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CONFERENCE COVERAGE

Toxicology

Calcium and Digoxin Toxicity

In the current experiment, digoxin toxic guinea pigs were randomized to receive either calcium or normal saline and then observed for dysrhythmias and death. All animals developed hyperkalemia, demonstrating classic digoxin toxicity. Although there were no statistical differences between the calcium and the saline groups, there was a trend toward decreased rates of death and dysrhythmia in the calcium-treated animals.

COMMENT BY ROBERT HOFFMAN, MD

Digoxin toxicity produces extracellular hyperkalemia and intracellular hypercalcemia, all as a direct result of blocking the Na-K-ATPase pump. The hyperkalemia is often profound, prompting clinicians to treat it aggressively, often before the diagnosis of digoxin toxicity is known. While standard emergency therapies with insulin, dextrose, and bicarbonate are all safe and effective, concern has been expressed about the use of calcium. This concern dates back to early animal investigations that demonstrated that intravenous calcium could be fatal in the setting of digoxin toxicity, probably as a result of profound intracellular hypercalcemia.

While this is a very interesting and provocative model, unfortunately the results suffer from the limitations of a small sample size. The failure to achieve statistical significance here means that the data can not be interpreted. While a power analysis would probably demonstrate that the sample size was too small, it is unclear if the trend would persist in a larger sample. The authors should be encouraged to repeat the study with a larger sample. For the time being, however, I would caution against using this paper to suggest that the use of calcium salts in the treatment of digoxin-induced hyperkalemia in humans is either indicated, effective, or safe. ***(Source:*** *Ghaemmaghami CA, Harchelroad F. Dangers of intravenous calcium chloride in the treatment of digoxin-induced hyperkalemia—Fact or fiction [abstract]?* Acad Emerg Med *1999;6:378.)* ❖

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INSIDE

Digoxin in Verapamil Toxicity

Since calcium channel blockers work largely through a reduction of intracellular calcium, the present investigation evaluated the effect of digoxin (which increases intracellular calcium) in verapamil toxicity. Dogs poisoned with verapamil were randomized to receive either calcium or calcium plus a high therapeutic dose of digoxin, and their hemodynamics were followed. Digoxin plus calcium produced a significant increase in systolic blood pressure and mean arterial blood pressure, as well as a non-significant trend toward decreased mortality, when compared to calcium alone.

COMMENT BY ROBERT HOFFMAN, MD

Calcium channel blocker overdose is among the leading causes of fatal ingestions of prescription medications reported to poison control centers. The severe toxicity of calcium channel blockers results largely from their combined negative inotropy and negative chronotropy. Sustained release formulations further compound toxicity by prolonging the absorptive phase. Although many therapies (including calcium, glucagon, phosphodiesterase inhibitors, and catecholamines) are available, they are often insufficient in severe toxicity.

Although these results were hampered by the small sample size, the findings are clear. What remains somewhat problematic is whether it is safe and advisable to administer digoxin (a drug known to produce bradycardia) to people who are at risk for profound bradycardia and hypotension. If this study can be verified in another model, human trials should follow promptly. *(**Source:** Bania TC, et al. Calcium plus digoxin versus calcium alone for verapamil toxicity [abstract].* Acad Emerg Med *1999;6:378.)* ❖

Antidote Stocking in the ED

The present study evaluated stocking of N-acetylcysteine, naloxone, cyanide antidote, deferoxamine, digoxin Fab, fomepizole, ethanol, pralidoxime, crotalid antivenom, and pyridoxine in hospitals in Oregon and Nevada. Not surprisingly, only 50% of hospitals surveyed had 24-hour quantities of all antidotes. Only 60% had six-hour quantities of all 10 antidotes. When these values were corrected for frequency of use, stock levels appeared better. Lee and colleagues note that for less than $10,000 a hospital can be sufficiently stocked to be prepared for routine care of even infrequent poisonings.

