



EFFICACY OF CORE DECOMPRESSION AND AUTOLOGOUS CANCELLOUS BONE GRAFTING IN AVASCULAR NECROSIS OF FEMORAL HEAD

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ABSTRACT

BACKGROUND: Avascular necrosis (AVN) of the femoral head is a disease that usually affects patients in the 20-50 year age group of life. The disease progresses with time and if left untreated, it may leads to complete deterioration of the hip joint. Various treatments modalities are available as non-surgical, core decompression alone or with autologous bone graft or PRP or bone marrow aspirate or vascularised fibular graft, osteotomies and hip replacement. We planned to evaluate the efficacy of core decompression and autologous bone grafting in the management of AVN of the hip.

MATERIALS AND METHODS- We performed a prospective study with 20 patients of 20-50 years age group having ficat-arlet stage 1 [8 patients] and 2a [12 patients]. The study period was from January 2018 to December 2019. All patients were treated with core decompression and autologous cancellous bone grafting. Pre-operative Harris hip score [HHS], plain radiograph and MRI were compared with postoperative ones at different time intervals.

RESULTS- Average Follow Up Period Was 12 Months And Average Age Group Of Presentation Was 31.1 Years . Males Were More Affected And Most Common Causes Were Idiopathic And Steroid Use. Average Preoperative Hhs Was 56.20 And Postoperative Hhs Was 80.15. At The End Of 1 Year, 12 Patients Showed Remission, 6 Patients Showed Preoperative Stage While 2 Patients Progressed To Advanced Stage And Required Arthroplasty.

CONCLUSION-core Decompression And Autologous Bone Grafting Is Effective Treatment Modality In Early Avascular Necrosis Of Femur Head In Terms Of Radiological And Clinical Results And Delaying Arthroplasty.

KEYWORDS : avascular necrosis of head of femur, core decompression, autologous cancellous bone graft, precollapse stage, HHS.

INTRODUCTION-

avn Of Femur Head Is Dying Of Osteocytes And Bone Marrow Resulting In Subchondral Fracture And Collapse^{[12][14]}. After Collapse Of Femur Head, Osteoarthritic Changes Occurs At Both Side Of Joint.

Usually Avn May Be Idiopathic, Traumatic, Steroid Or Alcohol Induced. It Affects Usually Population Of Third To Fifth Decade. In Older Population, Trauma Is More Common Cause And Patients Generally Presents With Increasing Pain And Radiologically Collapse Of Head And Failure Of Fixation. In Young Patients It May Be Idiopathic Or There May Be History Of Alcohol Or Steroid Use.

There Are Various Diagnostic Methods Available But Mri Is A Standard Tool As It Has High Sensitivity And Specificity. It Can Pick Avn Even In Pre-symptomatic Stage.

In Present Era There Are Lot Of Treatment Modalities Available.^{[2][4][10][18][19]} the Non-surgical Treatment Includes Nsaids, Bisphosphonates^{[5][6][8][16]}, Hyperbaric Oxygen And Extracorporeal Shock Wave Therapy, But Their Role Is Controversial. Hip Preservation Surgeries Delays The Replacement Procedures In Properly Selected Early Avn Patients. It Also Allows Floor And Squatting Activities Which Are Required In Indian Population. It Includes Trapdoor Procedure With Bone Grafting,^[21] Core Decompression^{[3][13][23]} And Osteotomies^[11]. Core Decompression May Be Done With Or Without Bone Graft (cortical Or Cancellous)^[20] Vascularised Fibular Graft^[17], Bone Marrow Aspirate, Stem Cell Transplantation^[9] Or Platelet Rich Plasma. Core Decompression

Relieves Intraosseous Pressure Caused By Venous Congestion And Improves Vascularity And Thus Slows Progression Of Disease. Current Studies Support Use Of Core Decompression Over Medical Treatment In Early Avn In Young Patients.^[22]

This Study Was Planned To Evaluate The Effect Of Core Decompression With Autologous Bone Grafting On Healing Of Avn Of Femoral Head.

