

FUNCTIONAL OUTCOME OF CORE DECOMPRESSION WITH FIBULAR GRAFTING IN THE MANAGEMENT OF AVASCULAR NECROSIS OF THE FEMORAL HEAD

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ABSTRACT

BACKGROUND

Avascular necrosis of the femoral head is a condition affecting people between ages 30 and 50 years, most often bilateral. Core decompression with bone grafting is a commonly done procedure in early stages of avascular necrosis to prevent its further progression. Very few studies on this issue have been done in India. This study aims to determine the functional outcome of core decompression with fibular grafting in different stages of avascular necrosis femoral head.

MATERIALS AND METHODS

This is a prospective observational study of 30 patients with avascular necrosis of the femoral head stages I, IIA, IIB & III admitted in Department of Orthopaedics, Government Medical College, Kottayam from February 2012 to August 2013.

RESULTS

The age of the patients ranged from 20 years to 51 years. Of the 30 patients, most of them belonged to the age group between 30 and 40 years (53.3%). The male to female ratio was 4:1. Out of 30 patients, 33.3% had right sided, 26.6% patients had left side and 40% of patients had bilateral involvement respectively. Pre-operative Ficat stages were - 8.1% with stage I disease, 32.4% with stage IIA, 32.4% with stage IIB and 27.1% with stage III disease. Ficat stage I and IIA there is improvement in range of movements, good functional outcome, improved mobility and pain relief. There is also no radiological worsening as indicated by the post-operative Ficat staging. In Stage IIB and III, there is no significant improvement in the range of motion. But the patients had significant pain relief, improved mobility and no radiological worsening.

CONCLUSION

Core decompression with fibular grafting was found to be a good treatment option for patient with Ficat and Artlet Stages I and IIA avascular necrosis of femoral head. In Stage IIB and III, procedure may be tried before going in for a Total Hip Replacement especially if the patient already has a good range of motion at the hip as it provides pain relief and improve mobility, thereby providing a functional hip till the disease process worsens.

KEYWORDS

Avascular Necrosis, Core Decompression, Fibula Grafting.

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BACKGROUND

Avascular necrosis of the femoral head also called Osteonecrosis refers to the death of osteocytes with subsequent changes in the femoral head finally leading to its collapse and secondary arthritic changes in the hip joint. The symptoms start as pain in the affected hip, progresses to limping and finally there will be inability to bear weight on the affected side. In many cases the affection will be bilateral causing significant debility in the patient. Many a time those with AVN are asymptomatic to start with, but

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later the femoral head undergoes collapse leading to arthritic changes in the hip joint resulting in significant morbidity. It has been estimated that up to 50% of patients with AVN will require a major surgery in the following 3 years.

Conservative forms of treatments are seldom effective in AVN hence surgical methods are often adopted. The gold standard surgical treatment is Total hip replacement. But before going in for a radical and costly treatment like THR we can try and contain the progression of the disease by procedures like 'core decompression with fibular graft'. Core decompression is aimed at reducing the intramedullary pressure thus enhancing the blood flow to the femoral head and thereby preventing the progression of AVN.

The age group affected by this debilitating disease is 30- 50 years which is the most economically productive age group. Hence when such a person becomes bedridden not only him, but the entire family suffers. The last treatment option in AVN of the femoral head is total hip replacement



which is very costly and is not afforded by most of our population. For these reasons, the relevance of study remains unquestioned.

Here is an effort to study the functional outcome of core decompression with fibular grafting in patients with avascular necrosis of the femoral head in our hospital and compare with other studies.

MATERIALS AND METHODS

This is a prospective observational study of 30 patients with avascular necrosis of the femoral head stages I, IIA, IIB & III admitted in Department of Orthopaedics, Government Medical College, Kottayam from February 2012 to August 2013. All patients were informed about the study in all respects and informed written consent were obtained. These patients were evaluated and analyzed preoperatively and underwent operation and were assessed both clinically and radiologically during post-operative follow up.

Inclusion Criteria

Patients of age between 20 to 60 years, patients with avascular necrosis of the femoral head with Ficat stage I, IIA, IIB & III, patients consenting for surgery and patients willing to participate in study.

Exclusion Criteria

Patients not willing to be part of the study, patients with associated fracture neck of femur, patients with Ficat stage IV disease and patients who have undergone any prior surgery at the hip.