COMMENT BY ROBERT HOFFMAN, MD

The ability to respond to poisoned patients often requires the use of specialized antidotes. Many of these antidotes are expensive, infrequently used, and have no other indications. Probably as a direct result of these factors, several previous studies have demonstrated that many hospitals are inadequately prepared to care for poisoned patients.

This study raises significant public health concerns. Hospitals are going to have to make the commitment to be adequately stocked, or else enter into cooperative agreements with other area facilities. Alternatively, it seems reasonable to have central supplies of antidotes in referral hospitals, poison centers, or poison treatment centers, and to move patients or antidotes depending on clinical necessity. Regardless of the solution, it is essential for communities to develop plans that assure that patients will have access to antidotes. *(**Source:** Lee JH, et al. Antidote stocking in Oregon and Nevada: Are EDs inadequately prepared [abstract]?* Acad Emerg Med *1999;6:392.)* ❖

Infectious Disease

Post-Exposure Prophylaxis for Rabies

The authors report the results of the rabies arm of the EMERGEncy ID NET study group, which consists of 11 EDs in the United States. These centers serve as the population base for the ongoing study of various emerging infections. Data were prospectively collected on animal exposure demographics and post-exposure prophylaxis (PEP) practices in an attempt to determine the appropri-

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ateness of therapy given or withheld. The gold standard for PEP practices varies with regional rabies epidemiological trends, and was determined in conjunction with local public health department recommendations. Of 2055 animal contacts, approximately 80% were with dogs, 13% with cats, 0.5% with raccoons, 0.2% with bats, and 6.5% with other animals. One hundred-thirty-one (6%) patients received PEP, and in 47% of those cases it was given inappropriately. Perhaps more concerning is the finding that in 114 (6%) of cases, PEP should have been administered and was not.

COMMENT BY RICHARD HARRIGAN, MD, FAAEM, FACEP

Post-exposure prophylaxis after potential exposure to the rabies virus is important in that the disease virtually is 100% fatal if contracted, yet is 100% preventable if PEP is administered correctly. What makes the issue of PEP prophylaxis difficult is that, unlike heart failure and asthma therapy, administration of rabies prophylaxis is not something the emergency physician does every day. Therefore, the issues of when and how to treat may not be at our fingertips; the data presented in this abstract certainly illustrate this point. Emergency physicians should be familiar with the recently published Centers for Disease Control and Prevention (CDC) guidelines concerning human rabies prevention,[1] which were reprinted in the *Annals of Emergency Medicine*.[2] Highlights of the current PEP recommendations were presented in a recent issue of *Emergency Medicine Alert*.[3] Consideration should be given to deriving a treatment algorithm for your ED, based on the CDC recommendations and regional rabies epidemiology as per your local public health department. This algorithm could be posted in the ED or integrated into the department computer system. The data presented by Moran and colleagues suggest that an emphasis should be placed on defining at-risk animals for transmission of the virus, the circumstances of exposure, and the availability of that animal (if it were a dog, cat, or ferret) for observation. *(**Source:** Moran GJ, et al. Appropriateness of emergency department rabies post-exposure prophylaxis for animal exposures in the United States [abstract]*. Acad Emerg Med *1999;6:376.)* ❖

Reference

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3. Harrigan RA. Update: Rabies 1999. *Emerg Med Alert* 1999;5:77-79.

Prevalence of Gonorrhea and Chlamydia

The purpose of this study was to determine the age-based prevalence of "unrecognized" gonorrhea (GC) and chlamydia trachomatis (CT) in a large, inner-city, university teaching hospital. This was viewed as a first step toward developing an ED-based screening program for sexually transmitted diseases. Urine samples were tested by a ligase chain reaction (LCR) assay in 700 patients aged 18-44 years.

Among the 434 patients who were 18-31 years old, 59 (13.6%) cases were positive for GC or CT by urine LCR. Among the 221 patients in the 32-44 year age group, only four (1.8%) cases were positive. Of those infected, 48 (76.2%) went "unrecognized" (did not receive appropriate treatment) by clinicians in the ED. Therefore, the prevalence of unrecognized GC or CT in the 18- to 31-year-old group was 10.4%.

