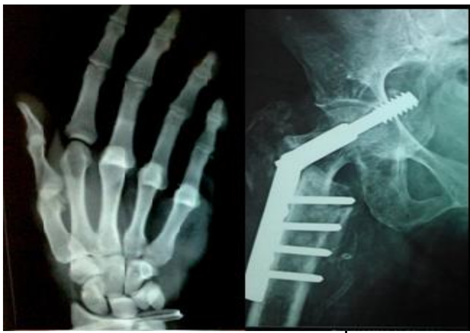

International Journal of Orthopaedics Sciences

E-ISSN: 2395-1958
P-ISSN: 2706-6630
IJOS 2022; 8(4): 170-174

www.orthopaper.com
Received: 14-08-2022
Accepted: 15-09-2022

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A rare case of spontaneous osteonecrosis of knee (SONK) treated with osteochondral autologous transfer system (OATS)

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DOI: https://doi.org/10.22271/ortho.2022.v8.i4c.3257

Abstract
A 34 years old male presented with spontaneous onset of progressive left knee pain since 4 weeks which aggravated on strenuous activities with no history of trauma, steroids or alcohol intake. Local tenderness was elicited over joint line with normal xrays and MRI revealed diffuse subchondral oedema with crescent sign hypointense on T1 and hyperintense on T2 weighted images. Diagnosis of spontaneous osteonecrosis of knee (SONK) was made. He was initially managed conservatively with analgesics and calcium supplements with no improvement. So osteochondral autologous transfer system (OATS) surgery was performed. Patient reported dramatic improvement.

Keywords: SONK, OATS, osteochondral defect, osteochondral autologous transfer, spontaneous osteonecrosis of knee.

Introduction
In 1968, Spontaneous Osteonecrosis of the Knee (SONK) was first described by Ahlbäck *et al*. [1]. Initially, the condition manifests as suddenly occurring atraumatic knee pain, with a typically unilateral involvement of the medial femoral condyle (around 90%) [2]. Females, particularly those aged 60 years or older, are affected three times more frequently than men [3]. Osteochondral Autologous Transfer System (OATS) is an emerging treatment modality for SONK either singly or with some other surgical procedure.

Case Report
A 34 years old male with complain of sudden onset progressive pain and swelling over left knee since 4 weeks which aggravated on exertion without any history of trauma or any other comorbidities. Physical examination showed joint line tenderness. Radiography was normal. MRI showed hypointense line on T1W and 'double line' on PD image with 'crescent sign' on PDFS due to subchondral fracture with separated osteochondral fragments of lateral femoral condyle causing mild irregularity of articular surface. Horizontal Full thickness tear of posterior horn and body of lateral meniscus [Fig-1a-4a].
Initially patient was managed conservatively for 3 weeks but there was no improvement so OATS was considered for further management. Surgically lesion of the femoral condyle was exposed through sub-vastus arthrotomy, and debridement of damaged cartilage was performed. Osteochondral plugs (8 mm in diameter and 20 mm in depth) were harvested from minimal weight-bearing periphery of the femoral condyles at the level of the patellofemoral joint and transplanted to corresponding burr holes in the cartilage defect using Arthrex OATS system [Fig-5, 6].
Postoperatively rehabilitation program including isometric quadriceps exercise and range-of motion exercise was started the day after surgery. Isometric exercise of the quadriceps, gluteus, and hamstrings; active/passive knee full range-of-motion exercise; patella mobilization; and hamstrings and gastrocnemius-soleus stretches were continued. A non-weight-bearing regimen was prescribed for 4 weeks with knee brace, followed by partial weight-bearing exercise.

Full weight-bearing exercise was permitted 6 weeks postoperatively. Patient was able to walk without the use of a walking aid at around 10 weeks.

Patient was followed up at 2 weeks, 4 weeks, 2 months and 6 monthly for clinical and radiographic assessments. Clinical evaluation of outcome was done using the Knee Society Score (KSS). Pre-operative knee score was 60/90 and functional score was 50/100 which improved to 75/100 and 80/100 6 months postoperatively. MRI 6 months postoperatively showed acceptance of graft plugs indicated by subchondral healing and iso-density of graft to surrounding normal bone [Fig 1b-4b].

