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MANAGEMENT OF AVASCULAR NECROSIS OF FEMORAL HEAD IN SICKLER PATIENTS BY CORE DECOMPRESSION AND STEM CELLS INJECTION

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Abstract

Background: O.N. of the femoral head, which is common in younger patients with S.C.D. The hip joint will deteriorate to the point of collapse and secondary osteoarthritis if not treated or if non-operative treatment is employed exclusively. Given the unsatisfactory long-term outcomes observed in this patient group after T.H.A., we recommend that patients with early-stage disease preserve their joints.

The aim: The point of this study is to find out if core decompression and stem cell therapy are safe, effective, and doable for treating acute venous non-hemolysis in people in our area who have problems with their spinal cord. Material and methods: The 22 hips of S.C.D. patients with A.V.N. of F.H. were the subjects of this prospective study, which ran from October 2012 to July 2014 in the orthopedic department of Basra General Hospital in Basra city, south of Iraq. They were 30 years old on average. Out of the eighteen patients, four (22.22%) showed bilateral involvement with AVN. There was a unilateral effect on 14 patients' reminders (77.77%). Every single patient had an MRI scan before their surgery. This study used a Ficat and Arlet staging approach, which included stages I, II, and III, to statistically examine how visible the disease was on radiographs. We evaluated patients clinically using M.H.H.S. We also approached each patient using the Hardinge method. A sample of stem cells was taken. The next step was to inject stem cells into the damaged area, starting at the anterior iliac crest. This was done after core decompression of the necrotic zone in the femoral head was done under fluoroscopic supervision.

Results: The S.C.D. After undergoing core decompression and stem cell therapy for the treatment of AVN of F.H., patients who had previously complained of moderate to severe pain, gait limitation, and functional limitations in their activities reported less or no pain and an improvement in their functional abilities in the four months after surgery. Additionally, a mean M.H.H.S. of 76.2% before surgery provided further support for this. Average MHHS after four months was 88.18%. The highly significant result is indicated by the paired t-test, which has a p-value of less than 0.0001. The outcomes of the clinical examination were more important than those of the radiographic and magnetic resonance imaging (MRI) exams.

Conclusion: To prevent the subchondral bone from collapsing even further, which would lead to secondary arthritis and the early need for T.H.A., which has terrible long-term outcomes for those individuals. Treatment of AVN with core decompression and stem cells is considered safe, practical, and effective for S.C.D. patients, particularly those with Ficat and Arlet stages I and II. Conversely, the clinical evaluation outcomes of those patients showed a weaker connection with radiographic and MRI findings.

Keywords: Femoral head, AVN Avascular Necrosis, decompression , stem cell therapy , MRI.

INTRODUCTION

Back ground:

When ignored, osteonecrosis of the femoral head causes the hip joint to deteriorate, collapse, and develop secondary osteoarthritis. This difficult condition typically affects young individuals in their 30s and 40s. Nontraumatic osteonecrosis has a well-documented natural history [4, 5], and despite advances in our understanding of the disease's origin and pathology, diagnosing and treating this condition remains a significant challenge. Reports 6 and 7 indicate a high risk of progression when symptomatic individuals receive nonoperative treatment alone. Patients in the early stages of the disease should have the joint preserved because they are usually young when they come in and have had bad long-term outcomes after T.H.A. 7, 8, and 9.

Definition

Meaning The death of bone cells and bone marrow can occur for various reasons, one of which is a decrease in blood flow. 2, 10.

Pathogenesis

How Diseases Cease Few details on the pathophysiology of AVN have been clarified. 1, 28, 39. Vascular necrosis can happen in the femoral head, femoral condyles, humeral head, capitulum, and proximal scaphoid and talus areas. These subarticular areas are surrounded by cartilage. They are at the ends of the bone's vascular domain and don't have easy access to nearby blood vessels. The subchondral trabeculae also depend on a network of end arterioles that don't have many collateral connections, which is another problem (22, 39). Vessel sinusoids, which lack an adventitial layer and are limited by marrow tissue pressure and volume, nourish bone and marrow cells. Just like a closed compartment, the system only

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allows one ingredient to grow by squeezing out the others. When there are changes in the area, like bleeding, swollen marrow, or less blood flow, ischemia, reactive edema or inflammation, marrow swelling, increased intraosseous pressure, and more ischemia can happen very quickly. 22. Elevated intraosseous pressure (IOP), a common occurrence in organs essentially incapable of expansion, causes ischemia and cell damage. Elevated intraocular pressure (IOP) has historically enabled early diagnosis. Cytotoxicity and other variables may play a significant role in this. Due to its occurrence in other disorders, elevated intraocular pressure (IOP) is not essential to the pathophysiology of this medical condition, such as osteoarthritis. Contrarily, artificially induced O.N. in rabbits has not been associated with elevated intraocular pressure (IOP), according to histological evidence. Histopathologic and imaging studies conducted during the early stages of the disease may provide further information about the etiology of O.N.19.

