

Comparative study of Functional outcome of Percutaneous Decoring and Grafting Versus Decoring and Fibular Graft Insertion in Patients of Avascular Necrosis of Head of Femur

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Abstract

Introduction: Avascular necrosis (AVN) of femoral head is common disease. It leads to joint destruction, requiring surgical treatment. Although number of therapeutic approaches is available but no universally satisfactory therapy has been developed. In the present study, functional outcome of percutaneous decoring and grafting is compared with decoring and fibular graft insertion in patients of AVN. **Materials & Methods:** A total of 30 hips in 20 patients were studied. Out of 30 hips per cutaneous core decompression was used in 15 hips and core decompression with fibular grafting was used in rest of the hips. **Results:** Excellent results in 14 hips (46.67%), good in 12 hips (40.00%), fair in 3 (10.00%), and poor in 1 hip (3.33%) observed. Harris hip score above 90% was seen in 5 cases of Percutaneous core decompression while in Core decompression with fibular grafting, it was seen in 10 cases. **Conclusion:** Percutaneous core decompression with bone grafting is a very good and useful procedure for the management of AVN in stages 1 and 2 without any complication to the patients.

Keywords: Avascular necrosis of femoral head, AVN, Fibular graft, Grafting, Percutaneous decoring

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Introduction

Avascular necrosis (AVN), also known as osteonecrosis, aseptic necrosis or ischemic bone necrosis is a disease that may affect several different bones as a result of temporary or permanent loss of the blood supply to these bones. The ischemia causes the death and eventual collapse of the bone tissue, with its overlying joint surface. The femoral head is most commonly affected by this disease. Usually, the patients are in their third, fourth or fifth decade of life at the time of diagnose. Men are more prone to this disease than women, the sex ratio being about 4.^[1]

There are various conditions than can be incriminated as triggers for this disease. However, almost half of the patients diagnosed present none of these conditions. This type of

avascular necrosis is termed primary, or idiopathic. All the other forms of this disease are secondary. One of the most common reasons for secondary avascular necrosis is prolonged systemic steroid use in high doses (equivalent to 4000 mg of Prednisone) for extended periods of up to 3 months, or longer. Initially, patients are asymptomatic, but, in time, AVN leads to joint destruction, requiring surgical treatment and, in latter stages, total hip replacement (THR). Although treatment has been facilitated by using a widely accepted international classification system, effective earlier diagnosis using MRI, and more aggressive surgical management, no universally satisfactory therapy has been developed, even for early disease. It is essential that AVN of the femoral head is diagnosed early because delaying this disease by joint preserving measures have a much better prognosis and

because the results of joint replacement are poorer in young individuals.^[2,3,4,5,6,7]

AVN can be managed using operative and non-operative techniques. The non-operative treatments reported in the literature include pharmacological therapy, extracorporeal shock-wave therapy, and electromagnetic stimulation. In addition, some authors reported using physical therapy or only monitoring disease progression at early stages without any intervention. Surgical techniques involved are core decompression, Small-Diameter Technique, Tantalum Implants, Bone-Grafting Non-vascularized Graft, Vascularized Graft and Osteotomy. But there is a need for more studies to better understand the efficacy of the various non-operative and surgical techniques that have been reported to be used in the treatment of early stage osteonecrosis of the femoral head. Furthermore, because there is a lack of standardized clinical and radiographic evaluation criteria, any attempt to perform a meta-analysis is limited, and valid comparisons are difficult to achieve. Despite these limitations, the literature suggests that, in general, the various techniques are comparable.^[5,7,8,9] The outcomes of patients treated at our institution as well as other reported outcomes in the literature suggest that core decompression and non-vascularized bone-grafting techniques are viable options to avert the need for additional surgery in patients with early stage osteonecrosis of the hip. Hence, the present study was conducted to compare functional outcome of percutaneous decoring and grafting versus decoring and fibular graft insertion in patients of avascular necrosis of head of femur.

Material & Methods

Patients of both the sexes and all age groups with disease stage 1 and 2 were included while patients with advanced disease and stages 3 and 4 were excluded from the study. A total of 30 hips in 20 patients were studied from November 2009 to April 2011. All these patients of AVN were complaining of pain in groin and in the region of hip joint and inability to walk properly. All the patients were operated after complete assessment implying harris hip scoring system. Out of 30 hips per cutaneous core decompression was used in 15 hips and core

decompression with fibular grafting was used in rest of the hips, i.e. 15 hips.

