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## Nebulized Epinephrine Apparently Not Useful in Acute Bronchiolitis

ABSTRACT & COMMENTARY

**Source:** Wainwright C, et al. A multicenter, randomized, double-blind, controlled trial of nebulized epinephrine in infants with acute bronchiolitis.

*N Engl J Med* 2003;349:27.

ACUTE VIRAL BRONCHIOLITIS IS THE MOST COMMON LOWER RESPIRATORY tract infection in infants and results in hospitalization of approximately 1% of this age group annually. Treatment is largely supportive, including supplemental oxygen, ventilatory support, and intravenous fluid hydration as needed. The disease is characterized by bronchiolar narrowing and obstruction from airway edema, mucus, inflammatory cellular infiltration, and sloughed epithelial debris. Accordingly, many have proposed that a combination of beta-adrenergic therapy (to improve airway constriction) and alpha-adrenergic stimulation (to reduce airway edema and obstruction) may have utility in acute bronchiolitis.

In this multi-center Australian study, infants diagnosed and hospitalized with acute bronchiolitis were randomized to receive three nebulized doses (each 4 mL) of either 1% epinephrine solution (99 infants) or placebo normal saline solution (95 infants) at four-hour intervals. Patients received other standard therapies as indicated in this double-blind study. Infants with a history of significant cardiac disease or respiratory disease (such as cystic fibrosis or neonatal lung disease) were excluded, as were any patients who had received either steroids or bronchodilators just preceding presentation.

The investigators found no significant difference in either length of hospital stay (58.8 vs 69.5 hrs for the epinephrine and placebo groups, respectively,  $p = 0.16$ ) or time to discharge readiness (as determined by need for supplemental oxygen and intravenous hydration) (46.5 vs 47.7 hours, respectively,  $p = 0.86$ ). In addition, there was no difference in duration of need for supplemental oxygen (54.0 vs 58.8 hours, respectively,  $p = 0.64$ ). Furthermore, no differences occurred in either group before or after each treatment dose in terms of respiratory rate, blood pressure, or respiratory-effort score (a score based on physical examination findings of nasal flaring, neck find-

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ings, and chest retractions). Heart rate, however, did significantly increase after each epinephrine dose.

Based on their findings, the authors conclude that the use of an inhaled bronchodilator with both alpha-adrenergic and beta-adrenergic effects does not produce clinically relevant improvement or reduce the length of stay for infants with acute bronchiolitis.

## ■ COMMENTARY BY THEODORE C. CHAN, MD, FACEP

Rates of hospitalization for infants with acute bronchiolitis have markedly increased in the past two decades.<sup>1</sup> Despite this increase, treatment remains largely supportive—primarily supplemental oxygen and intravenous hydration. Inhaled bronchodilators have been touted as a potential treatment, with a few small studies demonstrating short-term improvement in clinical scores, but no significant impact on oxygenation and hospitalization.<sup>2</sup>

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This well-designed, large study failed to find any significant benefit for nebulized epinephrine compared to placebo for infants hospitalized with acute bronchiolitis. Defining the diagnostic criteria for the disease can be problematic in studies on acute bronchiolitis. In this study, the authors set clinical criteria which included infants presenting with a history of upper respiratory tract infection and clinical findings of respiratory distress, wheezing or crackles. These criteria could include infants with a presentation of reactive airway disease or asthma who very well may have responded to bronchodilators. Interestingly, the authors found no difference in epinephrine responsiveness in patients with a history of a first-degree relative with asthma, eczema, or hay fever. ❖

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1. Shay DK, et al. Bronchiolitis-associated hospitalizations among U.S. children 1980-1996. *JAMA* 1999;282:1440.
2. Kellner J, et al. Bronchodilators for bronchiolitis. *Cochrane Database Syst Rev* 2000;2:CD001266.

# Much Smoke, No Fire Surrounding Inappropriate Antibiotic Use in the ED

ABSTRACT & COMMENTARY

**Source:** Lautenbach E, et al. Fluoroquinolone utilization in the emergency departments of academic medical centers. *Arch Intern Med* 2003;163:601-605.

THE AUTHORS OF THIS RETROSPECTIVE STUDY attempted to evaluate the appropriateness with which emergency physicians prescribe fluoroquinolone (FQ) antibiotics. The records of 50 consecutive patients discharged with a FQ prescription at each of two affiliated emergency departments (EDs) were reviewed by members of the institutions' infectious disease and pharmacy faculties. Appropriateness of FQ prescription was judged by the authors according to their own antibiotic utilization guidelines, which were distributed via pamphlets and available through the institutions' computer network. Use of the FQ was considered appropriate if the guideline's indications were met or if the patient had a contraindication to the recommended therapy.