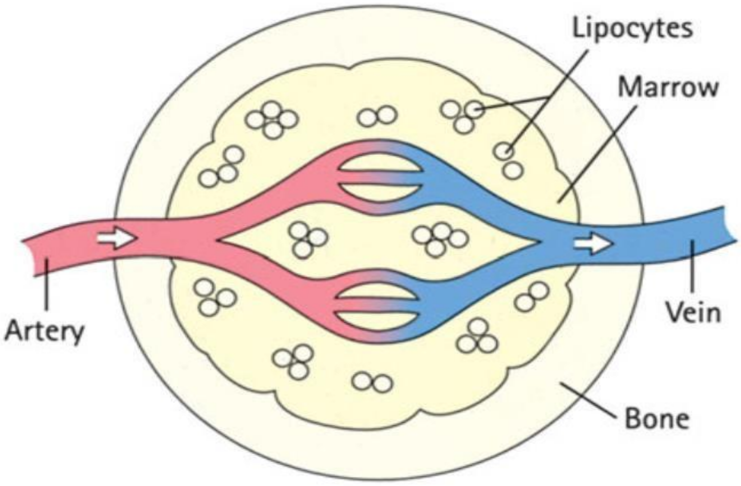

Figure (3) Pathogenesis of AVN: The medullary cavity of bone is virtually a closed compartment containing myeloid tissue, marrow fat and capillary blood vessels. Any increase in fat cell volume will reduce capillary circulation and may result in bone ischaemia.[22]

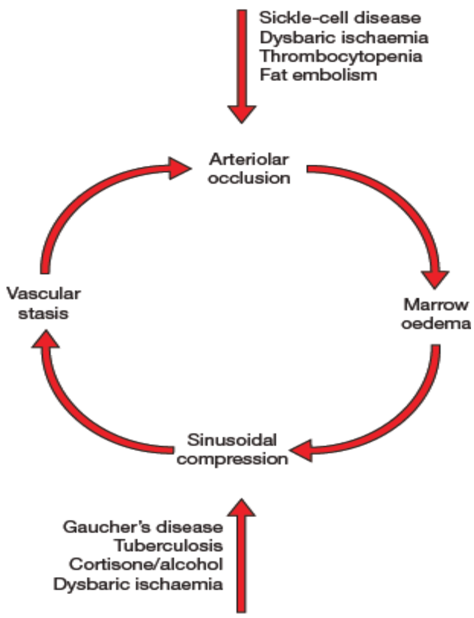

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Figure (4) Algorithm showing how various disorders may enter the vicious cycle of capillary stasis and marrow engorgement [22].

• Researchers have proposed various hypotheses. One of these is the enlargement of the bone marrow, which might put pressure on the sinusoids and capillaries (22). Venous stasis and retrograde arteriolar stoppage are examples of direct cellular toxicity. Moderate alcohol is toxic to osteocytes, and endogenous or exogenous corticosteroids are toxic to lipocytes because they stimulate the conversion of hemopoietic marrow into fat. • Injury or pressure cutting off blood flow to the area: (i.) bone marrow disease (Gaucher's) 10. (ii) Radioactive or vacuum-induced harm.17. The symptoms of intravascular thrombosis, which is the blocking of an arterial vessel, include SCD, nitrogen bubbles (bends), and hypercoagulable states. Weaken anticoagulants, such as S- and C-proteins (b.). Boost anticoagulant activity; hyperlipidemia accompanied by fat emboli is noted. In sickle cell disease (SCD), hemoglobin S is soluble in its oxygenated form, as it is in the lungs. However, when hemoglobin delivers oxygen to tissues, the deoxygenated form of hemoglobin S undergoes a major conformational change. This condition causes numerous adjacent hemoglobin S molecules to form long fibrous aggregates (polymers) due to hydrophobic interactions between their valines. When blood erythrocytes include certain polymers, they change their shape from a typical spherical biconcave disc to a sickle shape. This distortion causes the cells to become rigid and causes vaso-occlusion, which in turn causes sickled red cells to develop in the tissues. 40 A key process in the pathophysiology of sickle cell disease is the polymerization of hemoglobin. A person with chronic anemia has hemolysis, which is brought on by fragile red blood cells. This is made worse by persistent sickling in the tissues and desickling in the lungs. When stiff, sickled red cells clog blood vessels, it can cause a cascade of symptoms including inflammation, cognitive impairment, severe crises, and cerebrovascular illness. Vaso-occlusion and inflammation that last for a long time eventually turn into vasculopathy. This leads to microcirculation obstruction and tissue infarction (41, 42), which hurts most organs over time. The list includes the brain, kidneys, lungs, bones, and cardiovascular system. All of these theories fall short when it comes to explaining the wide range of possible reasons. Although many people without known risk factors do get O.N., the majority of patients with known risk factors never get it. Overall, it seems like the process is complex and involves more than one factor. 2, 22, 39. The final outcome depends on how bad the damage is and how well the regenerative and reparative procedures work, which replace diseased or dead bone cells with healthy ones. Bone collapse, joint incongruity, and secondary osteoarthritis[22] result from not revitalizing vast, affected areas.