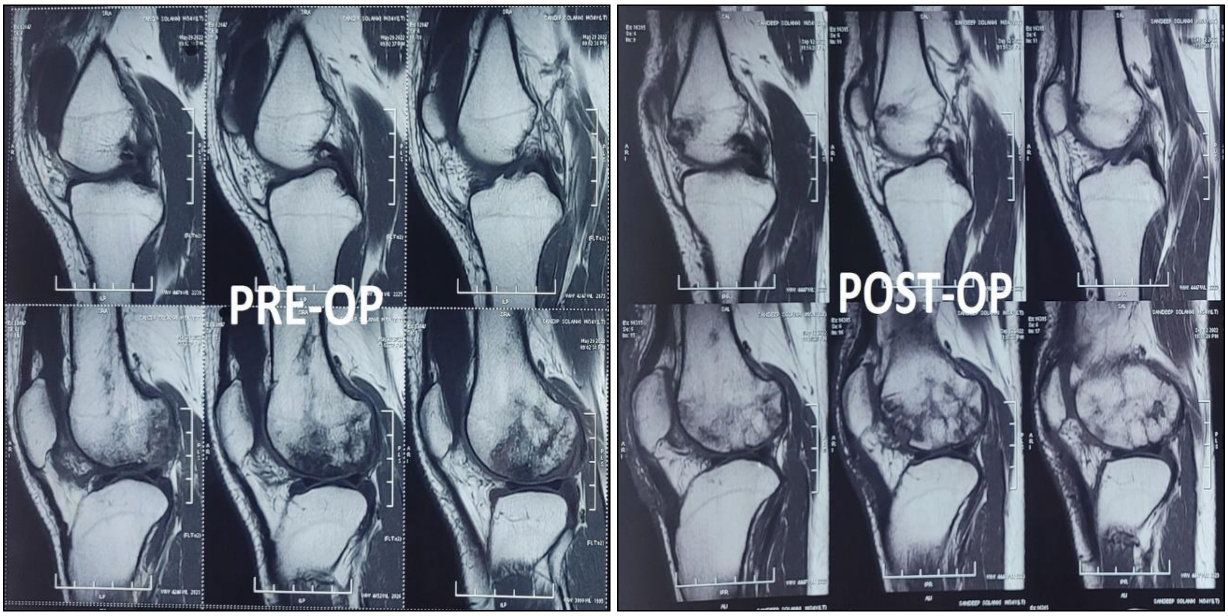

Fig 1 a, b: Image on the left (1a) shows T1 weighted sagittal MRI of preoperative left knee with 'crescent sign' due to subchondral fracture and radioluscency. Image on the right (1b) shows postoperative uptake of osteochondral plugs showing isolucency with the surrounding viable area.

