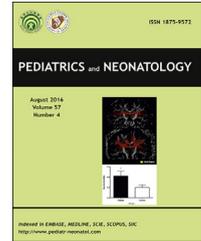


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## Images

# Lines of healing

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A 5-year-girl of South Asian descent, born at term to non-consanguineous parents, presented with nontraumatic bony pains and inward bending of the knees. She had minimal dietary calcium intake, 5 min/day of sunlight exposure, conservative dressing pattern, and noncontributory past or family history. Clinical examination revealed wrist widening, double malleoli, rachitic rosary, and bilateral genu valgus with no joint swelling, tenderness, or crepitus. Laboratory investigations showed the following: serum calcium, 7.4 mg/dL (8.8–10.8 mg/dL); phosphorus, 2.6 mg/dL (4–7 mg/dL); 25OHD, <4 ng/mL; and intact parathyroid hormone (iPTH), 1220 pg/mL (11.7–61.1 pg/mL). X-ray of the knee and wrist showed classical features of rickets, i.e., metaphyseal fraying, splaying, and cupping (Fig. 1A and B). After 12 weeks of vitamin D (4000 IU/day) and calcium (500 mg/day) supplementation, the patient's condition improved clinically and biochemically (serum calcium, 9.04 mg/dL; phosphorus, 5.55 mg/dL; 25OHD, 38.1 ng/mL; and iPTH, 72 pg/mL), and X-ray images showed remarkable improvement in form of white lines of healing and decreased radiological severity score (9–1.5) (Fig. 1C and D).

Calcium and vitamin D deficiencies (VDD), besides causing rickets and osteomalacia, respectively, also have an adverse effect on health, growth, and development of children and adolescents. Complications can include seizures, tetany, and dilated cardiomyopathy, which can be fatal or persist until adulthood.<sup>1</sup> Dark skin tone, atmospheric pollution, and sociocultural and genetic factors also contribute to significant VDD, even in tropical countries such as India, despite adequate sunlight.<sup>2</sup> Radiologically, rickets is confirmed by the presence of metaphyseal splaying, fraying, cupping, coarse trabeculae, growth plate widening, and osteopenia.<sup>3</sup> Both daily and intermittent regimens are efficacious in the management, although daily doses are more physiological. The earliest sign of healing is evident by 4 weeks on radiography as white lines of healing. If complete radiological healing and biochemical normalization are not attained by 12 weeks, refractory rickets assessment should be undertaken.<sup>2</sup>

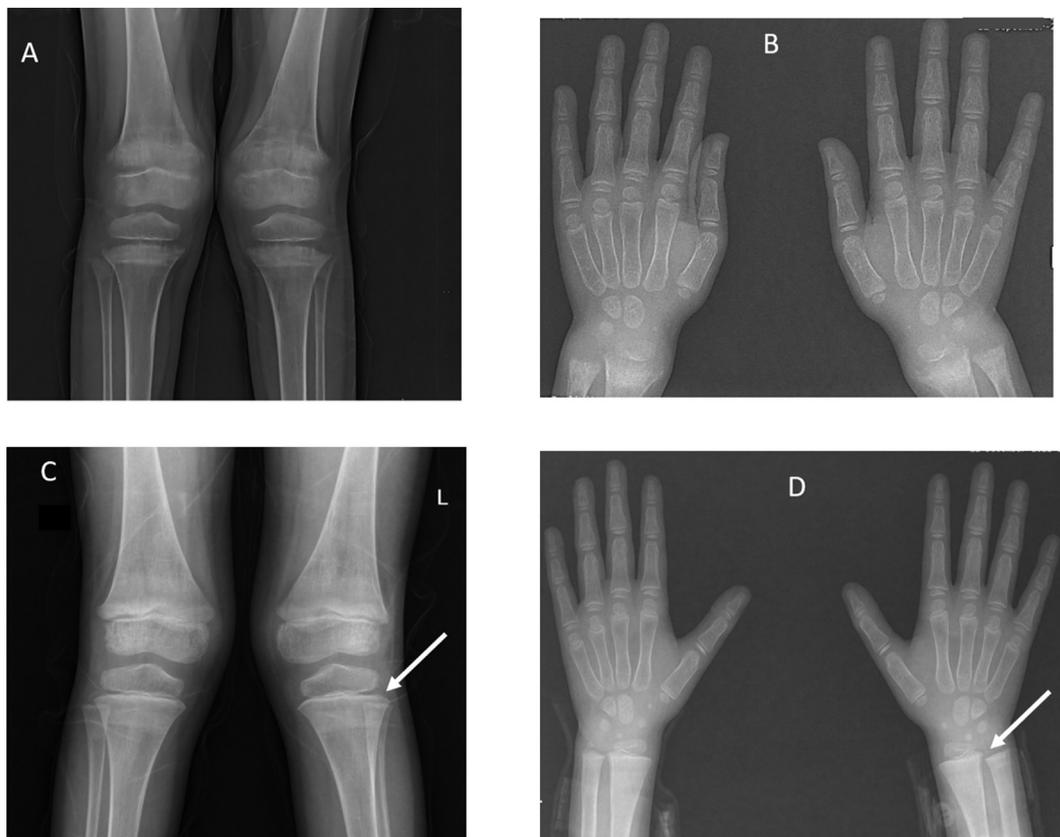
This patient presented with bony pain and deformities, was diagnosed with VDD rickets, was adequately managed, and had radiological and biochemical improvement by 12

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**Figure 1** Initial X-ray images of the knee (A) and wrist (B) showing splaying and cupping of the metaphyseal ends, with a radiological severity score of 9. X-ray images of the knee (C) and wrist (D) after 12 weeks of treatment, showing white lines of healing (white arrow) with a radiological severity score of 1.5.

weeks. Thus, early diagnosis and management can have rewarding results. As Hippocrates said, healing is a matter of time, but it is sometimes also a matter of opportunity.

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### Conflicts of interest

All the authors declare that they don't have any conflict of interest.

### References

1. Munns CF, Shaw N, Kiely M, Specjer LB, Thacher DT, Ozono K, et al. Global consensus recommendations on prevention and management of nutritional rickets. *J Clin Endocrinol Metab* 2016;**101**:394–415.
2. Gupta P, Dabas A, Seth A, Bhatia VL, Khadgawat R, Kumar P, et al. Indian Academy of Pediatrics Revised (2021) guidelines on prevention and treatment of vitamin D deficiency and rickets. *Indian Pediatr* 2022;**59**:142–58.
3. Uday S, Högl W. Nutritional rickets & osteomalacia: a practical approach to management. *Indian J Med Res* 2020;**152**:356–67.