COMMENT BY STEPHANIE ABBUHL, MD, FACEP

The high prevalence rates in this study are alarming and remind us of the disturbingly silent nature of some STDs. These results are consistent with a similar study of 13,200 new female U.S. Army recruits using urine LCR assays where the overall prevalence of chlamydial infection was found to be 9.2%, with a peak of 12.2% among the 17-year-olds.[1] I am philosophically in favor of GC/CT screening because it is epidemic, associated with significant morbidity, readily diagnosed, and treatable. Unfortunately, there are two practical issues that limit the feasibility of this kind of a screening program: 1) the urine LCR assay is labor intensive and time consuming and not available at point of service; and 2) the charge for each LCR assay runs in the $60-$90 range. *(**Source:** Mehta S, et al. Detection of unrecognized gonorrhea and chlamydia using a urine ligase chain reaction assay [abstract]*. Acad Emerg Med *1999;6:376.)* ❖

Reference

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Respiratory Disease

What Route for Dexamethasone in Croup?

Rittichier and colleagues ask the simple question, "why not the PO route for dexamethasone in croup?" Patients with moderate croup (history or presence of stri-

dor) were randomized to intramuscular or oral dexamethasone at 0.6 mg/kg to a maximum of 8.0 mg. Telephone follow-up demonstrated similar outcomes in each group—half were resolved, about one-third returned for re-evaluation, and one-tenth needed either more steroids, nebulized epinephrine, or admission. No adverse sequelae were reported for either group.

COMMENT BY RICHARD HAMILTON, MD, FAAEM, ABMT

This study is simple in design and end point. Of course, since no difference was found, I look forward to the power analysis in the completed paper. However, the differences in absolute terms were so minimal, I believe that the oral route is essentially the same as intramuscular in efficacy. These are the kinds of studies that help me see patients faster and more confidently. While I have always used oral prednisone for asthmatics, I have only rarely used oral dexamethasone. The savings in effort and avoiding needless injection makes this a study that shapes my practice—well done, and bring on the winter! *(**Source:** Rittichier KK, et al. Outpatient treatment of moderate croup with dexamethasone: Intramuscular versus oral dosing [abstract].* Acad Emerg Med *1999;6:493.)* ❖

Magnesium Sulfate and Asthma

Alter and associates reviewed 164 papers on magnesium sulfate and asthma. They performed a meta-analysis on seven trials that specifically studied the use of a 1.2-2.0 gram bolus of magnesium sulfate on spirometric function in acute bronchospasm. Magnesium sulfate improved spirometric functions by one-quarter of a standard deviation. In addition, there were no serious adverse events.

COMMENT BY RICHARD HAMILTON, MD

The authors' effort to make statistical sense of the studies done for magnesium in asthma is laudable. I have never routinely used magnesium in asthma because I have never been convinced of its efficacy. Admittedly, the central problem with clinical asthma studies is the end point. In every case, we are forced to accept surrogate markers of improvement, such as better peak flow rates or hospital discharge. I remain convinced that we achieve better clinical outcomes when we maximize β_2 agonist and corticosteroid therapy. Nonetheless, in this meta-analysis, magnesium appears to provide a small benefit in spirometric function as a surrogate marker for asthma severity and may be clinically useful without serious harm. *(**Source:** Alter HJ, et al. Intravenous magnesium sulfate as an effective adjuvant in acute bronchospasm: A meta-analysis [abstract].* Acad Emerg Med *1999;6:521.)* ❖

Route of Analgesia and Pain Perception

The purpose of this prospective, randomized, double-blind study was to compare the analgesic effects of IM vs. PO placebo. A convenience sample of 77 patients with acute musculoskeletal pain was given 800 mg of ibuprofen in an orange flavored drink. Thirty-nine of the subjects then received a physiologically inactive tablet resembling ibuprofen and the remaining thirty-eight subjects received a physiologically inactive IM injection resembling ketorolac 60 mg. Subjects then rated the intensity of their pain on a 100 mm visual analog scale (VAS) at baseline and 30, 60, 90, and 120 minutes after treatment.