The routinely followed method of core decompression involves a DHS reamer of diameter about 8-9 mm. This performs adequate core decompression but leaves a big void in the neck of femur which heals by creeping substitution or the surgeon has to put a fibular graft in the void. Our concern was that if there is no scaffold for bone conduction then creeping substitution will not occur and if fibular graft is put then further replacement gets difficult. So in our opinion core decompression with fibular graft was the best option. Our method basically involves the use of cancellous graft harvested during the procedure of core decompression which is reversed in polarity (inside end out) and reinserted in the femoral neck.

The instruments that were used in the procedure have been indigenously designed in our institute. The instruments used were: Guide Pin, Perforator, Graft Harvester Cum Tunneler and Graft Pusher.

The basic steps of surgery

Patient was positioned supine on the fracture table. Small incision was gives just superior to the greater trochanter. Guide wire was inserted and its position checked on the image intensifier. Next, a special instrument called perforator was used to penetrate the cortex to facilitate the subsequent easy decoring and graft harvesting. In the next step a specially designed instrument called a graft harvester cum tunneler was used to perform the decoring. This instrument has a specially designed serrated tip for this purpose. A cancellous bone graft is hence obtained after the decoring. The subchondral cyst is curetted. The cylindrical graft so obtained was reintroduced after reversing the polarity (inside end out) with the help of graft pusher. Wound was closed and dressed. Post-op x-ray of the patient was done (Photograph- 1). Patient was followed up at intervals of 6 weeks, 6 months, 1 year and 2 years with X-rays. Post-op MRI was also done to confirm the healing (Photograph- 1).

Results

In the present study it was observed that the incidence of avascular necrosis of femoral head is most common in 31-35 years of age ie 10

cases (33.33%) followed by 9 cases (30%) in 26-30 years age group followed by 7 cases (23.3%) in 36-40 years of age group and 4 cases in 20-25 years of age group. Involvement of bilateral hip was seen in 20 (66.67%) cases while unilateral in 10 (33.33%). 6 patients (8 hips) given history of chronic alcoholism, history of taking steroids was given by 4 patients (6 hips). 4 patients (6 hips) were having sickle cell disease and 6 patients (10 hips) were idiopathic in origin. All these patients coming under the high risk category were kept under observation (Table-1).

In the present study we got excellent results in 14 hips (46.67%), good results in 12 hips

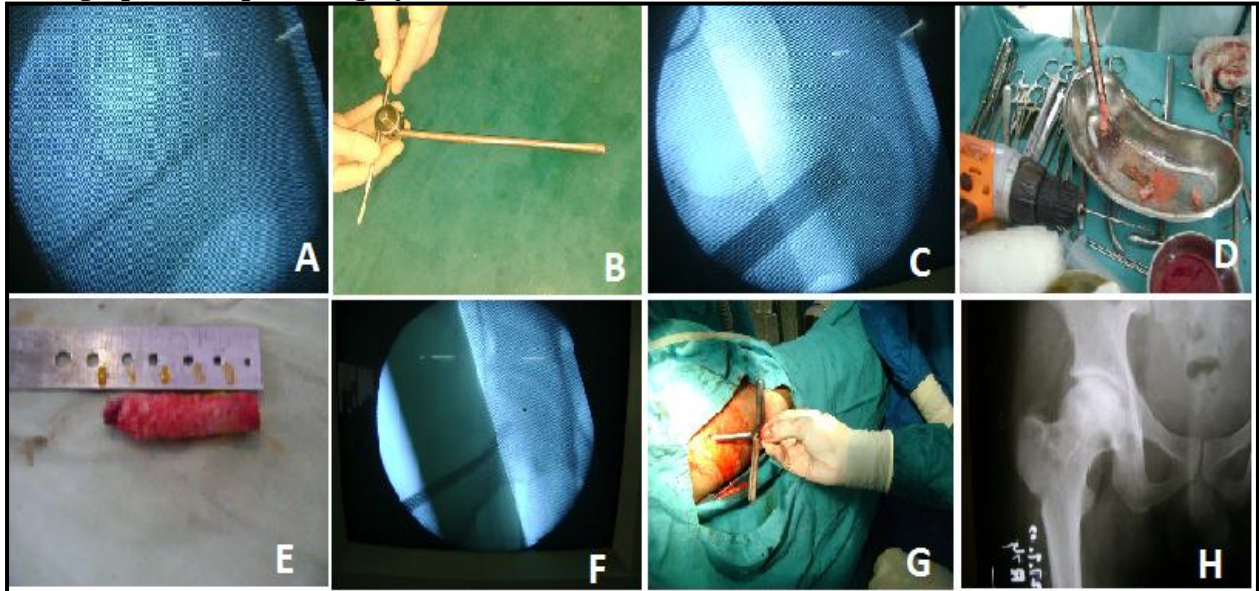
(40.00%), fair results in 3 patients (10.00%), and poor in 1 hip (3.33%).

