International Journal of Orthopaedics Sciences

E-ISSN: 2395-1958
P-ISSN: 2706-6630
IJOS 2023; 9(1): 324-327

https://www.orthopaper.com
Received: 18-10-2022
Accepted: 24-12-2022

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Multiple hole drilling in osteonecrosis of femoral head-promising and better method of core decompression in Asian population

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DOI: https://doi.org/10.22271/ortho.2023.v9.i1e.3314

Abstract
Introduction: Core decompression of femoral head has been one of the best option for delaying the need for Total Hip Replacement in cases of osteonecrosis of femoral head. It is also the best treatment option in earliest pre-collapse stages of disease. Techniques have been combined with several other adjunctive treatment modalities such as bone grafting and the addition of growth and differentiation factors [7]. Our case series describes the multiple hole drilling in osteonecrosis of femoral head.
Materials and Methods: Our series include 46 patients (64 hips), who were diagnosed with osteonecrosis of femoral head of various aetiology. We improvised the conventional decompression technique which usually requires 8mm Michele trephine and DHS reamer with patient in fracture table. In our method, the patient was positioned in supine without need of any fracture table and small incision of less than 1cm was made in lateral aspect of thigh. We used only a single 3.5 mm drill bit and 3-4 holes were drilled into the femoral head under C-arm guidance. We didn't use any adjunctive. Patients were allowed for partial weight bearing mobilisation with walker assistance for the first month and without any support thereafter.
Results: Our case series includes totally 46 patients (64 hips) of Ficat stage I, II and III of osteonecrosis of femoral head. We had a follow up of two years. Patients who were symptomatic and showing oedema in femoral head had better results. Harris hip score was used for assessment. Post operatively patients showed improvement clinically. Only one patient required Total Hip Replacement later. None of the cases reported any perioperative fracture.
Conclusion: Core decompression has been evolved the most reliable treatment for osteonecrosis of femoral head, especially for the early stages of necrosis. We have improvised the technique and made it quite simpler, less invasive, safer, and time saving and resulted in less morbidity, comparing to the conventional method of single coring, with better outcome and promising results. Also, considering the narrow width of Asian necks, multiple drill hole technique is more ideal option, as it eliminates the risk of fracture and other risks of single coring technique, and being cost effective too. Thus, multiple hole drilling is the best method of core decompression of femoral head, especially in Asian population.

Keywords: Osteonecrosis, femoral head, post COVID, core decompression, drill bit

Introduction
Osteonecrosis of femoral head (ONFH) or avascular necrosis (AVN) is a common an orthopaedic condition across the world [1]. Especially there is a drastic increase in the incidence post COVID. In ONFH, blood supply to the head of femur is interrupted and consequently leading to aseptic necrosis. The dead bone loses its strength and deforms under the weight of the body, and flattens. As the deformity in femoral head progress, it leads to wear in the acetabulum leading to secondary arthritis of the hip. Major underlying causes of the disease are using steroids, scuba diving disease, some drugs and trauma to the joint [2, 3] and post COVID. Patient's chief complaint is pain in the hip, which is felt mostly in front of the joint and in the groin. Slowly the joint has limited motion, and after a while the patient's hip becomes stiff. As femoral head deforms, its height reduces and the lower limb shortens. In chronic cases, hip and thigh muscles weaken and goes for atrophy [4]. Treating this disease depends on its severity (stage of the disease) and the extent of the involvement.
The more advanced the disease, the more extensive the intervention.

In advanced cases, where both femoral head and acetabulum are destroyed, we have no choice but to go total joint replacement or freezing the joint [5].

If the progress of the disease is stopped, femoral head and hip joint can be saved. To do so, core decompression is the only choice. If the disease is discovered at an early stage, and femoral head is not deformed, with surgical procedures we could resume the blood supply to it and prevent the progression of the disease. The most commonly done surgery is the decompression of femoral head. Core decompression reduces the pressure inside the bone, and thus enhances the vascularity as reduction of internal pressure opens up the capillaries and supplies more blood [6].

