Physiologic Periostitis: Erroneous presentation on ^{99m}Tc MDP bone scintigraphy - a case report

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European Journal of Medical Case Reports
Volume 4(10):364–367

https://doi.org/10.24911/ejmcr/173-1597812200

ABSTRACT

Background: Physiologic periostitis (PP) is characterized by periosteal reaction without any inflammatory condition, and with a more common presentation in pediatric age group involving long bones. It can easily be misinterpreted for a pathological process due to asymmetrical presentation in some cases. ^{99m}Tc-methylene diphosphonate (MDP) bone scintigraphy is one of the effective tools for its diagnosis as it helps to localize multiple lesions in the whole skeleton.

Case Presentation: A male child, 1 month of age, was referred to the nuclear medicine department of our hospital with swelling involving the right hip for 2 weeks with no history of fever and trauma. There was a mild skin discoloration at the site of swelling along with restricted leg movements. The ^{99m}Tc-MDP bone scan (BS) showed abnormal increased uptake in the proximal and distal ends of the right femur along with increased uptake in proximal right humerus. X-ray images showed periosteal reaction involving diaphyseal ends of respective long bones, and these findings together with the patient's history and normal biochemical profile suggested the presence of PP in this case. The patient's condition was improved later after treatment with non-steroidal anti-inflammatory drugs (NSAIDs), thus confirming our diagnosis.

Conclusion: PP is one of the differential diagnoses in children presenting with pain or swelling in upper or lower limbs. As the condition is self-limiting, it is important to accurately diagnose this condition before subjecting the child to vigorous testing and treatments. Exceptional behavior of this condition on BS should also be kept in mind.

Keywords: ^{99m}Tc-MDP bone scan, X-rays, physiological periostitis, case report.

Received: 19 August 2020 **Accepted:** 24 September 2020

Type of Article: CASE REPORT **Specialty:** Nuclear medicine

Funding: None.

Declaration of conflicting interests: The authors declare that there is no conflict of interest regarding the publication of this article.

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Background

Periosteal reaction occurs in response to any insult to the cortical bone showing abnormal increased uptake on bone scan (BS). It can appear in various patterns depending on the type, severity, and duration of insult [1]. It is seen as a periosteal elevation from the cortex [2]. It is more common and aggressive in children as the periosteum is loosely adherent to cortical bone in pediatric age group [3]. The periosteal reaction in children can result from physiological periostitis (PP), infection, trauma, prostaglandins administration, infantile cortical hyperostosis (ICH), hyper-vitaminosis A and D, and scurvy [4]. The PP is a periosteal reaction without any inflammatory conditions. It symmetrically involves long bones. However, it can present asymmetrically at times, hence it can easily be misinterpreted for a pathological process [5]. Prompt differentiation is important as PP is a self-limiting process without any active management. Different imaging modalities are used for diagnosis of PP, e.g., plain radiographs, computerized tomography, and magnetic resonance imaging. A ^{99m}Tc-methylene diphosphonate (MDP) BS demonstrates increased radiotracer accumulation in areas of increased bone metabolism. It has high sensitivity to delineate any such area [6]. We report a case in which PP presented with features and simulations of osteomyelitis on ^{99m}Tc-MDP bone scintigraphy.

Case Report

A 1-month-old male child was referred to the nuclear medicine department for bone scintigraphy with a history of swelling in the right hip joint for 2 weeks. The referring physician was suspecting infective process involving right hip joint. The guardian of the patient gave a history of swelling and reduced right leg movement along with irritability of the child. There was no history of fever or trauma. On examination, there was mild swelling and mild discoloration of the skin in the right proximal thigh with restricted extension. His complete blood counts, erythrocyte sedimentation rate, and C-reactive protein were within normal limits. A ^{99m}Tc-MDP three-phase BS was carried out with Infinia dual-head gamma camera equipped with low-energy high-resolution collimators at 140Kev peak with a 20% energy window. It showed abnormal increased perfusion with pool activity in region of right proximal femur (Figure 1). Delayed phase showed increased radiotracer uptake in proximal and distal ends of right femur

