Review Article

A review of literature: Mosaicoplasty as an alternative treatment for resection of patellar osteoid osteoma and cartilage reconstruction

Motasım K. Bavaneh^{a,*}, Gorkem Kiyak^b, Tevfik Balıkcı^c^a Dept. of Orthopaedic Surgery, Atasehir Avicenna Hospital, kayisdagi cad. No. 47, Atasehir, Istanbul, Turkey^b Dept. of Orthopaedic Surgery, Academic Hospital, Nuhkuyusu cad. No: 94 34664, Üsküdar, Istanbul, Turkey^c Dept. of Orthopaedic Surgery Medistate Hospital, Kavacık, Istanbul, Turkey

ARTICLE INFO

Keywords:

Osteoid osteoma

Patella

Mosaicoplasty

Nidus

Cartilage

ABSTRACT

Osteoid osteoma is an uncommon benign tumor and causes severe pain, being worse at night, that responds dramatically to nonsteroidal anti-inflammatory medications. An osteoid osteoma of the patella is very rare and if it arise close to chondral surface differential diagnosis may be challenging. In three patients the osteoid osteoma was completely excised by nidus removal by mosaicoplasty set with open surgical technique. The patients were followed up in average for 31 (16–48 months) months with annual clinical and radiographic evaluations. There were no relapse of the pain and no residual recurrent tumor. The aim of the treatment for osteoid osteoma is to remove entire nidus by open surgical excision or by percutaneous procedures such as percutaneous radiofrequency and laser ablation. Mosaicoplasty is a good alternative for treatment of osteoid osteoma of the patella in the subchondral bone.

1. A review of literature: mosaicoplasty as an alternative treatment for resection of patellar osteoid osteoma and cartilage reconstruction after that

Osteoid osteoma is a bone lesion which is surrounded by dense sclerotic bone and consists of loose vascularized tissue in the middle and also characterized by a small nidus that includes variable amount of calcific osteoid tissue^{1,8}. Pathologically; variable osteoid tissue and immature bone trabeculation are observed in vascular mesenchymal tissue. As a rule, reactive bone is more vascularized than normal bone, and the periost, which takes place on it, become thick. It is observed between the ages of 10–25 and in men, two times more. Although the lesion is seen in fibula, humerus, vertebra, talus, and calcaneus at times, it is frequently located in femur and tibia. This lesion, which presents typically with pain, was first described by Jaffe, in 1935^{1,9,10}. The disease has a characteristic, typical pain clinically. The pain is a beginning symptom, and it may reach a degree worsening the patients at nights. If the pain answers prostaglandin inhibitors, diagnosis can be made quickly. When the diagnosis was delayed; lesions close to the joints may cause contractures, or in spinal column region pseudo scoliotic sagittal plane deformities may be observed. Mostly, it is possible to make the diagnosis by a careful anamnesis, detailed examination and necessarily two-way radiographies at least. However; clinical and radiological examination is not sufficient in some locations such as hip

joint and vertebral colon at times; it is necessary to perform the other diagnostic procedures such as scintigraphy, computed tomography (CT) and magnetic resonance (MR)^{1,11,9,12,10}. In the young society, anterior knee pain is one of the most important musculoskeletal system disorders of pain and limitation of movement ability^{2,13}. Most common Reasons of the anterior knee pain without trauma story, are known as patellofemoral malalignment, tibial apophysitis, patellar tendinitis, SCFE, osteochondritis dissecans and less frequently- septic arthritis, synovial impingement and tumors^{2,14}. In this study; three cases of patellar osteoid osteoma, which is rarely seen as the anterior knee pain, and the preferred treatment have been presented. Patellar tumors represent special management problems because of their subcutaneous location, relationship of the extensor mechanism and difficulties in interpretation of radiographs¹⁵. Children less than 6 years of age with recurrent nocturnal pain and limb swelling should be investigated for osteoid osteoma¹⁶.

In the treatment of osteoid osteoma within this area; open curettage and excision of the nidus, and -if technical opportunities are sufficient-, percutaneous nidus excision by CT or radiofrequency ablation can be applied¹. CT-guided radiofrequency ablation should be the first treatment for intramedullary osteoid osteoma because of the high success rate and reduced invasivity¹⁶.

Surgical excision provides stopping the pain immediately and relieves the symptoms. When excision was made completely, and it was

* Corresponding author.

