A Novel Technique of Approach in a Skeletally Immature Case of Chondroblastoma – A Case Report

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Learning Point of the Article:

Surgical excision of chondroblastoma arising from distal femur involving physis is always challenging and our proposed technique provided an adequate exposure for excision of the lesion and reduced injury to physis.

Abstract

Introduction: Chondroblastoma is a rare benign cartilaginous neoplasm arising in the epiphysis of long bones in young patients. It is an uncommon benign but locally aggressive tumor, mostly located in the secondary centers of ossification. These tumors arise near a joint or growth plate and surgical excision is always challenging.

Case Report: A 13-year-old boy presented with intermittent knee pain, swelling, and limitation of movements for 1 year. On examination, magnetic resonance imaging revealed a hyperintense lesion in distal femoral epiphysis with superior transphyseal extension and inferior thinning of cortex with cartilage breach. Histopathological examination confirmed the diagnosis of chondroblastoma of distal femur. We report a novel technique of approach in a case of distal femoral chondroblastoma in a skeletally immature individual.

Conclusion: The technique we incorporated had an adequate exposure to reach the lesion for a complete curettage and bone grafting. It also reduced further injury to cartilage and physeal plate.

Keywords: Chondroblastoma, cartilage breach, curettage, bone grafting.

Introduction

Chondroblastomas, also referred as "codman tumors," are rare benign cartilaginous neoplasm that characteristically arises in the epiphysis of a long bone in young patients [1]. Chondroblastoma was first described as a calcified giant cell tumor by Ewing [2]. It is an uncommon benign but locally aggressive tumor, most frequently located in the secondary centers of ossification of long bones [3]. Ninety percent of patients are between the age of 5 and 25, males predominate with a ratio of 3:2. The tumor occurs most frequently in the distal femur, proximal tibia, and proximal humerus. Radiographically, it presents as a well-defined lesion centered in an epiphysis of a long bone [4]. Since the tumor is usually localized near a joint or growth plate, functional impairment, and growth disturbances may be expected. Recurrences also are a major concern. Metastasis of a histological benign chondroblastoma is rare [5,6]. Surgical management is the primary treatment of choice for chondroblastoma and it entails adequate intralesional curettage alone or in combination with adjuvants [7]. Surgical excision is always challenging in these cases since it is near to the growth plates.

In this report, our aim was to present a novel technique of approach in managing a case of distal femoral chondroblastoma in a skeletally immature individual.

Case Report

A 13-year-old boy came to our hospital with history of intermittent knee pain, swelling, and with minimal limitation of movements for the past 1 year, no history of the limitation of mobility and no history of injury noted. On examination, he had tenderness over lower end of femur. No signs of infection were

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Author's Photo Gallery


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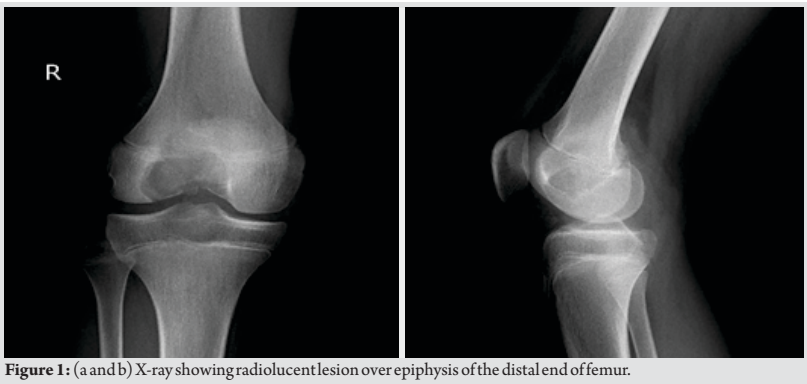

Figure 1: (a and b) X-ray showing radiolucent lesion over epiphysis of the distal end of femur.