A total of 64 patients completed the study, giving the authors the ability to detect a 20% difference in VAS score between the two groups with 90% power. After two hours, the mean VAS score had decreased from 60 to 26 for the IM group and from 59 to 27 in the PO group. There were no significant differences in the VAS scores at baseline or at each subsequent interval.

COMMENT BY STEPHANIE ABBUHL, MD, FACEP

I suspect that all of us have thought, at one time or another, that at least some of the benefit from a parenteral analgesic was due to the placebo effect of the perception of a "stronger medication." The authors of this clever, but small, study have provided some initial evidence to refute this commonly held belief. Instinctively, I like this study because it reminds us of our tendency as physicians to think that pain management is more of a subjective game of manipulation than part of objective disease management. We may have again underestimated our patients.

Admittedly, it is possible that larger studies will expose some placebo effect from parenteral analgesia. In addition, there may also be clinically important differences in patient-assigned VAS scores at less than a 20% difference.[1] Finally, it is also possible that certain subgroups of patients will gain a significant placebo effect from parenteral analgesics. *(**Source:** Schwartz NA, et al. Perceived mode of NSAID/placebo administration and its effects on analgesia [abstract].* Acad Emerg Med *1999;6:505.)* ❖

Reference

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Ketoralac vs. Meperidine for Renal Colic

This multicenter, prospective, randomized, double-blind equivalence trial examines a small area of controversy amongst many emergency physicians: Is ketoralac "better" than meperidine for analgesia in renal colic? Measure-

ments of pain relief and functional status were taken at 60 minutes. Ketoralac patients received single intravenous bolus followed by placebo, and meperidine patients received an intravenous bolus of 50 mg followed by 25-50 mg boluses repeated every 15 minutes. The results favored ketoralac by the percentage of patients with successful pain relief and the overwhelming percentage of patients who were able to resume normal activity (44% of ketoralac patients and 10% of meperidine patients).

COMMENT BY RICHARD HAMILTON, MD, FAAEM, ABMT

Those of us who favor the use of ketoralac in the specific condition of renal colic will ignore the authors' obvious bias toward the drug in developing this study, and use this study to reinforce our practice. Physicians who favor opiate analgesics would appropriately point out that the titration dosing regimen and 60-minute end point employ a suboptimal dose of meperidine as a bolus and then add additional drug at suboptimal dosing. The effect may be to cause some patients at 60 minutes to be in pain and others to be enduring the impairment of cumulative small doses of opiates. While my experience is in agreement with the authors' hypothesis that ketoralac provides successful analgesia and earlier return of function, this study does not necessarily provide me with the support I had hoped for. A more appropriate study would be to employ 1-2 mg/kg of meperidine as a slow intravenous bolus head-to-head with ketoralac. While I believe the results would be similar, at least adequate opiate doses would be employed earlier to provide immediate complete pain relief and a period of recovery. One end point not obtained here—rapidity of onset of analgesia—is something that often favors the use of opiates in these clinical scenarios. *(**Source:** Wood V, et al. NARC Trial: Single dose intravenous ketoralac versus titrated intravenous meperidine in acute renal colic—A randomized clinical trial [abstract].* Acad Emerg Med *1999;6:505.)* ❖

Clinical Practice

Abdominal Pain in the HIV-Positive Patient

This was a retrospective chart review of consecutive patients presenting with a chief complaint of abdominal pain to a high-volume ED with a large population of HIV-positive patients. Of 108 patients comprising the study population, 72% had acute (lasting fewer than 7 days) abdominal pain. The leading ED diagnosis was abdominal pain of unknown etiology (19%), followed by the usual assortment of abdominal pathologies (e.g, gastroenteritis, peptic ulcer disease, appendicitis, etc.). Interestingly, AIDS-associated opportunistic infections (OIs) were diagnosed in 6% of patients, with only 3% later being diagnosed with AIDS OIs after admission or in follow-up. Thirty-five percent of HIV patients with abdominal pain were admitted, as opposed to 18% of the general ED population ($P < 0.001$).