E-mail addresses: drbawaneh.ort@gmail.com (M.K. Bavaneh), drgorkemkiyak@gmail.com (G. Kiyak), tevfikbalikci@hotmail.com (T. Balıkcı).

removed by peripheral bone tissue, the risk of recurrence was also decreased. Showing the nidus in the excised lesion and confirming this after pathologic examination may give a future prediction about the success of surgery⁴.

2. Case presentations

We present 3 cases diagnosed with osteoid osteoma of the patella and treated in the same method using mosaicplasty for reconstrate the cartilage surface of the patella with follow up for 31 (16–48 months) months with annual clinical and radiographic evaluations.

The first patient is 26 years old and male. The pain started in his left knee averagely 1 year before his first hospital visit.(follow up for 48 months) The complaint was thought as chondromalacia patella at the first hospital that the patient applied. Then, medical treatment and quadriceps exercises were suggested. The patient's complaints were decreased a little but the patient referred to his doctor for a second time because of that the complaints started again after one month. No abnormal finding was detected after direct radiography, hemogram, crp, and sedimentation. For this reason, knee MRI was requested. It was reported that common signal changes, which are compatible with the bone marrow edema, exist in all sections of the patellar bone (Fig. 1). An appearance, which is consistent with the bone marrow edema-contusion, exists in average seven mm-scaled area in the subchondral bone of anterolateral medial femoral condyle, and also signal changes, which are compatible with the edema, exist in the Hoffa fat pad. For diagnosis; arthroscopic intervention was made, a biopsy was taken from the synovial tissue; and for the purpose of decreasing the intramedullary bone pressure, drilling was applied in the patellar bone by K-wire under scope control. As post-operative, the complaints decreased, and the pain ended. Physical treatment was started for the patient who had quadriceps strength loss and limitation of range of motion. The patient, who stated that his complaints started again in the third post-operative month, the pains increased at nights and that his pains ended by NSAID, applied to our clinic.

Edema and effusion existed in the left knee. Serious sensibility existed on the patella by palpation. The Patellofemoral grinding test could not be made. Passive and active motions of the joint were painful and limited; active extension was –70 degree, and flexion could reach to 130 degrees. When the hip was in flexion, passive knee extension was –50 degree. When the hip was in neutral position, and the leg was at the table, the knee could not reach to the full extension. –15-degree extension existed. The neurovascular symptom was not detected.

In MRI analysis made; chondral irregularity was detected in the medial facet of the patellar cartilage, and 7 mm sized osteochondral lesion was observed at this level. Mosaicplasty was suggested for the

osteochondral defect. Patient, then applied to another center for the cartilage repair and the pathological analysis of the below tissue, was directed to the physical treatment and psychiatry by consulting orthopedic surgeon. The patient applied our hospital again to after 3 months. We repeated MRI imaging of the knee; it was reported that 8 × 7 mm sized and hypointense lesion existed on T1 and T2-based sequences, in the subchondral bone at the level of medial facet within the patellar bone. Edema was observed commonly in the patella of adjacent bone marrow. The irregularity was observed in the anterior contour of the patella. The findings gave rise to thought the grade 4-chondromalacia patella, in the first plan. However, lesion contours and signal characteristics gave rise to suspicion of osteoid osteoma, in the differential diagnosis. Thin-section computed tomography images taken and sclerotic nodular formation was observed in subchondral bone of medial facet. (Fig. 2)

The second patient was 21 years old and male, the pain started in the right knee about 29 months ago. The complaints were thought as anterior knee pain upon quadriceps mechanism week due to the weights which taken lately. The patient complaints were started again especially at night and decreasing by NSAID. In radiography, MRI and thin-section CT lesion contours and signed characteristics gave rise to suspicion of osteoid osteoma measured as 6 × 6 mm size lesion. Edema and effusion existed in the right knee. Serious sensibility existed on the patella by palpation. The Patellofemoral grinding test could not be made. Passive and active motions of the joint were painful and full.

The third patient was 49 years and female. Complaints started 2 month before her first physician visit (follow up for 16 months). Her physical examination was serious sensibility in knee and patellofemoral joint. Passive and active motion of joint was full and with pain in the medial part of the knee, medial mc murray test was positive. In MRI there was degeneration in the medial meniscus and effusion of the knee. There was no any radiological findings in the direct radiographs. Diagnostic arthroscopic intermention was made and meniscal debridement was done. Postoperative the complaints decreased and the pain ended. Physical treatment course was maintained but in the post-operative 6th month pain started again especially with flexion of the knee and increased at night, her pain was give answer to NSAID. New radiography and MRI were taken, there was no any significant sign in x-ray but there was chondral irregularity about 7 × 6 mm detected in the medial facet of patellar cartilage. Thin section CT image taken and sclerotic nodular formation was observed in subchondral bone of medial facet of patella.