MATERIAL AND METHOD-

This Is A Prospective Longitudinal Study Done At Srg Hospital And Medical College, Jhalawar Between January 2018 To December 2019. We Included 20 Patients Of 20-50 Years Of Age Group With Stage 1 And 2a (ficat And Arlet Classification) Avn Of Femur Head. There Were Patients Of Both Sexes Having Either Unilateral Or Bilateral Disease.

Table 1: Grading According To Hhs [harris Hip Score][24]

90-100	EXCELLENT
80-89	GOOD
70-79	FAIR
<70	POOR

Inclusion Criteria-

Patients Giving Informed Consent To Take Part In Study, Of 20-50 Years Age Group Having Avn Of Stage 1 And 2a Due To Idiopathic, Steroidal, Alcoholic Or Coagulopathic Etiology. The Patients Were Available For A Minimum Of 1 Year Of Follow Up After Procedure.

Exclusion Criteria

- Patients With Local Site Infection
- Traumatic Etiology
- Patients With Comorbidities
- Patients <20 And >50 Years Of Age
- Not Fit For Surgery
- Not Willing To Give Consents

Diagnosis Of Avn Was Established On Basis Of History, Clinical Examination, X-ray And Mri. Total 20 Hips Were Found Eligible For Study Out Of Which 17 Were Of Males And 3 Were Of Females. Out Of 20 Patients 12 Patients Had Bilateral Involvement But We Performed The Procedure On More Painful Hip First And Included It In Study. Out Of 20 Hips Included In Study, 14(70%) Were Of Right Side And 6(30%) Were Of Left Side.

Procedure- A Meticulous History Regarding Pain, Drug History Of Steroid, Smoking, Alcohol, Coagulation Disorder Were Taken. General And Systemic Examination Were Done. Local Examination Of Both Hips, Spine And Knee Joints Were Done. Blood Investigations Like Complete Blood Count, Peripheral Blood Smear, Liver Function Test, Renal Function Test, Blood Sugar And Coagulation Profile Were Done. Pre-operative Hhs (harris Hip Score)^[24] Was Noted. Anaesthetic Fitness Was Taken. Consents For The Procedure And Bone Grafting Were Taken.

1gm Ceftriaxone Was Given 1 Hour Prior To Incision. The Patient Was Taken Supine On Fracture Table And Painting And Draping Done With Aseptic Precaution. Lateral Femoral Cortex Was Exposed Through A Small Incision. Fascia Lata And Vastus Lateralis Were Divided In Line With Incision. A Guide Wire Was Inserted At The Level Of Just Proximal To The Lesser Trochanter Up To Centre Of Lesion. Slowly Reaming Was Done Over The Guide Wire With Help Of A Triple Reamer (8 Mm) Of Dynamic Hip Screw Set And Necrotic Bone Was Removed.

Special Surgical Intervention-iliac Crest Bone Graft Was Obtained From Ipsilateral Side. Multiple Small Chips Of Cancellous Graft Were Filled Into The Core Decompression Tract And Hole Of The Track Was Closed With A Cortical Piece Of The Iliac Bone Graft. The Wound Was Closed In Layers.

Postoperative Management-post-operative All Patients Were Given Antibiotics For 5 Days. All The Patients Advised Not To Take Alcohol And Steroids Anymore.

- 6 Weeks- Non Weight Bearing And Active Assisted Range Of Motion Exercises
- 6 To 12 Weeks- Partial Weight Bearing
- > 12 Weeks- Full Weight Bearing

A Clinioradiological Follow Up Was Done At 1,2,4,12 Weeks, 6 Months And 1 Year

OBSERVATIONS AND RESULTS-

Out Of 20 Patients, 17 Were Males And 3 Were Females. 12 Patients Had Bilateral Involvement. 14 Patients Were Operated For Right Side And 6 Patients For Left Side. Mean Age Was 31.1 Years. Among Operated Patients, 8 Had Grade 1 And 12 Had Grade 2a Disease. All Patients Were Followed For 1 Year With X-ray And Mri Done At 6 Months And 1 Year. Hhs Was Recorded. At The End Of 1 Year, 12 Patients Showed Remission, 6 Patients Showed Preoperative Stage While 2 Patients Progressed To Advanced Stage. Post-operative Average Hhs After 1 Year Was Found 80.15