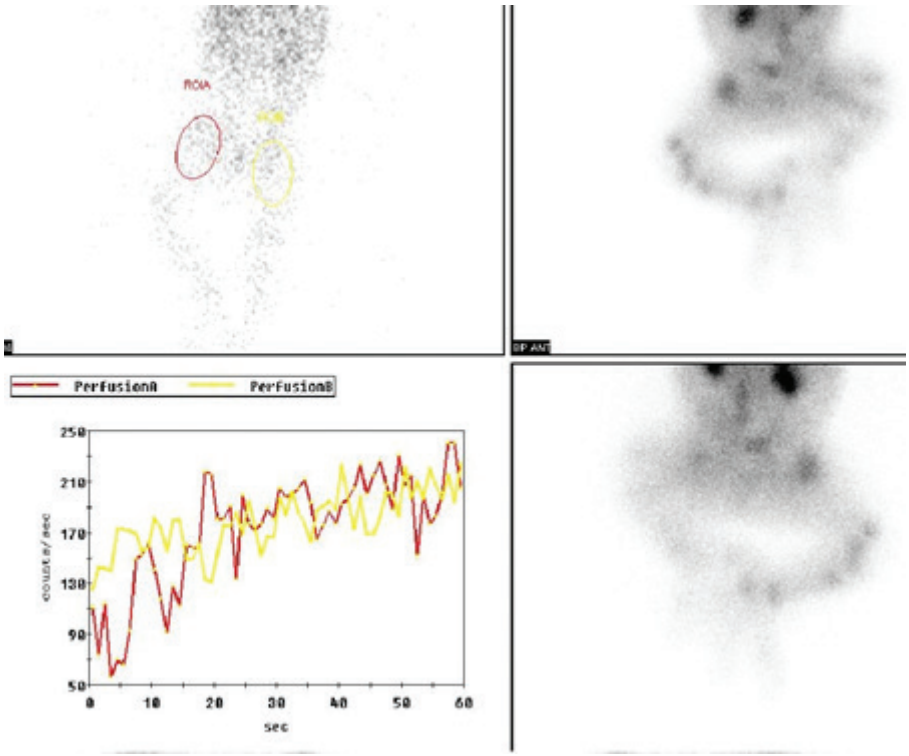

Figure 1. *^{99m}Tc-MDP bone scintigraphy (early dynamic sum images) focused on pelvis/femoral regions showing increased perfusion and blood pool activity in the proximal right femur.*

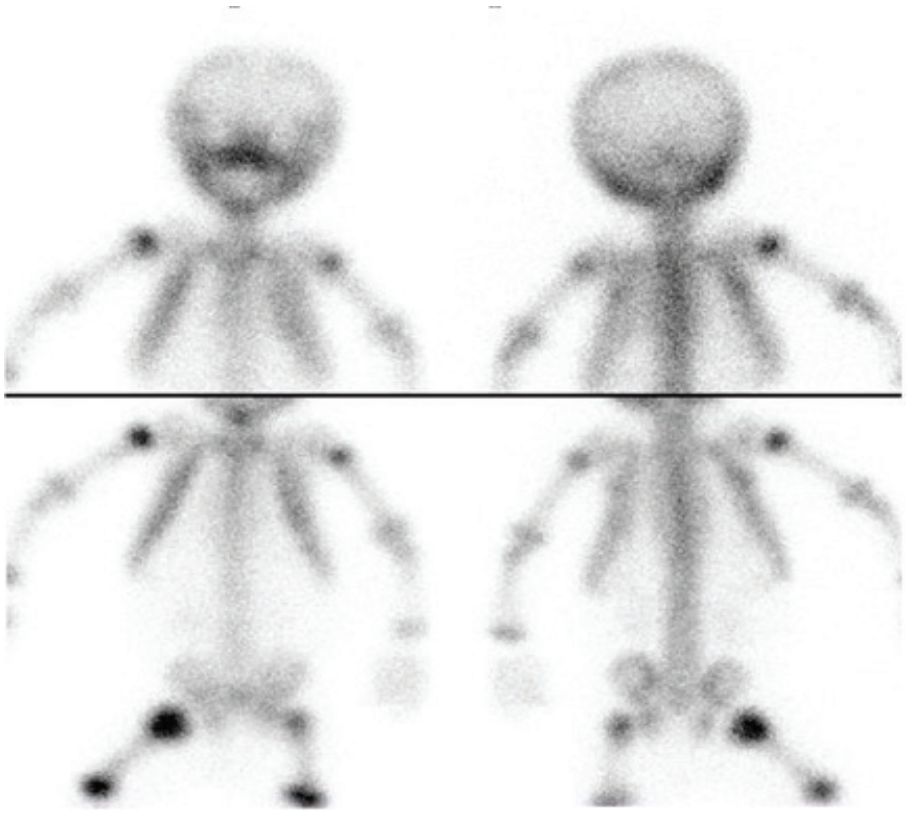

Figure 2. *^{99m}Tc-MDP bone scintigraphy (delayed phase images) showing abnormal increased uptake in proximal ends of right humerus and femur.*

along with increased uptake in proximal right humerus (Figure 2). Correlative X-ray images of right femur and humerus showed periosteal reaction at diaphyseal ends of respective long bones (Figure 3). Keeping in view the normal biochemical profile of the child, a detailed history of no evidence of antibiotics, vitamins, or other