COMMENT BY RICHARD HARRIGAN, MD, FAAEM, FACEP

This study seems to indicate what we should already know, but must remember—patients with HIV can develop the same abdominal problems that HIV-negative patients do, and our work-ups should be done with this in mind. Of course, OIs are important additions to the differential diagnosis, and should be considered in light of the patients' CD4 count if it is known (in this study, the mean CD4 count was 263 ± 224 mm^3). As with the general population,[1] the most common diagnosis at discharge was nonspecific abdominal pain, a diagnosis that I suspect was underutilized in this study, as some patients left with diagnoses such as "peptic ulcer disease," which is at best a presumptive diagnosis in the ED. *(**Source:** Yoshida DK, Caruso M. Abdominal pain in the HIV positive patient [abstract].* Acad Emerg Med *1999;6:470.)* ❖

Reference

1. Lukens TW, et al. The natural history and clinical findings in undifferentiated abdominal pain. *Ann Emerg Med* 1993;22:690-696.

Estimating the Probability of PE

The purpose of this prospective, observational study was to examine the concordance and accuracy of the pretest estimate of having a pulmonary embolus (PE). Emergency physicians (EP) made a choice for estimated pretest probability of low, mid, or high for patients receiving a diagnostic study for PE. When possible, a second EP completed a similar form that was blinded to the first EP's assessment. A PE was considered present with a positive angiogram, CT, or MRA; high probability V/Q without contradictory evidence; or an intermediate probability V/Q with evidence for deep vein thrombosis.

In 142 cases, a primary EP recorded a pretest estimate and PE was diagnosed in 29 (20%). A second estimate was available in 34 cases, and the agreement was only fair ($k = 0.42$). The positive predictive value for PE of the first EP's assessment was 0.27 for high, 0.22 for mid, and 0.09 for low pretest estimates.

COMMENT BY STEPHANIE ABBUHL, MD, FACEP

Ever since the landmark PIOPED study was published in 1990, most physicians use a combination of pretest probability assessment and the results of VQ scan to determine a "post-test" probability of the likelihood of

PE.[1] PIOPED showed us that in a given patient with a low probability VQ scan, the risk of PE could vary from 4% to 40% depending on the pretest probability assessment. This preliminary study attempts to expose an underappreciated problem in the diagnosis of PE—how does one determine the pretest probability that is so critical to interpretation of a VQ scan? Does low clinical suspicion translate into no risk factors? Are all risk factors created equally? Despite volumes of literature on PE, very little has focused on this aspect of most testing algorithms. This pilot study reminds us that the determination of pretest probability is not, at this point, a structured, validated process and more research needs to be done to define explicit criteria to determine pretest probability. ***(Source:*** *Jackson RE, et al. Emergency physician (EP) assessment of the pretest probability of pulmonary embolism (PE) [abstract].* Acad Emerg Med *1999;6:437.)* ❖

Reference

1. PIOPED Investigators. Value of the ventilation/perfusion scan in acute pulmonary embolism. *JAMA* 1990;263:2753-2759.

Special Feature

Rofecoxib Tablets and Oral Suspension (Vioxx—Merck & Co.)

By William T. Elliott, MD, FACP, and James Chan, PharmD, PhD

The cox-2 class of anti-inflammatory/pain relievers now has two entries, following the May 21 approval of Merck's rofecoxib (Vioxx). It joins celecoxib (Celebrex—Searle) in this class of "safer" NSAIDs. Selective cyclooxygenase-2 inhibitors reduce inflammation and produce analgesia without inhibiting COX-1 dependent prostaglandins that protect the gastric mucosa and affect platelet aggregation. Thus, these drugs have a much lower propensity to cause endoscopically detected ulcers and do not cause platelet dysfunction. COX-2 inhibitors, however, do have the same effect on renal blood flow as traditional NSAIDs.

Indications

Rofecoxib is approved for the relief of the signs and symptoms of osteoarthritis, for the management of acute pain in adults, and for the treatment of dysmenorrhea.