2.1. Surgical technique

We used the same surgical technic in the 3 patients and the

Fig. 1. MRI in the first application.

Fig. 2. Pre-operative Axial MRI and CT sections.

Fig. 3. Peroperative view of lesion before and after excision, peroperative view after mosaicplasty.

procedure was done by the same surgeon. Under spinal anesthesia and on supine position, Arthroscopic anterolateral and anteromedial portals was utilized. Then, diagnostic arthroscopy was made. The osteochondral defect was detected in the medial patella facet. Also, it was observed that it was darker colored from the peripheral tissues. Open surgery was started and the knee joint opened with median para patellar incision. Patella was flipped to lateral, and the lesion was observed. In pre-operative ct images, a lesion, which was between 6–8 mm in diameter and 6–7 mm in depth, was detected. Under scope control and by using the mosaicplasty set, the lesion was taken out totally by an 8.5 mm diameter harvester. Then; 8.5 mm-sized graft was harvested from the lateral femoral condyle, and mosaicplasty was made. (Fig. 3) In the post-operative follow period, angle-adjusted knee brace was used. The excised lesion was sent to pathological analysis, and they confirmed the diagnosis of osteoid osteoma.

2.2. Post-operative follow

In the post-operative period, angle-adjusted knee brace was given to all patients, and by partial weight bearing, mobilization was allowed. The patients stated that their pains ended completely, in the first post-operative day. Physical treatment and rehabilitation were started at the end of the first week, and motion range of the joint was regained without limitation. In MRI analysis made in the third post-operative month; it was detected that the joint-cartilage surface was regular-contoured and that union was provided in the graft (Fig. 4). After 31 (16–48) months of follow up patients are pain free without recurrence.

3. Discussion

MRI has a high sensitivity for imaging the full-thickness cartilage

lesions of the knee. While the highest sensitivity is 93 in medial femoral condyle lesions, the lowest sensitivity is about 71 in patella medial facet lesions³. Because of the absence of periosteal reaction in patellar osteoid osteoma, most of the time; radiological diagnosis may be difficult². In the first MRI images relating to our case; common edema was observed without any specific finding around the lesion. For this reason, was a delay in diagnosis and treatment. The same problem was described by Ma et al All that accurate diagnosis of osteoid osteoma in the patella in their cases had been delayed more than one year¹⁷.

In the treatment of osteoid osteoma within this area; open curettage and excision of the nidus, and -if technical opportunities are sufficient-, percutaneous nidus excision radiofrequency ablation using CT or three-dimensional navigation system can be applied (118). When the lesion localized in the patella beneath the cartilage surface it is effective to resect lesion under arthroscopic control¹⁹. In our study Per-operative diagnostic arthroscopy applied in all cases.

Surgical excision provides stopping the pain immediately and relieves the symptoms. When excision was made completely, and it was removed by peripheral bone tissue, the risk of recurrence was also decreased. Showing the nidus in the excised lesion and confirming this after pathologic examination may give a future prediction about the success of surgery⁴. According to the pre-operative measures by the set of mosaicplasty, the lesions, which were 6–7 mm in depth and 6–8 mm in width, were taken out totally by 8.5 mm-wide tubes, which were taken standart 15 mm in depth. The pathology findings confirmed the diagnosis of osteoid oteoma in the three patinets.

Mosaicplasty technique was applied for the reconstruction of cartilage lesion.

Mosaicplasty is a treatment alternative which can be preferred in patella cartilage lesions⁵. By this treatment, an effective and positive result can be received⁶.

Fig. 4. Post-operative axial MRI and CT sections at 3rd month.

As a result; osteoid osteoma should be brought to mind in the young patients who have chronic anterior knee pain without trauma^{7, 4, 18}. By total excision and mosaicplasty to reconstruct patellar articular surface, we achieved excellent result in our cases. The patients were followed up in average for 31 (16–48 m) months with annual clinical and radiographic evaluations. There were no relapse of the pain and no residual recurrent tumor.

The authors declares that there is no conflict of interest regarding the publication of this paper.