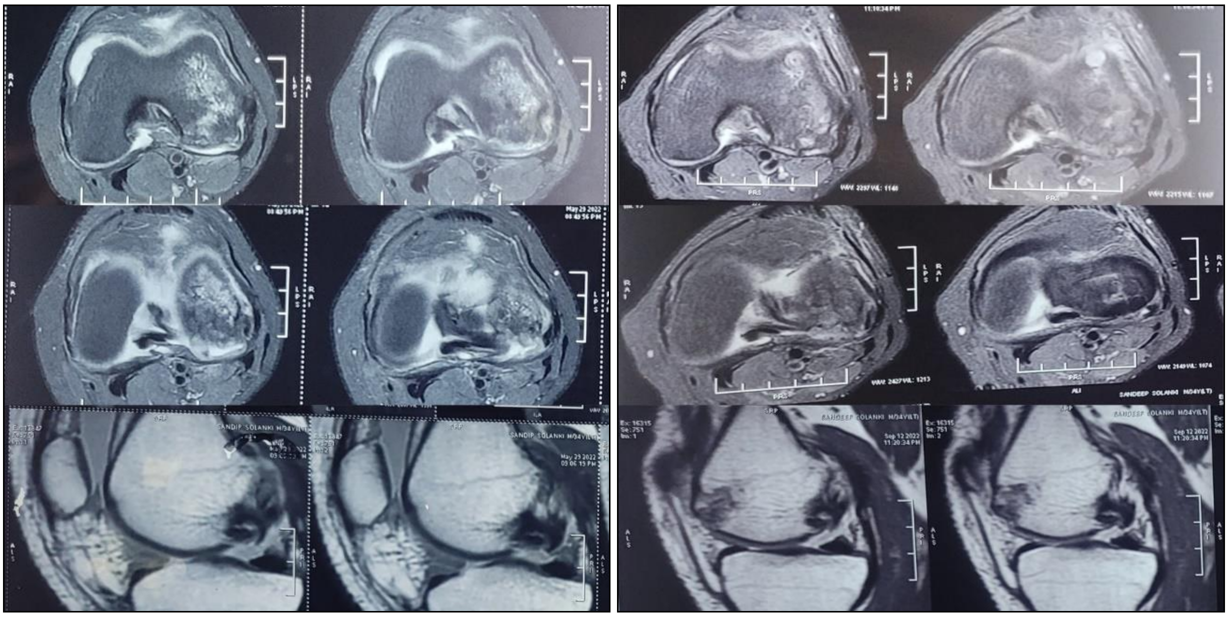

Fig 2 a, b: Image on the left (2a) transverse MRI section (preop) shows subchondral oedema and necrosis of the lateral femoral condyle. Image on the right (2b) shows postoperative uptake of recipient plugs and lower sagittal section section shows non weight bearing donor area.

Discussion

Osteonecrosis of the knee is often due to three separate conditions [4]:

i) Spontaneous Osteonecrosis of the Knee (SONK), usually affecting a single condyle in middle-aged or older females;
ii) Secondary Osteonecrosis from a known cause, such as corticosteroid treatment or sickle-cell anaemia, systemic disorders, alcoholism, Caisson disease, radiation trauma, chemotherapy more often affecting younger patients, with multifocal often both condyles and sometimes asymptomatic ''silent'' lesions;
iii) Post-Arthroscopy Osteonecrosis, characterized by increasing knee pain and positive magnetic resonance imaging (MRI) findings after arthroscopic surgery [5].

The aetiology of SONK remains unclear, it may be due to vascular injury and/or antecedent trauma [5–9]. The vascular theory supposes interference with the microcirculation to the subchondral bone of unknown cause, producing oedema in a non-expandable compartment. The resultant increased pressure in the bone marrow further diminishes the circulation and results in osseous ischemia and the low signal intensity of the marrow seen on the MR study. If the dead bone collapses, the typical radiographic appearance develops. If revascularization occurs before collapse, the lesion may heal, and the symptoms may resolve. Recent research supports the hypothesis that SONK occurs due to subchondral insufficiency fractures [7].

On Physical examination the most common finding is localized tenderness over the medial femoral condyle. Radiography initially may be negative, especially if the symptoms are of short duration, and the diagnosis is therefore often missed at this stage [2, 10]. With time, it shows characteristic half-moon-shaped sclerosis with a radiolucent centre adjacent to the joint surface [10], followed by a joint surface impression. MRI scan can diagnose SONK in the pre-radiographic stage. Findings include subchondral marrow edema, hypointense signal in subarticular marrow, flattening of subchondral bone plate, fluid filled cleft underlying subchondral bone plate. MRI may be used to monitor treatment.

The lesions can be classified into four stages according to Koshino's radiographic classification [9]:

Stage I: No abnormalities on radiographs.

Stage II: Radiolucent oval area in the subchondral region or flattening of the medial femoral condyle (MFC),

Stage III: Expansion of the radiolucent area with a sclerotic halo.

Stage IV: Secondary degenerative changes of osteophytes and osteosclerosis on both the tibial and femoral sides.

In stages 1 and 2, the treatment is conservative until the size of the lesion and its progression have been defined which may take as long as 6 months. Management consists of analgesics and protected weight bearing. Small lesions do well, although mildly symptomatic degenerative changes may slowly develop. Surgical treatment is required for later stages not responding to conservative management. Various surgical procedures including arthroscopic debridement, bone marrow stimulation with drilling or microfracture, core decompression, high tibial osteotomy (HTO), osteochondral autograft transplantation (OAT), osteochondral allograft transplantation, uni-compartmental knee arthroplasty, and total knee arthroplasty have been introduced for the treatment of SONK. Of these surgical options, the optimal one is selected on the basis of the pathological condition. OATS was considered appropriate management strategy in our patient.

Some of the complications of OATS include stiffness, donor site avascular necrosis or fracture, haemarthrosis, effusion, deep vein thrombosis, graft instability, infection and chronic pain.

Result and Conclusion

We had an extremely rare presentation of SONK in young male with lateral condyle involvement. OATS is an excellent treatment option for SONK with significant improvement in functional outcome and patient is able to walk without support and carry out daily activities. OATS can be an excellent treatment option for patients desiring joint preservation.

