



Original Research Article

Assessment of the interventional outcome of non-traumatic avascular necrosis head of femur in young age group with core decompression with fibular bone grafting

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ABSTRACT

Objective: Assessing the intervention outcome of non-traumatic avascular necrosis head of femur in young age group (Core Decompression with Fibular Bone Grafting).

Materials and Methods: Random prospective study on in young age group patients affected with avascular necrosis head of femur, admitted to in the Department of Orthopaedics in Tertiary care hospital. The study period was from March 2016 to March 2019 with total number of 32 patients. All patients underwent the intervention surgery followed with 4 weeks, 8 weeks, 12 weeks, 6 months and 12 months follow ups for assessing the intervention outcome.

Results: There weren't much difference in both the duration of surgery and hospital stay. After 12 months follow ups following treatment, 31 cases had no pain or evidence of progression but in one patient the lesion had progressed with collapse of the infarcted segment and enlargement of the lesion within 12 months following the intervention surgery. The patient was subsequently treated with total hip arthroplasty. None of the other 31 cases needed another operation.

Conclusion: Non-traumatic avascular necrosis of the femoral head affects younger and working age group which leads to morbidity and functional disability. With combination of surgical intervention we aim to prevent the collapse of head of femur and provide a better management of preserving the hip in the early stages itself and comparative cheaper than hip replacement surgery.

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1. Introduction

Avascular Necrosis or Osteonecrosis of head of femur which is known as a pathological process causing the impairment of the osseous blood supply to the femoral head which causes osteonecrosis leading to bone destruction, pain and loss of function on the affected joint.^{1,2} Recent studies have shown atraumatic avascular necrosis affecting young individuals^{3–5} with incidence of bilateral⁶ more common. The osteonecrosis of the hip may progress through various stages which finally conclude with degenerative arthritis of the hip joint.⁷ The management mainly prevents or delays the advancement of disease and collapse of

head of femur.⁷ Treatment options are numerous,^{8,9} The preferable surgical procedure is core decompression which mainly reduces intramedullary pressure which is the main cause of avascular necrosis.¹⁰ Through Creeping Substitution^{11,12} (the slow, near-complete resorption of the graft with simultaneous deposition of new, viable bone) the blood supply to the necrotic area are restored.^{13,14} Resulting gradual pain relief and conservation of the spherical femoral head.¹⁵ As technology has become more advance, management of osteonecrosis has been improved and modified.^{8,15–18} Recent studies has shown combination management with core decompression has yield a better result. Studies have shown combination management of core decompression along with fibular bone grafting as a suitable management for non-traumatic avascular necrosis

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head of the femur. The fibular bone grafting consist of free vascularized and vascularized which provides hip preservation and also support for the articular surface, it also improves the biology of the microenvironment of the osteonecrosis regions.^{19–21} This modified surgical intervention will provide revascularization to the avascular necrosis region and also provide proper mechanical support to the head of femur.^{22–24} The aim of this study was to assess the intervention outcome of non-traumatic avascular necrosis head of femur in young age group (Core Decompression with Fibular Bone Grafting).

2. Materials and Methods

Random prospective study on in young age group patients affected with non-traumatic avascular necrosis head of femur who were admitted to in the Department of Orthopaedics in Tertiary care hospital. The study period was from March 2016 to March 2019 and totally 32 patients were selected.

2.1. Diagnostic criteria

1. A long history of alcohol drinking.
2. Long term steroid administration.
3. Pain felt in hip joints and inguinal regions and aggravated when standing or walking.
4. A definite diagnosis to be made based on plain roentgenography of hip joint and MRI examination.

2.2. Inclusion criteria

1. Patients who not received surgery for the affected hips.
2. Patients age between 25 – 45 years old.
3. Depending to the Ficat & Arlet classification, patients up to stage II were selected.

2.3. Exclusion criteria

1. Pregnancy ladies.
2. History of any surgical intervention.
3. History of any hip disorder.
4. History of infections
5. History of any bone tumour
6. History of any steroid therapy in last six months.
7. History of systemic disorder such as uncontrolled hypertension and diabetes, rheumatoid arthritis, or hepatitis.
8. Individuals with mental health problems.

The patients who were chosen for this study were clinically examined, all the required investigations performed such as routine blood investigation, plain roentgenography of hip joint and MRI examination and fitness evaluation for anaesthesia. Written consent for the surgery, post-operatively management and discharge summary, follow

ups and the outcome after surgery of the study group were analysed.

