

CLINICAL VIGNETTE

Pseudohyperphosphatemia in an 85-Year-Old Woman

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Introduction

Hyperphosphatemia is unusual in multiple myeloma patients in the absence of kidney disease. However, severe paraproteinemia with elevated immunoglobulin levels can falsely elevate serum phosphorus levels (shown in Figure 1). This can lead to erroneous diagnostic testing, evaluation, and unnecessary consultations. Recognizing this form of hyperphosphatemia as a lab error may avoid unnecessary hospital days and improve patient care.

Case

An 85-year-old woman with Alzheimer's dementia and recently diagnosed multiple myeloma was admitted for weakness and lethargy. Recent bone marrow biopsy showed 90% plasma cells. She was started on dexamethasone and lenalidomide 1 week prior to admission. Given recent initiation of treatment, she was evaluated for tumor lysis syndrome. Physical exam was unremarkable. She was given two units of PRBCs and had resolution of her weakness which did not fit the picture of tumor lysis syndrome. Other causes for hyperphosphatemia, including rhabdomyolysis, CKD, and metabolic acidosis were ruled out with serum and urine studies.

Labs

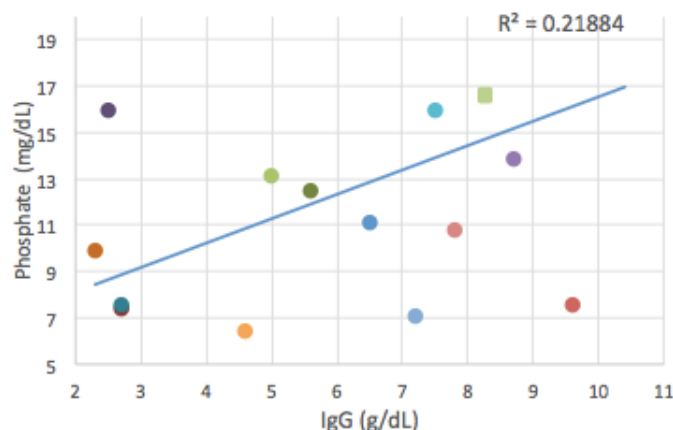
$\begin{array}{c} 6.0 \\ \diagdown \quad \diagup \\ 6.9 \quad \text{---} \quad 134 \\ \diagup \quad \diagdown \\ 17.7 \end{array}$	<table border="1"> <tr> <td>135</td> <td>100</td> <td>29</td> </tr> <tr> <td>4.1</td> <td>24</td> <td>0.83</td> </tr> </table>	135	100	29	4.1	24	0.83	$\begin{array}{c} 9.5 \\ \diagdown \quad \diagup \\ 85 \\ \diagup \quad \diagdown \\ 2.0 \\ \text{---} \\ 16.6 \text{ mg/dL} \end{array}$
135	100	29						
4.1	24	0.83						
Uric Acid 7.7	LDH 155	M-Spike 9.6						
IgG 8.256 g/dL	Kappa/Lambda 33.82							

Discussion

While our laboratory was not equipped for further analyses, prior publications have elucidated the mechanism for pseudohyperphosphatemia in patients with multiple myeloma. Standard lab testing uses a phosphomolybdate ultraviolet (UV) assay to measure serum phosphate. However, serum Paraproteins or immunoglobulins also react with the ammonium molybdate UV assay, causing increased absorption of UV light similar to phosphate – molybdate complexes. This elevated absorbance resulted on standard assays as phosphorus, falsely elevating reported phosphorus levels without clinical signifi-

cance. To avoid this processing error, other serum phosphate measuring techniques can be utilized. One approach uses 20% sulfosalicylic acid to remove paraproteins prior to running the assay, which provides a more accurate measurement of serum phosphate levels.^{1,2} Busse et. al reported normalization of phosphorus values after ultrafiltration of serum samples,³ proving that a high immunoglobulin burden can falsely elevate phosphorus levels.

Figure 1.



Relationship between serum immunoglobulin and phosphate in 15 patients with pseudohyperphosphatemia, including our own.¹

Conclusion

Our case illustrates an unusual instance of elevated immunoglobulin levels interfering with traditional phosphate analytic methods. Phosphate elevation in patients with multiple myeloma is often due to light chain-induced proximal tubular dysfunction and damage within the renal system. This can result in renal failure and inappropriate phosphate removal. Awareness of possible pseudohyperphosphatemia may reduce diagnostic confusion, unnecessary testing, and additional hospital expenditure.⁵ When suspected, repeat serum phosphate testing after deproteinization with sulfosalicylic acid should accurately measure serum phosphate levels. When pseudohyperphosphatemia is unrecognized, it can lead to inappropriate treatment with oral phosphate binders or unnecessary hemodialysis, which can result in true hypophosphatemia with serious, potentially fatal adverse effects such as cardiac arrhythmias. Unexplained hyperphosphatemia in an asymptomatic patient

should prompt investigation for diseases that can cause paraproteinemia and elevated serum immunoglobulin levels.

REFERENCES

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3. **Busse JC, Gelbard MA, Byrnes JJ, Hellman R, Vaamonde CA.** Pseudohyperphosphatemia and dysproteinemia. *Arch Intern Med.* 1987 Nov;147(11):2045-6. Erratum in: *Arch Intern Med* 1988 Feb;148(2):302. PMID: 3675108.