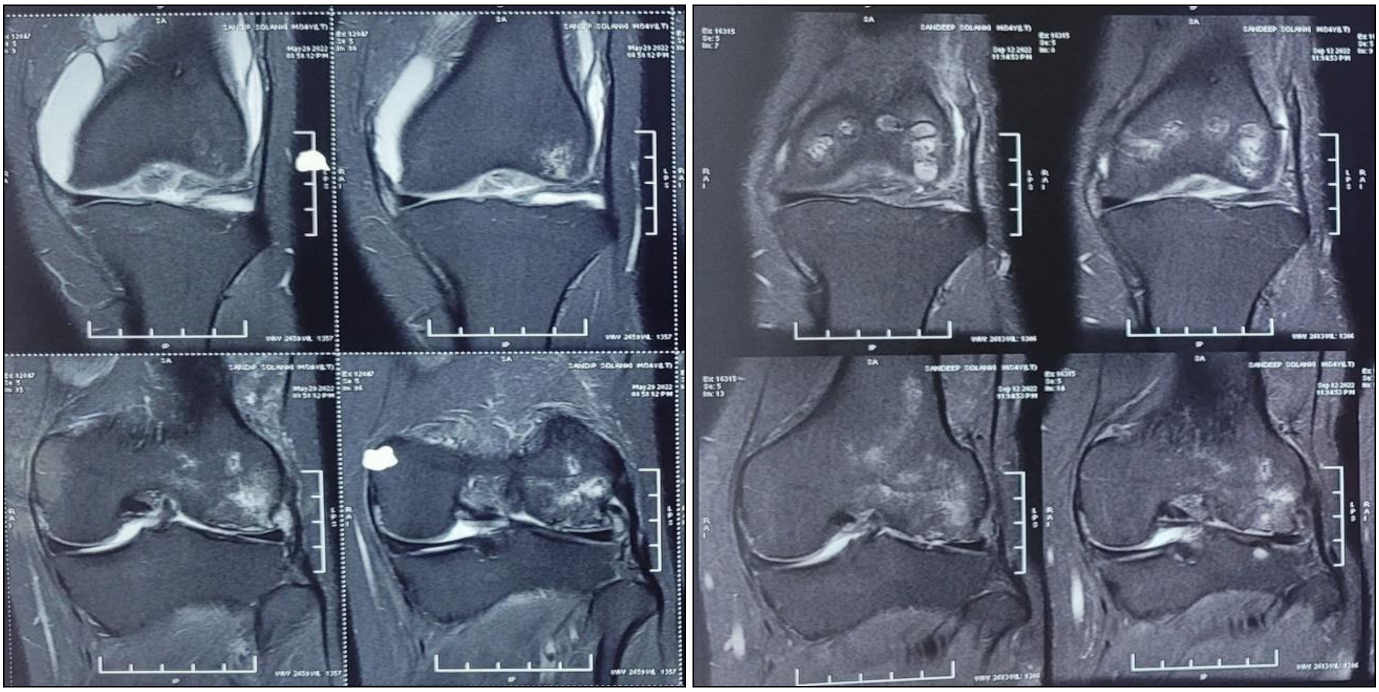

Fig 3 a, b: Image on the left (3a) shows coronal section (preop) T2 weighted MRI with subchondral oedema and necrosis of the lateral femoral condyle. Image on the right (3b) upper side shows postoperative donor area while right lower shows healing in weight bearing recipient area.

