DOI: 10.7860/JCDR/2026/88806.23870

Case Report

Orthopaedics Section

Chronic Osteomyelitis of Distal Femur Managed with External Fixator and Weight Bearing Calliper: A Paediatric Case Report

ADITYA DALVI[1], NITIN SAMAL[2], DHAIRYA VERAGIWALA[3], AMIT GAURKAR[4]

ABSTRACT

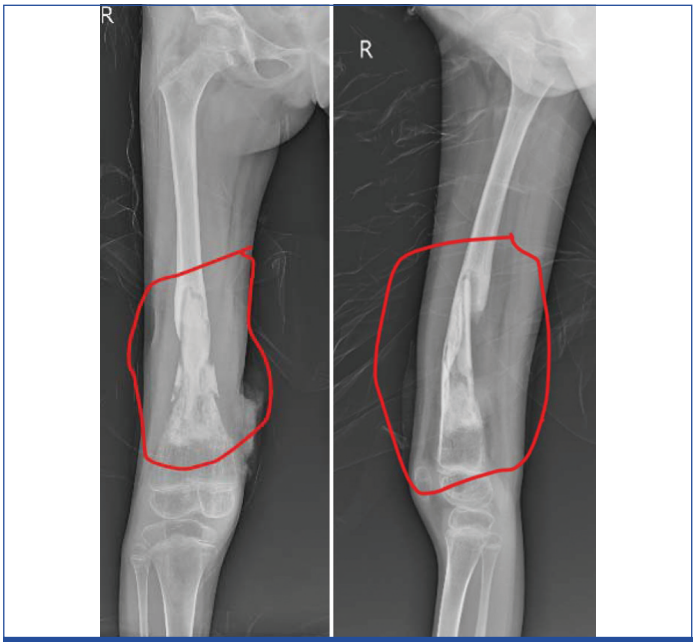
Chronic osteomyelitis is a long-standing infection of bone that can occur following trauma, fracture, or inadequate treatment of an initial infection. In children, delayed diagnosis may result in persistent pain, deformity, limb dysfunction, and difficulty in walking. Management is often difficult because the infected bone has poor blood supply and may contain sequestrum and chronic sinus formation. Timely surgical treatment with adequate stabilisation is therefore important for successful recovery. An eight-year-old child presented with pain, swelling, and discharge from the distal thigh for three months following treatment of a distal femur fracture with an above-knee slab. Clinical and radiological examination showed malunion of the distal femur with features suggestive of chronic osteomyelitis, including sequestrum formation. The patient underwent sequestrectomy with thorough debridement of infected tissue. Stabilisation was achieved using an external fixator, and autologous bone grafting was performed to aid bone healing. The postoperative period was uneventful. After six weeks, the external fixator was removed and gradual mobilisation was started with the help of a weight-bearing calliper and physiotherapy. The patient showed improvement in pain, infection control, and functional mobility during follow-up. This case highlights the importance of early identification and aggressive surgical management of chronic osteomyelitis in children. The present report is clinically significant because satisfactory limb function and infection control were achieved using sequestrectomy, external fixation, bone grafting, and structured rehabilitation in a case of paediatric distal femur infection.

Keywords: Bone transplantation, Debridement, Fracture fixation, Paediatric orthopaedics, Sequestrum

CASE REPORT

An eight-year-old child presented with pain and swelling over the lower part of the right thigh for the past three months. The pain was dull aching in character, present on most days, and became more severe while walking or putting weight on the limb. The child also had difficulty in walking and occasional discharge from the affected area. There was a history of fall while playing three months earlier, after which the child was evaluated at a local hospital and diagnosed with a distal femur fracture. The fracture was closed, with no external wound, bleeding, or visible contamination at the time of injury. Initial radiographs showed a displaced metaphyseal fracture of the distal femur without extension into the joint. Distal pulses were well felt, and sensory as well as motor examination of the limb was normal. Written informed consent for surgery and publication of clinical photographs and radiographs was obtained from the patient's parents.

The patient was initially treated with an above-knee slab for six weeks. Following removal of the slab, the swelling gradually increased and a small discharging sinus appeared over the lateral aspect of the distal thigh. On local examination, tenderness, local rise in temperature, and abnormal mobility were noted around the distal femur. Radiographs showed malunion of the distal femur along with sequestrum and cloaca formation suggestive of chronic osteomyelitis [Table/Fig-1].



