

PharmaCE™

a continuing education program for *JPT* readers

September/October CE Questions

the journal of Pharmacy Technology's educational consultants are listed on page 261.



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PROTON PUMP INHIBITORS

(see page 275)

Goal

To provide an overview of the literature examining the use of PPIs and the incidence of fracture, including the relationship between PPIs and calcium absorption and osteoclast function.

Objectives

After reviewing this article, the reader should be able to:

1. describe the effect of PPIs on calcium absorption;
2. describe the effect of PPIs on osteoclast function;
3. describe the overall effect of PPIs on the incidence of fracture, as seen in studies.

Test Questions

1. PPIs are commonly used to treat all of the following diseases *except*:
 - (a) peptic ulcer disease.
 - (b) Zollinger–Ellison syndrome.
 - (c) Barrett's esophagus.
 - (d) cardiac chest pain.
2. Which of the following statements regarding PPIs and adverse events is *true*?
 - (a) Lansoprazole has the highest incidence of adverse events.
 - (b) PPIs have been implicated in many significant drug–drug interactions.
 - (c) The overall incidence of adverse events is low.
 - (d) A common adverse effect of PPIs is rhinorrhea.
3. Which of the following statements about calcium is *true*?
 - (a) Calcium must first be dissociated from complexes to be absorbed.
 - (b) Calcium complexes are easily absorbed in the gut.
 - (c) Calcium solubility is not dependent on pH.
 - (d) Calcium salts are highly water soluble.
4. Based on the animal and human studies reviewed, which of the following statements about calcium salts is *true*?
 - (a) Calcium carbonate and calcium citrate have similar absorption rates, regardless of gastric pH.
 - (b) Calcium citrate is absorbed better in an achlorhydric or hypochlorhydric state compared with calcium carbonate.
 - (c) The studies did not evaluate comparative absorption of calcium citrate and calcium carbonate.
 - (d) Calcium carbonate is absorbed better in an achlorhydric or hypochlorhydric state than is calcium citrate.
5. PPIs may reduce bone resorption by which of the following mechanisms?
 - (a) reducing calcium absorption in the gut
 - (b) inhibiting osteoblast function
 - (c) inhibiting osteoclast function
 - (d) increasing calcium absorption in the gut
6. Which of the following statements *best* describes characteristics of PPI activation?
 - (a) PPIs require a high pH for conversion into an active form.
 - (b) PPIs do not require activation before they can become effective.
 - (c) PPIs are activated by pH-independent mechanisms.
 - (d) PPIs must be activated in a low pH environment before they can become effective.
7. PPIs may inhibit calcium absorption by which of the following mechanisms?
 - (a) increasing gastric pH and thereby reducing calcium solubility
 - (b) inhibiting osteoclast function
 - (c) decreasing gastric pH and thereby reducing calcium solubility
 - (d) improving pH-dependent calcium complex dissociation
8. Which of the following statements accurately summarizes the results of the Vestergaard et al.²⁴ study of PPIs, H₂-receptor antagonists, and fracture risk?
 - (a) Use of H₂-receptor antagonists increased overall fracture risk.
 - (b) Use of H₂-receptor antagonists increased hip fracture risk.
 - (c) Use of PPIs within one year increased overall fracture risk.
 - (d) Use of PPIs within one year decreased hip fracture risk.
9. Which of the following statements accurately summarizes the results of the Yang et al.²⁵ study of PPIs and fracture risk?
 - (a) There was no relationship between PPI use and the risk of fracture.
 - (b) Long-term PPI treatment decreased the risk of fracture.
 - (c) Risk of hip fracture was independent of duration of PPI treatment.
 - (d) Risk of hip fracture increased with a longer duration of PPI treatment.
10. Which of the following is a major difference in study design between the Vestergaard et al. and Yang et al. studies?
 - (a) ages of the patients
 - (b) concomitant disease states of the patients

Answer sheet appears on page 319.

- (c) adjustment for confounders
- (d) sex of the patients

11. A 68-year-old African American male has been taking pantoprazole for treatment of dyspepsia for the past 4 years. According to the Vestergaard et al. and Yang et al. studies, which of the following aspects about the patient puts him at a higher risk for fracture?

- (a) his sex
- (b) his long-term use of PPIs
- (c) his use of pantoprazole instead of another PPI
- (d) his dyspepsia