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Case Report

Surgery Section

Management of Pathological Femoral Refracture in a Child using Flexible Intramedullary Nail: A Case Report

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ABSTRACT

Simple Bone Cysts (SBCs) are benign, fluid-filled lesions primarily located in the metaphysis of long bones in children and adolescents. Depending on the clinical situation, management is performed, but the ultimate goal is to minimise surgical complications. Hereby, the authors present a case report presents the management of a seven-year-old male with a pathological refracture of the subtrochanteric region of the right femur due to an SBC. The patient presented with pain, swelling, and inability to bear weight on the affected limb. Diagnostic evaluation revealed a fracture in the subtrochanteric region along with a lytic, expansile lesion at the fracture site. The patient had a history of a similar fracture three years prior. Treatment involved closed reduction and internal fixation with two Flexible Intramedullary Nails (FIN), followed by immobilisation with a unilateral hip spica cast for six weeks. Follow-up radiographs showed satisfactory fracture reduction and signs of resolution of the bone cyst. The patient demonstrated good functional outcomes and successful management of the pathological refracture. The present case report contributes to the existing literature on the management of pathological refractures in paediatric patients and highlights the effectiveness of FINs as a treatment option in such cases.

Keywords: Paediatric patient, Simple bone cyst, Subtrochanteric femur

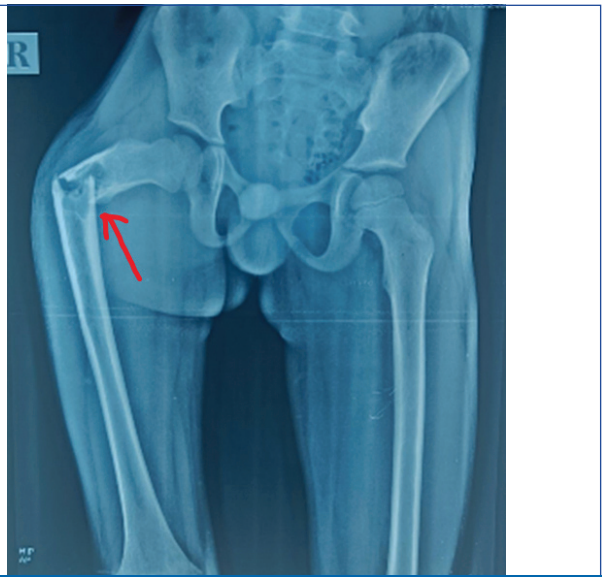
CASE REPORT

A seven-year-old male presented to the Orthopaedic Outpatient Department (OPD) with complaints of pain and swelling in his right proximal thigh, associated with an inability to bear weight on the affected limb for one day. The parents reported a history of trivial trauma while playing, without any associated open wounds or polytrauma. There was no history of loss of consciousness, blurred vision, vomiting, or bleeding. Upon examination, tenderness, crepitus, and abnormal mobility were observed in the proximal thigh region, indicating a high probability of a fracture. There were no distal neurovascular deficits, and the rest of the organ systems were within normal limits. No signs of head injury.

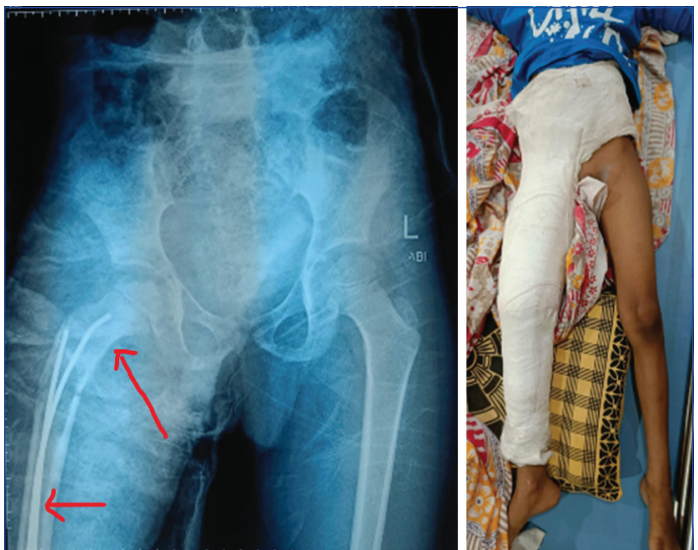
Immediate standard pelvis with bilateral hip Anteroposterior (AP) radiographs revealed a fracture in the subtrochanteric region of the right femur, along with a lytic, expansile, central lesion at the fracture site, suggestive of a pathological fracture [Table/Fig-1].