References

1. Şen Cengiz, Akman Şenol, Gedik Kazım. Femur boynunda osteoid osteoma. *Acta Orthop Traumatol Turc.* 1998;32:170–173.
2. Chillemi Claudio, Franceschini Vincenzo, D'Erme Massimiliano, Ippolito Giorgio, Farsetti Pasquale. Patellar osteoid osteoma as a cause of anterior knee pain in adolescents: a case report and literature review. *Case Rep Med.* 2013;2013:6 article ID 746472.
3. Flanigan DC, Harris JD, Jia G, Choi S, Siston RA, Randazzo JL, Knopp M. Effect of chondral defect size, shape, and location on MRI diagnostic performance in the porcine knee. *Orthopedics.* 2014;37(April(4)):e322–7. <http://dx.doi.org/10.3928/01477447-20140401-50>.
4. Stoffelen D, Martens M, Renson L, Fabry G. Osteoid osteoma as a cause of knee pain a review of 10 cases. *Acta Orthop Belg.* 1992;58(4).
5. Solheim E. Mosaicplasty in articular cartilage injuries of the knee. *Ídsskr Nor Laegeforen.* 1999;119(November 10(27)):4022–4025.
6. Visona E, Chouteau J, Aldegheri R, Fessy MH, Moyon B. Patella osteochondritis dissecans end stage: the osteochondral mosaicplasty option. *Orthop Traumatol Surg Res.* 2010;96(September(5)):543–548. <http://dx.doi.org/10.1016/j.otsr.2010.02.012>.
7. Harun M, Hayrettin Y, Serhat M, et al. Atypical location of an osteoid osteoma with atypical anterior knee pain. *Int J Surg Case Rep.* 2014;5(October 17(11)):873–876. <http://dx.doi.org/10.1016/j.ijscr.2014.10.015> (Epub Ahead of print).
8. Tachdjian MO. *Osteoid osteoma in Tachdjian MD eds.* 2nd ed 1990; 1990:1206–1216 PA, etc: W.B. Saunders.
9. Goldman AB, Schneider R, Pavlov H. Osteoid osteomas of the femoral neck report of four cases evaluated with isotopic bone scanning, CT and MR imaging. *Radiology.* 1993;185(1):227–232.
10. Ward WG, Eckardt JJ, Shayestehfar S, Mirra J, Grogan T, Oppenheim W. Osteoid osteoma diagnosis and management with low morbidity. *Clin Orthop.* 1993;291:229–235.
11. Alani WD, Bartal E. Osteoid osteoma of the femoral neck simulating an inflammatory synovitis. *Clin Orthop.* 1987;223:308–312.
12. Mazoyer JF, Kohler R, Bosard D. Osteoid osteoma: CT-guided percutaneous treatment. *Radiology.* 1991;181(1):269–271.
13. Sandow MJ, Goodfellow JW. The natural history of anterior knee pain in adolescents. *J Bone Jt Surg B.* 1985;67(No. 1):36–38.
14. Calmbach WL, Hutchens. Evaluation of patients presenting with knee pain. Part 2: differential diagnosis. *Am Family Phys.* 2003;68(No. 5):917–922.
15. Bhagat S, Sharma H, Bansal M, Reid R. Presentation and outcome of primary tumors of the patella. *J Knee Surg.* 2008;21(July(3)):212–216.
16. Falappa P, Garganese MC, Crocoli A, et al. Particular imaging features and customized thermal ablation treatment for intramedullary osteoid osteoma in pediatric patients. *Skeletal Radiol.* 2011;40(December(12)):1523–1530. <http://dx.doi.org/10.1007/s00256-011-1133-3>. Epub 2011 Mar 15.
17. Ma, Zhao HT, Niu XH, et al. Osteoid osteoma of the patella: report of two cases. *Chin Med J (Engl).* 2011;124(December(23)):4096–4098.
18. Outani H, Hamada K, Takenaka S, et al. Radiofrequency ablation of osteoid osteoma using a three-dimensional navigation system. *J Orthop Sci.* 2016;21(September(5)):678–682. <http://dx.doi.org/10.1016/j.jos.2016.05.005>. Epub 2016 Jun 16.
19. Franceschi F, Longo UG, Ruzzini L, et al. En-bloc retrograde resection of an osteoid osteoma of the patella using computed tomography under arthroscopic control. *J Knee Surg.* 2008;21(April(2)):136–140.