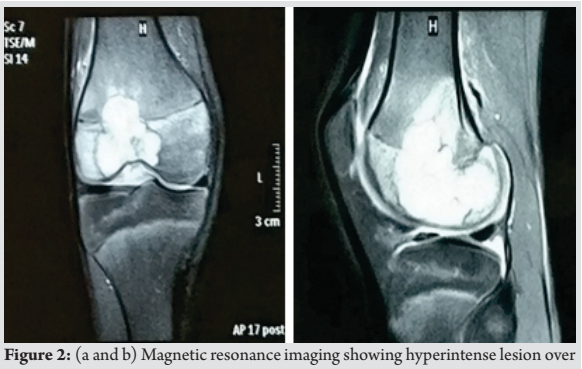

Figure 2: (a and b) Magnetic resonance imaging showing hyperintense lesion over distal femoral epiphysis extending into physis and metaphysis.

observed, and laboratory data were within normal limits. The radiographs revealed an ovoid radiolucent lesion with sclerotic margins over posterolateral aspect of epiphysis in distal end of the left femur with epiphyseal breach and transphyseal extension (Fig. 1).

Magnetic resonance imaging (MRI) showed a 4.5 cm × 3.7 cm × 3.7 cm well-defined T1 intermediate and mildly hyperintense lesion in the right distal femoral epiphysis. It had lobulated margins with narrow zone of transition, thin arc-like calcification within the lesion suggestive of the chondroid matrix. The lesion is fairly centrally located within epiphysis (more to the lateral half), superiorly transphyseal extension into metaphysis, and inferiorly thinning of cortex with the focal cortical breach (Fig. 2). Computed tomography-guided biopsy was taken, and histopathological reports showed oval nuclei with few showing evidence of longitudinal grooving and moderate eosinophilic cytoplasm. Interspersed in between is multinucleated osteoclastic types of giant cells and also seen are foci of chondroid areas with eosinophilic matrix and foci showing characteristic deposits of chicken wire type of calcification (Fig. 3a and b).

We planned to proceed with intralesional curettage and bone grafting. The procedure was carried out under general anesthesia. Midline incision with a medial parapatellar approach used. Intraoperative picture presented as a breach through intercondylar fossa with thinning of cartilage (Fig. 4). Plan for a thorough curettage was carried out by making a small window over the non-weight-bearing area. The cartilage window was elevated and the lesion was reached. Intralesional resection of the cyst contents was performed. Thorough curettage was done under direct vision and made sure that no lesions left out, which was confirmed under the guidance of fluoroscopy intraoperatively and sample was sent for histopathological examination. The cavity was treated with hydrogen peroxide followed by normal saline [4] and packed with ipsilateral iliac crest bone graft and synthetic bone substitutes (Allogran R-porous calcium phosphate). Since the cartilage window had adequate cover, we do not experience any spillage of graft and cartilage window was closed and sutured (Fig. 5).Post operative radiographs confirmed the entire removal of lesion (Fig. 6)

This technique helped in protecting and preventing further damage to the cartilage. It also gave a good approach to the lesion for a complete curettage. We avoided the lateral approach because, during curettage, it can perforate intra-articularly or causing more damage to physis. Post-operatively, the patient was immobilized with a knee brace. Post-operative biopsy reports also confirmed that the features were consistent with chondroblastoma. Isometric quadriceps muscle and straight leg raising exercises were initiated on the second post-operative day, following which non-weight bear walking was encouraged. The brace was removed 3 weeks after the surgery. Active and active-assisted range of motion exercises were initiated at that time. Two months after the surgery, the patient was pain-free,

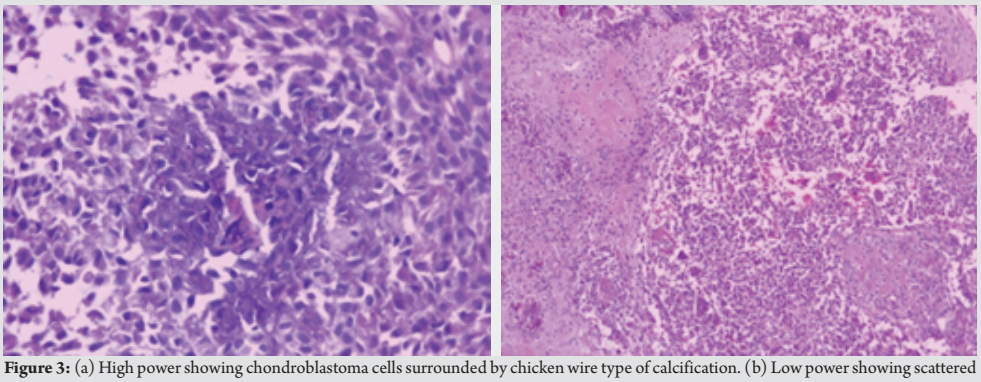

Figure 3: (a) High power showing chondroblastoma cells surrounded by chicken wire type of calcification. (b) Low power showing scattered osteoclasts, focal cartilage, and calcification.

