Zagazig University Medical Journal
www.zumj.journals.ekb.eg

https://doi.org/10.21608/zumj.2021.91611.2321 Volume 30, Issue 3, May 2024

Manuscript ID ZUMJ-2302-2745 (R1)
DOI 10.21608/ZUMJ.2023.192482.2745

ORIGINAL ARTICLE

Outcomes of Core Decompression for Avascular Necrosis Femoral Head: Ficat I, II or III

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Submit Date 2023-02-11
Revise Date 2023-02-21
Accept Date 2023-02-28

ABSTRACT

Background: Treatment for osteonecrosis is still difficult, and it frequently affects young people who aspire to lead active lifestyles. The aim of the present study was to evaluate the clinical and radiological outcomes of core decompression for Ficat stage I, II or III femoral head avascular necrosis. **Methods:** This interventional clinical trial included 30 hips in 18 patients with avascular necrosis (AVN) of femoral head Ficat type I, II or III, conducted at Orthopedic department, Zagazig University Hospitals. Pre- and post-operative clinical evaluation and radiological assessment were applied. **Results:** There was a statistically significant increase in the Harris Hip scores. There was a highly statistically significant decrease in the Modified Kerboul angle. There was a statistically significant negative correlation between the improvement in Harris Hip scores and each of BMI, Ficat stage, and post-operative Modified Kerboul angle as an increase in each of them was associated with decreased percent of improvement. **Conclusions:** Core decompression when performed before femoral head collapse has been advocated as an efficient technique to stop or delay the progression of the disease in young individuals.

Keywords: Avascular Necrosis Femoral Head; Core Decompression; Outcomes

INTRODUCTION

The femoral head is the bone that experiences avascular necrosis the most frequently. Patients typically affected by this condition are in their third and fourth decades of life [1]. Avascular necrosis (AVN) of femoral head occurs due to interruption of blood supply, which leads to the death of bone components. The bone structures then collapse, the hip joint loses its function associated with pain [2].

The two main categories of etiologic variables are traumatic and non-traumatic. Long-term oral corticosteroids, excessive alcohol intake, coagulation problems, hyperlipidaemia, smoking, storage diseases, autoimmune diseases, and haematologic diseases are some of the factors that contribute to non-traumatic femoral head avascular necrosis [3].

The Ficat classification was the most accurate among the various classification schemes used to categorise this condition and forecast treatment outcomes. Ficat and Arlet first described the classification scheme in 1964. Stages 1 through 4 make up this process. In 1985, Ficat advocated a change. From Stage 0 through Stage 4, the subsequent Ficat classification recognised five distinct stages of bone necrosis. (4) Invasive testing techniques and a preclinical, preradio graphic stage were included in the Ficat classification before the development of MRI in 1985. Since then, the system has undergone several changes to incorporate MRI findings, patient symptoms, revise the description of radiographic findings, and eliminate the invasive testing procedures [4].

The most popular method for treating femoral head avascular necrosis in its early stages is core decompression of the femoral subchondral region.

It slows the course of osteonecrosis, lowers the pressure inside the bone, promotes the growth of blood vessels around the decompression tunnel, and speeds up the replacement of new bone [5]. According to Ficat classification, core decompression of the femoral head is typically used in the precollapse phases of femoral head avascular necrosis to postpone or avoid reconstructive surgery like total hip arthroplasty (THA) and associated consequences of the damaged joint. It is typically done to maintain the hip joint's structure and function as well as to ease AVN-related pain [6].

The novelty of our study to evaluate both clinical and radiological results of core decompression for treating Ficat stage I, II, or III femoral head avascular necrosis to confirm the outcomes of this technique and predict its rate in stop the progression of that disease.

METHODS

This interventional clinical trial included 30 patients with AVN of femoral head Ficat type I, II or III and conducted in the Orthopaedic department, Zagazig University Hospitals to evaluate the clinical and radiological outcomes of core decompression for Ficat stage I, II or III femoral head avascular necrosis.

