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## Management of non traumatic Avascular Necrosis of Femoral Head at pre-collapse stage with Core Decompression and Tibial Bone Grafting (prospective study)

### ARTICLE INFORMATION

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### ABSTRACT

**Background:** Avascular necrosis have always presented great challenges to orthopedic surgeons and patients, remain in many ways today the unsolved dilemma. Varieties of non-vascularized bone grafting techniques preceded by core decompression have been proposed with varying degrees of success.

**Objectives:** The aim of this study is to review the the value of core decompression and non-vascularized tibial bone strip graft treatment for early stages of non-traumatic osteonecrosis stage II & III according to stein burg staging .

**Methods:** prospectively reviewed 26 patients (32 hips) with osteonecrosis of the femoral head between June 2006 and December 2013 at Imam Ali hospital in Sader city & Al-Wasity teaching hospital. Inclusion criteria were all patients ages 19 years to 50 years and in Stein burg stages II and III . Mean follow-up for 3 year. Exclusion criteria were stage I, IV, V and VI .We used Phemister technique to make a window at the posterior aspect of greater trochanter to remove necrotic bone and packed the excavated area with cortico-cancelloustibial bone strip graft. This study was taking into account ethical evaluation and approval by scientific committee of Arab board.

**Results:** The reported results of treatment for femoral head avascular necrosis was (87.6%) success rate of hips in our cohort of patients with core decompression & non-vascularized tibial bone strip

**Conclusions:** None vascularized tibial bone graft effectively reduce donor site morbidity and may defer jointarthroplasty in selected patient stein burg staging II& III.

### Introduction:

This study reports of 26 patients and 32 hips of osteonecrosis femoral head in stage II & III, they were treated with core decompression and tibial bone grafting from June 2006 to December 2013 with a mean follow up of three years. Inclusion criteria was all patients young 19-50 years of age with a mean age of 34 years and stages II and III of Steinberg<sup>1</sup>. Exclusion criteria was stage I, IV ,V and VI.

### Methods:

Three parameters were analyzed;

#### 1-Clinical result (according to Harris score)

Harris score is a system of hip evaluation, which has found acceptance in the USA. The system was designed to incorporate all important data into a single numerical value which has weighted according to the author's perception of relative value. Since pain and function are clearly the two most significant indicators of hip pathology and the usual

factors in surgical selection, these two variables receive 44 and 47 respectively,4 points for absence of deformity and 5 pints for full range of motion. A score of more than 80 points was considered success and a score of less than 80 points was considered a failure<sup>2</sup>.

#### 2-Evidence of radiological progression

Generally denoted a change from pre-collapse to post collapse stages of osteonecrosis of the hip, was considered failure.

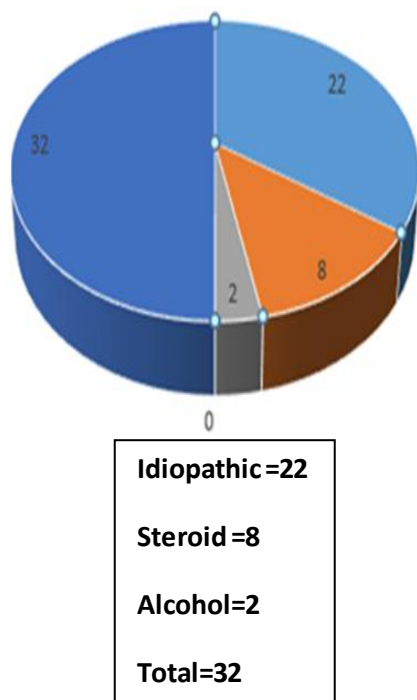
#### 3-Need for further surgery;

For example ,need for osteotomy,arthroplasty,was considered failure in the treatment.

**Operative technique** Technique of core decompression: after proper anesthesia and patient in supine position and lateral incision to the upper femur, the method of doing core decompression involves the use of a guiding wire inserted anteriorly parallel to the femoral neck and drilling by using a 4.5 mm drill inserted under fluoroscopic guidance to

penetrate the femoral cortex laterally at the level of the lesser trochanter through the femoral neck to reach the subchondral bone as far as possible reaching the lesion with a great precaution to avoid penetration of hip joint .Then using wider drill of 8 mm to enlarge the drilled track. The aim is to reach subchondral area and avoid penetration of the joint. After measuring the drilled track, the length used to harvest tibial graft by anterior longitudinal incision (about 10 cm) from the tibial tuberosity downward. After proper harvesting the longitudinal cortical with some cancelloustibial graft would be inserted in the drilled track. Then closure of both incisions in layers. Patient to be kept on six weeks off weight bear to avoid collapse.

