A study on stages and mode of treatment of Avascular Necrosis of Femoral headcases in a Tertiary care center

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ABSTRACT

Introduction: *Avascular necrosis of the hip bone is an increasingly common cause of musculoskeletal disability, and it poses a major diagnostic and therapeutic challenge. The disease affects mostly young adults within their 3rd and 5th decade, the majority of the patients being men. The aim of this paper is to present the findings of stages and modes of treatment of patients diagnosed with avascular necrosis of the femoral head, admitted in the Orthopaedics Department of the Clinical and Emergency Hospital.*

Material and method:*A descriptive study was conducted among 20 patients diagnosed with avascular necrosis of the femoral head and who were admitted in the Orthopedics Department of the Clinical and Emergency Hospital. The obtained findings were processed statistically to correlate clinical and laboratory data of patients diagnosed with this condition.*

Results: *The majority of our cases were in the 4th decade. It was also noticed that 9 hips (28.13) with stage III, 8 hips (25%) with stage II and 2 hips (6.25%) associated with stage I disease. Total Hip Replacement was done in 2 cases (10%). Two patients (10%) were referred to other centers for further evaluation.*

Conclusions: *The results of the study presented in this paper correspond with related research results found in the consulted literature.*

Keywords: *Avascular necrosis, Core decompression, Fibular grafting, Osteonecrosis*

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INTRODUCTION

The avascular necrosis (AVN) or osteonecrosis of the femur head (ONFH), a disease with many etiological factors, affects young population and if not managed timely, leads to the collapse of femur head eventually requiring hip arthroplasty. Early presentation of avascular necrosis of femur head may be painless; however the ultimate presentation is painful limitation of hip motion.[1] Passive movements of hip are also restricted. There is a high chance of bilateral presentation. Careful clinical history is important to find any of the risk factors. The Harris hip score is one of the most common clinical scales used for assessing the hip status

AVN typically occurs in the long bones or in the cuboidal bones of wrist and ankle. These regions consist of a honey comb of cancellous bone packed with myeloid tissue and fat, through which course the fine vascular capillaries, and sinusoids that support both marrow and bone. Unlike arterial capillaries, the sinusoids have no adventitial layer and their patency is determined by the shape and volume of surrounding structures (Branemark, 1959).[2]Ficat described a four stage (I through IV) classification system, which is based on standard radiographs.[3] In Stage I the radiographs are normal. In Stage II the contour of the femoral head is normal but the radiographs show evidence of bone remodeling including cystic and sclerotic areas. Stage III involves flattening of the femoral head. In Stage IV, there is joint space narrowing with secondary degenerative changes in the acetabulum. Steinberg *et al*,[4] expanded the Ficat system by dividing Stage III lesions into femoral heads with and without collapse or hips with acetabular involvement. The Japanese Investigation Committee introduced the concept of location of the lesions.[5] Association Research Circulation Osseous (ARCO) proposed a new international classification in 2001 using MRI. This system uses the four part staging system of Ficat, while adding the extent of involvement advocated by Steinberg[4] and the location of involvement proposed by the Japanese Investigation Committee.[5]

While patients with advanced AVN usually end up with hip arthroplasty, some of those with early diagnosis of the lesion (at pre-collapse stage) have been managed with hip salvage surgery. Newer modalities including variety of drugs have also been used for non-operative management of AVN. It is thus considered worthwhile to have a review of

stages of AVN femoral head and modes of management.

METHODOLOGY

A study was carried out in a tertiary care hospital on Avascular Necrosis.The present study includes 20 cases of avascular necrosis of bone. They were found as complications following traumatic and non-traumatic causes. All stages of osteonecrosis of bone of any age and both sexes were included for the study. On admission of the patient all the patients were assessed clinically. A detailed history was obtained thorough following proforma. Radiological investigations included plain X rays in the form of X-ray pelvis with both hips AP and lateral views. In patients with unilateral symptoms and in affordable patients MRI was done to assess the condition of the opposite hip and also to confirm the diagnosis and staging of the disease.

Based on the site and the extent of the necrotic lesion in the femoral head, the affected femoral heads were also classified into six types as shown in Fig.

RESULTS

Twenty cases of avascular necrosis of femoral head were diagnosed on the basis of clinical examination and radiological finding. Treatment was suggested according to the stage of disease at presentation. The following observations were made.

It was observed that the age of these patients ranged from 13 to 75 years with a median age of 39.5 years. The majority of our cases were in the 4th decade. The second peak of incidence was noted in 3rd and 5th decade (4 cases each: 20%).Out of 20 patients, 12 were males (60%) and 8 were females (40%). The ratio of M: F being 1.5.

Table1:Showing the stage of disease

Stages	Unilateral		Bilateral		Total	%
	Right	Left	Right	Left		
I			1	0	2	6.25
II	0	1	2	4	8	25
III	0	2	4	3	9	28.13
IV	2	2	4	3	11	34.38
V	0	0	0	1	1	3.13
VI	1	0	0	0	1	3.13

From the table-1, it was observed that 11 hips (34.38%) with stage IV disease. It was also noticed that 9 hips (28.13) with stage III, 8 hips (25%) with stage II and 2 hips (6.25%) associated with stage I disease. There was one hip (3.13) of Stage V and VI each. This was according to classification by Steinberg et al.

