www.jchr.org

JCHR (2024) 14(1), 2422-2426 | ISSN:2251-6727



# Efficacy of Autologous Bone Grafting in Addition to Core Decompression in Pre-Collapse Osteonecrosis of Head of Femur

# Dr.Aman Saraf, Dr.Parv Ohri, Dr.Yogesh V,Dr. Ankur Pandey,Dr..Karansher Randhawa

Department of Orthopaedics, Sir Ganga Ram Hospital, New Delhi, India

(Received: 22	7 October 2023	Revised: 22 November	Accepted: 26 December)
<b>KEYWORDS</b> Osteonecrosis of head of femur Core decompression Autologous cancellous bone grafting Pre-collapse stage Harris Hip Score VAS Score	ABSTRACT: Introduction: One A surgical procedu find a novel treatm Objective: To lood pre-collapse osteon Methods: Early-st core decompressiv were followed up f Results: Young m months were more The bone grafting Conclusion: In co outcomes in terms of femoral head in	e of the most often used treatments for fem re combining core decompression and imp ent for patients who have osteonecrosis in i c for functional outcome of autologous bon necrosis of head of femur age patients (FicatArlet I and II) were split on with or without autologous cancello for nine months. The outcomes were assessed ales with bilateral hip pain, Grade II at pr prevalent. Both groups' HHS and VAS sig group had even better HHS grade outcomes mparison to core decompression alone, auto of HHS/functional improvement and VAS young.	oral head osteonecrosis is core decompression. baction autologous bone grafting in an effort to ts early stages. He grafting in addition to core decompression in t into two treatment groups, each of which had bus bone grafting. Patients in both groups ed using HHS, VAS, and X-rays. Hesentation, and symptoms lasting less than six inificantly improved three months after surgery. Solution: bologous cancellous bone grafting showed better descores in pre-collapse stages of osteonecrosis

# 1. Introduction

Osteonecrosis of the femoral head is a degenerative condition of the hip joint which is marked by a decreased blood supply, resulting in escalating structural instability. Missing or delaying treatment frequently causes the femoral head to collapse, leaving only arthroplasty as a cure.<sup>[11]</sup>

Total hip replacement is currently the most often used operation for treating osteonecrosis, but it is not recommended for young patients who have the earliest stages of the disease. In order to protect the femoral head, early diagnosis and therapy of osteonecrosis is crucial. If applied at the pre-collapse stage, early intervention has a positive effect on the disease's prognosis.

For as long as feasible, the discomfort and pressure on the femoral head should be relieved as part of the avascular necrosis treatment. The literature <sup>[2]</sup> has proposed a number of different joint preservation techniques.

Core decompression lowers the pressure inside the bone, breaks up the area of sclerosis that prevents osteonecrosis from being repaired, promotes the growth of blood vessels around the decompression tunnel, speeds up the development of new bone, and slows the advancement of osteonecrosis. [3,4] It is the most common intervention performed during the pre-collapse stages. This procedure is carried out by drilling an 8-10 mm cylindrical core from the osteonecrotic lesion and removing it or by multiple percutaneous drillings. <sup>[5]</sup>Several other adjuvant treatment approaches, like bone grafting and the addition of growth and differentiation agents, have been coupled with techniques. [6]

Larger lesions can be treated with bone grafting without experiencing an early collapse. Grafts can be cortical or cancellous, autograft or allograft, vascularized or non-

www.jchr.org

JCHR (2024) 14(1), 2422-2426 | ISSN:2251-6727



vascularized. The necrotic zone may be revived by the vascularized bone graft, which brings fresh blood to the area. Autologous cancellous bone grafts are frequently employed because they have trabecular surface areaincreasing, complete histocompatibility, and osteogenic, osteo-inductive, and osteoconductive qualities. It contains crucial elements that promote bone healing, including osteoprogenitor cells, osteoconductive hydroxyapatite collagen matrix, and BMP. Numerous growth factors are also present, which promote the migration of bone-forming cells to the site of injury and the creation of new blood arteries into the graft.In autografts, creeping substitution emerges more quickly and functions best in conjunction with core decompression. The results of autologous cancellous iliac bone are better in terms of osteogenesis and transplant rejection. [7] As a result, it is frequently employed and acknowledged as the best method for bone grafting.<sup>[8]</sup>

# 2. Objective

The goal of this study is to compare the effectiveness of combined autologous bone grafting and core decompression therapy with existing core decompression, as well as to look for functional outcomes.