2.1. Patients and Methods:

Regarding sickle cell disease, this research is prospective. The orthopedic department at Basra General Hospital in Basra, Iraq, treated 22 hips from 18 SCD patients (seven men and eleven women) with avascular necrosis of the femoral head between October 2012 and July 2014. The treatment included core decompression and stem cell injection. Ages varied from fifteen to forty-five, with a mean of thirty. Either our facility initially diagnosed these patients, or other hospitals or outpatient clinics referred them to us after receiving a diagnosis elsewhere. Studied We used the medical history, physical exam findings, anteroposterior, and frog position radiographs for preoperative patient evaluation. We documented information such as gender, age at presentation, duration of symptoms prior to presentation, and concomitant risk factors. All patients underwent magnetic resonance imaging scans prior to surgery. We conducted a quantitative assessment using a Ficat and Arlet staging system to determine the degree of radiographic disease involvement. The patient will be scheduled for surgery if they meet our inclusion criteria. Inclusion criteria are as follows: 1. We confirmed that patients with sickle cell disease had the SS type of hemoglobin electrophoresis. 2. Patients that are medically fit do not have any co-occurring diseases. Using a quantitative approach based on the Ficat and Arlet staging system, the third stage is identified. Criteria for exclusion One, those suffering from different forms of hemoglobinopathy. Avascular necrosis can be caused by other methods as well. (such as those associated with trauma, alcoholism, steroid medication, oral contraceptives, etc.) 3. Patients were not included in the study until the femoral head physis was closed. 4. Any prior surgeries performed on the affected limb. 5. Infection, neoplasm, or any other malignancy that could render treatment ineffective. 6. Medical complications that can make the surgery unsafe. For patients with A.V.N. of the femoral head,