2.4. Surgical procedure

2.4.1. Core decompression with fibular bone grafting

The same team of surgeons did the intervention surgery on all the patients. The surgery were done by two teams, one team prepares the hip and the other team harvested the fibular bone graft simultaneously as a reason to reduce time consuming. After spinal/epidural anaesthesia were given, the patients were led in supine position and a straight incision about 2 to 3 cms was made from the tip of the greater trochanter distally and a guide wire of about 2.5 mm was inserted towards the necrotic region at the anterolateral aspect of head of femur until the guide wire was about 0.5 cm beneath the subchondral bone with the guidance of C-arm radiograph. A cannulated triple reamer drill was used to broach the tunnel along the guide wire to 0.5 cm below the subchondral bone. Yellowish white wax-like loose particles of the necrotic bone were removed from the front end of the biopsy device and sent for histopathological. The remaining necrotic bone were completely removed with a curette. A through wash was given with normal saline. The free vascularized fibular bone graft were inserted into the tunnel made after the removal of the necrotic bone and tightly fitted. A through wash was given with normal saline. The incision were closure in layer and a drain was kept in situ.

2.5. Postoperative management

All the patients were given second-generation cephalosporin antibiotics twice a day for 3 days after surgery for prophylaxis. Prophylactic anticoagulant low-molecular-weight heparin were administrated for 7 days. Active/passive hip and knee movements started after 2 days of surgery, Non weightbearing mobilization with walker frame started after 3 days of surgery. Partial weightbearing initiated after 4 weeks of surgery. Full weightbearing started after 6 to 8 weeks depending on the consolidation seen in the x-ray. The post-operative roentgenograms were taken at 4 weeks post operatively, three months, six months, one year and each year thereafter and were analyzed for signs of the progression, which was defined as an increase in the size of the infarct or as a pathological fracture with collapse. The longest follow-up done was 2 years with 6 patients. The roentgenograms were evaluated to ascertain the size and position of the graft. The graft was believed to be in the ideal position when its rounded end was seen to lie within the lesion and under the subchondral bone on the anteroposterior and lateral roentgenograms.

Assessment of the clinical success of structural bone-grafting for the treatment of stage I and stage II lesions was determined on the basis of standard scale for the rating of pain and activity.