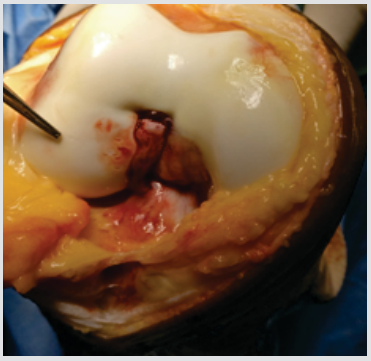

Figure 4: Intraoperative picture showing cartilage thinning and intercondylar breach of the tumor.

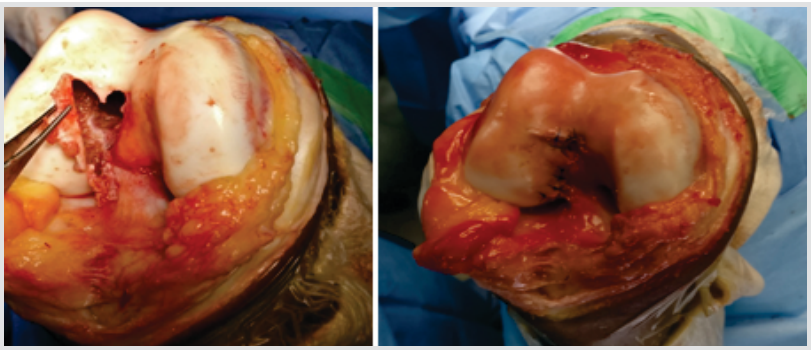

Figure 5: (a and b) Cartilage window elevation, curettage, and closure.

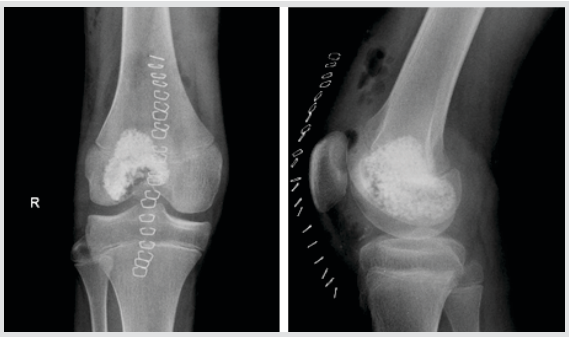

Figure 6: (a and b) Immediate post-operative X-ray showing entire removal of lesion and the cavity filled with bone graft.

ambulating full weight-bearing with a full range of movements and without support. Follow-up was done at 6 weeks, 3 months, 6 months, 9 months, and 1 year after the curettage. There was no recurrence of the lesion with a resolution of knee symptoms. Knee movements were not affected. No radiological sign of recurrence was found at 1-year follow-up (Fig. 7).

Discussion

Chondroblastoma constitutes a very rare bone tumor entity, accounting for 1%-2% of all primary bone tumors[8]. It represents the most frequent primary epiphyseal tumor in children aged between 10 and 30 years. These lesions are mostly dispersed in the skeleton; however, they generally occur in the regions of epiphysis or apophysis [9]. Majority are located in the proximal tibia (17%) and the proximal humerus (15%). The distal femur and pelvis represent the alternate regions that are affected generally. Chondroblastomas are, generally well-circumscribed lesions involving the medullary cavity. The radiographic appearance is usually suggestive of the diagnosis. The lesion is characterized as an oval intramedullary tumor with distinct margins. Its invariable location within an epiphysis or an apophysis is the main characteristic feature for diagnosis. Other common features are expansion, sclerotic rim, and matrix calcification.