the pre-operative planning process included the following steps: 1. obtaining a complete patient identity; 2. reviewing the patient's medical history; 3. conducting a thorough physical examination, including a general, systemic, and regional examination; and 4. evaluating the patient's results using the modified Harris hip score (12, 3). All the people who took part in the study had hematological (whole blood picture, blood group and cross-matching, ESR, C-reactive protein, and preparation of one or two pints of fresh blood) biochemical (RBS, urea, creatinine), and viral (hepatitis surface antigens, HIV) tests done on them. The patient also underwent a radiological evaluation that included a supine X-ray of both hips, taken in both an anterior and posterior (AP) position. Every single patient underwent magnetic resonance imaging (M.R.I.). We instruct the patient to shave the affected lower limb the night before the operation. 3. The surgical procedure and the entire schedule for follow-up were covered. 4. A release of consent was executed. Process: • While lying on an orthopedic table. Patient lying on their back. • Third-generation cephalosporins, which are preventive antibiotics, are administered during anesthesia induction and continued for three to five days after surgery. • A centrifuge was manufactured and sent to the medical college in Basra by the Harvest firm as part of their technological offerings. • They employed a canine imaging system. • The anesthetist decided on the method of anesthesia. • A single pint of blood was requested. There are two stages to the process: This procedure includes concentration and bone marrow aspiration from the anterior iliac crest. The procedure begins with a 20 ml syringe aspiration, which is followed by the deep insertion of a beveled needle (Jamshidi needle), 8 cm long and 1.5 mm in diameter, into the cancellous bone. We aspirate 90–110 ml of marrow in small fractions using numerous needle inserts at varying angles to minimize dilution by peripheral blood. The aspirate is moved to a clean cup that is attached to the centrifuge chamber after the marrow has been mixed with a solution that stops blood clotting (heparin, citric acid, sodium citrate, and dextrose) in a plastic bag. The instrument is then run at a specific speed for 15 minutes, following the instructions given by the original manufacturer. Upon completion of the procedure, a 20 ml syringe with a large nozzle will be used to aspirate a precipitate containing stem cells, which should range from 8 to 10 ml of buffy stem cells. At this stage, the afflicted hip is prepared for surgery by making a lateral incision (Hardinge approach) over the greater trochanter that is 5 to 8 cm long. An 8-millimeter cannulated electric drill was used to make an atunnal in the middle of the necrotic area. This was done by inserting a 2.5-millimeter-thick guide wire 2.5 centimeters below the greater trochanter and using an image to guide the wire to the necrotic area in the femoral head. Next, we injected stem cell precipitate into the affected area using a disposable 20 ml syringe with a large nozzle. The patient was then shifted to a semi-lateral position to minimize the risk of stem cell leaking due to gravity. Additionally, a little local bone wax prevented the implanted stem cells from leaking. After excellent hemostasis, we did not insert a drain; we closed the wound in layers, provided wound dressing, and did not require traction. Blood transfusions were not necessary unless two patients underwent simultaneous hip surgeries on the ward. We attempted to adhere strictly to operator regulations and the proper method, even if there was no CD34 or flow cytometer available to evaluate the quantity and viability of stem cells. Further information: We assessed the patients two weeks, one, four, and six months after the operation, or as required. At 4 months after the operation, patients reported their pain, function, and activities using the Modified Harris Hip score as a guide. • First day post-op X-ray (to rule out fractures and assess medicoligal) and 1, 4, 12, and 18 months post-op X-rays were performed. The purpose of the magnetic resonance imaging (MRI) scan at 4 months was to determine whether the disease had progressed or stayed the same. • After five days of intravenous antibiotics (ceftriaxone 1 g), the patient switched to oral antibiotics (cefixime, lincocin, and augmentin) for ten more days. After five days, the patient was sent home with workout instructions and told not to bear any weight for two to four weeks. Only then may they begin to use crutches. • After 10 to 14 days, the wound was examined once more, and the sutures were removed. • After 6 to 8 weeks, the horse began to bear its full weight. • Patients should consult the orthopedic department at any time in the event of complications.

Clinical and Radiographic Evaluation

Patients were evaluated preoperatively, and four months postoperatively, or whenever necessary for Pain, gait, and Functional activities, and were rated accordinto the score suggested by Modified Harris Hip Score92,93 , where a score scale ranging from 0 to 100 is attributed to those parameters. Hip function was rated according to the MHHS, as:

Excellent (91- 100 points),

Good (81 - 90 points),

Moderate (70 - 80 points), And poor (< 70 points).

Modified Harris Hip Score [92,93] .

Marked, serious limitations (10 points)

Totally disabled (0 points)

Function: Gait

Limp

None (11 points)

Slight (8 points)

Moderate (5 points)

Severe (0 points)

Unable to walk (0 points)

Support

None (11 points)

Cane, long walks (7 points)

Cane, full time (5 points)

Crutch (4 points)

2 canes (2 points)

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2 crutches (1 points)
Unable to walk (0 points)

Distance Walked
Unlimited (11 points)
6 blocks (8 points)
2-3 blocks (5 points)
Indoors only (2 points)
Bed and chair (0 points)
Funct

Pain:
None/ignores (44points)
Slight, occasional, no compromise in activity (40 points)
Mild, no effect on ordinary activity, pain after activity, uses aspirin (30 points)
Moderate, tolerable, makes concessions, occasional codeine (20 points)
ional Activities:
Stairs
Normally (4 points)
Normally with banister (2 points)
Any method (1 points)
Not able (0 points)

Socks/Shoes
With ease (4 points)
With difficulty (2 points)
Unable (0 points)

Sitting
Any chair, 1 hour (5 points)
High chair, ½ hour (3 points)
Unable to sit, ½ hour, any chair (0 points)

Public Transportation
Able to enter public transportation (1 points)

Unable to use public transportation (0 points)

Total number was multiplied by corrective factor 1.1 to get the total score.