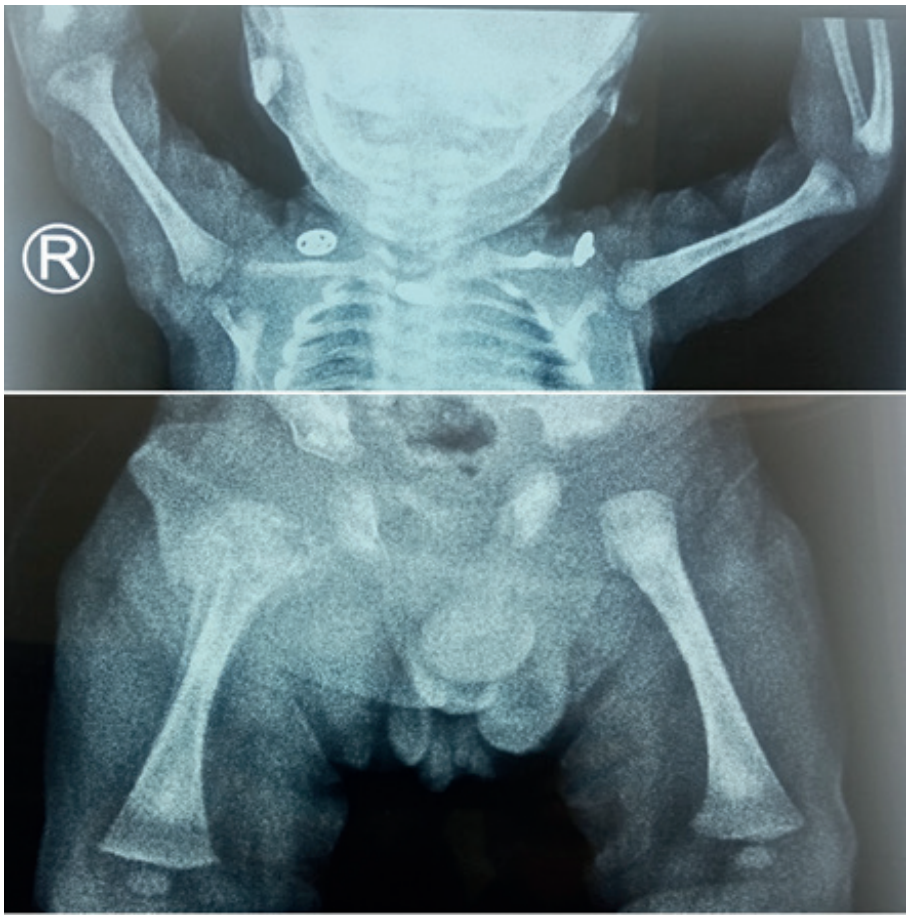

Figure 3. *X-ray images of right femur and humerus showing periosteal reaction at diaphyseal ends.*

treatment was present. The case was also discussed with the referring physician and local radiologist, but no clue of any infective pathology could be elucidated. Keeping in view the clinical and radiological findings, PP was suspected. The patient was given symptomatic treatment i.e., non-steroidal anti-inflammatory drugs (NSAIDs) by the treating physician and improvement in patient's condition was observed, subsequently confirming our diagnosis.

Discussion

PP is a periosteal reaction without any inflammatory condition and a well-documented pediatric radiological finding. It can present in infants up to 6 months of age with majority of cases reporting between 1 and 4 months of age with no gender preponderance [5]. The exact incidence and etiology are unclear. The loosely adherent periosteum and rapid bony growth in children may be the reasons for this finding. It is usually bilateral and symmetrical in distribution. It commonly involves the long bones, mostly femur and tibia. Occasionally, it may be asymmetrical and more prominent on one side, leading to diagnostic dilemma. It has been observed that if on first examination only one bone is involved then uninvolved ones may become evident in subsequent examination [7]. It can be suspected in case of normal physical examination and laboratory investigations as the condition is benign and self-limiting. Accurate diagnosis of this condition will eliminate the need for further rigorous testing and management of the child. BS is a sensitive tool to point out any focus of increased osteoblastic activity. It can augment the clinical suspicion to reach the diagnosis in most of the cases [8]. In this case, however, its finding was misleading. A unilateral periosteal reaction may lead to misdiagnosis of child abuse or infection [9]. The periosteal reaction due to trauma can be bilateral and multiple, but usually there is evidence of fracture and hematoma. Additionally appearance of new bone will be irregular so it can help in excluding the child abuse [10]. The osteomyelitis of bone will not involve multiple bones symmetrically, also presenting symptoms and laboratory investigations can help in excluding this common cause [11]. ICH occurs in same age group, but it is usually genetic and most commonly involves flat bones with involvement of mandible in 75%-80% of the cases, which may cause failure to thrive due to difficulty in eating [12,13]. PP, on the other hand, is a benign finding involving children of 1-6 months of age. It can be suspected in case of normal biochemical investigations and radiological finding of periosteal reaction involving diaphysis of multiple long bones. The condition is self-limiting, needs no surgical or aggressive pharmacological treatment, and has excellent prognosis [5].