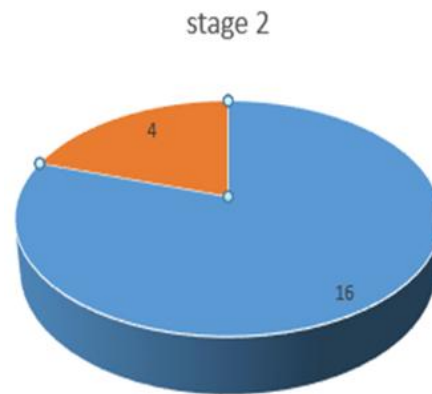
**Results:**



**Figure 1 .** The selected osteonecrotic hips according to the etiologies of AVN

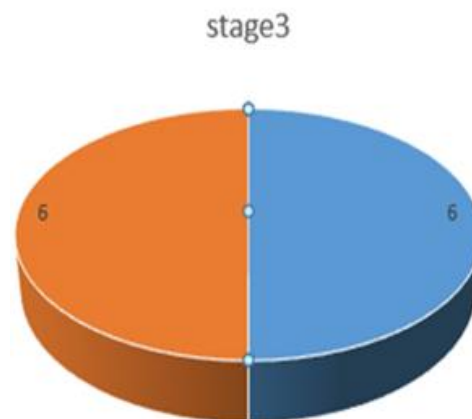
26 patient's were studied, 16 (61.54% ) were males and 10 (38.46%) were females .They have 32 hips of avascular necrosis , so that 6 patients ( 18.75% ) are bilaterally affected and 20 patients ( 76.9% ) are unilaterally affected .

Of these 32 hips there were 20 hips ( 62.50% ) in stage II avascular necrosis ( 16 hips (80.00%) of male patients and 4 hips ( 20.00%) of female patients) , and there were 12 hips ( 37.50% ) in stage III ( 6 hips (50.00 % ) of male patients and 6 (50.00 % ) of female patients).



**Stage II**  
**Male =16**  
**Female=4**

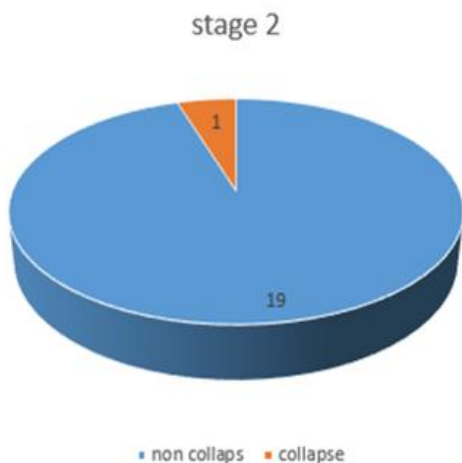
**Figure 2 .** Patients at stage II



**Stage III**  
**Male=6**  
**Female=6**

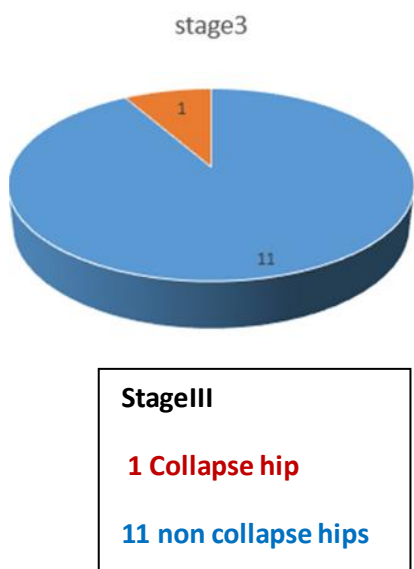
**Figure 3.**Patients at stage III.

Two patients developed collapse ; one of them was male at stage III and one was female at stage II as shown in table 2 and figures 4 & 5 .



**Stage II**  
**1 collapse hip**  
**19 non collapse hips**

Figure 4. Collapse cases in stage II.



**StageIII**  
**1 Collapse hip**  
**11 non collapse hips**

Figure 5. Collapse cases in stage III.

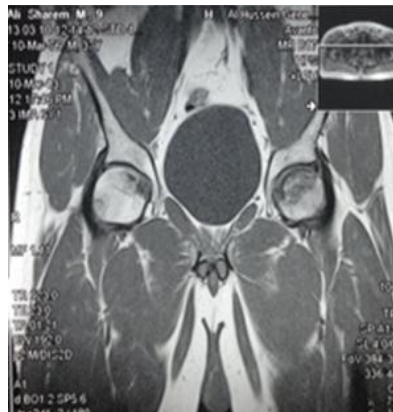


Figure 6 .patient 32 yrs. stage II.