Figure(15):Patient with AVN in the theater

Figure(16):Patient on the operative table SCD suffering of

Figure(17):Site of intrance of(Jamshidi needle) into iliac crest.

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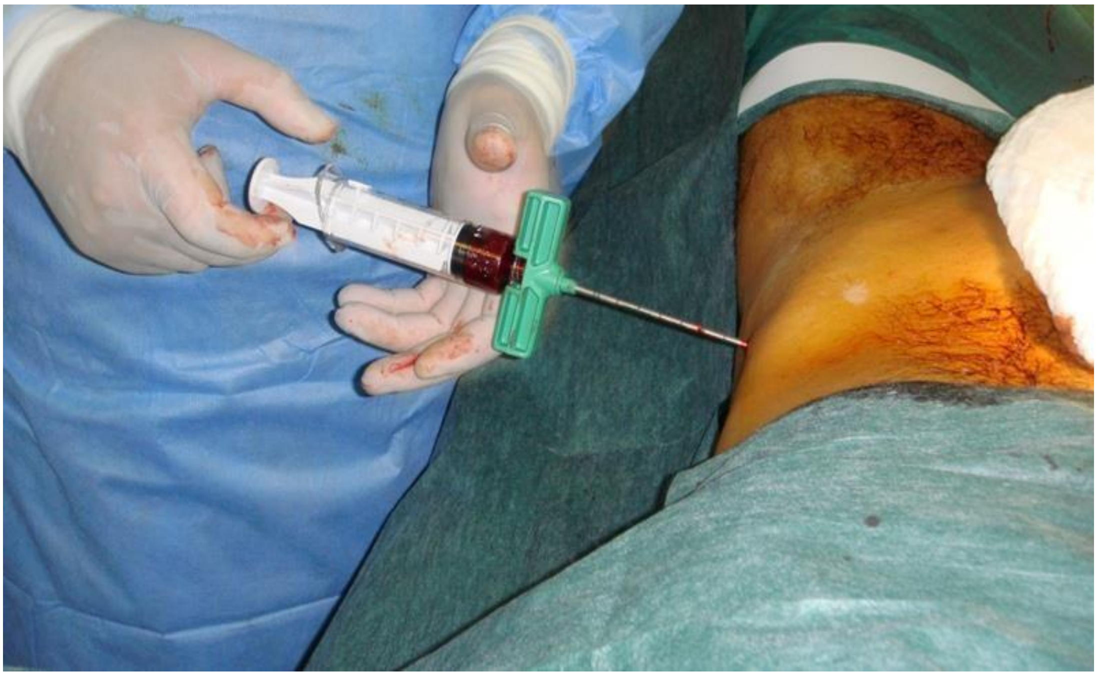


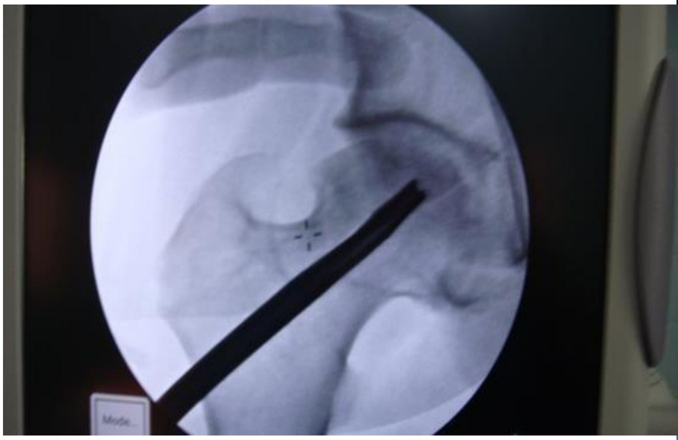
Figure(18):Bone marrow aspiration From iliac crest with (Jamshidi needle) .

Figure (19):Collection of bone marrow aspirate in aplastic bag containing anticoagulant.

Figure (20): Cinterfuge system used to collect the stem cells.

Figure(21):Through Hardinge approach used to drill the femoral neck and head to reach the necrotic zone.

Figure(22):Under fluoroscope control,drilling was done and guide wire was inserted.



Figure(23):Image shows the drill of 8mm was reached to necrotic zone under fluoroscope control.

Figure(24):Aspiration of The precipitate of stem cells.

Figure(25):Injection of the stem cells aspirate into the necrotic area in femoral head.