Dosage

Rofecoxib is available as 12.5 mg or 25 mg tablets and as an oral suspension containing 12.5 mg or 25 mg per 5 mL. The recommended initial dose for osteoarthritis is 12.5 mg once daily. Some patients may achieve added benefit at a dose of 25 mg once daily, which is considered the maximal dose for this indication. The recommended dose for the management of acute pain or the treatment of primary dysmenorrhea is 50 mg once daily. It may be taken without regard to meals.

Rofecoxib should not be taken by patients who have experienced allergic-type reactions to aspirin or other NSAIDs.

Potential Advantages

Rofecoxib, 25 mg or 50 mg daily, has been reported to produce a lower percentage of endoscopic gastroduodenal ulcers than ibuprofen 2400 mg daily. Difference was statistically significant at 12- and 24-week assessments.[1] Rofecoxib also appears to be well tolerated in terms of GI adverse events. In a clinical trial, the percent of patients experiencing diarrhea was 6.8% vs. 6.5% for placebo, 3.5% vs. 2.7% for dyspepsia, 3.8% vs. 2.8% for epigastric discomfort, and 4.2% vs. 3.6% for heartburn.[1] The metabolism of rofecoxib does not involve the cytochrome P450 enzymes, thus minimizing potential drug interactions. A general enzyme inducer, rifampin, has been reported to produce a 50% decrease in the plasma concentration of rofecoxib.[1] Rofecoxib has no effect on platelet function. Dosages up to 375 mg given daily for up to 12 days did not affect bleeding time relative to placebo.[1]

Potential Disadvantages

Rofecoxib is approved for osteoarthritis but not for rheumatoid arthritis. The renal effects of rofecoxib are similar to those of other NSAIDs.[1] The use of rofecoxib for the relief of pain at the 50 mg dose is not recommended beyond five days.[1] Coadministration of rofecoxib and warfarin have resulted in an increase of 8-11% in INR. Monitoring of INR is recommended with coadministration.[1]

Comments

Rofecoxib is a highly selective inhibitor of COX-2. In vitro studies using Chinese hamster ovary cell lines to express COX-1 and COX-2 showed that at doses up to 1000 mg (20 times the maximum recommended dose) no evidence of COX-1 inhibition was seen.[2]

Refocoxib was approved almost six months after the first COX-2 inhibitor, celecoxib, which was approved on Dec. 31, 1998. Merck took extra time to seek a pain indication for its drug, an indication that celecoxib does not have. In various acute pain models, the analgesic effect of rofecoxib 50 mg was similar to that of naproxen sodium 550 mg to ibuprofen 400 mg.[1,2] In

osteoarthritis, rofecoxib (12.5-25 mg) has been reported to be similar in effectiveness as ibuprofen 800 mg tid over six weeks or diclofenac 50 mg tid over six months.[1,4,5] Study patients included patients with osteoarthritis of the hip or knee. Ninety percent had an increase in pain following withdrawal of NSAIDs and 10% had moderate symptoms while taking acetaminophen. Rofecoxib, ibuprofen, and diclofenac all showed about a 50% reduction in the WOMAC (Western Ontario and McMaster Universities osteoarthritis index) visual analog scale walking on a flat surface. This is a composite of pain, stiffness, and functional measures in osteoarthritis. Like celecoxib, rofecoxib (25-50 mg) has been associated with fewer endoscopic ulcers (≥ 3 mm) than ibuprofen (2400 mg daily) (4.1-8.8% vs 27.7-29.2%). This compares favorably to placebo (5.1-9.9%).[1] However, endoscopic ulcers may not be reliable predictors of severe GI events.[7,8]

Merck will likely seek approval of the drug for treatment of rheumatoid arthritis; however the effective dose, 50 mg, may be associated with higher adverse events.[9] Rofecoxib is priced competitively with celecoxib for osteoarthritis used (12.5-25 mg daily). For pain, rofecoxib is about $5 per day (2 × 25 mg).

