as the mean scores with standard deviation with the help of Microsoft Excel (2010 version, Microsoft Corporation, Redmond, Washington, United states). Student's *t*-test (paired) was applied to the data, and the result was considered statistically significant if $P < 0.05$. The outcome of the various types of the surgical treatment for AVN hip was graded and expressed in percentages.

Results

There were 30 patients satisfying the inclusion criteria. The mean age of the patients was 44.4 ± 12.9 years, with the youngest patient of 20 years and the oldest patient being 67 years. Table 1 shows the stage of AVN and various treatment modalities given to these 30 patients.

The patient outcome at 1-year follow-up was compared to the patient condition on presentation in all the three subsets of patients, i.e., core decompression, core decompression with bone grafting, and THR. The HHS had been noted at each follow-up, and a progressive increase of the average HHS value was recorded. Table 2 shows the improvement in the mean HHS at different postoperative time intervals in all three treatment modalities. In each patient group, there was an increase in the HHS which was statistically significant.

Table 1: Various types of treatment modalities given to the patients with avascular necrosis of hip

Stage of AVN	Treatment modality	Number of patients, *n* (%)
Stage 1	Core decompression	7 (23.33)
Stage 2 and 3	Core decompression with fibular graft	8 (26.67)
Stage 4	THR	15 (50)
Total		30

AVN: Avascular necrosis; THR: Total hip replacement

The initial HHS at presentation and final HHS at 1-year follow-up were analyzed for each of the three subsets of patients. On applying Student's *t*-test (paired), $P < 0.001$ was obtained in each of the groups, which indicates that there was a significant increase in the HHS values.

Table 3 compares the outcome in the three modalities of treatment based on the HHS. In patients with stage 1 disease, core decompression had been done which produced good-to-excellent results in 4 of 7 patients (57.1%). The HHS at a preoperative stage to final outcome at 1 year increased from 58 to 80.

In patients of stage 2 and 3 diseases, core decompression with fibular grafting had been done and 6 of 8 (75%) patients had good-to-excellent results. The HHS increased from a preoperative score of 59 to final score at 1 year of 81. In patients with stage 4 disease, THR was performed and had an excellent and good result in 13 out of 15 patients (86.6%).

Discussion

AVN of the femoral head is increasingly seen in younger patients in their most productive years of life; the final outcome of which is osteoarthritis of the hip joint. Hip replacement in younger patients is not a good option, because with an increasing life expectancy, revision surgery will be required. Hence, in the earlier stages of the disease, it is preferable to do hip-preserving surgery.[8]

The operative treatments start from simple core decompression in Ficat stage 1.[4] Core decompression lowers the intraosseous pressure in the femoral head and allows new blood vessel ingrowth for the restoration of vascularity.[4] Core decompression in FICAT I produces restoration of up to 97% to the normal hip anatomy. However, as the amount of femoral head destruction increases, the success of this procedure decreases.[5] In more advanced stages of the disease, bone grafting of the involved area either directly after dislocating the hip and

Table 2: The Harris Hip Score at different time intervals among patients

HHS	Mean±SD		
	Core decompression (*n*=7)	Core decompression with fibular graft (*n*=8)	THR (*n*=15)
Preoperative	58.14±1.77	59.62±1.99	48.06±2.84
3 weeks postoperative	62.29±2.36	63.63±1.59	61.67±4.86
6 weeks	66.14±5.27	69.75±3.01	68.27±5.79
3 months	68.28±6.47	72.62±4.56	72.8±5.53
6 months	70.57±7.91	75.62±5.83	76.8±5.44
1 year (*P*)	80.43±10.53 (0.0001)*	81.75±8.29 (<0.0001)*	87.47±6.84 (<0.0001)*

**P* values are calculated comparing preoperative HHS and 1-year postoperative HHS using paired *t*-test. HHS: Harris Hip Score; THR: Total hip replacement; SD: Standard deviation

Table 3: Outcome of patients based on the Harris Hip Score

Outcome	Core decompression (*n*=7), *n* (%)	Core decompression with fibular graft (*n*=8), *n* (%)	THR (*n*=15), *n* (%)
Excellent	2 (28.58)	2 (25)	8 (53.33)
Good	2 (28.58)	4 (50)	5 (33.33)
Fair	1 (14.28)	1 (12.5)	2 (13.33)
Poor	2 (28.58)	1 (12.5)	0

THR: Total hip replacement

elevating the involved segment or using a fibular graft placed up the center of the femoral neck from the lateral cortex can be done.[4]

In our study of 30 patients, we had 50% of patients in stage 4. The rest were nearly equally distributed in stages 1, 2, and 3. This could be possible due to patients getting treatment from quacks and presenting to orthopedic surgeons in a later stage of disease.

The mean age of the patients in our study was 44.4 ± 12.9 years. More than 80% of patients were below the age of 50 years. This shows that AVN of the femoral head is increasing in younger patients, and this finding is corroborated by other authors.[9,10]

Our division of patients for different surgical treatments was similar to that done by other authors. In a study by Babhulkar., core decompression was done in stages 0 and 1 of the disease, and core decompression with bone grafting was done in stages 1, 2, and 3 of AVN hip.[9] The treatment given by Tsai *et al*. was different in that they did only core decompression in stages 1 and 2 of AVN Hip. In stages 3 and 4, patients were operated for THR, and no patient underwent core decompression with bone grafting in the study by Tsai *et al*.[11]

Regarding the outcome of different treatment modalities, there was an improvement in the HHS, which showed the efficacy of the treatment chosen. In a study done by Marker *et al*., core decompression produced good-to-excellent results in 57% of patients and poor-to-fair result in 39% of patients.[12] This study corroborates our findings as our study had obtained 57.1% of good-to-excellent results and 42.8% fair-to-poor of results in the core decompression group.

In a study by Steinberg, where the University of Pennsylvania classification was used for AVN hip, only core decompression with bone grafting had been done.[13] The study had 78% success in stage 1A and 2A and 60% success in stage 1B, 2B, and 2C. The operative intervention chosen and success rates were similar to our study, where we had 75% of patients with good-to-excellent results in stages 2 and 3 treated by core decompression with bone grafting. Many other authors who performed core decompression in stages 1, 2, and 3 were having outcomes which were similar to our study.[3,12]

The optimum treatment of patients with collapse of the femoral head and significant pain is controversial.[14] Osteotomies, which transfer healthy surface areas of the femoral head for weight bearing, are a viable treatment option, but the results can be inconsistent.[15] THR has become the gold-standard treatment for these patients and is the currently most common intervention for the stage 4 disease.[16,17]

In patients with stage 4 disease, the patients were treated with cemented THR, and 13 of 15 patients (86.6%) had good-to-excellent results. The HHS increased from a low preoperative score of 48 to a higher HSS at the end of 1 year of 87. Kakaria *et al*. found that after THR in AVN hip, the mean HHS improved from 43 to 89, and all of their patients (100%) had good-to-excellent results with HHS >80.[16] Similar results are obtained by other authors.[17,18]

The small sample size of 30 patients and a small period of follow-up for 1 year only are the major limitations of this study. A longer follow-up of these patients will be desirable and is being continued.

Conclusion

We can conclude from our study that core decompression is a good option for the treatment of early stage of AVN of the femoral head in terms of improving the activity of

daily living of the patients. In advanced stage of AVN with collapse of the femoral head, the best treatment option is THR which provides excellent, reliable, and reproducible results.

Ethical statement

The study was approved by Institutional Ethics committee of Government Medical College, Patiala by IEC approval letter no (Trg).EC/NEW/.INST/2020/997.

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Conflicts of interest

There are no conflicts of interest.

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