Adult patients with AVN of femoral head Ficat type I, II or III, aged between 20 and 60 years. All genders included. Patient qualifies for core decompression based on clinical examination and MRI radiographic evaluation. Core decompression has never occurred. The patient is able and willing to give written, informed consent.

Patients diagnosed as stage IV using the Ficat staging system. Extremes of age (less than 20 and more than 60). Patients with active or latent infection. Patients who have had radiation to the bones, inflammatory arthritis, or septic arthritis in the past. Patients who were not followed up on.

The ethical committee at Zagazig University approved the study. All the subjects' written informed permission was acquired. The Declaration of Helsinki, the World Medical Association's code of ethics for studies involving humans, guided the conduct of this work.

I. Preoperative evaluation:

For all patients included in this study, a full detailed history was taken from all patients, this included age, sex, occupation. Complaints mostly pain amplified with weight bearing, limitation of movement, and restriction of activities Any potential risk factors: previous fracture neck of femur, hip dislocation, hemoglobinopathies, or alcohol abuse [duration, amount, and frequency]. Previous steroid therapy (route, dosage and duration). Type and duration of the initial treatment. The presence of systemic disease and any medications received. Special habits e.g. smoking [number of cigarettes per day and duration] or diving. To reduce patient fear and obtain the highest level of patient compliance, patient counselling was crucial.

General examination for determination of underlying etiology as bruises and abdominal distention in Gaucher's disease, leg ulcers or delayed puberty in sickle cell disease. Antalgic gait was detected with a limp during walking.

Local examination included range of motion (ROM): is measured according to Harris Hip Score. The hip's passive range of motion was constrained and uncomfortable, particularly forced internal rotation and abduction. Typically, passive abduction has a clear constraint. The presence of limb length discrepancy and deformity or not. Spine examination was performed to exclude any radiating pain. Nearby joints were examined including sacroiliac and knee joints. Clinical examination of the involved limb was performed to exclude signs of instability, neurovascular disorders or any loss of motor power.

Laboratory Investigations included CBC, coagulation profile, Liver, and kidney function tests, ESR, CRP and R.B.S. Also, ECG and echocardiography were performed if patients age more than 40 years old.

Radiological assessment included X-ray (AP & Frog leg lateral position) and MRI. An antero-posterior (AP) view of both hip joints, femur, and frog-leg lateral view. Radiological parameters include decreased joint space, increasing radio-opacity, sclerotic or cystic lesions, subchondral collapse, irregular contour, and progressive osteoarthritis should be assessed pre-operative.

The modified kerboul angle is divided hips into four groups based on the total of the angles of the femoral surface involved in necrosis on a midcoronal and midsagittal MRI: grade 1 (200°), grade 2 (200° to 249°), grade 3 (250° to 299°), and grade 4 (300°).

Operative technique:

All patients received spinal anesthesia. On a traction table, the patient was positioned supine. In order to provide easy access to the affected hip and allow for the acquisition of sufficient anterior-posterior (AP) and frog-leg lateral images, the c-arm is placed over the patient from the nonoperative side. The hip(s) being operated on were properly draped. During the examination of x-ray and MRI images done prior to surgery, the quadrant localization of femoral head necrosis is performed. 20 minutes before surgery, two grammes of third-generation cephalosporin were administered. To reach the lesser trochanter, a lateral incision is made around 1 cm deep through the skin and tensor fascia. Under fluoroscopic vision, a threaded guidewire is placed in the antero-posterior and frog-leg lateral planes.

The subchondral bone plate with necrosis should be within 1 to 2 mm of the guidewire. The necrotic area is drilled with a cannulated 10mm trephine that is progressed to within 5mm of the articular surface once the wire in the necrotic area has been preoperatively located through evaluation of x-ray and MRI images, taking care not to perforate into the joint.

Once the procedure was finished, the drill was taken out, and the incision was stitched up with basic sutures. Since there is never a dead space at the location of the incision, we didn't always utilize a suction drain.