Statistical Analysis

The statistical analysis was carried out using the SPSS and Microsoft Excel programs to assess the success of the surgical treatment and the outcome of avascular necrosis of the femoral head treated with core decompression and stem cells. A result was deemed significant if the P value was less than 0.05 and highly significant if the P value was not statistically significant if the P value exceeds 0.01 and not significant if it is less than 0.04 or 0.05.

Results :

This study investigated eighteen patients with stage I, II, or III AVM of the femoral head, involving a total of twenty-two hips. Out of all the patients who underwent surgery, the follow-up period went smoothly. Only two patients experienced complications: one had a superficial wound infection during skin suture removal, which responded well to oral antibiotics and daily dressing, and another had a broken guide wire inside the affected femoral head during the operation. Fortunately, this did not impede the free movement of the hip joint, which was examined under the fluoroscope at the time. Concerning the effects of the anesthesia and operation on the patient's oxygen saturation, pulse, blood pressure, severe bleeding, bone fracture, and other complications, no patient exhibited any major alterations or problems. The average procedure time was 1.5 h (1 – 2h) for unilateral hip (stage one(the bone marrow aspiration from iliac crest and centrifugation) take about 45 minutes divided to 15 minutes bone marrow aspiration ,15 minutes for 60 ml centrifugation ,and other 15 minutes for centrifugation of the second 60 ml of bone marrow aspirate, and stage two(the bone core decompression and injection of stem cells) take around 30 minutes), and around 2h for bilateral hips(this is divided into around 1.5 h as for unilateral with other 30 minutes for preparation of the contralateral hip where during the same time the centrifugation of other fraction of bone marrow aspirate is prepared(the time consumed for the contralateral hip is reduced because we utilizes the time during closure of the first affected si It took about an hour after bone marrow was collected to infuse the BMAC fraction. Nobody experienced any kind of infection, discharge from the sinuses, bruising, or persistent pain at the injection site. Furthermore, due to a shortage of kits, all patients with bilateral hip involvement by A.V.N. were processed in a single session.

Age distribution:

Distribution o: Most cases of AVN in this investigation occurred in late childhood, between the ages of 15 and 25, according to the patient distribution by age group (table 1).

Table. 1 distribution of patients according to age:

Age(year)	Number	Percentage
15-25	10	55.55%
26-35	5	27.78%
36-45	3	16.6%
Total	18	99.93%

2.2.1. Sex distribution:

The operation was conducted on females more than males, as shown in (table 2).

Table.2. Distribution of patients according to sex:

Sex	Number	Percentage
Male	7	38.89%
Female	11	61.11%
Total	18	100%

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2.2.2. Presenting symptoms:

The eighteen patients (100%) presented by hip pain followed by limitation of movement in fifteen patients (83.33%) and limping in thirteen patients (72.22%) as shown in (table 3).This indicate that pain is the most predicted symptom.

Table.3.Distribution of patient according to presenting illness:

presenting illness	Number	Percentage
Pain	18	100%
LOM	15	83.33%
Limping(Gait)	13	72.22%

2.2.3. Side affected:

Four hips (22.22%) had bilateral involvement with AVN and the remaining 14 patients (77.78%) have unilateral hip involvement on presentation, mostly the right side. This indicate that most affected side was the dominant side, (as all patients were right handed) as shown in (table 4).

***Table.4.* Patients distribution according to the affected hip(s) on presentation:**

Hip(s)	Number of patient	Percentage
Right	9	50%
Left	5	27.78%
Bilateral	4	22.22%
Total	18	100%

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2.2.4. Medication was received:

Also patients were classified into two groups :

Group A :patients were on regular visit to thalassemia center ,and were kept on medication and blood transfusion as needed.

Group B :patients who were visiting other medical center on demand (not regular medication ,neither received blood transfusion)

Table 5. Distribution of patients according to their medical consultation:

Group of patients	Number of patients	Percentage
Group A	13	72.22%
Group B	5	27.78%
Total	18	100%

2.2.5. Duration of illness:

Most patients; 9(50.0%) were presented within two years, Of complaint , followed by five patients (27.78%) presented within three years, then three patients (16.67%)within one year ,and one patient (5.55%) within 4 years, while 4 patients were affected bilaterally although one side was asymptomatic, this gives a hint to screen for the sound hip as it may be involved by the disease, as shown in (table.6).

Table.6.Distribution of disease stage (Ficat&Arlet) according to the duration of complains before presentation.