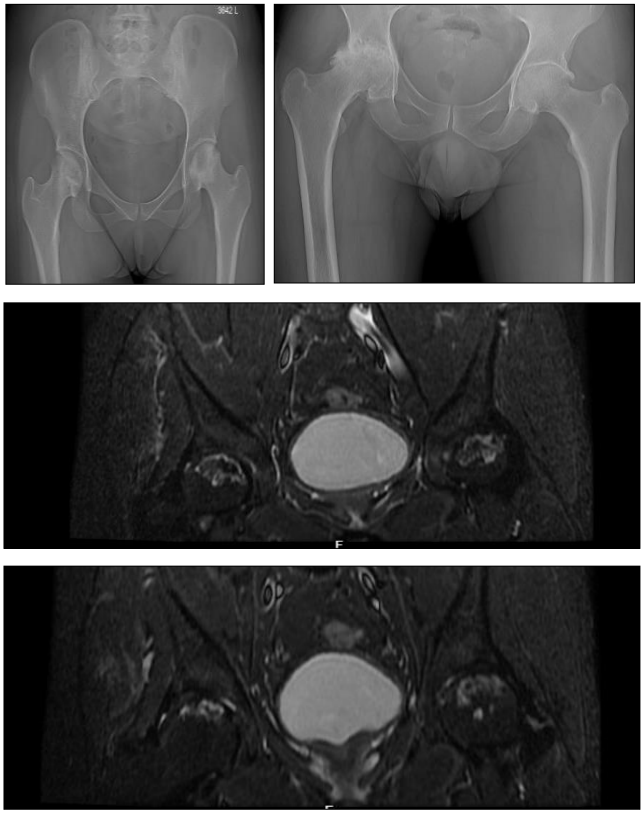

Fig 1: X-ray and MRI images showing AVN changes of hip

Materials and Methods

Patients were interviewed and examined, and pre-operatively X-ray and MRI was taken. Furthermore, the severity of pain and range of motion of hip joint was recorded. Patients received general or spinal anaesthesia and patient was positioned in supine. Fracture table is not used in our method. Standard lateral and proximal hip incision is made on the affected side. Incision size was of about 1cm. A 3.5mm drill bit is passed in and checked under fluoroscopy. For lateral view just figure of 4 position of the leg is done. Once the direction is confirmed, multiple drill holes were made, which aimed the sclerosed affected area. The necrosed area even in the periphery of the femoral head can be reached without breaching the cortex. On an average, 3-4 drill holes were made. Then, the patient was discharged on the same day or the next day. Partial weight bearing mobilisation with walker was advised for the patients from day 1. Follow up was done at 3,6 and 12 months after surgery and final assessment of motion range, return to work, and severity of pain in thigh was performed. Standard lateral and AP X-ray were taken at 6 and 12 months to evaluate patient's radiological improvement. Harris hip score was assessed at pre and post operatively.

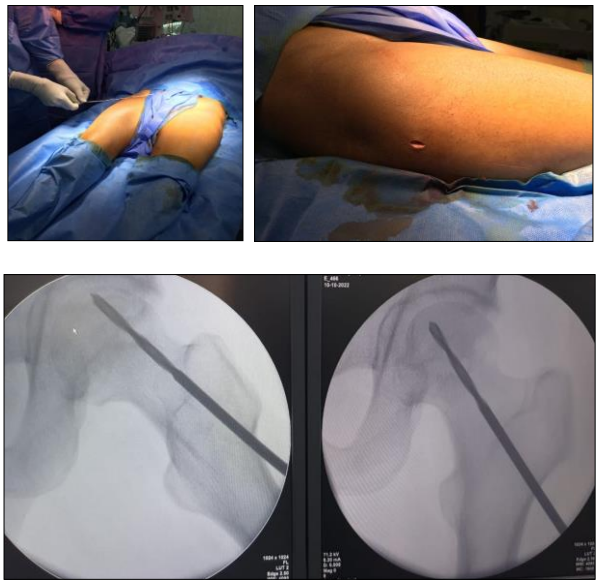

Fig 2: Intra op patient positioning (without need for fracture table), incision size, c-arm images lateral and AP views with drill bit