Post-operative care:

The patients were kept in ward for 1-3 days for observation, For the first 24 hours, intravenous antibiotics were given to the patients, and first-day radiographs were taken. The same postoperative rehabilitation regimen was followed by all patients: no weight bearing on the operated limb for three weeks; gradual partial weight bearing with crutches for another three weeks; total weight bearing was allowed after six weeks; bilateral patients were instructed to use a wheelchair for three weeks; after that, gradual partial weight bearing with crutches was allowed. Within a few weeks, the majority of patients have significant pain reduction.

Post-operative follow-up:

All the patients were seen for the first time 2 weeks after discharge from hospital to assess any problem and removal of stitches. The patients were then evaluated monthly. During this evaluation clinical and radiological examinations were made. A minimum of two views (antero-posterior and frog-leg lateral) and MRI were taken.

Radiological parameters include changes in size and signal characteristics of lesions, improvement in bone marrow edema and reconversion from fatty to hemopoietic marrow should be assessed at post-operative, 4 weeks and 3, 6 months. Functional outcome was measured with the Modified Harris Hip Score system.

STATISTICAL ANALYSIS

Excel software is used to examine data. Then, for analysis, data were imported into SPSS version 23.0, Statistical Package for the Social Sciences. Qualitative data is represented as a number and a percentage, while quantitative data is represented by the mean SD. Statistical differences between quantitative independent multiples. The correlation co-efficient test was used to rate several variables in a linear relationship, whether it was positive or negative. P value was set at 0.05 for significant outcomes and 0.001 for extremely significant outcomes.

RESULTS

The current study showed the average age of the studied group was (38.8±7.8) ranging from 27 to 59 years, more than half of them (56.7%) in the age group from 27-37 years. Regarding sex, most of them (73.3%) were males, and (26.7%) were females **(Table 1)**.

The average BMI of the studied group was (26.7±2.3) ranging from 23 to 33. About half (53.3%) of the studied group were left-sided affected and (46.7%) were right-sided. 43.3% of the studied group were smokers and (56.7%) were non-smokers. Most of the studied group (93.3%) didn't have comorbidities, one case (3.3%) had HTN and one case (3.3%) had D.M. Half of the studied group (53.3%) had Ficat stage II, 12 cases were Ficat stage III and 2 cases (6.7%) had Ficat stage I **(Table 2)**.

There was a statistically significant increase (improvement) in the Harris Hip scores from (67.2±11.5) ranging from 47 to 87 to become (87.7±7.) ranging from 72 to 100 (p-value<0.001) with (33.4%) percent of improvement ranging from 10.3% to 70.6% **(Table 3)**.

There was a statistically significant decrease (improvement) in the Modified Kerboul angle from (237.5±26.1) ranging from 180 to 280 to become (183.7±37.4) ranging from 90 to 250 (p-value<0.001) with (23.3%) percent of improvement ranging from 7.4% to 50.0% **(Table 4)**.

Patients without difficulties had statistically higher postoperative Harris Hip scores than patients with complications and among patients with Ficat stage

I > II > III. Regarding sex, age, affected side, and aetiology, there was no statistically significant association with the postoperative Harris Hip scores **(Table 5)**.

Postoperative Modified Kerboul angle was statistically significantly lower in patients without difficulties than in patients with complications, among patients with Behcet< steroid< idiopathic < COVID-19 causes, and among patients with Ficat stage I > II > III. Regarding sex, age and the affected side, there was no statistically significant association with the postoperative Modified Kerboul angle **(Table 6)**.

There was a statistically significant negative correlation between the improvement in Harris Hip scores and each of BMI, Ficat stage, and post-operative Modified Kerboul angle as an increase in each of them was associated with decreased percent of improvement. Regarding age, there was no statistically significant association with the improvement in Harris Hip scores **(Table 7)**.