Further investigation revealed that the patient had experienced a similar fracture three years prior, following minor trauma. At that time, he was diagnosed with a pathological subtrochanteric femur fracture secondary to an SBC. Treatment involved open reduction and internal fixation with a plate and screws, followed by histopathological confirmation of the cyst, with subsequent resolution. The implant was removed after one year, and the patient remained asymptomatic for two years before the current presentation. The recurrence of symptoms following another trivial trauma led to a diagnosis of a pathological refracture of the subtrochanteric region of the right femur secondary to an SBC.

After thorough evaluation and anaesthesia clearance, the patient underwent closed reduction and internal fixation with two FINs in a retrograde fashion, proximal to the physeal line, under fluoroscopic guidance [Table/Fig-2]. Postoperatively, a unilateral hip spica cast was applied for six weeks for immobilisation [Table/Fig-3].

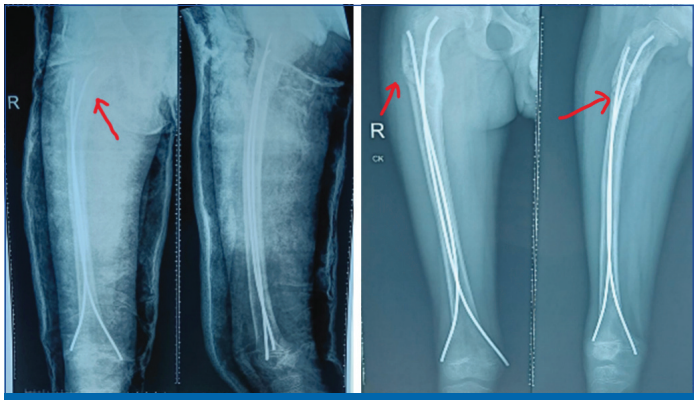


[Table/Fig-1]: Pathologic fracture in the subtrochanteric region of the right femur, along with lytic, expansile, central lesion at the fracture site in a skeletally immature patient.



[Table/Fig-2]: Postoperative radiograph showing subtrochanteric femur fracture with two flexible intramedullary nail in-situ. **[Table/Fig-3]:** Postoperative immobilisation using hip spica. (Images from left to right)

Follow-up radiographs at four and eight weeks postsurgery revealed a satisfactory reduction of fracture fragments with the FIN nails in-situ, along with signs of resolution of the SBC [Table/Fig-4,5]. The patient demonstrated good functional outcomes, with partial weight-bearing initiated at eight weeks postsurgery. The section shows a fibrocartilaginous cyst composed of proliferating fibroblasts, osteoclastic giant cells, extravasated Red Blood Cells (RBSs), and mixed inflammatory cells. At three months postsurgery, the patient exhibited successful management of proximal femoral pathological refractures caused by SBCs, with favourable functional outcomes [Table/Fig-6].



[Table/Fig-4,5]: Follow-ups radiographs at 4 and 8 weeks, respectively showing signs of fracture union. (Images from left to right)

[Table/Fig-6]: Follow-up and favourable functional outcome at 3 months.

DISCUSSION

The SBCs also known as unicameral bone cysts or solitary bone cysts, are benign, fluid-filled lesions primarily located in the metaphysis of long bones in children and adolescents. They most commonly occur in the proximal humerus followed by the proximal femur, with a peak age of occurrence around 10 years and a higher prevalence in boys compared to girls [1]. The exact cause of SBCs remains unclear, but theories suggest obstruction of venous drainage within the bone as a likely contributing factor [2].

On X-ray, these cysts appear as well-localised lesions without signs of periosteal reaction. Most cysts become static or resolve near skeletal maturity, but they can weaken the bone and predispose to pathological fractures, especially in weight-bearing bones like the proximal femur [1].

Surgical intervention is typically reserved for cases with associated symptoms or pathological fractures, particularly in weight-bearing areas like the proximal femur, where fractures can lead to severe complications [1,2]. Various surgical techniques, including curettage, grafting, and fixation, are employed based on lesion characteristics and location. Prevention of pathological fractures and recurrence is a key consideration. However, evidence on adjuvant therapies and the impact of patient age on outcomes remains inconclusive [3].

Firstly, the recurrence of a pathological refracture in the same location highlights the importance of thorough evaluation and long-term follow-up in paediatric orthopaedic patients with a history of bone cysts. Despite previous successful treatment and resolution of the cyst, the risk of refracture remains, especially in cases of high-impact trauma or repetitive stress [4].

Postoperative management, including the application of a unilateral hip spica cast for six weeks, aimed to provide adequate immobilisation and support for optimal fracture healing. Additionally, the initiation of partial weight-bearing at eight weeks postsurgery was carefully timed to balance the need for early mobilisation with the requirement for sufficient bone remodeling and consolidation [5].

