**CASE REPORT**

**TRANSPHYSEAL SPREAD OF BENIGN TUMORS AND INFECTIONS IN PEDIATRIC PATIENTS: A SERIES OF SIX CASES**

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**ABSTRACT**

Epiphyseal extension of benign pathology is regarded as an infrequent occurrence. This observation has been attributed to anatomical and biochemical phenomenon unique to physeal cartilage. We report a retrospective series of six patients over a period of 4 years, diagnosed with benign pathologies that showed crossing of an open physeal plate by the disease. Four of these cases were infections and two were benign tumors. The patients were aged between 5 and 11 years, all of them were treated at a tertiary referral centre and followed up for a minimum period of 6 months to evaluate the progress of disease. The findings are more than just a pathological curiosity as they alter the management and surgical procedure that needs to be performed for these conditions. The recognition of the fact that benign tumors may occasionally present with transphyseal spread will prevent unjustified radical procedures that are best reserved for aggressive malignant conditions.

**KEY WORDS:** Benign tumor, chondroblastoma, infection, multifocal osteomyelitis, transphyseal spread, tuberculosis

**INTRODUCTION**

Crossing the physis by primary metaphyseal localized bone tumors and osteomyelitis in childhood has rarely been observed. The physis had been traditionally been considered as a strong barrier against spread of tumors and infection. However, aggressive tumors like osteogenic sarcoma were frequently reported to cross the physis. Due to the primary noninvasive nature of infections and nonmalignant tumors, there have been only isolated case reports of transphyseal spread in these group. A series of six cases in which such a spread was seen is presented here.

**CASE HISTORIES**

This retrospective study includes six patients in which there was transphyseal extension of a benign pathology. These cases were identified over a period of 4 years in a tertiary care institute. In all the patients, the physeal plate was open. The cases were examined and clinical findings recorded, a biplane radiograph of all six patients was done, three of these patients also under went MRI scanning. An orthopedic radiologist without any prior knowledge of point of the question (epiphyseal extension) was asked to review the data and form an opinion as of transphyseal involvement; Epiphyseal incongruity and areas of local bone destruction on X-rays were taken as an indicator of involvement. A tissue diagnosis was obtained in each of the cases following which appropriate course of management instituted. All the cases were followed up for an average duration of 1 year (shortest follow up being 6 months and the longest follow-up was of 6 years). During each clinical follow-up, the past clinical charts were reviewed and appropriate radiographs were taken.

**Case 1**

A case of chondroblastoma in an eight-year-old child located in proximal humerus: the child presented with complaints of pain in the shoulder for 4 months, on examination there was local tenderness at upper humerus region and the shoulder range of motion was terminally restricted in all directions. Needle biopsy was done and histopathological diagnosis of chondroblastoma was established. The lesion was curetted transphyseally and the defect filled with bone graft without damaging the entire physis. After 6 months follow up, there was no evidence of tumor recurrence and the defect had healed partially [Figure 1 and 2].

**Case 2**

A case of unicameral bone cyst in an 11-year-old child with lesion in the proximal humerus, after obtaining a histopathological diagnosis the lesion was treated by transphyseal curettage. After 5 years follow up, there was partial healing with sclerosis with asymptomatic shortening of humerus [Figure 3].

**Case 3**

A five-year-child who presented with complaints of pain around knee joint showed a lytic lesion around distal femur, the lesion on X-ray appeared to have crossed the physeal

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**Figure 1:** Transphyseal spread of chondroblastoma on MRI

**Figure 2:** Post-operative radiograph following curettage and bone grafting along with the histopathological pictures of the lesion under low and higher magnification.
Figure 3: Transphyseal spread of unicameral bone cyst at the last follow-up at the time of skeletal maturity plate. The patient had constitutional symptoms in form of fever, weight loss and malaise. His blood investigation showed an increased ESR. On the basis of clinical suspicion, antitubercular therapy was started. The limb was splinted in a plaster slab. The child improved clinically within 6 weeks, the ESR levels decreased, and following pain relief, an active range of movement was started. The lesion healed on antitubercular treatment without any surgical intervention. After 2 years follow-up, the patient was clinically and radiologically asymptomatic. The range of motion at knee was full and painless.

Case 4
A six-year-old child presented with painful restriction of knee range of movement (ROM), on examination, the child had low-grade fever, showed evidence of weight loss, and had tenderness at the proximal tibia. There was no warmth or any evidence of fluid in the knee joint. The radiographs showed a lytic lesion involving the epiphysio-metaphyseal region of proximal tibia. On blood investigations, the ESR was raised and the blood count indicated a lymphocytosis. In view of these findings a provisional diagnosis of tuberculosis was made and the child was started on antitubercular treatment. There was sign of early improvement with decrease in pain and increased knee ROM during first 2 weeks; this was, however, followed by sudden clinical deterioration. The child presented in emergency department with severe pain and restriction of knee range of movement. The radiographs taken at that time suggested a possible involvement of the knee joint and an arthroscopy was immediately done. The lesion was left untouched. The synovial fluid was clear and did not grow any organism including mycobacteria on culture. The patient symptom rapidly improved following arthroscopy, the antitubercular therapy was continued for 1 year. After 1 year follow up, patient had no clinical signs or symptoms of the disease and the radiographs showed signs of healing of the lytic lesion with sclerosis.