Table (1): Demographic characteristics of the studied group

Demographic data	The studied group	
	No=(30)	%
Age (years) Mean ± SD Median (Range)	38.8±7.8 37 (27-59)	
Age range (years)		
27-37 years	17	56.7%
37-47 years	8	26.7%
47-59 years	5	16.7%
Sex		
Male	22	73.3%
Female	8	26.7%

Table (2): Clinical data among the studied group

Variables	The studied group	
	No=(30)	%
BMI Mean ± SD Median (Range)	26.7±2.3 27 (23-33)	
The affected side Right Left	14 16	46.7% 53.3%
Special habits No Yes	17 13	56.7% 43.3%
Comorbidities No HTN D.M	28 1 1	93.4% 3.3% 3.3%
Ficat stage I II III	2 16 12	6.7% 53.3% 40.3%

Table (3): Comparing pre- and post-operative Harris Hip scores among the studied group

Variable	Preoperative Mean ± SD Median (Range)	Postoperative Mean ± SD Median (Range)	Paired t-test	p-value
Harris Hip score	67.2±11.5 69.5 (47-87)	87.7±7.8 89 (72-100)	8.2	0.001**
Percent of improvement	33.4% (10.3%-70.6%)			

***Statistically highly significantly different.*

Table (4): Comparing pre- and post-operative Modified Kerboul angle among the studied group.

Variable	Preoperative Mean ± SD Median (Range)	Postoperative Mean ± SD Median (Range)	Paired t-test	p-value
Modified Kerboul angle	237.5±26.1 240 (180-280)	183.7±37.4 180 (90-250)	17.8	0.001**
Percent of improvement	23.3% (7.4-50.0%)			

***Statistically highly significantly different.*

Table (5): Relation between Post-operative Harris Hip scores with patients' sex, age, affected side, etiology, Ficat stage, and complications among the studied group.

Variables	Post-operative Harris Hip score Mean ± SD	Test	
		Test	p-value
Sex Male (no.=22) Female(no.=8)	87.4±8.2 88.2±7.2	T=0.2	0.8
Age 27-37 years(no.=17) 37-47 years(no.=8) 47-59 years(no.=5)	87.9±7.4 87.0±10.6 87.8±6.5	F=0.03	0.9
The affected side Right (no.=14) Left(no.=16)	88.0±8.5 87.4±7.5	T=0.2	0.8
Special habits No(no.=17) smoking(no.=13)	87.0±8.3 88.5±7.5	T=0.3	0.8
Aetiology Steroid (no.=20) Idiopathic(no.=6) Behcet(no.=2) Covid 19(no.=2)	87.9±6.7 87.5±10.5 96.0±1.4 77.0±1.4	F=2.2	0.1
Ficat stage I(no.=2) II(no.=16)	97.1±0.4 91.9±10.6	F=14.7	0.001**

III(no.=12)	**80.9±5.8**		
Postoperative complications **Yes (no.=2)** **No(no.=28)**	**80.9±5.8** **92.1±7.3**	**T=2.6**	**0.03***

*Statistically significantly different (p<0.05), ** statistically highly significantly different (p<0.001)*

Table (6): Relation between Post-operative Modified Kerboul angle with patients' sex, age, affected side, etiology, and presence of complications among the studied group.

Variables	Post-operative Modified Kerboul angle Mean ± SD	Test	
		T	p-value
Sex **Male (no.=22)** **Female(no.=8)**	**180.9±39.9** **191.2±29.9**	**0.6**	**0.5**
Age **27-37 years(no.=17)** **37-47 years(no.=8)** **47-59 years(no.=5)**	**187.1±32.5** **186.3±43.4** **168.1±47.1**	**0.5**	**0.6**
The affected side **Right (no.=14)** **Left(no.=16)**	**186.4±36.5** **181.2±39.1**	**0.3**	**0.7**
Special habits **No(no.=17)** **smoking(no.=13)**	**191.7±31.1** **173.1±43.3**	**1.3**	**0.2**
Etiology **Steroid (no.=20)** **Idiopathic(no.=6)** **Behcet(no.=2)** **Covid 19(no.=2)**	**184±28.3** **191.7±41.7** **110.0±28.3** **230±14.1**	**5.4**	**0.005***
Ficat stage **I(no.=2)** **II(no.=16)** **III(no.=12)**	**90.0±1.2** **167.6±21.3** **214.2±28.4**	**20.2**	**0.001****
Postoperative complications **Yes (no.=2)** **No(no.=28)**	**194±10.5** **110.0±28.3**	**3.1**	**0.006***

