

Kaplan USMLE Step 1 prep: Elevation of bone metabolites with osteoblastic lesions

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If you're preparing for the United States Medical Licensing Examination® (USMLE®) Step 1 exam, you might want to know which questions are most often missed by test-prep takers. Check out this example from Kaplan Medical, and read an expert explanation of the answer. Also check out all posts in this series.

This month's stumper

A 75-year-old man comes to the physician because of nocturia, urinary urgency and a feeling that he cannot completely empty his bladder. He voids six times per day and four times per night. He has a strong desire to void, and when he reaches the toilet can only void with a weakened stream with straining. Digital rectal examination shows a firm, enlarged prostate measuring approximately 30 grams. Post-void residual by ultrasound is 300 mL. Bone scan shows multiple osteoblastic lesions in the vertebral bodies. Elevation of which of the following bone metabolites is most strongly associated with these lesions?

- A. Prostate-specific antigen
- B. Prostatic acid phosphatase
- C. Serum alkaline phosphatase
- D. Tartrate-resistant acid phosphatase
- E. Urinary hydroxyproline

The correct answer is C.

Kaplan medical explains why

This patient has prostate cancer causing osteoblastic bone lesions. Osteoblastic cells respond to metastatic prostate carcinoma by forming bone (osteoid) and secreting alkaline phosphatase, which is thought to either initiate or facilitate mineralization. The use of serum alkaline phosphatase is not for prostate cancer screening purposes but for patient management and follow-up after treatment is initiated. Recurrence of elevated serum alkaline phosphatase would suggest recurrence of tumor metastasis. It is important to note that this patient will likely have an elevated PSA because of his prostate cancer. However, PSA is prostate-specific, and bony disease from prostate cancer also will show elevated alkaline phosphate levels.

Why you shouldn't choose the other answers

Read these explanations to understand the important rationale for each answer to help you prepare with future studying. **Choices A and B:** Prostate-specific antigen and prostatic acid phosphatase are not correct because they do not answer the question being asked. The question asks for bone metabolites related to the patient's skeletal metastasis. These two markers are synthesized by the tumor and would most likely be elevated in this case; however, they are elevated due to the prostatic cancer, independent from the bony metastasis. **Choices D and E:** Tartrate-resistant acid phosphatase and urinary hydroxyproline are metabolic markers of osteoclastic (not osteoblastic) cell activity. Lytic tumor metastasis (lung, kidney, gastrointestinal tract, melanoma) would be associated with increased levels of these markers. Tartrate-resistant acid phosphatase is secreted by the osteoclast during bone resorption. Hydroxyproline is associated with collagen breakdown and increased levels are excreted in the urine.

Tips to remember

- Serum alkaline phosphatase levels are used to screen for osteoblastic bony metastases in prostate cancer.
- General screening tests for prostate cancer include prostatic acid phosphatase and prostate-specific antigen. However, the PSA is the more accepted test to have performed and is the current standard of care for prostate cancer screening.

For more prep questions on USMLE Steps 1, 2 and 3, view other posts in this series.

The AMA and Kaplan have teamed up to support you in reaching your goal of passing the USMLE® or COMLEX-USA®. If you're looking for additional resources, Kaplan provides free access to tools for pre-clinical studies, including Kaplan's Lecture Notes series, Integrated Vignettes, Shelf Prep and more.