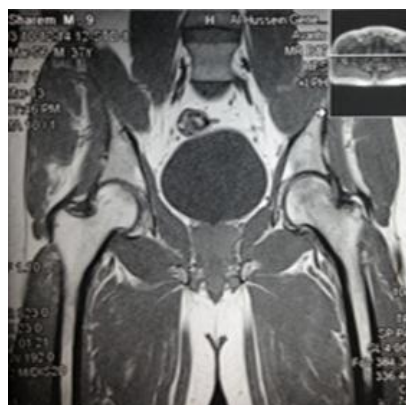


Figure 7 . 1.5 year after see, radiological improvements



Figure 8 .Bilateral hip osteonecrosis, steroid induced stage III (2 yrs. between the images)



**Figure 9.** Collapse (failure) 50 yrs. Chronic obstructive pulmonary disease on steroid .

**Table 1.** clinical and radiological outcome of core decompression and bone graft (tibial strip)

Stage	Hip number	Clinical success (%)harris score>80	Radiological Success (%)	Combined success (%)
	20	19(95.00%)	17(85.00%)	90%
III	12	11(91.70%)	9 (75.00%)	83.3%
Total	32	30(93.75%)	26(81.25%)	87.6%

### Discussion:

Need to treat ischemia of femoral head is becoming more common since many cases are detected in early stages in young patients.<sup>3</sup> One must consider the possibility of osteonecrosis if individual has pain in the vicinity of hip that had history of chronic alcoholism, corticosteroid consumption, associated disease like sickle cell disease, Gauchers, Gout etc<sup>4,5,6,7</sup>.

Early diagnosis prior to the appearance of radiological changes is crucial in the treatment of ischemic necrosis. Its diagnosis based on clinical examination and by bone scan, x-ray, and MRI in early stages, as osteonecrosis is the response to the vascular impairment of the bone marrow circulation.

We evaluate our recent experience with non-vascularized tibial bone graft. The primary questions were whether this technique effectively

deferred further surgical treatment. In addition to that, we questioned whether the outcomes of this study were comparable to other studies of non-vascularized bone grafts. In this study, out of 26 patients with 32 hips only two patients progressed to collapse. The long standing effect of surgery was good with great improvement in reducing pain and range of movement, it achieved Harris score more than 80 points. It postpones the indication of hip arthroplasty. The success rate of hips in our study is found to be 87.6% . The occurrence of collapse was statistically not significant (p value was 0.161 and 0.717 for stage 3 and 2 respectively); as also shown in table 2 .

**Table 2 .** Occurrence of collapse in each stage.

Stage	Collapse	Non collapse	P value
2	1	19	0.717
3	1	11	0.161

In those patients who had collapsed femoral head, the first one had history of chronic pulmonary disease on large dose of intermittent prednisolone 30 mg a day for a minimum one week with every exacerbation of his chest problem, might explain the reason behind failure and collapse. The second one was chronic heavy alcohol intake of 1.5L of beer a day .This reflects the bad selection of such procedure for them.

Regarding comparison between our study, and other studies, Buckley et al<sup>8</sup> in 1991 showed clinical and radiographic success approached 90% for 20 hips with osteonecrosis stage II & III for 4 years, which is similar to our result. Hernigou et al<sup>9</sup> in 2002 with bigger sample 189 also with about same success value with about the same follow up period. Contrary to that Kasser et al<sup>10</sup> had less engorged result with success rate of about 59% radiologically and clinically with 80 hips for the same period of follow up. So in his summary, he blamed the use of fibular avascular graft instead of tibial avascular strip for his lower result than other studies.

There is little discrepancy between clinical and radiological success in our study i.e. 93.8% vs. 81.7% , this discrepancy also occurs in other comparative studies like Phemister<sup>11</sup>. That due to fact, the patient got benefit from decompression only, so they had improved clinically and not got benefit from bone graft, which reflected on radiological suboptimal result

Ficat and Arlet<sup>12</sup> also reported this discrepancy on 133 hips in stages I and II treated with core decompression. They noted good and very good results in 90% of hips clinically and in 79% of hips radiographically. This study

has several short coming, including relatively smaller sample number when comparing to other studies (see below **table 3**. Seconed, in short term result was satisfied, but in long term, we need further studies to approve its efficacy to total hip arthroplasty. Nevertheless, the apparent results encourage the continued use and further study of this procedure. A larger series with bigger number of patients, help more to assess the positive and negative predictors of outcom

