



Short Communication

Adolescent Osteomalacia Mimicking Neuromuscular Disorders

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ABSTRACT

Background: Osteomalacia is a common metabolic bone disorder, characterized by defective bone mineralization due to Vitamin deficiency.

Design and setting: A retrospective hospital-based study, conducted at King Khalid University Hospital, Riyadh, in the period January 1990 and December 2014.

Methods: Medical records of patients with osteomalacia were retrospectively reviewed.

Results: Twenty-three adolescents were diagnosed with osteomalacia, 16 females (69.6%) and 7 males (30.4%) aged 12 to 16.5y (mean; 13.6) serum concentrations of 25-hydroxy Vitamin D were low, ranging between < 10 to 45 nmol/L (normal >50). Muscular weakness and fatigue were universally present, with four females (17.4%) presented with proximal weakness which improved by therapy.

Conclusion: Osteomalacia, as a cause of myopathy, is underdiagnosed, and indicates the importance of considering osteomalacia in the assessment of patients presenting with myopathy, as dramatic recovery after treatment can occur. Further studies, is needed to elucidate the pathophysiology of the disease.

Keywords: adolescent, disorders, neuromuscular, mimicking, osteomalacia

INTRODUCTION

Osteomalacia is a common metabolic bone disorder, characterized by defective bone mineralization as a result of Vitamin D deficiency, whether nutritional, lack of sun exposure, malabsorption or impaired vitamin D metabolism. [1] In a healthy individual, bone mineralization continues throughout childhood and adolescents until peak bone mass are reached Vitamin D. [2] There is a positive co-relation between Vitamin D and bone health. Deficiency is

still considered as a major community health problem and osteomalacia reported with increasing frequency. [3-7]

Proximal myopathy may occur in association with several muscle diseases. However, myopathy associated with endocrinopathies is quite rare. Vitamin D deficiency rickets or osteomalacia is a common cause of myopathy. [8-13] This causative association can easily be overlooked although the condition is readily treatable.

In our experience, osteomalacia is under recognized as a cause of myopathy leading to delay in diagnosis or even misdiagnosis.

This retrospective review elucidates the importance of considering osteomalacia in the assessment of patients presenting with myopathy.

MATERIALS AND METHODS

This is a retrospective, hospital-based study, conducted at King Khalid University Hospital (KKUH), Pediatric Endocrine Clinic, Riyadh, Saudi Arabia during the period between January 1990 and December 2014. The medical records of patients, with osteomalacia, were reviewed. The diagnosis was based on clinical, biochemical (bone profile, serum Mg “commercial kits” and radiological data, supported by concentration of 25-OH-Vitamin D, below 50 nmol/L. Parathyroid hormone (Radio Immuno Assay) was performed in majority of patients. The clinical symptoms and signs were documented in addition to detailed family history, social circumstances, dietary and sun exposure. Clinical and proper neurological examination documenting myopathy and any other relevant systemic or neurological findings were recorded. All patients received appropriate treatment (Vitamin D and calcium). Serial clinical assessments were conducted to define the clinical outcome.

RESULTS

Twenty-three adolescents were diagnosed with osteomalacia in the period under review (January 1995 and December 2014), 16 females (69.6%) and 7 males (30.4%) patients, aged 12 to 16.5 years. With a mean age of 13.6. Table 1 shows the aetiological diagnosis, with nutritional being the commonest. Serum concentrations of 25-OH-Vit D were low ranging between less

than 10 to 45 nmol/L (normal, > 50). Muscular weakness and fatigue were universally present, with four female patients (17.4%) presented with severe proximal muscular weakness, which improved by therapy. One female was seen initially, before doing bone profile, by neurologist who perned nerve conduction and muscle biopsy which showed atrophy.

Table 1: Aetiological diagnosis of osteomalacia in 23 patients

Diagnosis	No. of patient	%
Nutritional	17	73.9%
Anti-convulsant medication induced	3	13.0%
Celiac diseases	2	8.7%
Chronic renal failure	1	4.4%
TOTAL	23	100%

DISCUSSION

Osteomalacia is a common metabolic bone disease, characterized by defective bone mineralization due to deficiency in Vitamin D, whether poor nutrition, lack of exposure to sunlight, malabsorption or impaired Vitamin D metabolism. [1,3,4] Several studies from Saudi Arabia showed that Vitamin D tends to be low among various ages, groups and gender, inspite, the abundant sunshine across the country. [5-7] The diagnosis of osteomalacia was based on radiological findings, normal or low calcium, hypophosphataemia and increased alkaline phosphatase activity and hyperparathyroidism. This is supported by low 25 hydroxy Vitamin D concentrations. [1,3-7,14]