Duration(year)	Stage I	Stage II	Stage III	Total number	Percentage %
Accidentally diagnosed	4			4	22.22%
1 year	1	2		3	16.67%
2 years		9		9	50%
3years		2	3	5	27.78%
4 years			1	1	5.55%

2.2.6. Modified Hip harris score:

The M.H.H.S pre operatively and postoperatively questionnaire in SCD patients, the follow up period was 4 month post operatively, as shown in (table 7):

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Table (7): Pre- and postoperative scores with the Modified Harris Hip questionnaire in SCD patients.

No.of hip	Pre-operative score	Post-operative score
1	**95.7**	**100.1**
2	**92.4**	**100.1**
3	**91.3**	**95.7**
4	**88**	**95.7**
5	**86.9**	**96.8**
6	**85.8**	**96.8**
7	**83.6**	**95.7**
8	**81.4**	**91**
9	**79.2**	**93.5**
10	**78.1**	**92.4**
11	**75.9**	**95.7**
12	**75.9**	**93.5**
13	**74.8**	**95.7**
14	**74.8**	**90.2**
15	**71.5**	**91.3**
16	**71.5**	**89.1**
17	**70.4**	**89.1**
18	66	77
19	63.8	79.2
20	**59.4**	**69.3**
21	**57.2**	**59.4**
22	**52.8**	**52.8**

Patients were rated preoperatively and postoperatively according to M.H.H.S., best results were gained with excellent, good and moderate scores. As shown in table (8):

Table (8) Patients were rated according to M.H.H.S.

MHHScore	Pre-operative	Post-operative
Excellent	3	15
Good	5	2
Moderate	8	2
Poor	6	3
Total hips	22	22

2.2.7. Radiological staging:

According to Ficat and Arlet staging system[26] five hips (22.72%) presented with stage (I), thirteen hips (59.1%) presented with stage (II), and four hips (18.18%) Presented with stage (III), as shown in (table9).

Table (9): Distribution of patients according to Ficat and Arlet staging system[26] :(preoperatively and postoperatively)

A. Preoperatively: **B. postoperatively:**

Stage (Ficat)	Number of hips	Percentage	Stage (Ficat)	Number of hips	Percentage
I	5	22.72%	*I*	5	22.72%
II	13	59.1%	*II*	13	59.1%
III	4	18.18%	*III*	2	9.09%
IV	0	0%	*IV*	2	9.09%
Total	22	100%	*Total*	22	100%

Despite the small sample size, these results show that hip functions were restored favorably, discomfort was reduced, and quality of daily activities was enhanced. In the first four months after surgery, 20% of patients reported moderate or minimal restrictions on daily activities, and 80% of patients said they were satisfied with stopping frequent use of analgesic medication and just using paracetamol on occasion for exertional activities.

Discussion

Enquiry Cell treatment for avascular necrosis of the femoral head in sickle cell disease patients was the subject of the first ever clinical trial in Basra, Iraq. Evaluating the procedure's practicability, efficacy, and safety was the primary goal. This study selected SCD as the etiology of AVN and treated it accordingly. 2. Bone involvement is the most common sign of SCD, both in short-term situations (like painful vasoocclusive crises) and as a cause of long-term, worsening disability (like avascular necrosis in teens). 1. The prevalence of SCD is high, reaching up to 16% of the population in the southern region of Iraq (33). 13 This could potentially affect as many as 50% of these individuals, a statistic that aligns with the higher rate of complications in younger patients. 9. Once osteonecrosis has progressed, it will continue to worsen at an alarming rate; nevertheless, all measures to slow the so-called rate of development of collapse [98] must be vigorously pursued. The challenge, therefore, is to administer the correct treatment to prevent the subchondral bone from collapsing even further, which can lead to secondary arthrosis and, in as many as 70% of cases, an early need for a complete hip replacement.[12]. Up to half of SCD patients experience poor outcomes 5–10 years following arthroplasty, on top of the fact that it is an invasive treatment with high morbidity-mortality rates. It has been found that a large percentage of patients with SCD11 experience pain and considerable limitations on their range of motion after undergoing complete hip arthroplasties. Additionally, the failure rate and ineffectiveness of these procedures are even higher in this patient population. In light of these results, the study's authors suggest a stem cell implant-related surgery to treat early-stage femoral osteoarthritis (O.N.). This could slow or stop the disease's progression, ease joint pain and other symptoms, and even repair damaged tissues. The patients in this study showed no signs of disease progression during the follow-up period. In this trial, we used core decompression and stem cells to treat eighteen individuals, twenty-two of whom had impacted hips. Four patients had bilateral effects, while fourteen had unilateral effects. No significant or less severe problems such as hypotension, decreased oxygen saturation, altered pulse rate, or reactivity to any cause were recorded during the perioperative period of the procedure. Fortunately, no one required a blood transfusion, experienced an intertrochanteric fracture, or developed pulmonary embolism or deep vein thrombosis (DVT) after the procedure. Two of the three patients had broken guide wires in their hip joints, which the operating room studied using a fluoroscope. Additionally, one patient developed a superficial skin infection after having their sutures removed but responded well to oral antibiotics, and wound healing proceeded well. This study is comparable to APilot Studies 103, 105, and 107 in that it includes patients aged 15–45 (mean 30). Furthermore, see the work of Rajiv Gandhi (16) and Hernigou (17). Only 22.22% were affected on both sides; the rest were affected unilaterally; 50% of those afflicted were on the right side, while 27.78% were on the left. The most common presenting symptoms were pain in 100%, loss of motion in 83.33%, and limping in 72.22%. In this study, 22.72% were in stage I, 59.1% were in stage II, 18.18% were in stage III, and 0% were in stage IV, according to the Ficat and Arlet staging method (23). All patients in this study had their anterior iliac crest aspirate stem cells extracted and centrifuged in a Harvest system. The Hardinge approach was used, which involved cutting along the side of the greater trochanter of the hurt femoral head with an