**Table 3** .Comparison between our study &other recent study.

Study	year	Hi ps	Follow up(months )	Clinical success (%)	Radiogr aphic success (%)
Buckly et al. <sup>8</sup>	1991	20	96(24-228)	90	90
Hernigou et al. <sup>9</sup>	2002	18 9	80(60-120)	85	85
Lieberman et al. <sup>13</sup>	2004	17	53(26-94)	82	82
Kim et al. <sup>14</sup>	2005	30	50(36-67)	78	80
Kasser et al. <sup>10</sup>	2006	80	84(36-NA)	46	43
Our study.	2013	32	36(4-68)	93.8	81.7

### Conclusions:

1. Non vascularized tibialcortico-cancellous is very useful way in treating early stages of femoral head osteonecrosis and defer the need for arthroplasty.
2. The goals of treatment of osteonecrosis are to relieve pain, disability and preserve the femoral head for as long as possible.

### Recommendation:

1. Early detection of disease (pre symptomatic or pre radiological) is the key to get good result involving screening those people at risk (steroids and alcohol ingestion).
2. MRI seems to be the most sensitive imaging for detection of early stages of the disease, particularly for those patients with risk factors such as steroid &alcohol ingestion and can be used to follow up them postoperatively ,core decompression and non-vascularized tibial bone graft is very

useful method in treating early stages of femoral head osteonecrosis and defer the need of arthroplasty ,this might be correct for short term. In long term we need further studies to approve its efficacy to total hip arthroplasty.

### References:

1. Steinberg ME, Hayken GD, Steinberg DR: A quantitative System for staging avascular necrosis. *J Bone Joint Surg. Br* 1995; 77(1):34-41.
2. Steultjens MP, Dekker J, van Baar ME, Oostendorp RA, Bijlsma JW. Range of joint motion and disability in patients with osteoarthritis of the knee or hip. *Rheumatology (Oxford)* 2000 Sep;39(9):955-961.
3. Ficat RP. Idiopathic bone necrosis of the femoral head. Early diagnosis and treatment. *J Bone Joint Surg Br*. 67 BW: 3-9, 1985.
4. -Hungerford DS, Jones LC: Diagnosis of osteonecrosis of the femoral head. In SchoutensA, ArletJ, Gardeniers JWM, et al (eds): *Bone Circulation and Vascularization in Normal and Pathological Conditions*. New York, NY, Plenum Press, 1993, pp 265-275.
- 5- Arlet J, Ficat biopsies of osteonecrosis primitivehisto-pathologic features. *Rev Rhumat* 1964pp264-310.
- 6-Bradway JK, Morrey BF: The natural history of the silent hip in bilateral a traumatic osteonecrosis. *J Arthroplasty* 1993; 8:383-387.
- 7-Mitchell DG, Steinberg ME, Dalinka MK et al: Magnetic resonance imaging of the ischemic hip: Alterations within the osteonecrosis, viable, and reactive zone. *Clin.Orthop.*1989; 244:60-77.
- 8-Buckley PD , Gearen PF, Petty .Structural bone -grafting for early atraumatic avascular necrosis of femoral head .*J Bone Joint surg.Am.*1991;73:1357-1364.
- 9-Hernigou, Philippe MD; Beaujean, Françoise MD *Clinical Orthopedics& Related Research*: December 2002 - Volume 405 - Issue - pp 14-23SECTION I SYMPOSIUM.
- 10-Kasser, J.M.:*Orthopedic Knowledge Update* (5)1996.American Academy Of Orthopedic Surgeon: 393-396.
- 11-Phemister DB.Treatment of the necrotic head of the femur in adults.*J Bone Joint Surg Am.* 1949; 31:55-66.
- 12- Ficat P, Arlet J, Hungerford DS (eds): *Ischemia and Necrosis of Bone*. Baltimore, MD Williams& Wilkins, 1980.
- 13-Lieberman JR, Conduah A, Urist MR. Treatment of osteonecrosis of the femoral head with core decompression and human bone morphogenetic protein. *Clinical Orthopedics Related Res.* 2004; 429: 139-145.
- 14- Kim SY, Kim YG, Kim PT, Ihn JC, Cho BC, Koo KH. Vascularized compared with nonvascularized fibular grafts for large osteonecrotic lesions of the femoral head.*J Bone Joint Surg Am.* 2005; 87:2012-2018.