[Table/Fig-1]: X-ray image of the patient.

Baseline blood investigations revealed elevated total leucocyte count, erythrocyte sedimentation rate, and C-reactive protein levels, suggestive of ongoing infection. Pus culture from the sinus grew methicillin-resistant *Staphylococcus aureus* and *Pseudomonas aeruginosa* sensitive to vancomycin and ceftazidime, [Table/Fig-2].

Considering the child's age and the anticipated duration of surgery, the procedure was performed under general anaesthesia. Under strict aseptic precautions, a lateral approach to the distal femur was used. On exposure, purulent material along with unhealthy and necrotic tissue was identified. A sequestrum measuring approximately 4×2 cm was present in the distal metaphyseal region and was removed completely. Thorough debridement was carried out until healthy bleeding bone was seen [Table/Fig-3-6].

After debridement, the remaining bone defect measured around 3 cm. Intraoperative pus and tissue samples were sent for culture and sensitivity testing. Culture from the sinus and intraoperative tissue

CBC investigations on Cell counter with PS

INVST. DATE	Hb%	MCHC	MCV	MCH	Total RBC Count	Total WBC Count	Total Platelet Count	HCT	MPV	Monocytes	Granulocytes	Lymphocytes	RDW	Eosinophils	Basophils
06/05/2025 12:30 am	10.3	31.8	64.5	20.5	5.04	11600	2.7	32.5	7.6	04	50	45	17.9	01	00
19/05/2025 09:17 pm	11.3	31.5	64.1	20.2	5.61	10100	1.49	36	6.7	04	60	15	17.9	01	00
22/05/2025 07:50 am	8.1	32.1	66	21	3.85	19200	3.3	25	7.2	04	80	15	18.3	01	00
21/05/2025 09:24 am	7.5	32.7	66	21.6	3.47	13800	2.41	22.9	7.2	04	75	20	18.3	01	00
24/05/2025 06:22 pm	8.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Coagulation profile-BT,CT,PT,APTT

INVST. DATE	APTT-Control	APTT-Patient	Prothrombin Time-Control	Prothrombin Time-Patient	INR
06/05/2025 12:47 am	29.5	48.9	11.9	12.4	1.04

E.S.R.

INVST. DATE	ESR
06/05/2025 12:31 am	33

PERIPHERAL SMEAR

INVST. DATE	PARAMETER VALUE
24/05/2025 04:22 pm	RBCs: Microcytic Hypochromic RBCs with anisopoikilocytosis showing few pencil cells WBCs: Total count increased on smear Platelets : Adequate on smear. No Haemoparasite

CRP(QUANTITATIVE)

INVST. DATE	CRP
06/05/2025 12:38 am	1.790

MICRO REPORT

SPECIMAN	CULTURE	GRAM STAINING
PUS CULTURE	Growth of methicillin resistant Staphylococcus aureus(MRSA). correlate clinically.	Plenty of pus cells /oil ,Gram positive cocci
TISSUE CULTURE	No growth	3-4 /hpf pus cells /oil ,No organism seen.
TISSUE CULTURE	Growth of methicillin sensitive Staphylococcus other than Staphylococcus aureus. (it may be a skin contaminant. As he sample is superficial tissue.).	Plenty:/oil pus cells seen, Gram positive cocci in clusters & pairs seen.
TISSUE CULTURE	Growth of Pseudomonas aeruginosa.	plenty:/oil pus cell seen, Gram positive cocci in Pairs seen, Gram negative bacill seen.