Table 1- Age Distribution

AGE GROUP (YEARS)	NO. OF PATIENTS	PERCENTAGE
20-29	12	60%
30-39	4	20%
40-50	4	20%

Table 2- Sex distribution

SEX	NO. OF PATIENTS	PERCENTAGE
MALES	17	85%
FEMALES	3	15%



Image 1- Pre operative X-ray of AVN hip



Image 2- intraoperative image- positioning, approach and reaming



image 3- Intraoperative fluoroscopy image



Image 4- X-ray at 6 months follow up

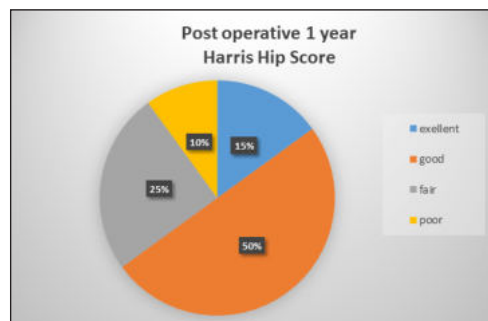


Figure 1- Hhs At 1 Year Follow Up (preoperative Hhs Was Poor In All The Patients)

DISCUSSION-

Osteonecrosis Of Femur Head May Lead To Osteoarthritis Of The Hip Joint Which Generally Requires Total Hip Arthroplasty To Obtain Painless Stable Hip. As Avn Is Increasing In Young Population, Need Of Revision Arthroplasty Is Also Increasing. Early Diagnosis Of Avn In Precollapse Stage And Treatment By Various Modalities May Prevent Progression Of The Disease.^[15] In Our Study Of 20 Cases Of Early Avn Treated By Core Decompression And Autologous Bone Grafting, The Analysis Of Result Was Made In Terms Of Age & Sex Distribution, Side Of Involvement, Stage Of Disease, Progression Or Remission Of Disease By X-ray, Mri And Clinical Assessment (Harris Hip Score)

In Our Study The Mean Age Of Patients Was 31.1 Years With Minimum Of 20 Years And Maximum Of 48 Years. In A Study By Sumanth Et Al.^[11] The Average Age Of The Patients Was 30 Years (range 18–48 Years). Thus We Concluded That Avn Is More Prevalent In Younger Population Which May Be Multifactorial Or May Be Associated With Increasing Intake Of Alcohol And Steroids.

17 Males And 3 Females Were Included In Our Study. Thus We Concluded That Males Were More Frequently Affected Than Females. A Thorough Search Of Literature Didn't Find Any Association Of Idiopathic Avn With Sex. Even Etemadifar Et Al.^[8] Did Not Find Any Association Of Avn With Sex.

12 Patients Were Bilaterally Affected. Out Of 20 Hips Operated, 14 Were Of Right Side While 6 Hips Were Of Left Side. This Data Did Not Have Any Statistical Significance To Show That There Was Any Association Of Avn With A Side Of Involvement. We Found That Maximum Patients In Our Study Had Bilateral Involvement Which Was Also Seen In A Study By Etemadifar Et Al.^[8]

In Our Study, We Found That Most Common Stage Of Avn At Presentation Was Stage 2a According To Ficat And Arlet Classification. Steinberg Et Al.^[20] Found In Their Study Of 312 Hips In 208 Patients That Maximum Patients Were In Stage Ii-a According To Ficat Arlet Classification. Many Western Studies Have Reported Stage I To Be More Common Than Stage Ii-a Which Could Be Due To Better Diagnostic Methods And Awareness.