There was no superficial or deep infection, iatrogenic fracture or skin necrosis. Harris hip score above 90% was seen in 5 cases of Percutaneous core decompression while in Core decompression with fibular grafting, the Harris hip score was seen in 10 cases.

Table- 1: Associated conditions

Associated conditions	Cases	%
Sickle Cell	6	20.00
Alcohol Abuse	8	26.67
Steroid Induced	8	20.00

Photograph- 1: Steps of Surgery



A- Position of guide wire on IITV, B- Harvester as well as Tunneler, C- Decorer reaching the cyst, D,E- Cancellous bone graft, F- Curettage of the cyst, G- Graft being reintroduced, H- Post OP X-Ray

Discussion

In the present study it was observed that the incidence of avascular necrosis of femoral head was most common in the age group of 20 to 40 years. According to R Marle [11], men are exclusively affected between age of 20-45 years with highest incidence between 3rd and 4th decade of life. Since all the patients in our study were in stage 1 or 2, its slightly earlier age group as compared to R Marle. A peak incidence between 40-60 years (52%) by Ficat & Arlet [12,13] was given in the analysis of their personal series. The sex wise distribution in our series was 6.5:1 in favour of males and was similar to one given by Ficat & Arlet with a

male predominance having a 2:1 male/female ratio. Although it has long been recognized that this disease occurs concomitantly in both the hips the reported frequency of bilateral involvement has steadily increased. A view of scattered reports prior to 1962 revealed the incidence to be 35% while R Marle described it as 50% and Boetlcher et al [5] found that 72% of the patients sooner or later had bilateral involvement when observed for prolonged period. In our study of 20 patients (30 hips) the incidence of bilateral involvement was 66.67%. This was in agreement with the study of Ficat and Arlet. The commonest occurrence of avascular necrosis of head of femur was found to be in association with idiopathic ie 10 hips

(33.33%). In the study of Ficat and Arlet, majority of cases were attributed to minor trauma but in our study none of the patients gave history of trauma. It might be that idiopathic group patients were unaware of some minor trauma or that they did not feel it worth mentioning.

In the present study the value of radiological investigations was immense. As we did X-ray pelvis with both hips (A-P view), frog leg views followed by MRI to delineate early changes so we can manage patients through head salvaging procedures like as in our study, percutaneous core decompression and core decompression with fibular grafting. We followed up each and every patient for functional outcome post surgery using Harris hip score to see if there is any further progression of disease process in any case. In our study we got excellent results in 14 hips (46.67%), good results in 12 hips (40.00%), fair results in 3 patients (10.00%), and poor in 1 hip (3.33%). Harris hip score above 90% was seen in 5 cases of Percutaneous core decompression while in Core decompression with fibular grafting, it was seen in 10 cases. There was no superficial or deep infection, iatrogenic fracture or skin necrosis in the present study. Complication through the tract of core decompression is not unknown and such a paper was presented by D Bhatia et al^[14] in the meeting of British Orthopaedic Association, U.K. Sept. 1992. In our study there was no complication through the tract of core decompression, however there were some site complications in core decompression and fibular grafting group. These were: Injury to peroneal musculature, Tethering of Extensor Digitorum longus and Extensor Hallucis longus, Neurovascular complications. These complications require prolonged physiotherapy for recovery.

The incidence of avascular necrosis of head of femur in this part of the world is much more for various reasons, and the treatment to salvage the femoral head in stages 1 and 2 has been standard decoring and grafting with fibular strut graft. Since the surgery is associated with morbidity and donor site complications to the extent of 33%, we have thought of providing an alternative method to preserve the femoral head and relieve pain so that the patient can be back to work in near future. Once decoring is done

the intraosseous pressure becomes less, as a result of which there is decreased sense of perception of pain. The void created by the process of decoring is filled by bone graft which will heal by the process of creeping substitution and for this purpose autologous bone is the best material. Bone graft from iliac crest is the ideal material since it is cancellous but it needs one more incision and there is pain at the donor site.^[15,16] Taking this into consideration we devised an instrument which would not only serve the purpose of decoring of femoral head and neck but complex but at the same time help us to procure a cylindrical graft which acts as a good grafting material in the void created by decoring. The procedure is not only simple but is done with per-cutaneous technique where surgical time and blood loss is less. In our series this procedure of per-cutaneous decoring and grafting has given excellent results, however long term follow up of atleast five years is needed to assess the result, of this procedure. We believe that more number of cases and long term follow-up will certainly be needed to ascertain that this procedure is superior to the standard procedure that is being followed today. The results that we have obtained in a short span of 2 years are encouraging, after this procedure of per-cutaneous decoring and grafting and with no complications of donor site harvesting of graft, we feel confident to recommend this procedure for Avascular Necrosis of Femoral head in stages 1 and 2.