Procedure

The study was approved by the Ethical and Research Committee of Government medical college, Kottayam, Kerala. After finding the suitability as per inclusion and exclusion criteria, patients were selected for the study, briefed about the nature of study, the interventions used and written, and informed consent were obtained. Further, descriptive data of the participants like name, age, sex, detailed history, were obtained by interviewing the participants and by clinical examination, radiologically staged according to Ficat and Arlet classification and were recorded on predesigned proforma. Core decompression is done using a Ficat (or DHS) reamer and fibular graft is introduced after curetting out all the necrotic bone. After the surgery the patients were evaluated by assessing pain free walking distance,¹ range of motion of hip, Universal pain score,² Harris hip score³ and radiologically staged according to Ficat classification. Patient is then reviewed every three months clinically and with radiographs up to one year.

Statistical Analysis

All the data that is obtained will be entered using Microsoft EXCEL software and analysis done using SPSS software version 16. Paired T- test was used for the comparison of continuous variables such as hip flexion, abduction, adduction, internal and external rotation. Wilcoxon signed ranks test was used for comparing Ficat staging, Harris Hip

score, Universal pain score and pain free walking distance score. The results are analyzed at the end of the study and observations made.

RESULTS

During the study duration 30 patients with avascular necrosis of femoral head were assessed. As some patients underwent bilateral core decompression with fibular grafting, a total of 37 hips were included in the study. The age of the patients ranged from 20 years to 51 years. Of the 30 patients most of them belonged to the age group between 30 and 40 years (53.3%). There was a male predominance for the disease with 24 (80%) of the patients being male and only 6 (20%) being female. The male to female ratio was 4:1. Among them 33.3% having right sided involvement, 26.6% patients having left side involvement. However, 40% of patients had bilateral involvement.

History of steroid intake was found in 40% of patients. 36.7% had history of chronic alcoholism. None of the females had history of alcoholism. Only 10% had history of smoking. Two patients had associated collagen vascular diseases. Both had Systemic lupus erythematosus (SLE). Both these patients had bilateral involvement. One patient also had history of long-term steroid intake. Seven (23.3%) patients had significant associated diseases. Two had diabetes, while five others had disorders which were treated with long duration steroids. Two patients had Bronchial asthma, one had optic neuritis, another patient had nephritic syndrome and one had pemphigus. Out of the 37 hips (in 30 patients), 3(8.1%) had stage I disease, 12(32.4%) had stage II A, 12(32.4%) had stage II B and 10(27.1%) had stage III disease pre-operatively.

Post-operatively, in Ficat stage I avascular necrosis group, the statistical analysis revealed that there is an improvement in range of motion of the hip after surgery. Flexion at the hip improved by a mean of 4.363 degrees, which was not found to be statistically significant (p value= 0.423). But abduction improved by mean of 8.333 degree (p value= 0.039), which was highly significant. Adduction also improved by 3.333 degree but was not found to be statistically significant (p value= 0.184). External rotation increased by a mean of 2.667 degree, but this was not significant (p value= 0.123). Again, the internal rotation showed improvement by 3.333 degree which was not statistically significant (p value= 0.184). There is no statistically significant improvement in the pain one year after the surgery (p- value of 0.102). The pain free walking distance after one year shows a high statistical significance (p value = 0.015). Even though there is improvement in the functional parameters of hip joint after core decompression and fibular grafting in terms of Harris hip score, this is not statistically significant. (p value = 0.109). A p value of 0.317 indicates that there was no statistically significant improvement of the Ficat stage radiologically after one year of core decompression and fibular grafting. However this also indicates that there was no radiological worsening at the end of one year.

In Ficat stage II A group there is a significant improvement in range of motion of the hip after surgery. Flexion at the hip improved by a mean of 4.583 degrees, which was found to be statistically significant (p value= 0.035). Similarly, abduction improved by mean of 3.333 degree (p value= 0.013), which was highly significant. Adduction also improved by 3.108 degree but was not found to be statistically significant (p value= 0.191). External rotation increased by a mean of 2.083 degree, but this was not significant (p value= 0.096). However, the internal rotation showed improvement by 2.50 degree which was statistically significant (p value= 0.043). There is a very significant improvement in the pain one year after the surgery with a p- value of 0.002. The pain free walking distance after one year shows a high statistical significance (p value = 0.002). There is a statistically highly significant improvement in the functional parameters of hip joint in terms of Harris hip score (p value = 0.002). A p value of 1 indicates that there was neither improvement nor worsening of the Ficat stage radiologically after one year post operatively.