Results

Our case series includes totally 46 patients (64 hips) of Ficat stage I, II and III of osteonecrosis of femoral head out of which 16, 42 and 6 patients belongs to Ficat stage I, II and III respectively. The aetiology was found to be corticosteroids treatment in 26 patients (22 for COVID, 2 for bronchial asthma and 2 for bell's palsy), 6 patients had blood dyscrasias (5 had sickle cell anaemia and 1 had TTP), 2 patients had chronic kidney disease, 2 post renal transplant patients who were on immunosuppressants and 2 HIV positive patient and rest 8 patients were found to be idiopathic.

We had a follow up of totally 12 months. Patients who were symptomatic and showing oedema in femoral head had better results. Post operatively all patients showed improvement clinically. There was a significant improvement in the Harris Hip score pre and post operatively.

Only three patient required Total Hip Replacement later. None of the cases had need for blood transfusion and none of the cases reported any perioperative fracture.

Fig 3: Post-operative full ROM in our patient and his follow up X-ray showing drill hole tracts in femoral head.

Discussion

The surgical interventions in osteonecrosis of femoral head

have to be planned with the intention of preserving the joint and keeping in mind the future surgeries required. Wang *et al.*, [7] have shown short-term effect of increased femoral-head blood flow due to core decompression in the rabbit model. The results of his study showed that the decrease in femoral head blood flow due to prolonged steroid therapy was reversed by core decompression. Femoral head perfusion can return to a normal or slightly elevated state, four weeks after treatment. Core decompression is expected to relieve the pain and to allow creeping substitution to the necrotic area by bringing the blood supply through the drill channels.

The conventional method of core decompression involves the use of an 8 mm Michele trephine and DHS reamer inserted under fluoroscopic guidance to penetrate the lesion. Complications can occur with multiple drillings with the use of these large-diameter trephines which can weaken the femoral head or when the trephine penetrates the femoral head, can injure the articular cartilage, and enter the joint space [8]. In addition, if the core tract is started in the subtrochanteric or diaphyseal area, rather than entering through the metaphyseal region of the proximal femur, the stress risers created can lead to a subtrochanteric fracture [9].

Fig 4: Decoring with 8mm DHS reamer

Multiple drilling with 3.5mm long drill bit, there is no chance of intraoperative fracture. In our series, fracture was never reported either intra/post operatively. Thus, there is no fracture risk in our technique.

When the pressure in the femoral head is completely relieved, patient had a drastic improvement with the symptoms. Thus, the symptomatic patients and patients with oedema in femoral head are more beneficial and immediate relief with the core decompression.

In the conventional methods, only the central decoring was done and thus if the necrosed area is in the periphery of the head, its just left alone. Necrosis is common on the superolateral quadrant of head and central decoring doesn't decompresses that area and there won't be any creeping substitution in that area. This doesn't completely relieve the symptoms and there is a risk of progression of the disease. But with our technique we can reach even the superolateral quadrant and the other peripheral parts of the head too without any risk of fracture and thus the necrosed area is completely decompressed. This allows the creeping substitution to all parts of the femoral head. Thus, our technique ensures symptomatic relief, complete recovery and less chance of progression.

Patients were allowed for partial weight bearing mobilisation with assistance of walker from the very next day for the initial month. After a month, patients were asked for full weight bearing mobilisation. With our technique, recovery is fast and the absence from work is much less comparing to the conventional techniques.