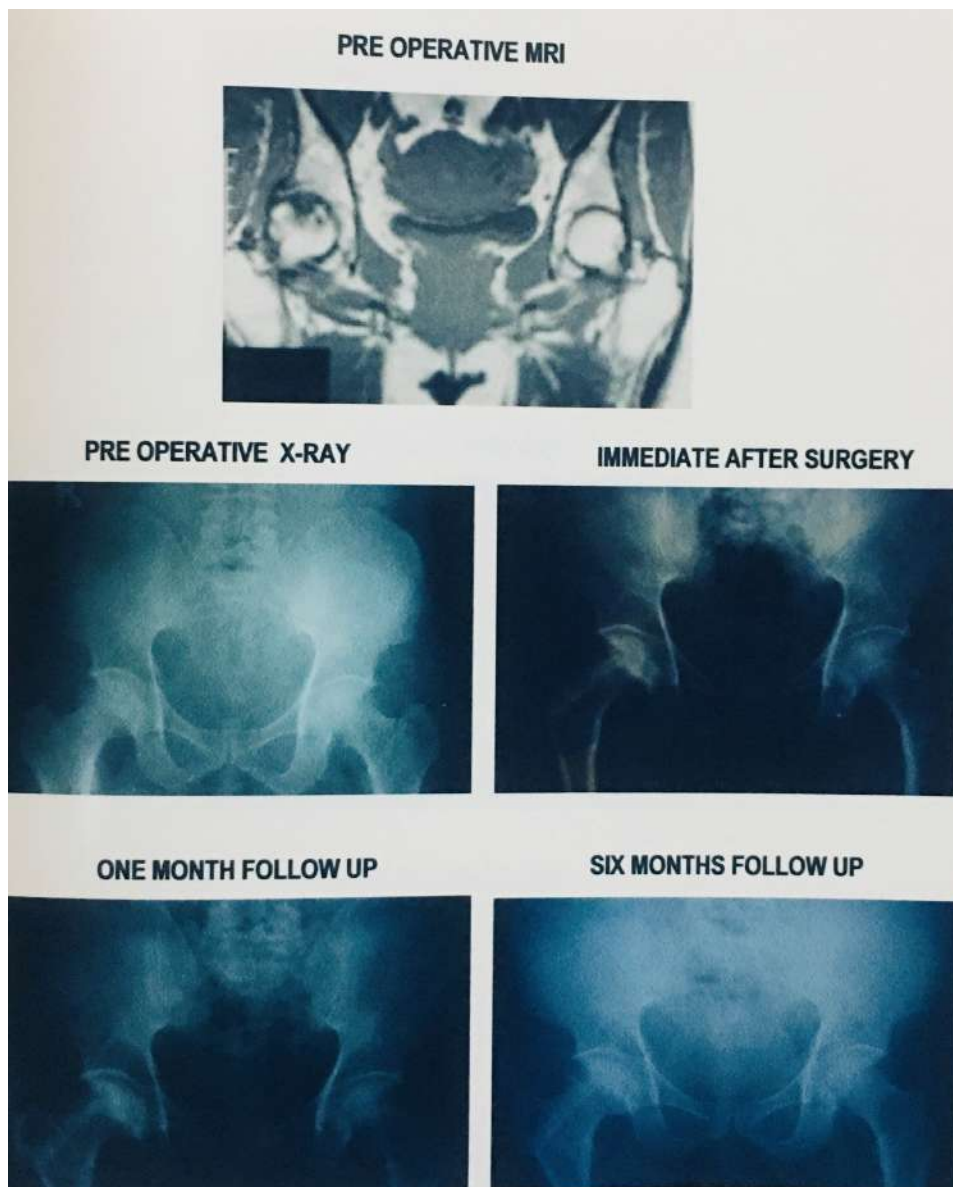


Fig. 1: Case 1

1. A score of good or very good was defined as an excellent result. The rating was good if there was no evidence of progression or collapse, full range of motion of the hip, and patient walked without a limp.
2. Failure was defined as fair or poor score with the development of pain, the need for walking aids, subsequent operative treatment for relief of pain. Roentgenographic evidence of progression of the lesion to stage III or beyond indicated failure.

3. Observation & Results

Among the 32 selected patients which included 23 men and 9 women. The age ranged from 25 - 45 years with a

mean age of 38 years. Among the 32 patients, 11 patients had stage II-A involvement and 1 patient had stage II-B involvement, according to Ficat & Arlet classification. Four patients had received high doses of steroids for herniated nucleus pulposus and two of the patients had history of excessive intake of alcohol. The remaining six patients had no associated medical problems. All the 32 patients underwent a combination surgical intervention of core decompression along with fibular bone grafting. All the surgical intervention were successful, there were no complications related to the surgery such as infection, deep venous thrombosis, femoral neck fracture, sub-trochanteric fracture, peroneal nerve palsy etc. There weren't much difference in both the duration of surgery and hospital stay.



Fig. 2: Case 1

After 12 months follow up following surgical treatment, 31 cases had no pain or evidence of progression, but in one patient, the lesion had progressed with collapse of the infracted segment and enlargement of the lesion, within 12 months following the intervention surgery. The patient was subsequently treated with total hip arthroplasty. None of the other 31 cases needed another operation.

4. Discussion

The aim of this study was to assess the intervention outcome of non-traumatic avascular necrosis head of femur

in young age group with a combination surgical intervention of core decompression with fibular bone grafting, which may prevent or delay the advancement of disease especially in young individuals. A definite management for osteonecrosis are still under discussion.^{24,25} The preservation of the contour of head of femur, the articular surface and prevention of progression of the osteonecrosis which is the main technique to avoiding arthrosis of the hip.²⁵ The modified core decompression along with implantation of progenitor cells from the fibular grafting has become the most proven method for