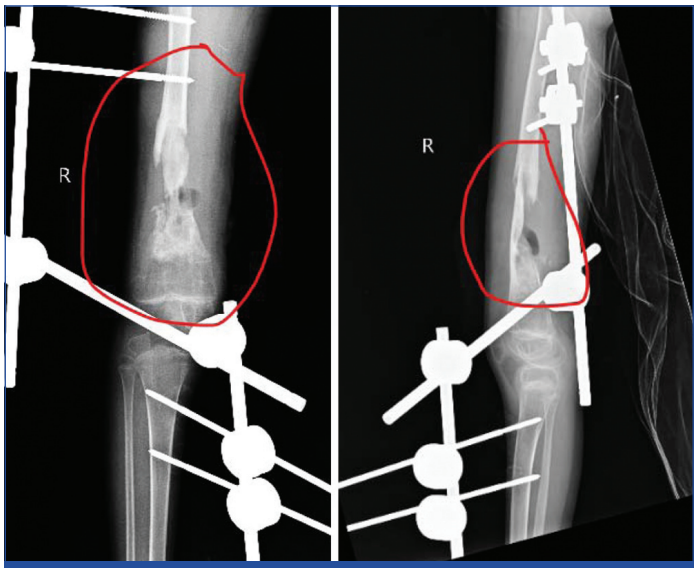
Antibiotic Sensitivity Report

REPORT_DATE	ORGANISMS	CEFTAZIDIME	CIPROFLOXACIN	PIPERACILLIN_TAZOBACTUM	TOBRAMYCIN	CEFIPIME
	Pseudomonas aeruginosa	Sensitive	Sensitive	Sensitive	Sensitive	Sensitive

Antibiotic Sensitivity Report

REPORT_DATE	ORGANISMS	AZITHROMYCIN	CINDAMYCIN	CO-TRIMOXAZOLE	DOXYCYCLINE	ERYTHROMYCIN	TETRACYCLINE	VANCOMYCIN
	Coagulase positive Staphylococci	Resistant	Resistant	Sensitive	Sensitive	Resistant	Sensitive	Sensitive

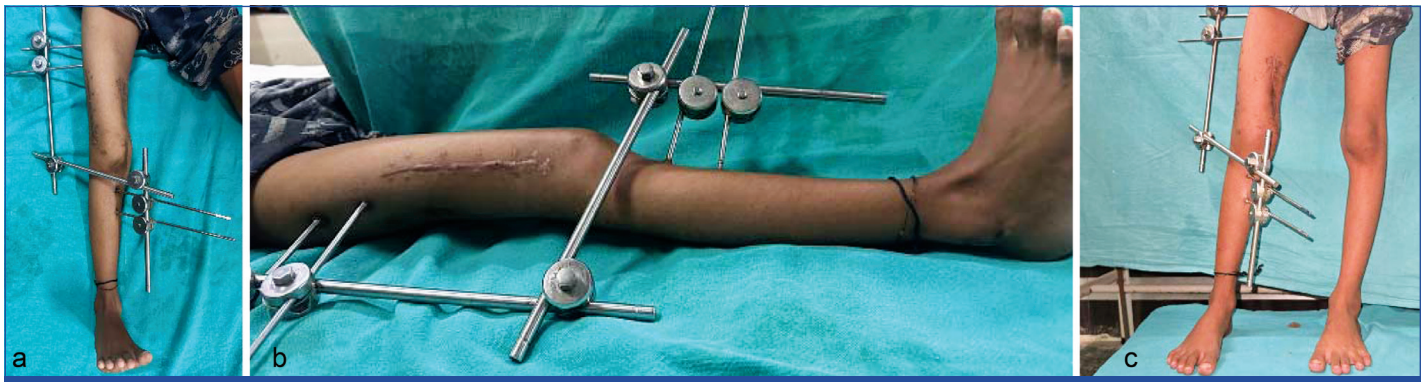
[Table/Fig-2]: Blood reports of patients with microbial culture sensitivity of tissue and pus preoperatively and postoperatively.