# 3. Materials and Methods

All the patients between 18-60 years presenting with unilateral or bilateral hip pain and with stage I and II (FicatArlet classification) osteonecrosis of hip were included after written informed consent. Sickling test was done to rule out Sickle cell anemia.

The selected patients were randomized based on procedure to be done into- Group A (core decompression) and Group B (core decompression with autologous cancellous bone grafting).

After administering appropriate anaesthesia, patients were placed in supine position on fracture table. Core decompression was done using a 2.5mm guide wire and multiple percutaneous drill holes were made in the femoral head through the lateral wall below greater trochanter under fluoroscopic guidance and confirmed in AP and Lateral views (Figure 1).A 3 cm transverse incision was given behind ASIS along outer lip of iliac crest. Dissection done and iliac crest exposed. 8mm

hollow mill along with trocar was used to harvest the bone graft(Figure 2).The exact location of necrotic segment of femoral head on MRI was noted and 2.5mm guide wire was passed through below greater trochanter into the segment and confirmed under fluoroscopic guidance in AP and Lateral view. A 1.5cm longitudinal incision was given along the entry of guide wire and 8mm ACL reamer was used to the drill and decompress the tract upto subchondral area. The trocar which was already filled with autologous cancellous bone graft was passed through the drilled area and the graft was punched inside with help of plunger as is evident on fluoroscopy by radiodensity occupying the radiolucent area in necrotic segment (Figure 3).

Partial weight bearing was started on Day 2 in unilateral cases patient was kept non weight bearing for 1 month in bilateral cases. Full weight bearing started at 6 weeks. All patients were followed up periodically till 9 months. Harris Hip scoring system (HHS) and VAS score was used for evaluation of functional outcome and radiological outcome was assessed by x-ray of the affected hips and the two groups were compared.







Figure-2

www.jchr.org

JCHR (2024) 14(1), 2422-2426 | ISSN:2251-6727





Figure 3



Avascular necrotic bone

Autologous cancellous bone graft

#### Figure-4: Comparison of bone

#### 4.Results

The study was conducted on 19 patients (30 hips) with early stage of osteonecrosis of femoral head. The mean age was 29.8 years.73.6% patients were males. 11 out of 19 patients had bilateral involvement. 83.33% hips had grade II osteonecrosis at presentation. The duration of symptoms was less than 6 months in 20 (66.6%) hips. Alcohol was the most consistent etiological factor. The mean duration of surgery was 17.3 minutes in Group A and 35 minutes in Group B. The preoperative mean HHS in the Group A was 32 and in the Group B was 37.36 and at 9 months follow up the mean HHS in Group A was 75 and in Group B was 85. The preoperative mean VAS in the Group A was 8 and in the Group B was 7.53 and at 9 months follow up the mean VAS in Group A was 3.8 and in Group B was 2.9.

On comparing Harris Hip grade at 9 months, in the Group A, none had excellent, 26.6% had good, 60% had fair and 2 (14.3%) had poor grade while in the Group B, 3 (20%) had excellent, 8 (53.3%) had good and 4 (26.7%) had fair. Hence, better outcome was seen in Group B in comparison to Group A. There were no complications in both the groups postoperatively.