Mean Preoperative Hhs Was 56.8 In Our Study While Mean Postoperative Hhs At 1 Year Follow Up Was 80.15. Berend Et Al.^[17] In Their Study On The Management Of Osteonecrosis Found That Average Preoperative Score Was 54.5 Points. They Found That The Postoperative Average Improvement In Hhs Was 81.0 Points At An Average Of 4 Years. The Values Of Pre And Post Operative Hhs In Our Study Coincide With Study Of Berend Et Al.^[17] But A Further Long-term Follow-up Of All The Patients Included In Our Study Is Required As These Patients Were Followed Up Only For 1-year. According To Hhs As Described By Harris There Should Be An Average Increase Of 20 Points In Pre- And Post-operative Hhs To Consider The Treatment As Effective. In Our Study This Difference In Pre And Postoperative Hhs Was 23.95 Which Was Significant.

All Patients Had Poor Harris Hip Score (hhs) Preoperatively But After 1 Year Of Surgery, 3(15%) Patients Had Excellent, 10(50%) Patients Had Good, 5(25%) Patients Had Fair And Only 2(10%) Patients Had Poor Hhs. Gangji Et Al.^[7] Did A Comparative Study Between Core Decompression And Core Decompression With Bone Marrow And After 5 Years Followup Found That 8 Of 11 Hips Failed After Core Decompression And Only 3 Of 13 Hips Failed In Bone Marrow Group. It Was Concluded That The Mentioned Procedure Was Effective In Delaying The Progression Of Collapse Of Osteonecrosis Of Femoral Head.

CONCLUSION-

The Core Decompression With Autologous Bone Graft Is A Considerable Option To Manage Early Avn Of Femoral Head. It Heals Or Delays The Necrosis And Improves Performance Of Daily Activity. By Preserving Hip It Allows Squatting And Decreases Need Of Primary And Revision Arthroplasty. Filling The Core Decompression Track With Autologous Bone Graft Gives Additional Good To Excellent Results.