Case 5
An 11-year-old boy presented with complaints of mild pain around ankle, the radiographs showed presence of lytic lesion crossing the physis plate. A needle biopsy yielded seropurulent material, which was sent for culture. The culture report confirmed a diagnosis of tuberculosis. The patient was started on antitubercular drugs. After 8 months follow-up, the lesion patient became clinically asymptomatic but showed no signs of radiological healing. An aspiration biopsy under radiological guidance was performed in order to rule out multidrug resistance tuberculosis. There was no growth on any culture medium. The antitubercular therapy was continued in the wake of clinical improvement and no surgical intervention was done. After 1 year follow up, the patient is symptoms free, and the radiographs showed early signs of healing of the lytic lesion [Figure 4].

Case 6
A case of multifocal chronic osteomyelitis was seen in a child aged 9 years with proximal humeral epiphysio metaphyseal involvement, metaphyseal involvement of lower femur and distal radius. The patient was severely under nourished and showed systemic signs of high-grade fever, severe weight loss and anorexia. A blood culture was obtained, which was positive for staphylococcus aureus. Patient was treated with a six-week intravenous course of antibiotic (third generation Cephalosporin and Aminoglycoside). The child showed signs of clinical and radiological improvement after 6 weeks of therapy. After subsequent follow up, the patient progressively improved in terms of pain, and ROM. The systemic symptoms disappeared and child showed weight gain and improved nutritional status after 6 weeks. The radiographs at 1 year showed almost complete healing of the lesion with child completely symptom free. The child was lost to follow up after 1 year.

DISCUSSION

The physeal plates are thought to be a barrier for spread of infectious and neoplastic pathologies. The mechanism behind this phenomenon is still unclear. It is thought to be a consequence of production of collagen inhibitor by physis that was demonstrated in organ cell culture system.[6] Certain studies showed that growth plate chondrocytes secrete Transformation Growth Factor (TGF) Beta 1 that inhibited neo-angiogenesis and consequently impeded the tumor spread.[6]

Ghandur-Mnaymneh et al. showed crossing of the cartilaginous plate by the malignant neoplasm (Osteosarcoma) in 12 of his 14 patients.[1] Later, Panuel et al. in a study of 22 patients with metaphyseal primary malignant tumor (17 Osteosarcomas and five Ewing tumors) showed that transphyseal spread occurred in 13 cases (59%), these findings were based on preoperative MRI and correlated with pathological examination.[6]

Other series based on MRI findings and histopathological studies have reported a transphyseal spread rate of 75–93%.[6] Most of the studies have indicated that the spread in malignant conditions can be attributed to neoangiogenesis seen in the tumor mass that results in tumor vasculature crossing the physis plate.[1][10][12] A similar phenomenon was hypothesized to occur in infections wherein the transphyseal vessels are thought to provide a direct connection between the growth plate (physis) and the epiphyseal...
cartilage facilitating the spread of osteomyelitic foci in the metaphysis to epiphysis.\cite{10}\cite{11}\cite{12} The less common mode of approach is thought to be spread around the epiphyseal plate beneath the perichondrium and into the epiphyseal vascular channels.\cite{13}

The transphyseal spread of benign conditions like infection and benign tumors have been infrequently reported in literature most often as isolated case reports.\cite{4}\cite{14}\cite{15} This particular study is a large collection of six benign cases in which transphyseal spread occurred. These findings are not mere pathological curiosity but represent a diagnostic dilemma and alter the management plan. Unlike the more aggressive malignant tumors, many of these conditions do not always require a surgical intervention, moreover, surgical intervention when required needs to be less radical than those required for the malignant conditions. Three of the cases in this particular series were diagnosed early in the course of disease and resolved on conservative management in response to chemotherapy. This underlines the importance of early recognition and institution of nonsurgical management in some of these conditions to avoid surgical intervention that are often needed on account of delayed diagnosis and consequent disease progression. On the other hand, when a surgical treatment is required, radical procedure like complete excision of the physeal plate may not always be necessary. Also a careful planning of the intervention with regards to the mode of approach to the lesion needs to be done. The risk of potential growth arrest and shortening should be anticipated and informed to the parents.

In conclusion we find that the occurrence of transphyseal spread in benign condition although rare is not necessarily an exception. The recognition of this fact will help expedite the diagnosis, and may also prevent unwarranted radical surgical interventions.

REFERENCES