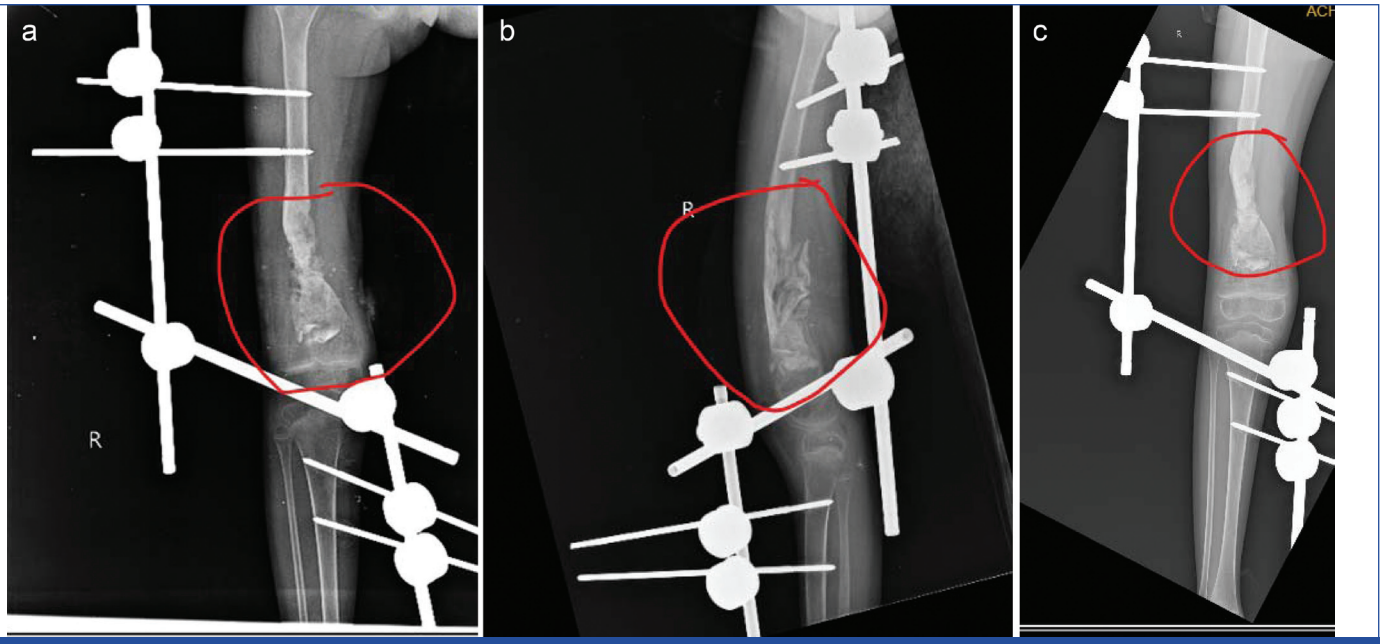
[Table/Fig-3]: Preoperative X-ray of patient with external fixator in situ with chronic osteomyelitis of distal femur.

samples revealed methicillin-resistant *Staphylococcus aureus* and *Pseudomonas aeruginosa*, which are frequently seen in chronic post-traumatic bone infections. The patient showed gradual reduction in pain, swelling, and discharge following thorough surgical debridement and administration of antibiotics according to culture sensitivity. Stabilisation was achieved using a unilateral uniplanar external fixator with proximal and distal Schanz pins under fluoroscopic guidance. Autologous cancellous bone graft harvested from the ipsilateral iliac crest was used to fill the defect and promote healing. This was confirmed postoperatively with X-ray [Table/Fig-7].

