

Original Research Article

Management of avascular necrosis of femoral head by core decompression

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ABSTRACT

Background: Avascular necrosis (AVN) is defined as cellular death of bone components due to interruption of the blood supply; the bone structures then collapse, resulting in bone destruction, pain, and loss of joint function. The head of femur is the most common bone affected by avascular necrosis. Our aim is to study results of core decompression and bone grafting in avascular necrosis of femoral head.

Methods: The present study was performed at Pravara Rural Hospital, a constituent hospital of Rural Medical Collage at Village Loni, Rahta and district: Ahamadnagar. The study includes patients who underwent core decompression and bone grafting in avascular necrosis of femoral head at Department of Orthopaedics, Pravara Rural Hospital from June 2015 to June 2017.

Results: In our study majority of the patients belongs to the group of 31-40 years and most of them were males. Male female ratio was 4:1. Out of 20 patients, 6 of them were unilaterally involved rest 14 had bilateral involvement. Out of 28 hips of bilateral involvement 6 were grade III and IV Ficat and Arlet. That 6 were not considered as they come in grade III & IV of FICAT & ARLET classification. So we study 28 hips only.

Conclusions: The average success rate was 82.61% after core decompression and bone grafting. The patients who had less than 60 Harris hip score on presentation had poorer outcome. Patients who had less than 80 degrees of flexion had also poorer outcome.

Keywords: Femoral head, AVN, Core decompression

INTRODUCTION

Avascular necrosis (AVN) is defined as cellular death of bone components due to interruption of the blood supply; the bone structures then collapse, resulting in bone destruction, pain, and loss of joint function.¹ Certain bones have precarious blood supply, hence even a small vascular insult can result in avascular necrosis of that part supplied by it. The head of femur is one among them which is mostly affected by avascular necrosis, followed by lunate, talar body, navicular, head of 2nd metatarsal, scaphoid, head of humerus and tibial tuberosity. Clinically the pain may be minimal at onset, but if no

active intervention is done it may worsen gradually, affecting the activity of daily living. In 1960, Arlet and Ficat done core biopsies on a patients with avascular necrosis to study the pathologic changes in AVN.^{2,3} By observation, they found that due to this procedure patient immediately relieved from preoperative pain, and it was observed that this was due to decompression of the increased intraosseous pressure. After that, it was used as a therapeutic instead of diagnostic procedure and procedure was known to as "core decompression." According to Urbaniak, Coogan et al, hence if the diagnosis is made in early stage, catastrophe can be avoided by smaller surgical procedure called core

decompression. If core decompression can be done at early stages before collapse occur, the normal femoral head can be preserved.⁴

Core decompression is mostly done to preserve the function and the structure of the hip and to relieve pain associated with AVN. There are many research study that suggest that core decompression is useful in treatment of early stages (I or II) of AVN of the hip.⁵

Literature provides variable results even at pre-collapse stage and hence study is necessary to account the details of core decompression at pre collapse stage and thereby correlate it clinically as well as radiologically with MRI.

In our research we study results of core decompression and bone grafting in avascular necrosis of femoral head.

METHODS

The present study was performed at Pravara Rural Hospital, a constituent hospital of Rural Medical Collage at village Loni, Rahta, Ahamadnagar.

The study includes patients who underwent core decompression and bone grafting in avascular necrosis of femoral head at Department of Orthopaedics, Pravara Rural Hospital from June 2015 to June 2017.

Inclusion criteria

All cases of AVN femoral head upto grade II B (Ficat and Arlet) admitted in PRH.

Exclusion criteria

Exclusion criteria were patient with sickle cell disease; patient having AVN of femoral; head grade III and grade IV; patient not willing for admission or operation; patient not giving written consent for the study.

History and clinical examination

All the patients in our study were first examined in the Out Patient Department. Patient particular ars were noted as name, age, sex, registration number, occupation, pain with detailed characteristic, limp, duration of symptoms, progression of symptoms, deformity, support required to walk or not, any history of trauma and history of other joint pain. History of risk factors like steroids and alcoholism was also noted.

Local as well as systemic examination (CNS, Cardiorespiratory and GI) was done to rule out any other associated disorder or multiple joint involvements or any other bony abnormalities.

Investigations

Hip: X-ray of both joint were taken in AP view and Lateral view or Frog views.

MRI pelvis with both hips after establishing the diagnosis and staging of AVN and if our inclusive criteria for suspected disease were full-filled then the patient was considered for the operation in form of core decompression and bone grafting.