Fig. 3: Case 2



Fig. 4: Case 2



Fig. 5: Case 3

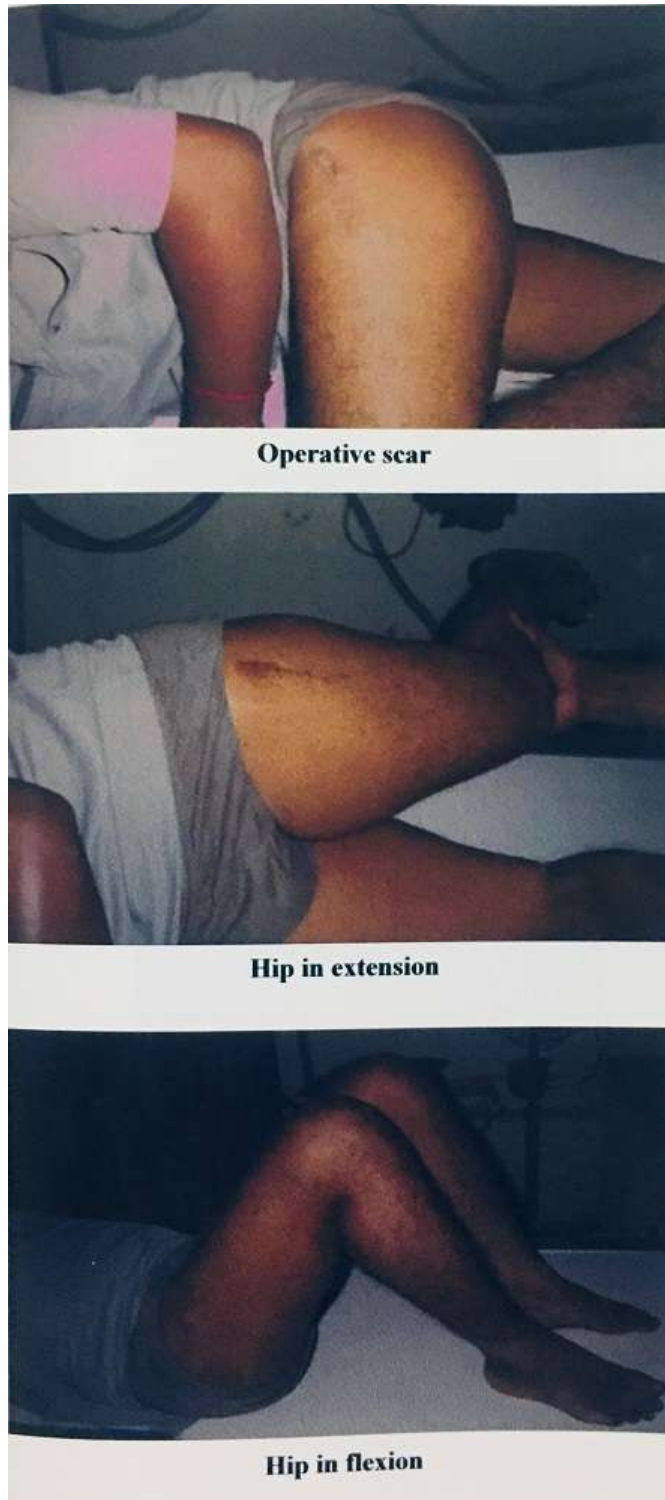


Fig. 6: Case 3

the treatment of osteonecrosis.^{2,8,9,13,17} Free vascularized fibular grafting is considered a tortuous technique but improves the biology of the microenvironment of the osteonecrosis regions and preserves the hip for more than 20 years.^{19,20,26–29} Comparison studies between free vascularized and vascularized bone grafts which showed favourable outcome.³⁰ The combination of core decompression with free vascularized fibular bone grafting were preferable for young individuals before the collapse of the head of femur radiologically.^{24,27,28}

In our study, we wanted to assess the intervention outcome of non-traumatic avascular necrosis head of femur in young age group with combination intervention surgery of core decompression along with free fibular bone grafting. We observed a favourable intervention outcome. The theoretical explanation of non-traumatic avascular necrosis may be due to decreased in number or reduce proliferative activity of bone mesenchymal stem cells which contains progenitor cells in the femoral head.^{31–34} It was believed that treating non-traumatic avascular necrosis with core decompression along with fibular bone grafting may benefit by seeding mesenchymal stem cell which can promote repair and restoration of the femoral head by accelerate reconstruction and produce creeping substitution of new bones and these mesenchymal stem cells can differentiate into osteoblasts or vascular endothelial cells which promote bone repair and regeneration.^{35–37}

5. Conclusion

Non-traumatic avascular necrosis of the femoral head affects younger and working age group which leads to morbidity and functional disability. With combination surgical intervention we aim to prevent the collapse of head of femur and provide a better management of preserving the hip in the early stages itself and comparative cheaper than hip replacement surgery.

But in cases where the head of femur is impossible to be save, hip replacement surgery is the ideal management to improvement of the individual's quality of life.

6. Source of Funding

None.

7. Conflicts of Interest

Nil.

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