Clinical Implications

Osteoarthritis is the most prevalent form of arthritis, and acute pain and dysmenorrhea are common problems. Pharmacologic management of osteoarthritis includes acetaminophen, topical capsacin, other analgesics, and NSAIDs.[6] Gastrointestinal toxicities are problematic with the use of NSAIDs, especially for patients who have a history of gastritis, peptic ulcer disease, or GERD. COX-2 inhibitors are an attempt to find "safer" NSAIDs.

While the frequency of drug-induced endoscopic ulcers appears to be less with rofecoxib, it is not clear if long-term serious events are reduced. In addition, it is not known if there are any deleterious effects with prolonged COX-2 inhibition and how it would affect the homeostasis of other body systems such as the balance of prostacycline and thromboxane in blood vessels.[10] *(Dr. Elliott is Chair, Pharmacy Education, California Division of Kaiser Permanente; Asst. Clinical Professor of Medicine, University of California-San Francisco; Dr. Chan is Pharmacy Quality and Outcomes Manager, Kaiser Permanente, Oakland, CA.)* ❖

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CME questions

21. The most common discharge diagnosis in HIV-infected patients with abdominal pain in Yoshida and colleagues' study was:

a. gastroenteritis.
b. lymphoma.
c. cytomegalovirus.
d. abdominal pain of unknown etiology.

22. The meta-analysis by Alter et al on the use of magnesium sulfate in acute asthma showed:

a. no advantage in the magnesium-treated patients.
b. no serious adverse effects.
c. an increase in spirometric function only in those patients with adverse effects.
d. improved spirometric function if the magnesium was delivered by aerosol.

23. In the study by Schwartz and associates on the effect of route of drug administration on pain perception, the following conclusion was drawn regarding the efficacy of the route of administration:

a. the oral route is better than the IM route.
b. the IM route is better than the oral route.
c. the IM and oral routes were equivalent.
d. the IM and oral routes were superior to the IV route.

24. In the study by Bania et al on the effect of digoxin on dogs made toxic with verapamil:

a. dogs receiving calcium plus digoxin had significant increases in mortality.
b. dogs receiving calcium plus digoxin had significant increases in mean arterial pressure.
c. dogs receiving calcium plus digoxin had significant increases in bradyasystolic deaths.
d. dogs receiving calcium plus digoxin had increased rates of heart block.

25. In the NARC study comparing the efficacy of ketorolac and meperidine in the treatment of acute renal colic:

a. meperidine provided better pain relief.
b. cognitive status improved significantly more in the meperidine group.
c. functional status improved significantly more in the ketorolac group.
d. the drugs were equally efficacious when given IM, but not IV.

26. Generalized use of the urine ligase chain reaction assay for detection of gonorrhea and chlamydia:

a. is easily attained due to the simplicity of this bedside test.
b. is limited due to impaired sensitivity for gonorrhea.
c. is limited by the high cost of the test.
d. is limited due to impaired sensitivity for chlamydia.

Septal Q Waves in a 22-Year-Old Man

By Ken Grauer, MD

Clinical Scenario: The ECG in the figure was obtained as part of a pre-employment physical exam. The patient was an otherwise healthy and completely asymptomatic 22-year-old man who was applying for a position as a policeman. How would you interpret this tracing? *Would you "clear" the patient for work?* Physical exam (including cardiac auscultation) was completely normal.