The preoperative medical evaluation of patients was necessary to judge patient's capability to withstand anesthesia and perioperative blood loss.

Routinely chest X-ray, ECG, CBC and ESR, HIV, HBsAG, LFT, RFT, RBS, 2-D echocardiography were done.

MRI evaluation: the necrotic area in the head femur was mapped out preoperatively.

Surgical procedure

Following the consent of the patient, he was taken for operation.

Following spinal anaesthesia, patient was given lateral position on simple OT table.

Under aseptic conditions, painting and drapping was done.

A 5 cm skin incision was taken from trochanteric ridge distally and subcutaneous tissue was cut in the same plane.

After splitting tensor fascia latta (TFL) and vastus lateralis bone was exposed and a guide pin was inserted from lateral femoral cortex 3cm below the trochanteric ridge under IITV guidance,

The guide pin was directed towards the centre of the necrotic area in femoral head and its position was confirmed under IIT, usually it was anterosuperior portion.

Core was created with 10mm hollow meal.

Scrapping was also done with long scoop to remove all remaining dead necrotic bone under IITV guidance.

The void thus created was filled with the cancellous bone grafts which were harvested from the posterior iliac crest (as narrated subsequently). Adequate filling was confirmed in IITV and layer wise closure was done.

Postoperative protocol

Appropriate antibiotic coverage was given for 5 days and dressing was done on 2, 5 and 8th postoperative day.

Suture removal was done on 11 or 12th postoperative day

Physiotherapy protocol

It was started on following second postoperative day in form of Static quadriceps, Ankle toe movement, Knee bending.

Strict bed rest was given for 3 months following which gradual weight bearing was started

In one of the unit, patients were kept bed ridden only for 1 month (based on operating surgeon's decision)

Follow up was done at 1st, 3rd and 6th months and the details were accounted as per the following proforma which included detailed history, clinical examination findings and radiological details; if patient agreed then MRI was also done at 6th month follow up or later.

RESULTS

In our study majority of the patients belongs to the group of 31-40 years and most of them were males. Male female ratio was 4:1.

Table 1: Age and sex.

Age (year)	Male (%)	Female (%)	Total (%)
20-30	6 (30)	1 (5)	7 (35)
31-40	5 (20)	3 (15)	8 (40)
41-50	5 (20)	0	5 (25)
Total	16 (80)	4 (20)	20 (100)

Out of 20 patients, 6 of them were unilaterally involved rest 14 had bilateral involvement. Out of 28 hips of bilateral involvement 6 were grade III and IV Ficat and Arlet. That 6 were not considered as they comes in grade III & IV of FICAT & ARLET classification. So we study 28 hips only. Majority of the patients were laborers.

Table 2: Occupation.

Occupation	Number of Pt. (%)
Farmer	4 (20)
Student	3 (15)
House wife	3 (15)
Sedentary work	4 (20)
Labourer	6 (30)
Total	20 (100)

Table 3: Risk factor.

Cause	No of patient (%)
Alcohol	12(60)
Steroid	1(5)
Trauma	0
HIV	1(5)

Alcohol consumption contributed in majority of patients (60%) for AVN.

Table 4: Duration of pain.

Months	Total hip involved
No pain	6
0-3 months	10
3-6 months	5
6-9 months	3
9-12 months	1
12-18 months	2
More than 18 months	1
Total	28

Out of 28 hips, 15 came to us within 6 months with complain of pain.

Table 5: Procedure.

Procedure	Hip
Core decompression with cancellous graft	26
Core decompression with fibular graft	2
Total	28

Most of the patients were treated with core decompression and cancellous grafting. Only 2 had been treated with fibular graft.

Table 6: Period of immobilization.

Weeks	Total patients
No rest	2
Less than 4	1
4-8	1
12	16
Total	20

Majority of the patients (16) were immobilized for at least 12 weeks as per the conventional protocol. However 4 patients were mobilised earlier depending upon the surgeon's decision.

Out of 28, 26 hips had pain relief immediately after operation. In follow up, at 3 months 22 hips had complete pain relief and at 6 months and final follow up 19 had no pain. So it suggest that majority of patients (67.86%) had pain relief after procedure.

Out of 28 hips, though 19 hips had no complication, 8 hips showed further advancement of the disease resulting into arthritis. One hip had superficial infection initially which subsided after debridement.

Majority of the hips (89.28%) did not require any other secondary procedure; however 2 hips worsened requiring total hip replacement surgery.