Therefore, it is important that the knowledge of this condition should be kept in mind before subjecting the child to long and laborious procedures and treatments.

Conclusion

PP is a benign, self-limiting cause of periosteal reaction in children of 1-6 months of age. It is a well-documented radiological entity usually bilateral although it can be unilateral creating a diagnostic dilemma. A ^{99m}Tc-MDP BS can be helpful in such situations.

What is new?

PP is a benign, self-limiting cause of periosteal reaction in children of 1-6 months of age. It is a well-documented radiological entity usually bilateral although it can be unilateral creating a diagnostic dilemma. A ^{99m}Tc-MDP BS result can be erroneous, which should be kept in mind

List of abbreviations

BS	Bone scan
ICH	Infantile cortical hyperostosis
MDP	Methylene diphosphonate
PP	Physiological periostitis

Consent for publication

Written informed consent was obtained from the parents of the patient.

Ethical approval

Ethical approval is not required at our institution to publish an anonymous case report.

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References

1. Wenaden AE, Szyszko TA, Saifuddin A. Imaging of periosteal reactions associated with focal lesions of bone. Clin Radiol. 2005;60(4):439–56. https://doi.org/10.1016/j.crad.2004.08.017
2. Kumar VS, Barwar N, Khan SA. Surface osteosarcomas: Diagnosis, treatment and outcome. Indian J Orthop. 2014;48(3):255–61. https://doi.org/10.4103/0019-5413.132503
3. Chaturvedi A, Ranasinghe RA, Chaturvedi A, Meyers SP. Lesions involving the outer surface of the bone in children: a pictorial review. Insights Imaging. 2016;7(6):763–78. https://doi.org/10.1007/s13244-016-0527-0
4. Rana RS, Wu JS, Eisenberg RL. Periosteal reaction. AM J Roentgenol. 2009;193:W259–72. https://doi.org/10.2214/AJR.09.3300
5. Pradhan SK, Mutalik PSA. Physiological periostitis: reporting a medical conundrum! West Afr J Radiol. 2013;20:107–9. https://doi.org/10.4103/1115-1474.121104
6. Zhang L, He Q, Zhou T, Zhang B, Li W, Peng H, et.al. Accurate characterization of 99mTc-MDP uptake in extraosseous neoplasm mimicking bone metastasis on whole-body bone scan: contribution of SPECT/CT. BMC Med Imaging. 2019;19(1):44. https://doi.org/10.1186/s12880-019-0345-1
7. Charles FS. Periosteal bone growth in normal infants; a preliminary report. AM J Roentgenol. 1966;97(1):154–63. https://doi.org/10.2214/ajr.97.1.154
8. An YS, Park S, Jung JY, Suh CH, Kim HA. Clinical characteristics and role of whole-body bone scan in multifocal osteonecrosis. BMC Musculoskelet Disord. 2019;20(1):23. https://doi.org/10.1186/s12891-019-2401-y
9. De Silva P, Evans-Jones G, Wright A, Henderson R. Physiological periostitis; a potential pitfall. Arch Dis Child. 2003;88:1124–5. https://doi.org/10.1136/adc.88.12.1124
10. Pergolizzi R, Oestreich AE. Child abuse fracture through physiologic periosteal reaction. Pediatr Radiol. 1995;25(7):566–7. https://doi.org/10.1007/BF02015797
11. Arıcan P, Okudan B, Şefizade R, Naldöken S. Diagnostic value of bone SPECT/CT in patients with suspected osteomyelitis. Mol Imaging Radionucl Ther. 2019;28(3):89–95. https://doi.org/10.4274/mirt.galenos.2019.20053
12. Ranadheer M, Murari S, Sujith N, Jayanthi, Sudhakar P, Prabhakar Rao V. Scintigraphic and radiological correlative and confirmative features obviating invasive biopsy in Caffey's disease. Indian J Nucl Med. 2010;25(1):20–2. https://doi.org/10.4103/0972-3919.63595
13. Kirby K, Ponnarasu S, Alsaleem M, Wright JE. Infantile cortical hyperostosis (Caffey Disease). In: StatPearls. Treasure Island, FL: StatPearls Publishing StatPearls Publishing LLC; 2020. Available from: https://www.ncbi.nlm.nih.gov/books/NBK532878/

Summary of the case

1	**Patient (gender, age)**	1-month-old male
2	**Final diagnosis**	Physiologic periostitis
3	**Symptoms**	Swelling in right proximal thigh with restricted extension of right leg
4	**Medications (generic names only)**	NSAIDs
5	**Clinical procedure**	^{99m}Tc MDP bone scintigraphy, X-ray images
6	**Specialty**	Nuclear medicine