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Conflicts Of Interest

There Are No Conflicts Of Interest Between Authors

REFERENCES

1. Sumanth Lakshminarayana, Ish Kumar Dhammi, Anil K Jain, Himanshu Bhayana, Sapan Kumar, Rahul Anshuman; Outcomes Of Core Decompression With Or Without Nonvascularized Fibular Grafting In Avascular Necrosis Of Femoral Head: Short Term Followup Study; Indian Journal Of Orthopaedics | Volume 53 | Issue 3 | May-june 2019
2. Tripathy Sk, Goyal T, Sen Rk. Management Of Femoral Head Osteonecrosis: Current Concepts. Indian J Orthop 2015;49:28-45.
3. Shah Sn, Kapoor Cs, Jhaveri Mr, Golwala Pp, Patel S. Analysis Of Outcome Of Avascular Necrosis Of Femoral Head Treated By Core Decompression And Bone Grafting. J Clin Orthop Trauma 2015;6:160-6.
4. Banerjee S, Issa K, Pivec R, Kapadia Bh, Khanuja Hs, Mont Ma. Osteonecrosis Of The Hip: Treatment Options And Outcomes. Orthop Clin North . 2013;44:463-76.
5. Kang P, Pei F, Shen B, Zhou Z, Yang J. Are The Results Of Multiple Drilling And Alendronate For Osteonecrosis Of The Femoral Head Better Than Those Of Multiple Drilling? A Pilot Study. Joint Bone Spine. 2012;79:67-72
6. Agarwala S, Shah Sb. Ten-year Followup Of Avascular Necrosis Of Femoral Head Treated With Alendronate For 3 Years. J Arthroplasty. 2011;26:1128-34.
7. Gangji V, De Maertelaer V, Hauzeur Jp. Autologous Bone Marrow Cell Implantation In The Treatment Of Non-traumatic Osteonecrosis Of The Femoral Head: Five Year Follow-up Of A Prospective Controlled Study. Bone 2011;49:1005-9.
8. Etemadifar M, Kooskzari M, Khalilollah N, Ali Mk, Mahsa B. The Results Of Core Decompression Treatment In Patients With Avascular Necrosis Of Femoral Head In Patients At Isfahan City Educational Hospitals In 2010-2011. Adv Biomed Res 2014;3:93
9. Chang T, Tang K, Tao X, Cao H, Li H, Chen Q, Et Al. Treatment Of Early Avascular Necrosis Of Femoral Head By Core Decompression Combined With Autologous Bone Marrow Mesenchymal Stem Cells Transplantation. Zhongguo Xue Fu Chong Jian Wai Ke Za Zhi 2010;24:739-43
10. Sen Rk. Management Of Avascular Necrosis Of Femoral Head At Pre-collapse Stage. Indian J Orthop. 2009;43:6-16.
11. Biswal S, Hazra S, Yun Hh, Hur Cy, Shon Wy. Transtrochanteric Rotational Osteotomy For Nontraumatic Osteonecrosis Of The Femoral Head In Young Adults. Clin Orthop Relat Res 2009;467:1529-37.
12. Nam Kw, Kim Yl, Yoo Jj, Koo Kh, Yoon Ks, Kim Hj, Et Al. Fate Of Untreated Asymptomatic Osteonecrosis Of The Femoral Head. J Bone Joint Surg Am 2008;90:477-84.
13. Marker Dr, Seyler Tm, Ulrich Sd, Srivastava S, Mont Ma. Do Modern Techniques Improve Core Decompression Outcomes For Hip Osteonecrosis? Clin Orthop Relat Res 2008;466:1093-103.
14. Weinstein Sl, Buckwalter Ja, Editors. The Adult Hip. In: Turek's Orthopaedics: Principles And Their Application. 6th Ed. Philadelphia: Lippincott Williams & Wilkins; 2008. P533
15. Babhulkar S. Osteonecrosis: Early Diagnosis, Various Treatment Options And Outcome In Young Adults. Indian J Orthop 2006;40:138-46.
16. Mont Ma, Jones Lc, Hungerford Ds. Nontraumatic Osteonecrosis Of The Femoral Head: Ten Years Later. J Bone Joint Surg Am 2006;88:1117-32.
17. Berend Kr, Gunneson Ee, Urbanick Jr. Free Vascularized Fibular Grafting For The Treatment Of Postcollapse Osteonecrosis Of The Femoral Head. J Bone Joint Surg Am 2003;85-a:987-93.
18. Lieberman Jr, Berry Dj, Mont Ma, Aaron Rk, Callaghan Jj, Rayadhyaksha A, Et Al. Osteonecrosis Of The Hip; Management In The 21st Century. J Bone Joint Surg Am 2002;84:834-53.
19. Khanuja Hs, Mont Ma, Etienne G, Hungerford Ds. Treatment Algorithm For Osteonecrosis Of The Hip. Tech Orthop 2001;16:80-9.
20. Steinberg Me, Larcom Pg, Strafford B, Hosick Wb, Corces A, Bands Re, Et Al. Core Decompression With Bone Grafting For Osteonecrosis Of The Femoral Head. Clin Orthop Relat Res 2001;386:71-8.
21. Mont Ma, Einhorn Ta, Sponseller Pd, Hungerford Ds. The Trapdoor Procedure Using Autogenous Cortical And Cancellous Bone Grafts For Osteonecrosis Of The Femoral Head. J Bone Joint Surg Br 1998;80:56-62
22. Mont Ma, Carbone Jj, Fairbank Ac. Core Decompression Versus Nonoperative Management For Osteonecrosis Of The Hip. Clin Orthop Relat Res 1996;324:169-78.
23. Fairbank Ac, Bhatia D, Jinnah Rh, Hungerford Ds. Long Term Results Of Core Decompression For Ischemic Necrosis Of The Femoral Head. J Bone Joint Surg 1995;77-b:42-9
24. Harris Wh. Traumatic Arthritis Of The Hip After Dislocation And Acetabular Fractures: Treatment By Mold Arthroplasty. An End-result Study Using A New Method Of Result Evaluation. J Bone Joint Surg Am 1969;51:737-55