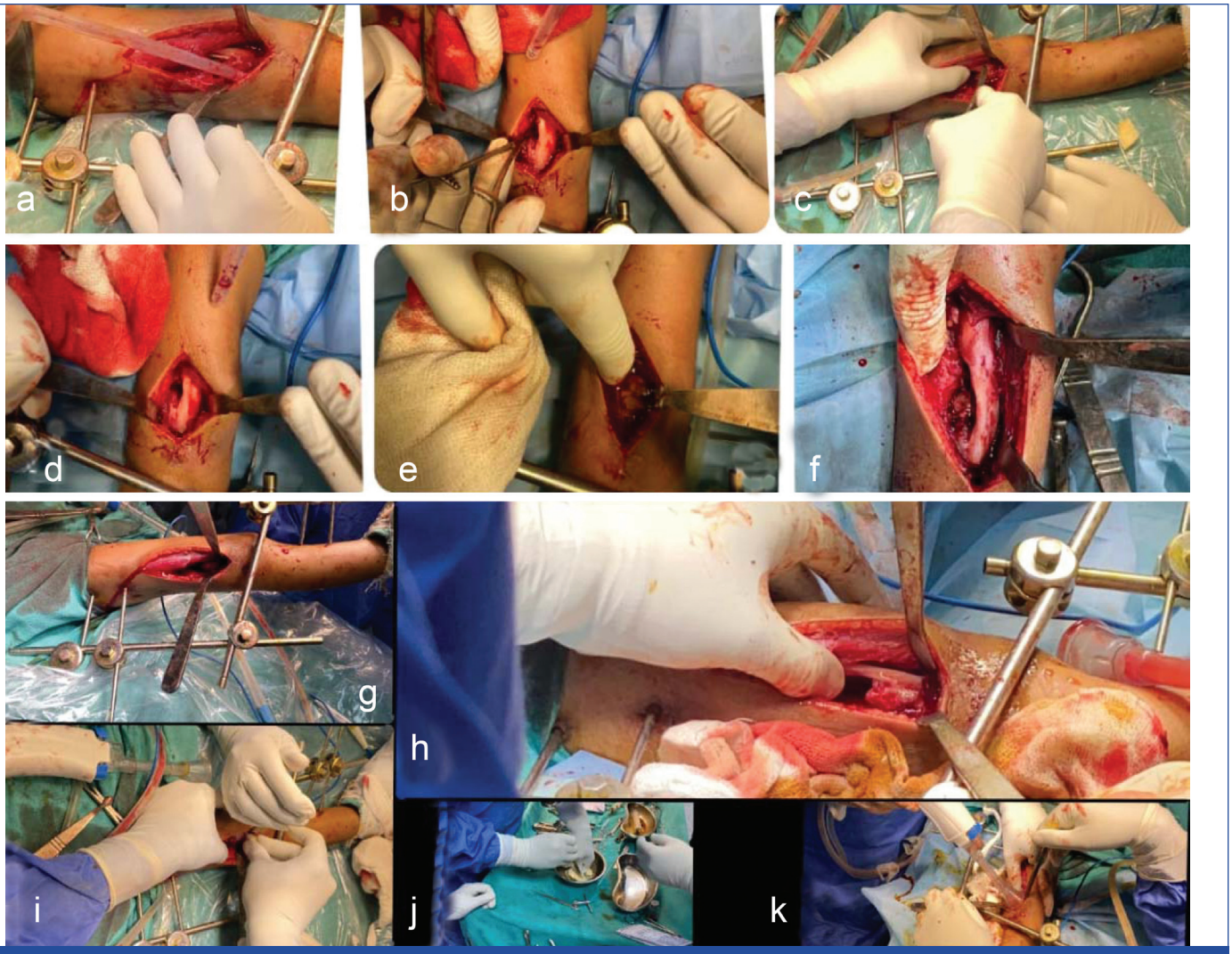
Intravenous vancomycin and ceftazidime were started postoperatively and later continued according to the culture sensitivity report removed from pus sample intraoperatively which was sensitive to ceftazidime, piperacillin-tazobactam, ciprofloxacin, tobramycin, cefepime and vancomycin. Intravenous antibiotics were given for two weeks, followed by oral antibiotics doxycycline and ciprofloxacin for another four weeks. Regular wound inspection and pin tract dressing were done during follow-up. The patient showed gradual improvement in pain, swelling, and discharge during the postoperative period.



[Table/Fig-4]: Clinical images of the patient preoperatively with external fixator in situ taken in anteroposterior, lateral and in standing position.



[Table/Fig-5]: Sequestrectomy done followed by autologous bone graft intraoperatively.

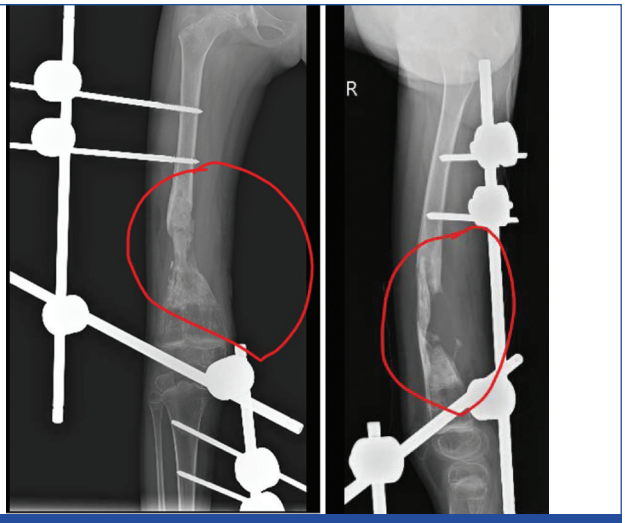


[Table/Fig-6]: Represents intraoperative images of sequestrectomy and bone graft.