Table2: Types of treatment

Treatment options	No of patients	%
Conservative	5	25
Core decompression and impaction bone grafting	4	20
Core decompression and fibular grafting	4	20
Bipolar arthroplasty	3	15
Total Hip Replacement	2	10
Referral	2	10

From the table-2, it was observed that 5 patients (25%) were preferred conservative method of treatment and operative method of treatment was suggested in 13 cases (65%). Core decompression and impaction bone grafting was done in 4 cases (20%), Core decompression and fibular grafting was done in 4 cases (20%), Bipolar arthroplasty was done in 3 cases(15%) and Total Hip Replacement was done in 2 cases(10%). Two patients (10%) were referred to other centers for further evaluation.

DISCUSSION

We studied 20 patients with osteonecrosis of femoral head by following traumatic and non-traumatic causes in 32 hips. Out of 32 hips 11 hips (34.38%) with stage IV, 9 hips (28.13) with stage III, 8 hips (25%) with stage II and 2 hips (6.25%) associated with stage I disease. There was one hip (3.13) of Stage V and VI each. This was according to classification by Steinberg et al.

Treatment

Conservative (stage1)

In our series 5 patients (25%) were preferred for nonoperative treatment. Two patients are referred to other centers for further evaluation.

Core decompression(stage 1and II)

Ficat (1980) claimed core decompression is only indicated in precollapse stage. The mean percentage of good results is 75% for Stage I and 57% for Stages 11 and I .[6]Hungerford (1983) found encouraging results for stage I and stage II lesions.[7]Stulberg et al (1991) reported that core decompression was successful in 70 % of the hips that were Ficat Stage I, II, or III. [8]

Mont et al. (1995) reviewed 24 studies of core decompression, and found satisfactory clinical results in 741 of 1166 hips (63.5%). For precollapse lesions there was a 71% success rate in the core decompression group compared with a 34.5% success rate in the nonoperative group.[7]Lieberman et al. (2004) reported that success of core decompression improved in pre-collapse hips in which the lesion was small and there was a sclerotic rim surrounding the necrotic bone.[9]

Results of core decompression

Authors	Year	No of hips	Success rate Stages I,II,III
Aigner et al[10]	2002	45	80
Simank et al[10]	2001	94	78
Steinberg et[10]	2001	312	72(I),66(II), 77(III), 64(IV)
Maniwa et al[10]	2000	26	66
Mont et al[10]	1996	1206	63.5

In our series 4 patients (20%) had undergone core decompression in precollapse stage. Out of those 4 patients we did only core decompression in 2 patients (10%). In remaining two patients we did core decompression and impaction bone grafting. Core was packed with cortico-cancellous graft after curetting the necrotic bone. Cortico cancellous graft was obtained from the iliac crest and converted into small pieces in such away that graft could be loaded in a special metallic syringe. Then the graft was inserted into core under image guidance up to the lateral femoral cortex. We used cortico cancellous graft for this procedure because we believe that this graft would provide osteoinduction, osteoconduction, better incorporation and also provide structural support. Only cancellous graft would not give structural support.

Core decompression and fibular grafting

In precollapse and early postcollapse disease in which articular cartilage is viable, bone grafting has numerous theoretical advantages. It allows for removal of weak necrotic bone, decompression of the femoral head, and stimulation of repair and remodeling of subchondral bone. Bone grafting also provides for maintenance of articular congruity and prevention of collapse. Cancellous bone and cortical bone can both be used. [4]

Strut-grafting (nonvascularized fibular grafting) procedures, was originally described by Phemister (1949).[11]At a mean of eight years, Buckley et al. (1991) reported excellentresults in eighteen (90%) of twenty hips in which a Ficat Stage-Ior II lesion had been treated with core decompression combined with tibial auto grafting and fibular grafting. [11]

Results of core decompression and fibular grafting

Series	Stages included in the study	Result	Follow-up
Dunn and Grow [12]	Stage I, II, III, and IV	30%	5 years
Buckley et al[13]	Stage I & II	90%	8 years
Marcus et al.[10]	Stage I &II	63%	7 years
Wang and Thompson(1976)[10]	Stage I &II	63%	5 years

In our series 4 patients (20%) had undergone core decompression and fibular grafting in precollapse and early collapse stages.

Bipolar arthroplasty

Cabanela(1990) found 10 successful clinical outcomes in 17 patients (59%) that had a bipolar prosthesis for stage III or IV osteonecrosis at a mean follow-up of 9.2 years.[14]Bipolar hip prostheses are preferred for the treatment of advanced ANFH,

provided that stable initial fixation can be achieved.[15] Ito et al (2000). Reported that 48 hips in 35 patients with a mean age of 37 years who underwent primary bipolar Hemiarthroplasty were observed for an average of 11.4 years.[16] Bipolar arthroplasty was suggested in 3 patients of stage 3(15%) as per indications

THR

Fye et al. (1998) reported the results of 72 arthroplasties at a mean follow-up of 84 months. Good to excellent results were reported in 94% of all the hips.[7]Garino and Steinberg et.al(1997) considered that THR was the best available treatment in most cases of advanced osteonecrosis of the femoral head and the often appearing secondary osteoarthritis.[7]In our series total hip arthroplasty was suggested to 2 patients (10%) as per indications.

CONCLUSION

Early diagnosis and intervention prior to collapse of the femoral head is the key to a successful outcome of joint preserving procedures. New pharmacological measures as well as the use of growth and differentiation factors may eventually alter the treatment outcomes, but it is necessary to await the results of clinical research with long-term follow-up of these patients. The surgical innovations currently under investigation represent modifications of standard core decompression.

To conclude, It is most important to diagnose avascular Necrosis of femoral head as early as possible in order to decide the treatment method before the collapse

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