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8mm electric drill that was guided by a fluoroscope image. After injecting the collected stem cells into the necrotic zone of the afflicted femoral head, the treatment concluded with layer closure. In the preoperative examination, the majority of patients reported moderate to severe pain, gait limitation, and functional limitations in activities. However, in the four months following surgery, they reported a decrease or elimination of pain and an improvement in functional activities. The average Modified Harris Hip Score (SD=11.632) before surgery was 76.2% according to the survey. With a standard deviation of 12.828, the average linked score after four months was 88.18%. Results on the questionnaire were noticeably better at the It is significantly significant in the postoperative term ($p<0.0001$ - paired t-test). In comparison to the outcomes of the clinical examination, the results of the MRI and radiological tests were less significant. Hip pathology has been found to be statistically stable at X-ray and MRI in patients with favorable and significant clinical evolution; there has been no worsening or reduction of lesion size. The only exception to the rule is two patients with stage three Ficat and Arlet staging system, who showed collapse of the femoral head on X-ray (stage IV) and MRI after one year of follow-up. The small sample size and the brief duration of follow-up after surgery possibly explain the lack of a statistically significant link between postoperative clinical findings and the Modified Harris Hip score, as well as radiologic and MRI findings. The conclusion is backed by the following: "X-ray evidence of the femoral bone tissue regeneration is expected from the 12th postoperative month on, and the bone structure stabilization must be followed up over many years" (Daltro et al., 2008, p. 18). Other studies supported the results of this one. For example, Gangji et al. (2004) found that "implantation of bone marrow cells decreased the pain and other joint symptoms caused by the O.N. and delayed the progression of the disease to the point of subchondral fracture (stage III) during the twenty-four-month follow-up period"19. And Yan et al. (2006)110 looked into whether the procedure was possible, how well it worked, and whether it was safe. Findings from this study show how important it is to stop or delay femoral head collapse and early surgical procedures like arthroplasty as key success factors for this procedure with cell therapy in SCD patients presenting with O.N.F.H., especially in the early stages (Ficat and Arlet staging system 23 (I, II/III)). Despite the limited number of patients and short follow-up period, the results of this enhanced way of treating avascular necrosis on SCD patients are promising.

Conclusion:

1. While postoperative radiographic and MRI studies do not reveal significant changes in the necrotic area, the majority of patients report reduced discomfort or no pain at all, along with improvements in their gait and functional abilities. 2. This approach shows promise for future successful orthopedic procedures in terms of practicality, efficiency, and safety.

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Recommendation:

1. SCD patients require extra care by learning about the risk factors for crisis and future bone infarction, the advantages of frequent visits to specialist centers, and the necessity of blood transfusions. 2. To limit progression and reduce consequences, early diagnosis of AVN is crucial, especially in patients with SCD (e.g., in the early stage or in the contralateral o.n. of an asymptomatic femoral head). 3. Further in-depth research. 4. An increased quantity of kits is required. 5. A flow cytometer and CD34 materials are required.

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