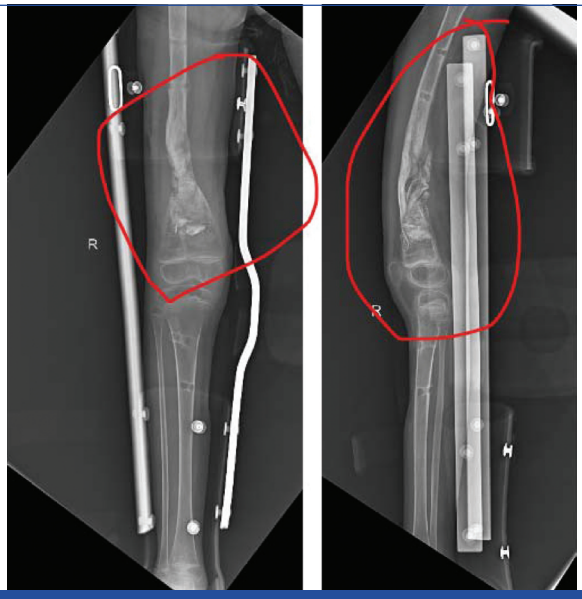
The external fixator was removed after six weeks once satisfactory clinical and radiological healing was observed [Table/Fig-8]. Gradual mobilisation was then started with physiotherapy and weight-bearing calliper support [Table/Fig-9]. During follow-up, the child showed gradual improvement in pain and walking ability. At three months after surgery, there was no discharge, swelling, or evidence of recurrent infection. The child was able to walk with support using a weight-bearing calliper and continued physiotherapy regularly. At six months follow-up, radiographs showed satisfactory healing of the distal femur with incorporation of the bone graft and maintained alignment.

DISCUSSION

Chronic osteomyelitis in children is a challenging condition, especially when diagnosis and treatment are delayed. The metaphyseal region of long bones is more prone to infection because of its rich blood supply and sluggish circulation. Acute haematogenous osteomyelitis



[Table/Fig-7]: Postoperative image of sequestrectomy with autologous bone graft of patient.



[Table/Fig-8]: Postoperative image of external fixator removal after six weeks of patient.

[Table/Fig-9]: Postoperative mobilisation with weight bearing calliper of patient.

is reported more commonly in children, with an incidence ranging from two to 13 cases per 100,000 children annually [1,2]. If not treated adequately, the infection may progress gradually and lead to chronic osteomyelitis with sequestrum and sinus formation. In the present case, the child developed chronic osteomyelitis after conservative treatment of a distal femur fracture. Persistent pain, swelling, and discharge following immobilisation raised suspicion of underlying bone infection. Radiographs demonstrated sequestrum and cloaca formation which are features of chronic osteomyelitis [1]. Metsemakers WJ et al., also reported that delayed recognition of infection following fracture treatment may result in chronic infection and prolonged morbidity [3].

The distal femoral physis contributes significantly to growth of the lower limb, and infection around this region can lead to growth disturbance, angular deformity, limb length discrepancy, and restriction of knee movement if not managed properly [2,4]. Therefore, early diagnosis and timely control of infection are important in children to preserve limb function and prevent long-term complications. The basic principles of management include adequate debridement, removal of sequestrum, skeletal stabilisation, and administration of culture-sensitive antibiotics [5,6]. In the present case, thorough debridement was performed until healthy bleeding bone was identified. Removal of necrotic tissue helped reduce bacterial load and improved the effectiveness of antibiotic therapy. Simpson AH et al., observed that adequate surgical excision remains one of the key factors for achieving infection-free survival in chronic osteomyelitis [5].

External fixation was preferred because it provided stable fixation while avoiding placement of internal implants in an infected area. It also allowed regular wound care and easier postoperative monitoring. Since the residual defect after debridement was small, autologous cancellous bone grafting was sufficient to promote healing. Other reconstructive methods such as bone transport and the Masquelet technique are usually reserved for larger defects and often require prolonged treatment and multiple procedures [7-9].