*Graph 1: Line diagram* comparing Mean HHS and Mean VAS Preoperatively and at 9 months followup

#### 5.Discussion

Because avascular necrosis typically affects relatively young people and there are few effective treatments for advanced disease, early detection and therapy are essential.<sup>[2]</sup> A conventional technique of therapy following collapse has been demonstrated to be total hip replacement. When possible, efforts should be taken to save the femoral head before it collapses because many of these patients are young and a hip replacement cannot be expected to last the patient's lifetime.

The average age of the participants in the study was 29.8 years, which may reflect the complex aetiology of the disease, the fact that risk factors are more prominent when people are younger, as well as the advancement of diagnostic tools that can detect disease at an early stage. Male dominance (73.6%) was seen, which may be

www.jchr.org

JCHR (2024) 14(1), 2422-2426 | ISSN:2251-6727



explained by the fact that males consume more alcohol, steroids, and trauma/accidents than females do. Eight individuals had unilateral involvement and eleven patients had bilateral involvement. Most of them described how they had initially experienced unilateral hip discomfort that had turned into bilateral hip pain. Similar findings were found in a study carried out by Sri Krishna Soni et al.<sup>[9]</sup> At presentation, 83.33% of hips exhibited grade II osteonecrosis. Due to their low socioeconomic level and lack of knowledge, patients in India typically do not seek treatment for minor ailments at hospitals. As a result, most patients are diagnosed at later stages than stage I, which has a significant impact on prognosis and treatment options. The majority of patients sought treatment within six months of the commencement of their symptoms, necessitating early detection of the precollapse stage and the need for intervention to interrupt the illness process as soon as possible. The most reliable etiological factor was alcohol. The average length of the procedure was 17.3 minutes in Group A and 35 minutes in Group B due to the addition of iliac bone harvesting, tract preparation, and grafting.

There was significant improvement in Mean HHS score in both groups postoperatively but the Mean score was better in Group B compared to Group A at 9 months follow up. In similar studies done by Omran et al.<sup>[10]</sup> and Song et al.<sup>[11]</sup> showed significant improvement in HHS scores at 2 months follow up. Better outcome was seen in Group B in comparison to Group A in terms of Harris Hip Grade at final follow up with more excellent and good scores.

There was significant improvement in Mean Vas score in both groups postoperatively but the score was lower in Group B compared to Group A at 9 months follow up. It can be concluded that both treatment modalities are successful in providing pain relief at 9 months follow up. In a study conducted by Martina et al. <sup>[12]</sup>, VAS scores started improving in all patients as early as 6 weeks after surgery.

To offer organized assistance and further improve patient-reported outcomes, various bone graft types have been incorporated into core tracts. Bone grafting is thought to promote healing and serve as a base for the formation of new bone. A study by Wei and Ge<sup>[13]</sup> produced comparable findings after a 2-year follow-up. Additionally, numerous studies have demonstrated that this can be a useful strategy for postponing the requirement for replacement, consequently enabling core decompression to be effective in advanced stages of osteonecrosis. <sup>[14]</sup>

At a 9-month follow-up, Xrays revealed illness progression in every case in both groups. X-rays may not match the patients' functional state in cases of osteonecrosis. Therefore, it is important to combine the functional assessment with the radiological examination.

Osteonecrosis should not be treated with Core Decompression as a stand-alone therapy. It must always be used along with other therapeutic options, such bone grafting. The most crucial measures in treatment are promoting osteogenesis and angiogenesis as well as resuming bone formation to rebuild the support at the joint surface. The temptation to choose replacement surgery as the first line or only therapy option, even in early osteonecrosis, is growing as a result of recent advances in surgical methods, improved implant longevity and more familiarity with the process. Due to its promising outcomes and numerous benefits, Core decompression with or without autologous cancellous bone graft should be promoted in early osteonecrosis. Surgery involving vascularized fibula graft and muscular pedicle bone transplant is laborious and carries a high risk of surgical morbidity.