*Statistically significantly different (p<0.05), ** statistically highly significantly different (p<0.001)*

Table (7): Correlation between the improvement in Harris Hip scores with patients' age, BMI, Ficat stage, and Post-operative Modified Kerboul angle among the studied group.

Variables	The improvement in Harris Hip scores		
	r	P-value	Sig.
Age	-0.1	0.9	NS
BMI	-0.6	0.006*	S
Ficat stage	-0.5	0.03**	S
Post-operative Modified Kerboul angle	0.6	0.007*	S

*NS=non-significant, S=significant, *statistically significantly different (P<0.5).*

DISCUSSION

AVN of the femoral head has been linked to osteonecrosis of the femoral head, which can result from both traumatic and nontraumatic sources. Idiopathic AVN refers to cases that are between 10% and 20% of the time and have no obvious explanation. In between 80% and 90% of new cases of nontraumatic AVN, steroid use has been found to be causal [7].

Subchondral osteonecrosis develops through four distinct morphological stages, which may be shown to correlate with reported radiological appearance. The first stage is primarily recognised by the presence of bone and bone marrow necrosis without signs of healing. In the second stage, the edges of the necrotic zone show signs of reparative processes. Segmental collapse of articular cartilage is the main characteristic of the third stage. The fourth stage has developed signs of secondary osteoarthritis [8].

It's critical to understand that AVN of the femoral head is a composite of necrotizing and reparative processes that cause the emergence of degenerative characteristics, such as segmental collapse in the third stage that results in clinical symptoms [8].

Osteonecrosis may be clinically quiet or it may be accompanied with discomfort, which is typically limited to the groyne region but may also occur in the ipsilateral buttock and knee [9].

Utilizing an accurate and efficient classification and staging system is essential because the treatment for AVN of the femoral head is mostly dependent on the disease's stage. Several classification techniques have been employed; the Ficat and Arlet classification method was the most widely used, followed by the University of Pennsylvania classification method and the ARCO staging system. [9] Plain radiographs continue to be the first imaging step despite their limitations in the diagnosis of osteonecrosis because they can be utilized to distinguish AVN from a number of other causes of hip joint discomfort. There is proof that MRI is the most reliable imaging technique for diagnosing femoral head osteonecrosis, particularly in the early stages when only bone marrow alterations are present [10].

The management of osteonecrosis has long been a challenge. No one technique or set of techniques has been fully applied to stop the progression of a disease. Early on, preventative measures such protective weight bearing, pharmacological therapy, and core decompression are implemented to stop the disease's future progression. In later phases, when collapse occurs and there is substantial femoral head deformity, a reconstructive operation is the preferred course of treatment [11].

The objective of the present study is to evaluate the clinical and radiological outcome of core decompression of femoral head AVN. This study suggests that this procedure leads to symptomatic pain relief in a majority of patient and prevent collapse of femoral head. This study included 30 hips in 18 patients, unilateral in 6 in the 14 patients, followed by idiopathic cause in 4 patients. Selected cases were examined clinically and radiologically using plain radiographs and MRI, and then staged according to Ficat and Arlet classification system. Core decompression is a simple technique that can be performed on an outpatient basis.

A maximum 2 cm long incision in the midcoronal plane of the lateral thigh, centered over the proximal femoral metaphysis, gives adequate access. A guide wire is inserted into the center of the lesion in the femoral head under the image intensifier. Over the guiding wire is placed a 10 mm trephine. To avoid puncturing into the joint, it is advanced to within 5 mm of the articular surface. The intertrochanteric bone that was removed is essentially normal; it is set aside to be used for the transplant in the future. The necrotic area's excised tissue is sent for a histopathological analysis. The Harris Hip Score was used to assess patients both before surgery and at various points after surgery.

