ACE Anesthesiology Continuing Education

ACE Question

Which of the following opioids has significant active metabolites that accumulate in patients with renal failure?

(A) Fentanyl **(B) Morphine** **(C) Hydromorphone**

Renal failure affects the pharmacology of all opioids, but especially morphine and meperidine. Morphine is metabolized into two water-soluble metabolites in the liver and kidney: morphine-3-glucuronide (M3G) and morphine-6-glucuronide (M6G). These metabolites are excreted by the kidney and can accumulate in patients with renal failure. M6G has analgesic properties and can cause respiratory depression.

Similarly, meperidine is metabolized to normeperidine, which is excreted through the kidneys. Normeperidine has analgesic properties, but unlike meperidine, it also produces central nervous system excitation. This can lead to anxiety, tremulousness, and myoclonus, at times progressing to frank seizures. Meperidine should not be used in patients with depressed renal function.

The metabolism of fentanyl and hydromorphone is significantly less affected by renal failure. Fentanyl has no active metabolites, and while hydromorphone does have metabolites that are excreted in the urine, these metabolites do not appear to have analgesic properties, nor do they appear to cause significant adverse effects in humans. ■

References:

1. Hemmings HC Jr, Egan TD, eds. *Pharmacology and Physiology for Anesthesia: Foundations and Clinical Application*. 2nd ed. Elsevier; 2019:341-342.
2. Dean M. Opioids in renal failure and dialysis patients. *J Pain Symptom Manage*. 2004;28(5):497-504. doi:10.1016/j.jpainsymman.2004.02.021

Answer: B

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