At the 9-month follow-up in our trial, both treatment modalities demonstrated improved functional outcomes and pain alleviation. At the end of the follow-up, people in group B had improved functional outcomes more than those in group A. Few patients in both groups continued to report persistent discomfort after 9 months of follow-up.

# 6.Conclusion

We come to the conclusion that core decompression alone or combined with bone grafting are both effective therapy options for young individuals who present with early-stage osteonecrosis. They also relieve pain while enhancing patients' functional ability to carry out their everyday tasks. In comparison to preoperative values, both groups had

www.jchr.org

JCHR (2024) 14(1), 2422-2426 | ISSN:2251-6727



statistically significant improvement in HHS and VAS at 9 months. Core decompression results in superior HHS/functional outcomes when accompanied with bone grafting than when performed alone. To improve outcomes and its efficacy, core decompression should be utilized in concert with other modalities like bone grafting

rather than as a sole mode of treatment.

# Refrences

- 1. Mankin HJ. Nontraumatic necrosis of bone (osteonecrosis). N Engl J Med. 1992;326:1473–9
- Malizos KN, Karantanas AH, Varitimidis SE, Dailiana ZH, Bargiotas K, Maris T. Osteonecrosis of the femoral head: aetiology, imaging and treatment. European journal of radiology. 2007;63(1):16-28.
- Mont MA, Ragland PS, Etienne G. Core decompression of the femoral head for osteonecrosis using percutaneous multiple small-diameter drilling. Clin OrthopRelat Res. 2004;429:131–8.
- Zhang HJ, Liu YW, Du Z-Q, et al. Therapeutic effect of minimally invasive decompression combined with impaction bone grafting on osteonecrosis of the femoral head. Eur J Orthop Surg Traumatol. 2013;23(8):913– 9.
- 5. Koo KHMM, Jones LC. Osteonecrosis. New York: Springer; 2014.
- Marker DR, Seyler TM, Ulrich SD, Srivastava S, Mont MA. Do modern techniques improve core decompression outcomes for hip osteonecrosis? Clin OrthopRelat Res. 2008;466(5):1093.
- Li N, Li G, Guan T. Bilateral bone plate with autogenous iliac bone graft in treating Schatzker IV-VI complex tibial plateau fractures. *Zhongguo Gu Shang*. 2015;28(12):1078–1082.
- Snavely JE, Mercer RW, Stewart G. Harvest of Iliac crest autograft not associated with localized pain. *Int J Spine Surg.* 2019;13(3):275–282. Doi:10.14444/6037
- 9. Dr. Shri Krishan Soni, Dr. Vishnupratap Singh Chouhan and Dr. Vinay Joshi "Study of functional outcome of core decompression with platelet rich plasma enhanced cancellous

bone graft in avascular necrosis of femoral head grade I and II" IJOS 2019; 5(2): 710-713

- Al Omran A. Multiple drilling compared with standard core decompression for avascular necrosis of the femoral head in sickle cell disease patients. Arch Orthop Trauma Surg. 2013;133(5):609.
- 11. Song WS, Yoo JJ, Kim YM, Kim HJ. Results of multiple drilling compared with those of conventional methods of core decompression. Clin OrthopRelat Res. 2007;454:139.
- 12. Martina Rocchi, Nicoladrea Del Piccolo, Alessandro Mazzotta, https://doi.org/10.1177/1120700020 964996AVN treated by core decompression, bone chips allograft, fibrin platelet-rich plasma (PRF) and concentrated autologous mesenchymal stromal cells (mscs).
- 13. Wei BF, Ge XH. Treatment of osteonecrosis of the femoral head with core decompression and bone grafting. Hip Int J Clin Exp Res Hip PatholTher. 2011;21(2):206.
- 14. Steinberg ME, Larcom PG, Strafford B, Hosick WB, Corces A, Bands RE, Hartman KE. Core decompression with bone grafting for osteonecrosis of the femoral head. Clin OrthopRelat Res. 2001;(386):71.