In Ficat stage II B group there is an improvement in range of motion of the hip after surgery. However statistical improvement occurs only in range of abduction. Flexion at the hip improved by a mean of 2.914 degrees, which was not statistically significant (p value= 0.171). But, abduction improved by mean of 2.083 degree (p value= 0.046), which was statistically significant. Adduction improved only by 0.833 degree but was not found to be statistically significant (p value= 0.438). External rotation increased by a mean of 0.833 degree, but this was also not significant (p value= 0.586). The internal rotation showed improvement by 1.667 degree which was again not statistically significant (p value= 0.166). There is a very significant improvement in the pain after one year with a p- value of 0.003. The pain free walking distance showed a high statistical significance (p value = 0.003). There is a statistically significant improvement in the functional parameters of hip joint after core decompression and fibular grafting in terms of Harris hip score (p value = 0.032). Ficat staging does not show any statistically significant improvement. However, a p value of 0.652 also indicates that there was no radiological worsening.

In Ficat stage III group there is not much of improvement in range of motion of the hip after surgery. Flexion at the hip does not show any improvement a mean of 0.000 and a p value of 1.000. But, abduction showed worsening by mean of 1.000 degree (p value= 0.343), which was also not statistically significant. Adduction improved only by 0.500 degree but was not found to be statistically significant (p value= 0.678). External rotation also showed

worsening by a mean of 1.500 degree, with a p value of 0.343. The internal rotation showed improvement by 2.000 degree which was again not statistically significant (p value= 0.137). There is a very significant improvement in the pain one year after surgery with a p- value of 0.005. The pain free walking distance one year after surgery shows a high statistical significance (p value = 0.007). There is no improvement in the functional parameters of hip joint after surgery in terms of Harris hip score (p value = 0.953).

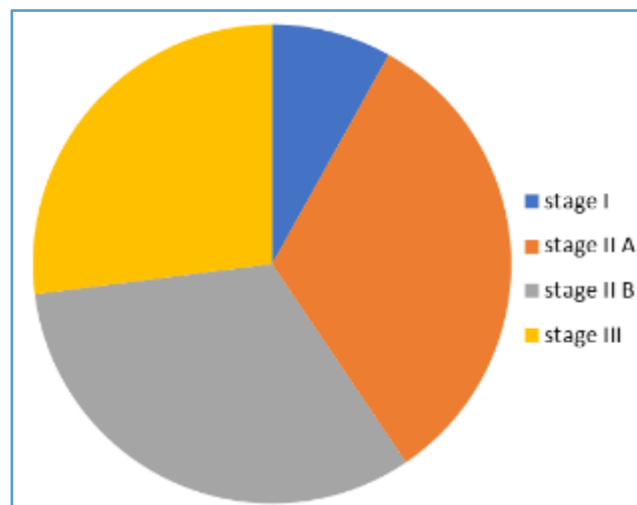


Chart 1. Pre-operative Ficat Staging

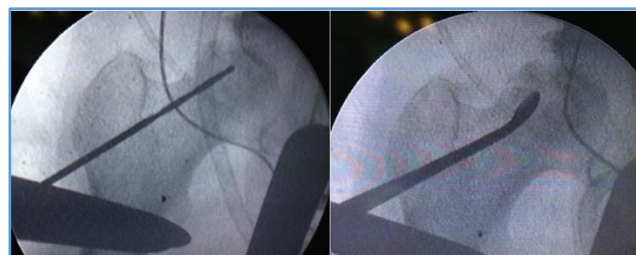


Figure 1. Core Decompression Technique



Figure 2. Fibular Grafting

Parameter	Frequency	Percentage
Age Group (Years)		
20-30	5	16.7
30 - 40	16	53.3
40 - 50	8	26.7
50 - 60	1	3.3