Intra operatively our technique assured very less working time and therefore less bleeding. There is no need of any fracture table and patient can be positioned supine on the table. Thus for bilateral hips, multiple drilling is more convenient considering the easy procedure, minimal bleeding and rehabilitation too.

With ONFH being a common incidence in blood dyscrasias, multiple drilling would be safer and ideal considering the minimal bleeding with our method.

The average width of the neck of femur in Asians is 3.099 cms which is less compared to the western population. The conventional method uses DHS reamer which has larger diameter (8 mm). Thus, while reaming with DHS reamer, the cortex can get breached intra operatively and making multiple drill holes in head with DHS reamer makes it weaker, thus there is risk of collapse of the head and patient has to be allowed for full weight bearing mobilisation only after long period. But with 3.5 mm drill bit, there no risk of fracture and early mobilisation can be allowed. Thus, the multiple drill holes with 3.5 mm drill bit is more safer than performing single coring with DHS reamer, especially in Asian population who has narrow neck than western population.

We did not use any adjunctive techniques such as BMAC, Bone grafts/plug or calcium pellets which are all widely used after core decompression. We reproduced the comparable outcome with our techniques, without need of any adjunctive, which are costly and time consuming as well.

Conclusion

Considering the above mentioned advantages, being the simpler, less invasive, cost effective, lesser operating time, safer method with less risks and faster recovery with better outcomes, multiple hole drilling should be considered the method of choice of core decompression for early osteonecrosis of femoral head comparing to that of single coring method of core decompression, especially in Asian population.

Conflict of Interest

Not available

Financial Support

Not available

References

1. Garino JP, Steinberg MA. Total Hip Arthroplasty In Patients With Avascular Necrosis Of Femoral Head. A 2 To 10 Years Follow Up. Clin Orthop Relat Res. 1997;334:108-15.
2. Koo SH, Song HR, Yang JW, Yang P, Kim JR, Kim YM. Trochanteric Rotational Osteotomy For Osteonecrosis Of Femoral Head. J Bone Joint Surg. 2001;83B:83-9.
3. Learmonth ID, Maloon S, Dall G. Core Decompression For Early Atraumatic Osteonecrosis Of Femoral Head. J Bone Joint Surg. 1990;72B:78-90.
4. Steinberg ME, Larcon PG, Strafford B, Hosick WB, Corces A, Bands RE, *et al*. Core Decompression with Bone Grafting For Osteonecrosis Of Femoral Head. Clin Orthop Relat Res. 2001;386:71-8.
5. Gangji V, Hauseur JP, Matos C, De Maertelaer V, Toungouz M, Lambermont M. Treatment of Osteonecrosis Of Femoral Head With Implantation Of Autologous Bone-Marrow Cells. J Bone Joint Surg. 2004;86-A:1153-60.

6. Dr Sankara Rao Pinnamaneni, Dr. Veera Reddy Gunda. Core Decompression in Avascular Necrosis of Femoral Head – Single Drill Vs Multiple Drills: A Prospective Study. IOSR-JDMS. 2016;15:36-9.
7. Wang GJ, Dughman SS, Reger SI, Stamp WG. The Effect of Core Decompression On Femoral Head Blood Flow in Steroid Induced Avascular Necrosis Of The Femoral Head. J Bone Joint Surg Am. 1985;67:121-4.
8. Hougaard K, Kuur E. Femoral Head Avascular Necrosis: MR Imaging with Clinical-Pathologic and 99mtc-SN-Pyrophosphate Scanning. Injury. 1988;19:389-92.
9. Kim SY, Kim DH, Park IH. Multiple Drilling Compared with Core Decompression For The Treatment Of Osteonecrosis Of The Femoral Head. J Bone Joint Surg Br. 2004;86:149.

How to Cite This Article
Sudarsana GN, Mahesh SR, Sagar TP, Mallinath G. Multiple hole drilling in osteonecrosis of femoral head- promising and better method of core decompression in Asian population. International Journal of Orthopaedics Sciences 2023; 9(1): 324-327.