In the present patient, satisfactory stability and healing were achieved with external fixation combined with cancellous bone grafting. Culture from the sinus and intraoperative tissue samples grew methicillin-resistant *Staphylococcus aureus* and *Pseudomonas aeruginosa*, organisms commonly associated with chronic post-traumatic osteomyelitis and fracture-related infections [3]. Administration of culture-sensitive antibiotics along with proper surgical debridement resulted in gradual improvement in pain, swelling, and discharge. Similar favourable outcomes in paediatric osteomyelitis have been reported when adequate debridement is combined with appropriate antibiotic therapy and skeletal stabilisation [10]. At final follow-up, the child showed satisfactory infection control, progressive radiological healing, and improved walking ability with support of a weight-bearing calliper. This case highlights that early recognition, aggressive debridement, stable fixation, and structured rehabilitation can help achieve good functional outcome in paediatric chronic osteomyelitis involving the distal femur.

CONCLUSION(S)

Chronic osteomyelitis of the distal femur in children is a difficult condition that can cause long-term complications if treatment is delayed. Early diagnosis along with proper surgical debridement, stabilisation of the bone, and appropriate antibiotic therapy plays an important role in controlling infection and improving functional outcome. In the present case, sequestrectomy with external fixation and bone grafting helped achieve satisfactory healing and good limb function. Regular follow-up is necessary in such children to identify recurrence of infection, deformity, or growth-related complications at an early stage.

REFERENCES

[1] Lew DP, Waldvogel FA. Osteomyelitis. Lancet. 2004;364(9431):369-79.
[2] Peltola H, Pääkkönen M. Acute osteomyelitis in children. N Engl J Med. 2014;370(4):352-60.
[3] Metsemakers WJ, Kuehl R, Moriarty TF, Richards RG, Verhofstad MHJ, Borens O, et al. Infection after fracture fixation: Current surgical and microbiological concepts. Injury. 2018;49(3):511-22.
[4] Beaty JH, Kasser JR. Rockwood and Wilkins' Fractures in Children. 8th ed. Philadelphia: Wolters Kluwer; 2015.
[5] Simpson AH, Deakin M, Latham JM. Chronic osteomyelitis. The effect of the extent of surgical resection on infection-free survival. J Bone Joint Surg Br. 2001;83(3):403-07.
[6] Cierny G, Mader JT, Penninck JJ. A clinical staging system for adult osteomyelitis. Clin Orthop Relat Res. 2003;(414):07-24.
[7] Lari A, Esmaeil A, Marples M, Watts A, Pincher B, Sharma H. Single versus two-stage management of long-bone chronic osteomyelitis in adults: A systematic review and meta-analysis. J Orthop Surg Res. 2024;19(1):351.
[8] Panteli M, Giannoudis PV. Chronic osteomyelitis: What the surgeon needs to know. EFORT Open Rev. 2017;1(5):128-35.
[9] Walter G, Kemmerer M, Kappler C, Hoffmann R. Treatment algorithms for chronic osteomyelitis. Dtsch Arztebl Int. 2012;109(14):257-64.
[10] Dartnell J, Ramachandran M, Katchburian M. Haematogenous acute and subacute paediatric osteomyelitis: A systematic review of the literature. J Bone Joint Surg Br. 2012;94(5):584-95.

PARTICULARS OF CONTRIBUTORS:
1. Junior Resident, Department of Orthopaedics, Datta Meghe Institute of Higher Education and Research, Wardha, Maharashtra, India.
2. Professor, Department of Orthopaedics, Datta Meghe Institute of Higher Education and Research, Wardha, Maharashtra, India.
3. Junior Resident, Department of Orthopaedics, Datta Meghe Institute of Higher Education and Research, Wardha, Maharashtra, India.
4. Junior Resident, Department of Orthopaedics, Datta Meghe Institute of Higher Education and Research, Wardha, Maharashtra, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Aditya Dalvi,
Junior Resident, Department of Orthopaedics, Jawaharlal Nehru Medical College, Sawangi, Meghe, Wardha-442001, Maharashtra, India.
E-mail: adityadalvi1404@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Apr 01, 2026
- Manual Googling: May 25, 2026
- iThenticate Software: May 27, 2026 (2%)

ETYMOLOGY: Author Origin

EMENDATIONS: 7

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Mar 06, 2026**
Date of Peer Review: **May 12, 2026**
Date of Acceptance: **May 29, 2026**
Date of Publishing: **Jul 01, 2026**