Table 7: Pain relief after surgery.

Type	Postoperative (%)	3 month (%)	6 month (%)	Final follow up (%)
No	26 (92.85)	22 (78.57)	19 (67.85)	19 (67.85)
Mild	2 (7.14)	1 (3.57)	3 (10.71)	2 (7.14)
Moderate	0	3 (10.71)	3 (10.71)	4 (14.28)
Severe	0	2 (7.14)	3 (10.71)	3 (10.71)
Total	28	28	28	28

Table 8: Complication.

Complication	Total hip (%)
No	19 (67.85)
Infection	1 (3.57)
Arthrosis	8 (28.57)
Total	28

Table 9: Secondary procedure.

Procedure	Total hip (%)
No	25 (89.28)
Debridement	1 (3.57)
Total hip replacement	2 (7.14)
Total	28

Table 10: Harris hip score.

Harris hip score	Pre operative	Final follow up
0-11	-	-
11-20	-	2
21-30	-	-
31-40	1	-
41- 50	1	1
51-60	2	2
61-70	14	3
71-80	7	1
81-90	3	10
91-100	-	9
Total hip	28	28

In our study majority of the hips in pre-op were between 61-80 range but at the final follow up the range improved to 81-100. However 2 patients also worsened inspite of the treatment.

Table 11: Final result by Harris hip score.

Result	Harris hip score	Total hip (%)
Excellent	90-100	9 (32.14)
Good	80-89	10 (35.71)
Fair	70-79	1 (3.57)
Poor	Less than 70	8 (28.57)
Total	28	

In the final result by Harris hip score, 19 hips had good or excellent outcome. However 8 hips showed poor result and 1 hip had fair outcome.

DISCUSSION

Avascular necrosis (AVN) is defined as cellular death of bone components due to interruption of the blood supply; the bone structures then collapse, resulting in bone destruction, pain, and loss of joint function.¹

The AVN of femur head, a disease with many etiological factors is usually associated with many risk factors but mostly two-thirds of this is related to corticosteroid intake and alcohol abuse, rest are mainly Idiopathic.⁶

Clinically the pain may be minimal at onset, but if no active intervention is done it may worsen gradually, affecting the activity of daily living. Young population is mostly affected and if it is not managed by early, it cause the collapse of femur head and after that the only management option is hip arthroplasty.

Johnson described the importance of raised intraosseous pressure in the femoral head in his study of pathogenesis.⁷ Arlet and Ficat proposed that it was caused by raised intraosseous pressure later on followed by intramedullary venous stasis, edema, necrosis, fibrosis, and infarction.^{8,9}

According to Kozinn et al, incidence of bilaterally affected AVN ranges from 6 to 72%. Despite such a high incidence of bilateral affection, only about 15% of patients report of contralateral involvement on initial presentation.¹⁰

According to Steinberg, the anteroposterior radiograph of the diseased hip demonstrates the principal area of AVN. However as the anterior portion of posterior acetabular margins overlaps the superior portion of the femoral head, due to this subtle abnormalities of AVN in the subchondral region of head may be missed. So lateral x-ray of the femoral head is also advised. A frog leg lateral view is more satisfactory than a cross table to see the architectural defects of the femoral head.¹¹

According to Steinberg and Lang et al, Many studies have explained that MRI is the most accurate of all

imaging modalities. MRI can also reveals revascularization of bone after procedure and gives evidence of tissue repair in response to treatment and helpful in evaluation of AVN lesions even on follow-up.^{11,12}

Steinberg, suggest that core decompression with cancellous bone grafting is an effective procedure for the treatment of early stage AVN of the femoral head.¹³

Similar results were also found in various other studies so we concur with age group of 20-40 years.^{14,15}

In our study primarily males are more commonly affected (80%) as compared to females, (M:F- 4:1).

As above mentioned similar results were also shown in the study of Babhulkar where 81.25% were males.¹⁶

CONCLUSION

If we exclude noncompliant patient, our success rate was 92.3% for grade I, 100% for grade IIA and 50% for grade IIB.

The average success rate was 82.61% after core decompression and bone grafting. The patients who had less than 60 Harris hip score on presentation had poorer outcome. Patients who had less than 80 degrees of flexion had also poorer outcome.

Though our series is small we humbly suggest, MRI grading along with clinical features put together give accurate prognosis for the outcome of the surgery and give excellent result when patients are carefully selected.

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Ethical approval: The study was approved by the institutional ethics committee

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