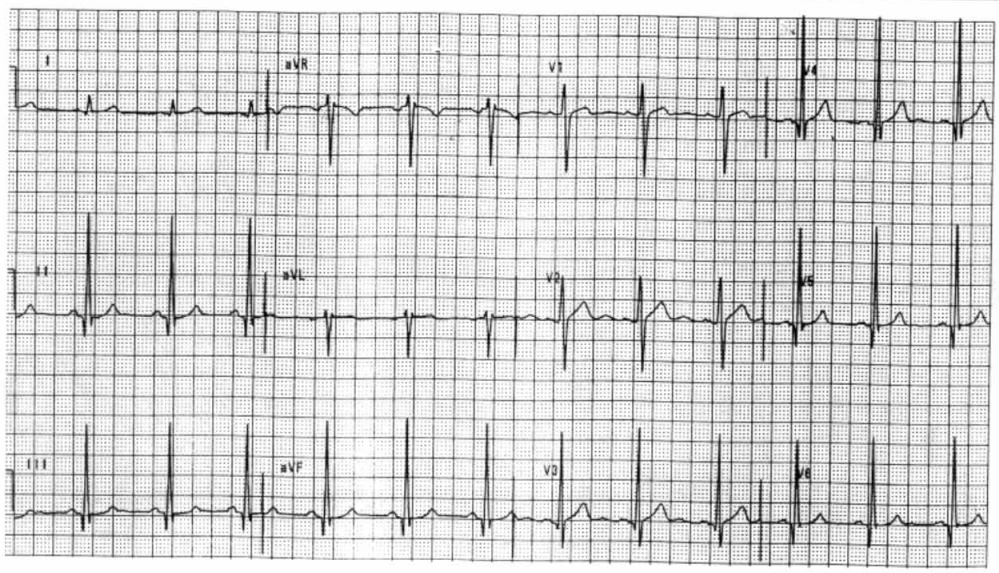

Figure. ECG obtained from an otherwise healthy 22-year-old man as part of a pre-employment physical exam. Would you "clear" the patient for work as a policeman?

Interpretation: The rhythm is sinus arrhythmia. All intervals are normal. The mean QRS axis is +80°. Although QRS amplitude appears to be increased, assessment for left ventricular hypertrophy (LVH) is difficult in view of the patient's age. Increased QRS amplitude is often seen in young adults and does not necessarily reflect LVH.

The most remarkable finding on the tracing is the presence of surprisingly deep Q waves in multiple leads. Normally, small narrow q waves may be seen in lateral leads. Such q waves are commonly referred to as "normal septal q waves"—since they reflect the normal process of septal depolarization. Thus, because the septum normally depolarizes from left to right—one or more left-sided leads (i.e., leads I, aVL, V_4, V_5, and V_6) commonly manifest a small initial negative deflection or q wave. On occasion, septal q waves may also be seen in the inferior leads. This is most likely to occur when the mean QRS axis is relatively vertical—as it is in this case.

The unusual finding in the ECG shown in the figure is *not* that Q waves are present in so many leads, but that these Q waves are relatively deep, and clearly much deeper than is usually seen with "normal" septal q waves. This may reflect a relative prominence of *septal* forces. In support of the suggestion that septal forces are greater than usual is the finding of a surprisingly tall initial R wave in lead V_1.

The purpose of pre-employment screening is to hopefully identify persons who might be placed at undue risk if accepted for the job for which they are applying. Although far from perfect as a screening tool, an ECG is often obtained as a means to assess cardiovascular risk. The ECG in the figure should *not* be interpreted as normal for a 22-year-old man.

Sudden cardiac death is a rare event among otherwise healthy adolescents and young adults. In this age group, almost all episodes of this tragic occurrence are associated with underlying congenital cardiac abnormalities—the most common of which is hypertrophic cardiomyopathy (HCM). HCM is characterized by marked ventricular hypertrophy with disproportionate enlargement of the ventricular septum. Obstruction of the left ventricular outflow tract may occur with cardiac contraction. Although a heart murmur suggesting this lesion will usually be heard on cardiac auscultation, this is not always the case.

The ECG is typically abnormal in patients with HCM. However, ECG findings are variable and generally nonspecific (i.e., increased QRS amplitude, ST-T wave flattening or depression, bundle branch block, etc.). One finding that should heighten suspicion for the possibility of HCM is prominence of septal forces, as is shown in this figure. Further evaluation with echocardiography is clearly indicated for such cases. Surprisingly, the patient in this case turned out to have a *dilated* (not hypertrophic) cardiomyopathy. Strenuous work was therefore *not* advised. ❖

In Future Issues: **Utility of Abdominal X-ray in Appendicitis**