Radiographic assessment during follow-up revealed satisfactory fracture reduction and signs of resolution of the bone cyst, indicating successful treatment outcomes. The observed functional improvements and restoration of normal activities of daily living further validate the effectiveness of the chosen treatment approach [6].

Wilbawa MAS and Maharjana MA, report a five-year-old female presented with severe pain in her left thigh after a fall. Physical and radiological examinations confirmed a fracture in the left subtrochanteric femur, revealing a large lytic lesion indicative of a SBC. Surgical intervention included open reduction, curettage, biopsy, bone grafting, and fixation with a locking plate and screw. Postoperative care included antibiotics, pain management, and fluid therapy. Regular follow-up over seven months showed successful healing with normal function and minimal leg length discrepancy. The treatment outcome was satisfactory, demonstrating effective management of pathological subtrochanteric femur fractures in children with SBC using surgical curettage, bone grafting, and stable fixation [7].

In Tsutsumi R and Mammoto T reports, a previously healthy 10-year-old boy sustained a left hip injury while playing, which led to a subtrochanteric femur fracture through a pathological lesion diagnosed as a SBC. Initial radiographs, Computed Tomography (CT) scans, and an Magnetic Resonance Imaging (MRI) indicated a cystic lesion, and a biopsy ruled out malignancy. The fracture was treated with open reduction and internal fixation using a Non-contact Bridging Plate (NCB-PH™). The surgery involved a lateral approach with temporary cable fixation and the insertion of locking screws to avoid damaging the growth plate. Postoperative care included non weight-bearing for four weeks, progressing to full weight-bearing by six weeks. At 12 months postsurgery, the fracture and cyst had healed with no growth failure, and the patient had resumed all activities without pain [8].

Both cases presented by Wilbawa MAS and Maharjana MA and Tsutsumi R and Mammoto T were treated with open reduction and internal fixation plates, whereas in this particular case, the patient underwent treatment with closed reduction and FINs [7,8]. Both

cases presented by Agus SW and Maharjana MA and Tsutsumi R and Mammoto T were treated a lateral approach with temporary cable fixation and locking screws; however, in present instance, the authors opted for a retrograde insertion of FINs under fluoroscopic guidance [7,8]. In both scenarios, there were non weight-bearing periods (4-6 weeks) followed by gradual weight-bearing [7,8]. Additionally, a unilateral hip spica cast was applied in present case. Both patients experienced successful healing of the fracture and cyst without growth failure, regained full activity levels, and reported no pain during follow-up [7,8]. The present case report contributes to the existing literature by showcasing a successful treatment approach and emphasising the importance of thorough evaluation in managing similar clinical scenarios.

CONCLUSION(S)

The management of pathological femoral refractures in Paediatric patients presents unique challenges that require careful consideration of individual patient factors, treatment options, and long-term outcomes.

REFERENCES

[1] Zhao J, Wang J, Huang W, Zhang P, Ding N, Shang J. Interventions for treating simple bone cysts in the long bones of children. Cochrane Database Syst Rev. 2017;2(2):CD010847.

[2] Chigira M, Maehara S, Arita S, Udagawa E. The aetiology and treatment of simple bone cysts. J Bone Joint Surg Br. 1983;65(5):633-37. Doi: 10.1302/0301-620X.65B5.6643570. PMID: 6643570.

[3] Yang L, Wang D, Zuo J, Yang P, Tang X, Yang X. Pathological fracture increases the risk of unsatisfactory functional results and avascular necrosis in children with proximal femur simple bone cysts. Injury. 2024;55(3):111068.

[4] Jackson WF, Theologis TN, Gibbons CL, Mathews S, Kambouroglou G. Early management of pathological fractures in children. Injury. 2007;38(2):194-200.

[5] De Mattos CB, Binitie O, Dormans JP. Pathological fractures in children. Bone Jt Res. 2012;1(10):272-80.

[6] Canavese F, Samba A, Rousset M. Pathological fractures in children: Diagnosis and treatment options. Orthop Traumatol Surg Res. 2016;102(1, Suppl):S149-59.

[7] Wibawa MAS, Maharjana MA. Pathological fracture of subtrochanteric femur in children with simple bone cyst - Case report. International Journal of Science and Healthcare Research. 2022;7(2):412-16.

[8] Tsutsumi R, Mammoto T. Pediatric pathological subtrochanteric fracture treated with an adult proximal humerus polyaxial locking plate: A case report. SAGE Open Med Case Rep. 2022;10:2050313X221093112.

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