The clinical symptomatology of osteomalacia can be non-specific, in the majority of patients. The clinician should have a high index of suspicion, and should not miss the diagnosis. Bone pains can be mistaken with rheumatological disorders, or even malignancy. Muscle weakness or even myopathy can be mistaken with neuro-muscle disorders. In our first case the patient had undergone extensive neurological investigations that did not include measurement of her serum bone

profile. The mechanism of the weakness is not known, however, it is likely that high levels of parathyroid hormone, hypophosphatemia, and low levels of Vitamin D and metabolites all contribute. Over the last two decades, however, there has been increasing evidence that Vitamin D plays an important role in many other tissues including skeletal muscle. Early clinical descriptions of a reversible myopathy associated with Vitamin D deficiency and or chronic renal failure recognized a potential association between Vitamin D and muscle. [9,10,12,15-18] The identification of Vitamin D receptor (VDR) in muscle cells provided further support for a direct effect of Vitamin D on muscle. Recent studies on animal cell culture have advanced our understanding of some of the molecular mechanism through which Vitamin D targets skeletal muscle, however, much remains to be characterized. [19]

Clinically, patients with parathyroid hormone excess share similar symptoms of muscle weakness and fatigue as in Vitamin D deficiency. Furthermore, muscle biopsies demonstrate atrophy of type II muscle fibre in patients with PTH excess. [20] The question of whether Vitamin D deficiency itself or secondary hyperparathyroidism is the primary cause of muscle abnormality is still not fully answered. [21] Low Vitamin D levels, leads to hypocalcemia, and therefore stimulates PTH production and this may have a direct effect on skeletal muscle. Studies in animals have demonstrated that PTH induces muscle catabolism, reduces calcium transport and impair mitochondrial fatty acid oxidation in skeletal muscle. [9,10,20] All of these may contribute to the development of myopathy associated with excess parathyroid hormone, which all return to normal with therapy.

CONCLUSION

In conclusion osteomalacia, as a cause of myopathy is undersigned, and indicated the importance of considering osteomalacia in the assessment of patients presenting with myopathy as dramatic recovery after treatment can occur. Further studies are needed, to elucidate the pathophysiology of the disease.

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REFERENCES

1. Parfitt AM. Osteomalacia and related disorders In: Avioli LV, Krane SM, editors. Metabolic bone disease and clinically related disorders. Philadelphia WB Saunders 1980 p 324-96.
2. Bachard KL. Making an impact on pediatric bone health. *J Pediatr* 2000; 136:137-39.
3. Holick MF. Vitamin D deficiency. *N Engl J Med* 2007; 357:266-81.
4. Bhan A. Osteomalacia as a result of Vitamin D deficiency. *Endocrinol Metab Clin North Am* 2010; 39:321-31.
5. Al Jurayyan NA, El Desouki ME, Al Herbish AS, Al Mazyad AS, Al Qhtani MM. Nutritional rickets and osteomalacia in school children and adolescents. *Saudi Med J* 2002; 23:182-185.
6. Sedrani SH. Are Saudi at risk of developing Vitamin D deficiency. *Saudi Med J* 1982; 7:427-433.
7. Abdullah MA, Salhi HS, Bakry LA, et al. Adolescent rickets in Saudi Arabia: a rich and sunny country. *J Pediatr Endocrinol Metab* 2002; 15:1017-1025.
8. Reginato AJ. Musculoskeletal manifestations of osteomalacia. *Rev Rheum Engl Ed* 1997;64(6):107-13.
9. Skaria J, Kaliyar BC, Srivastava TP, Dube B. Myopathy and neuropathy associated with osteomalacia. *Acta Neurol Scan* 1975; 5(1):37-58.

10. Russell JP. Osteomalacia myopathy. *Muscle Nerve* 1994; 17:578-80.
11. Prabhala A, Garg R, Dandone P. Severe myopathy associated with Vitamin D deficiency in Western New York. *Arch Intern Med* 1999; 160:11:199-203.
12. Kaur K, Singh A, Prabhakar BR. Osteomalacia myopathy. *J Indian Med Assoc* 1980; 74(12):238-40.
13. Al Said YA, Al Rached HS, al Qahtani HA, Jan MMS. Severe proximal myopathy with remarkable recovery after Vitamin D treatment. *Can J Neurol Sci* 2009; 36:336-9.
14. Bligham CT, Fitzpatrick KLA. Non-invasive testing in the diagnosis of osteomalacia. *Am J Med* 1993; 95:519-22.
15. Swash M, Schwartz MS, Sargeant MK. Osteomalacia myopathy: an experimental approach. *Neuropathol Appl Neurol* 1979; 5(4):295-302.
16. Pfeifer M, Begerow B, Minne HW. Vitamin D and muscle function. *Osteoporosis Int* 2002;13(3):187-94.
17. Sharma V, Borash P, Basumatary LJ, Das M, Goswami M, Kayal A. Myopathies of Endocrine Disorders: A prospective clinical and biochemical study. *Ann Indian Aca Neurol* 2014; 17(3):298-302.
18. Griggs RX, Mendell JK, Miller JR. Myopathy of systemic disease in : Evaluation and treatment of myopathies. Philadelphia F. A. Davis 1995, pages 355-76.
19. Rico H, Gomez F. Adult hypophosphatemia osteomalacia: report of two cases. *Clinical Rheumatology* 1985;4:325-334.
20. Gaglia L. Vitamin D and skeletal muscle tissue and function. *Molecular Aspect of Medicine* 2008;29:407-414.
21. Zanello SB, Collins ED, Marinissen MJ, Norman AW, Boland RL. Vitamin D receptor expression in chicken muscle tissue and cultured myoblasts. *Hormone Metab Res* 1997;29:231-236.

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