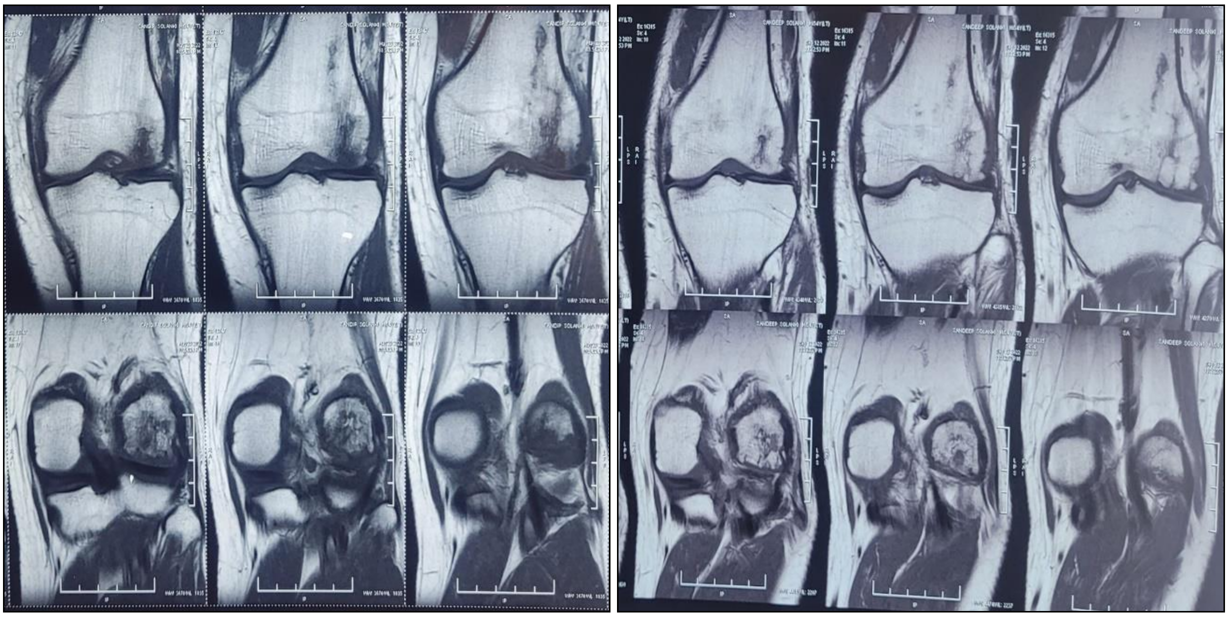

Fig 4 a, b: Image on the left (4a) shows coronal section T1 weighted MRI of the lateral femoral condyle preoperatively. Image on the right (4b) shows post operative changes in the corresponding areas.

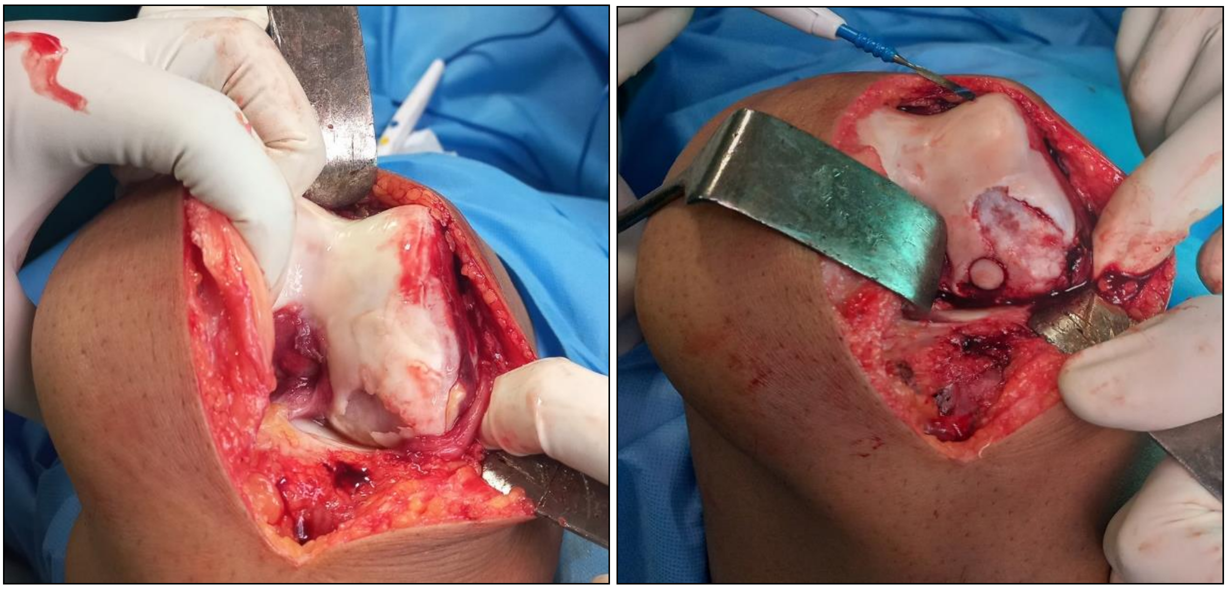

Fig 5 a, b: Intraoperative images showing worn out necrosed articular cartilage with underlying subchondral bone on the right (5b).