The study group's average age was (38.8 + 7.8), ranging from 27 to 59 years, with the majority (56.7%) falling into the 27–37 year age range. That was near **Bi et al.** [12] followed 20 patients who had core decompression. All of the patients were accessible for follow-up at an average of 24 months, and their average age was (35.30 4.72). However, **Kang et al.** [13] evaluated a total of 50 patients with a mean age of 47.3 years old.

Recent study by **Serong et al.** [14] reported high rate of treatment failure in elderly patients, with the cutoff age at 40 years old.

In our study, most of them (73.3.9%) were males, and only (26.7%) were females. That was close to **Yin et al.** [15] performed core decompression procedure in a group of 16 patients using multiple small size (2 mm) drilling instead of single large core. However, **Serong et al.** [14] reported that sex doesn't affect the prognosis of different therapies and seem to be giving the same clinical and radiological outcome in patients not affected by treatment failure.

Although no obvious difference was detected, it was clear that corticosteroid therapy has been the etiology of the majority of cases. No obvious differences regarding laterality have been detected [16].

In our study, of 30 hips in 18 patients, despite short term follow up more than 80% of cases show clinical and radiological improvement on X-rays and MRI, Among the patients, symptoms had improved in fifteen of the eighteen cases. When compared to preoperative HHS (67.211.5), there was a substantial postoperative rise in HHS (87.77.8) ($p < 0.001$). That was close to **Lausten et al.** [17] and like the result of **Classen et al.** [18] with preoperative HHS (70.48±13.53) and postoperative HHS (88.58±13.8) despite the modified technique of core decompression with extendable reamer and injection of Pro-Dense (resorbable synthetic bone substitute). [101, 102] The same result reported by **Bi et al.** [12] with HHS converted from preoperative (68±4.8) to postoperative (86±4.29).

Our study show significant decrease (improvement) in the Modified Kerboul angle from (237.5±26.1) ranging from 180 to 280 to become (183.7±37.4) ranging from 90 to 250 (p-value<0.001) with (23.3%) percent of improvement ranging from 7.4% to 50.0%, with postoperative mean angle (90.0±1.2 - 167.6±21.3 - 214.2±28.4) for grade I, II and III respectively. In our study five hips with grade III modified kerboul angle show segmental collapse during follow up, two converted to THA and expected four more hips to follow the same pathway, we predict that patient with grade III and laterally located necrotic lesion will suffer from collapse eventually. Similar result reported by **Boontanapibul et al.** [19] with a mean follow-up of 36 23 months, grade I hips collapsed in 3/9 cases (33%), grade II hips collapsed in 7/13 cases (54%), and grade III-IV hips collapsed in 82% of cases (P =.256). For combined necrotic angles >250°, core decompression had a high failure rate, which accelerated the illness and necessitated THA.

According to the same data, **Mont et al.** [20] demonstrate hips with combined necrotic angles of more than 250° had a 16% survival rate (seven of 45), compared to hips with combined necrotic angles of less than 250°, which had a 57% survival rate (13 of 23). Steinberg Stage III hip with a core minor lesion (250° combined necrotic angle) and no head depression was the best multiple regression model for a successful result. With this combination, 89% of the results were successful (8 of 9 hips).In our study patients with stage III and late stage II show HHS with a mean (80.9±5.8) and modified kerboul angle with a mean (214.2±28.4) postoperatively and nearly half of them show fair (unsatisfactory) result. **Mont et al.** [20] revealed 52 patients (68 hips) in cross-sectional research who had core decompression for Ficat and Arlet Stage III osteonecrosis of the femoral head had their patient outcomes assessed at a mean follow-up of 12 years (range, 4-18 years) following core decompression. Overall, 20 out of 68 hips (29%) had successful results. 18 (41%) of the 44 hips with Stage III Steinberg disease had complete hip arthroplasty. The best generalized linear model for unsatisfactory outcomes (0 hips surviving out of 14) was

Steinberg Stage IV disease (head depression), lateral location of the lesion, and a large extent of the lesion (>250° combined necrotic angle).