In our case, the lesion was typically a chondroblastoma on both X-ray and MRI. The lesion is usually seen as an oval intramedullary tumor with distinct margins. A key diagnostic feature is its almost invariable location within an epiphysis or an apophysis. Other common features are expansion, sclerotic rim, and matrix calcification. Penetration through the cortex into the soft tissues is seen only in a small percentage of cases. The subchondral articular cortex is thinned to <5 mm in slightly more than half of the cases. The cortex is normal in 41% and completely destroyed in at least one region in up to 5% of cases [5,12]. Penetration through the cortex into the soft tissues is seen only in a small percentage of cases [10]. The adjacent cortex is normal in only 15% of tumors. Three-fourths of the tumors lead to the erosion and thinning of the involved cortical bone. Cortical destruction is rare and found to prevail only in 10% of cases [9]. Penetration of soft tissues and cortical destruction was not a feature of our case. However, there was thinning of the subchondral bone and cartilage flaking in the knee joint adjacent to the lesion. Chondroblastoma can be treated by simple curettage, bone grafting, and cementation involving similar surgical techniques as for giant cell cancer. The reconstruction following intralesional curettage can also be filled with autogenous bone graft, allogeneic bone graft, or both [5,9]. Although radiofrequency ablation has been reported as one option for the treatment of chondroblastoma in the literature, the mainstay of treatment remains surgery. Specifically, meticulous curettage of the lesion followed by bone-grafting is the gold standard [5].

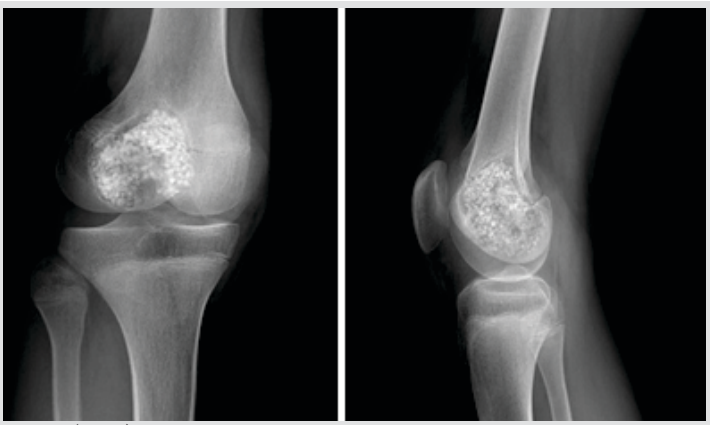

Figure 7: (a and b) One-year follow-up X ray showing graft incorporation and remodeling with no signs of recurrence.

Curettage of physeal chondroblastomas in children has resulted in limb length discrepancy and malformation [10]. There were no such complications noted in our patient. About 87% can be cured by meticulous intralesional curettage alone and this technique can produce good long-term functional outcomes [11].

The case reported here shows the aggressiveness of the lesion causing marked destruction of the bony wall in the posterolateral cortex and inferior subchondral bone. Thinning of sub-chondral bone and close proximity to the articular cartilage caused cartilage breach. Since the lesion has crossed the physis and considering the extent of cartilage breach, we

avoided approaching the lesion through lateral aspect of distal femur, which may cause further damage to the physis. Approaching through proximal aspect can cause migration of lesion into the joint and further damage the cartilage. The other way of approaching the lesion was through breach over the intercondylar notch. Since the femoral attachment of anterior cruciate ligament was very close, to prevent further damage to the ligament, we avoided this approach.

Hence, we decided to approach the lesion through a window in the cartilage from a non-weight-bearing area of the joint. This will provide good access to the lesion by minimizing further damage to the physis. Intralesional curettage was carried out completely and filled with ipsilateral bone graft and bone graft substitutes, following which cartilage window was closed and sutured (Fig. 3).

This technique helped in protecting and preventing further injury to the cartilage and other healthy tissues. It also gave a better access to the lesion for a complete curettage. Recurrence is observed when curettage was incomplete or when tumor cells were disseminated during surgery [13]. Local recurrences after curettage range from 10% to 38% [5,14,15]. In our case, there is excellent graft incorporation, remodeling and excellent function of the knee after a 1 year follow-up period with no recurrence (Fig. 7).

Conclusion

The technique we incorporated through the cartilage had an adequate exposure to reach the lesion for a complete curettage, bone grafting, and it also reduced further injury to cartilage and physeal plate.

Clinical Message

Chondroblastoma most commonly arises in the epiphysis of long bones affecting the young population. This technique has provided a better access to the lesion and minimizing damage to the growth plate.

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