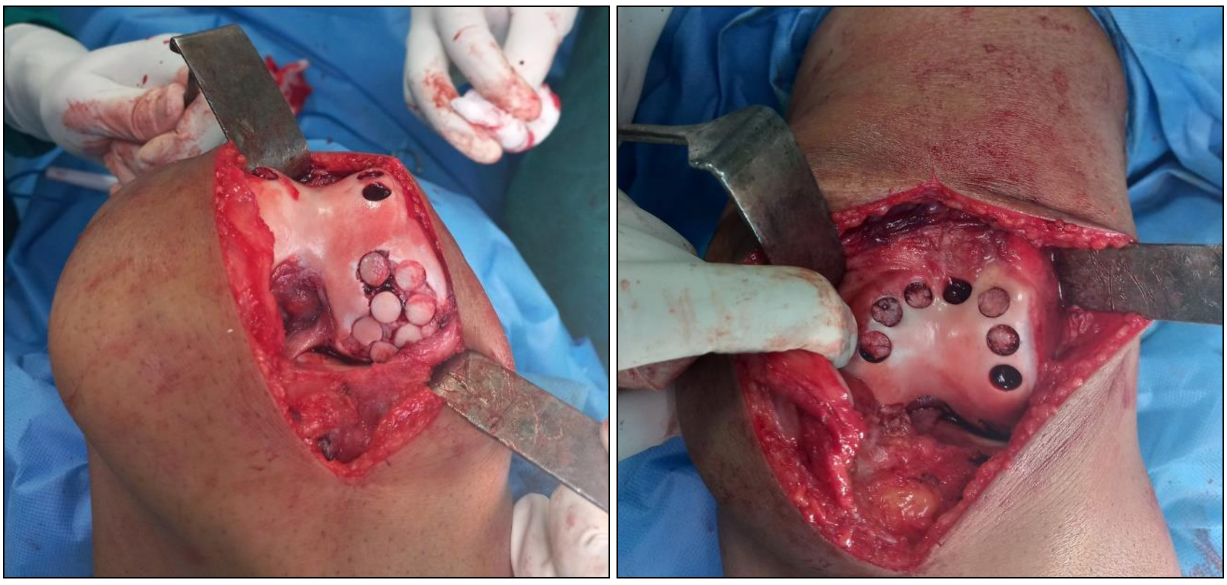

Fig 6 a, b: Image on the left (6a) shows intraoperative weight bearing recipient area for the 8mm osteochondral plugs while the image on the right (6b) shows non weight bearing donor site.

Footnotes
Patient consent: Obtained.
Competing Interests: None.

References

1. Ahlbäck S, Bauer GC, Bohne WH. Spontaneous osteonecrosis of the knee. Arthritis Rheum. 1968 Dec;11(6):705-33. Doi: 10.1002/art.1780110602. PMID: 5700639.
2. Al-Rowaih A, Björkengren A, Egund N, Lindstrand A, Wingstrand H, Thorngren KG. Size of osteonecrosis of the knee. Clin Orthop Relat Res. 1993;(287):68-75.
3. Patel DV, Breazeale NM, Behr CT, Warren RF, Wickiewicz TL, O'Brien SJ. Osteonecrosis of the knee: current clinical concepts. Knee Surg Sports Traumatol Arthrosc. 1998;6(1):2-11.
4. Zywiel MG, McGrath MS, Seyler TM, *et al*. Osteonecrosis of the knee: a review of three disorders. Orthop Clin North Am. 2009;40(2):193–211.
5. Kantor H. Bone marrow pressure in osteonecrosis of the femoral condyle (Ahlback's disease), Archives of Orthopaedic and Traumatic Surgery. 1987;106(6):349-352.
6. Jones JP Jr. Fat embolism, intravascular coagulation, and osteonecrosis, Clinical Orthopaedics and Related Research. 1993;292:294-308.
7. Yamamoto T, Bullough PG. Spontaneous osteonecrosis of the knee: the result of subchondral insufficiency fracture," The Journal of Bone & Joint Surgery—American Volume. 2000;82(6):858-866.
8. Akamatsu Y, Mitsugi N, Hayashi T, Kobayashi H, Saito T. Low bone mineral density is associated with the onset of spontaneous osteonecrosis of the knee," Acta Orthopaedica. 2012;83(3):249-255.
9. Koshino T. The treatment of spontaneous osteonecrosis of the knee by high tibial osteotomy with and without bone-grafting or drilling of the lesion, The Journal of Bone & Joint Surgery—American.1982;64(1):47-58.
10. Lotke PA, Ecker ML. Osteonecrosis of the knee. J Bone Jt Surg Am. 1988;70(3):470–473.

How to Cite This Article
Dr. Maulik Liladhar Bumtaria, Dr. Himanshu D Shah, Dr. Satish G Kripalani, Dr. Abhishek K Yadav and Dr. Abhishek N Agrawal. A rare case of spontaneous osteonecrosis of knee (SONK) treated with osteochondral autologous transfer system (OATS). International Journal of Orthopaedics Sciences. 2022;8(4):170-174.