Conclusion

It is concluded that per cutaneous core decompression with bone grafting is a very good procedure without any complication to the patient and there should not be any donor site morbidity as we used graft material which was removed during decoring procedure. The graft harvested is full of progenitor cells or bone forming cells, it halts the progression of the disease process and lead to healing by creeping substitution and to some extent for revascularization of femoral head so that near normal hip function can be restored. Moreover, early detection of Avascular Necrosis of Femoral head is absolutely necessary to preserve the integrity of the femoral head. Also various associated conditions in which avascular necrosis are commonly seen should be watched

so that disease process in its pre-radiological stages can be diagnosed and treated.

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References

1. Arlet Jacque. Nontraumatic Avascular Necrosis of Femoral Head; Past, Present and future. Clin Othop Relat Res. 1992;277:12-21. [\[PubMed\]](#)
2. Cruess RL. Osteonecrosis of bone; current concept as to etiology and pathogenesis. Clin Othop Relat Res. 1986;208:30-39. [\[PubMed\]](#)
3. Babhulkar SS. Avascular necrosis of femoral head in chronic alcoholics. Ind Jr Ortho. 1982;16:42.
4. Babhulkar SS. Corticosteroid induced hip arthropathy and Avascular necrosis of femoral head. Ind Jr Ortho. 1985;19:9.
5. Boettcher WG, Bonfiglio M, Hamilton HH, Sheets RF, Smith K. Nontraumatic necrosis of Femoral head, Part –I Relation of altered hemostasis to etiology. J Bone Joint Surg Am. 1970;52(2):312-21. [\[PubMed\]](#)
6. Stulberg BN, TW Bauer, GH Belhobek, Levine M, Davis A. A diagnostic algorithm for Osteonecrosis of femoral head. Clin Othop Relat Res. 1989;249:176-182. [\[PubMed\]](#)
7. Ware HE, Brooks AP, Torye R, Berney SI. Sickle cell disease and silent avascular necrosis of the hip. J Bone Joint Surg Am. 1991;73(6):947-9. [\[PubMed\]](#)
8. Stulberg BN, M Lewvine, TW Bauer et al. Multimodality approach to Osteonecrosis of femoral head Clin Othop Relat Res. 1989;240:81-193. [\[PubMed\]](#)
9. Mont MA, Jones LC, Hungerford DS. Non-traumatic osteonecrosis of the femoral head: Ten years later- current concepts review. J Bone Joint Surg Am. 2006;88(5):1117-32. [\[PubMed\]](#)
<http://dx.doi.org/10.2106/JBJS.E.01041>
10. Springfield DS, Enneking WJ. Surgery for aseptic necrosis of the femoral head. Clin Othop Relat Res. 1978;130:175-85. [\[PubMed\]](#)
<http://dx.doi.org/10.1097/00003086-197801000-00017>
11. Merle R, D'Aubigne, M Postel, K Mazabraud et al. Ideopathic necrosis of femoral head in adults. J Bone Joint Surg Am. 1965;47(4):612-33. [\[PubMed\]](#)
12. Ficat RP, Arlet J. Ischaemia and Necrosis of Bone, Baltimore 1980. The william and Wilkins Company.
13. Ficat RP. Idiopathic Bone Necrosis of the femoral Head. Early diagnosis and treatment. J Bone Joint Surg Am. 1985;67(1):3-9. [\[PubMed\]](#)
14. Bhatia et al. Orthopaedic proceedings. J Bone Joint Surg Am. 1993;75-B:40.
15. Massie MD. Treatment of femoral neck fractures emphasizing long term follow up. Clin Othop Relat Res. 1973;92:16-62. [\[PubMed\]](#)
<http://dx.doi.org/10.1097/00003086-197305000-00004>
16. Lausten GS, Mathiesen B. Core decompression for femoral head necrosis: Prospective study of 28 patients. Acta Orthop Scand 1990;61(6):507-11. [\[PubMed\]](#)
<http://dx.doi.org/10.3109/17453679008993572>