In contrast, 22 of 24 Steinberg Stage IV hips (92%) underwent arthroplasty. In a retrospective study made by **Yoon et al.** [21] reported 39 hips treated with core decompression for osteonecrosis of the femoral head, we assessed the size of the necrotic region, the Ficat stage, and the location of the lesion. Three categories of necrotic lesion severity were established: mild (15%), moderate (30%), and severe (greater than 30%). Core decompression was unsuccessful in 2 of the 14 mild instances, 4 of the 7 intermediate cases, and 16 of the 19 severe cases.

In osteonecrosis of the femoral head, the amount and position of the necrotic portion as well as the Ficat stage can be utilized as predictors for the outcome of core decompression. According to the study, if a patient has necrosis of the femoral head with Ficat stages I or II and an MRI shows a necrotic segment of less than 15%, a core decompression is advised; if the segment is more than 30% necrotic.

Rajagopal et al. [22] found that Ficat stage classification of patients showed that THA rates rose as Ficat stage rose. After a minimum of two years of follow-up, researchers identified a correlation between bigger areas of necrosis and the subsequent requirement for a THA, with patients in Ficat Stage I having a THA rate of 0-16.7% compared to 66% in Stage III. Finally, they discovered a significant correlation between development to THA and a high Ficat stage.

As regarding the operative technique (single vs multiple drilling), our study didn't find significant difference in the clinical and radiological outcome and this may explained by short period of follow up, the small size of the sample and 40% of them were in stage III. This was close to **Al Omran et al.** [23] reported that clinical investigation on 39 hips with early Ficat II sickle cell disease patients found that 78% of cases with repeated drilling and 80% of cases with traditional core decompression both significantly reduced pain and improved HHS. These patients didn't exhibit any radiographic disease progression. They come to the conclusion that while multiple drilling is safer and less invasive than single coring in SCD, there is no statistically significant difference in outcome or complication rate between both procedures. The remaining 20% CD and 22% MD eventually progressed radiologically to grade III or grade IV and had HHS less than 75 at last visit.

In our study, no fracture or femoral head perforation or deep venous thrombosis and PE occurred only two cases show superficial infection which resolves quickly with good antibiotic and repeated dressing. Because the short follow up period of the study, long term complication can't be shown. However, a study made by **Fairbank et al.** [24] found 128 femoral heads in 90 patients had ischemic necrosis in phases I, II, and III. Four fractures from postoperative falls and one head perforation owing to technical error were complications of the main treatment. They come to the conclusion that core decompression prevents young patients with ischemic necrosis from needing a total hip replacement.

A Study made by **Naza et al.** [25] revealed that percutaneous standard CD is associated with a 10–15% complication rate, including weakening the bone contributing to collapse, subtrochanteric fracture, or violation of the articular cartilage. A total cohort of 11 hips (8 patients) were identified, and the mean patient follow-up was 7 years 1.48 years (range, 64–118 months).

The majority of our patients were receiving corticosteroid therapy so we recommend close screening of these high-risk patients with MRI which may show changes even before the patient clinical complaint.

The primary limitations of the present study is that the follow up period is not enough to show the long term outcome and complications as the follow up period was 6 months to 1 year and limited number of patients.

CONCLUSION AND RECOMMENDATION

Core decompression provides an effective treatment for steroid associated AVN and early stages of the disease in non-steroid associated cases. Core decompression when performed before femoral head collapse has been advocated as an efficient technique to stop or delay the progression of the disease in young individuals.

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To Cite :

Sheathe, E., Salama, A., El-Adawy, A., Rozek, R. Outcomes of Core Decompression for Avascular Necrosis Femoral Head: Ficat I, II or III. Zagazig University Medical Journal, 2024; (828-838): -. doi: 10.21608/zumj.2023.192482.2745