Gender		
Males	24	80
Females	6	20
Laterality		
Right	10	33.3
Left	8	26.7
Bilateral	12	40.0
Steroid Intake		
Present	12	40
Absent	18	60
Alcoholism		
Present	11	36.7
Absent	19	63.3
Smoking		
Present	3	10
Absent	27	90
Collagen Vascular Diseases		
Present	2	6.7
Absent	28	93.3
Other Diseases		
None	23	76.7
Bronchial asthma	2	6.7
Diabetes mellitus	2	6.7
Optic neuritis	1	3.3
Nephrotic syndrome	1	3.3
Pemphigus	1	3.3
Preoperative Ficat Staging		
I	03	8.1
IIA	12	32.4
IIB	12	32.4
III	10	27.1

Table 1

DISCUSSION

This study on the functional outcome of core decompression and fibular grating in the treatment of avascular necrosis of femoral head, had evaluated the post-operative function of the hip after 1 year of the surgery in terms of mobility, pain relief, radiological worsening and functional score.

In stage I Ficat AVN it is seen that there is improvement in range of movements to different levels in the various planes. However, there was marked improvement in abduction which was also statistically significant. It is also seen that the functional outcome is also good as shown by an improved Harris hip score. In all the patients at the end of one year the hip function was good. Lennox et al⁴ also found that up to 84% of the patients had good results. Buckley, Gearin and Petty⁵ found that 90% of the patients after core decompression and fibular grafting were asymptomatic and had no progression of disease at 8 year follow up. Stulberg et al⁶ in prospective study of only core decompression found that there was 70% good results in patients with stage I disease. Our study also shows that patients with stage I disease had improved mobility (as shown by increased pain free walking distance) and pain relief (as indicated by the improved universal pain score). However, though there is an improvement in the Harris hip

score, it is not statistically significant. This can be attributed to the fact that most stage I AVN will be without any significant symptoms (preclinical). There is also no radiological worsening as indicated by the Ficat staging.

In Ficat Stage IIA AVN there is significant improvement in almost all ranges of motion. Statistically significant improvement is seen in abduction, flexion and internal rotation. The functional status of hip as assessed by the Harris hip score also showed statistically significant improvement. This finding is consistent with the findings of Lieberman, Condua and Urist⁷ who reported 93% good results in Ficat stage IIA AVN. The study also shows that there is a significant improvement in the mobility of the patient as shown by an improved pain free walkable distance. There is also significant pain relief for the patient as there is a significant improvement in the universal pain score. The post-operative Ficat staging shows that there is no radiological worsening at the end of 1 year.

In stage IIB AVN there is statistically significant improvement only in abduction. However, there is improvement in the other ranges of motion but those were not statistically significant. The Harris hip score showed a statistically significant improvement indicating a good functional outcome at the end of 1 year. There is also a

significant improvement in the mobility of the patient as shown by an improved pain free walkable distance. There is also significant pain relief for the patient as indicated by a significant improvement in the universal pain score.

The post-operative Ficat staging shows that there is no radiological worsening at the end of 1 year. This finding is consistent with the findings of Ganjiet al.⁸ Who reported 90% good outcomes of core decompression with fibular grafting in Stage II avascular necrosis. This study however does not differentiate Stage IIA and IIB AVN.

In stage III AVN there is no improvement in range of motion in any plane. No statistically significant improvement in range of movement could be established. The Harris hip score also did not show a statistically significant improvement indicating a poor functional outcome at the end of 1 year. These findings are consistent with the Camp and Colwell et al⁹ who reported nearly 80% failure rate in post collapse AVN (Ficat stages III and IV). However, our study found that there is statistically significant improvement in the mobility of the patient as suggested by an improvement in the pain free walkable distance. There is also significant pain relief for the patient.

CONCLUSION

Core decompression with fibular grafting was found to be a good treatment option for patient with Ficat and Arlet Stages I and IIA avascular necrosis of femoral head. In both these stages patients had improvement in range of motion, good pain relief and improved mobility, thereby getting a good functional outcome. In Stage IIB and III, there is no significant improvement in the range of motion. But the patients had significant pain relief, and improved mobility and there was no radiological worsening at the end of 1 year of surgery. Hence in selected patients, in whom total hip replacement needs to be delayed (example in young patients), core decompression with fibular grafting can be done to provide pain relief and improve mobility, thereby providing a functional hip till the disease process worsens.

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