Of the 100 prescriptions for a FQ, the authors judged 81 to have been inappropriate. Of these inappropriate cases, 43 did not utilize the institutions' preferred antibiotic choice, 27 provided no evidence of infection based on the clinical evaluation or diagnostic studies, and 11 had inadequate documentation. The vast majority of

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## Questions & Comments

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inappropriate antibiotic use was for urinary tract infections (in which trimethoprim-sulfamethoxazole was recommended) and respiratory illnesses (preferred therapy not stated). The authors conclude that inappropriate FQ use in EDs is extremely common.

■ **COMMENTARY BY DAVID J. KARRAS, MD, FAAEM, FACEP**

This article has created a minor stir in the world of infectious diseases. Even a cursory glance at the study, however, reveals extraordinary flaws both in its methodology and its premise, in which one illogical assumption is compounded upon the next. First, while the title and conclusions imply that the study examined practices at multiple EDs, the authors examined prescriptions only at two branches of the same ED system. Thirty-eight of the 81 presumptive designations of “inappropriate” antibiotic use were based on inadequate or incomplete information available to the authors. It’s important to note that the emergency physicians were not instructed in the use of the authors’ guidelines and were not constrained to adhere to them, yet were “tested” for consistency with their recommendations.

Most troubling is that the authors convinced themselves that inconsistency with their homegrown practice guidelines constitutes inappropriate prescribing behavior. Antimicrobial use recommendations published by established expert panels often conflict with one another and usually leave much to the discretion of the treating physician. The authors’ guidelines adhere to the most restrictive expert recommendations for FQ use in various illnesses. While a detailed review of appropriate FQ use is beyond the scope of this abstract, suffice it to say that the Infectious Disease Society of America finds FQ therapy to be appropriate for uncomplicated community-acquired pneumonia,<sup>1</sup> and the Sanford Guide recommends FQ therapy as first-line treatment for uncomplicated pyelonephritis.<sup>2</sup> Selection of an FQ for either of these conditions, however, is considered inappropriate by the study authors.

In summary, the authors’ desire to limit the use of FQ therapy in their institution does not, ipso facto, make its use inappropriate. Far better studies have documented that physicians in many specialties use antibiotics inappropriately. However, the attempt by these authors to point a finger at emergency physicians is undermined by a study in which the premise, methodology, and conclusions are best described as highly questionable. ❖

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1. Bartlett JG, et al. Practice guidelines for the management of community-acquired pneumonia in adults. *Clin Infect Dis* 2000;31:387-382.
2. Gilbert DN, et al. *The Sanford Guide to Antimicrobial Therapy*. Hyde Park, VT: Antimicrobial Therapy; 2003.

## Assessment-oriented Presentation: Getting to the Point Quickly, Accurately

ABSTRACT & COMMENTARY

**Source:** Maddow CL, et al. Efficient communication: Assessment-oriented oral case presentation. *Acad Emerg Med* 2003; 10:842-847.

WHAT IS THE BEST WAY FOR ONE PHYSICIAN TO PRESENT data to another? The authors of this study have made a detailed analysis of two methods of presentation—traditional and assessment-oriented formats. In the traditional format, the presentation starts with the chief complaint, continues with selected data from history of present illness, past medical history, social and family history, review of systems, physical examination, and laboratory data. After this, the presenter concludes with diagnosis or assessment and plan. In the assessment-oriented format, the presenter begins with diagnosis or assessment and plan, continues with data in variable order, including pertinent positives and negatives from history and physical as deemed important.

The study was conducted using 25 first- to third-year emergency medicine residents. The residents had a one-hour conference and 30-minute workshop in both styles of presentations, as well as practice sessions on the two styles. The residents were asked to then use the traditional format while working in the ED for the first month and then switch to the assessment-oriented format in the ED for the second month. A research assistant recorded the length of presentation and then surveyed the faculty member and resident for satisfaction with organization, content, and expression of decision making. The bottom line: without diminishing the quality of the presentation, the assessment-oriented format took a little more than a minute on average, whereas the traditional format took almost two minutes. Both styles of presentation were viewed as satisfactory, although the residents expressed slightly greater satisfaction with the organization of the assessment-oriented approach.

■ **COMMENTARY BY RICHARD J. HAMILTON, MD, FAAEM, ABMT**

When I was working in a small community hospital, I had some practice-shaping experiences, one of which was dealing with a notoriously brusque but competent orthopedic surgeon. When he was contacted by telephone about a fracture, instead of patiently waiting to listen to the entire case presentation (however abbreviat-

ed or accelerated) he would cut the caller off and bellow, “What’s the fracture?” I finally reached the point that, one day when he called back, I picked up the phone and said, “Bimalleolar fracture left ankle,” without even introducing myself. There was a pause, and he said, “I’ll be there in 10 minutes.”

Since then, I have been keenly interested in presentation styles and how they influence the efficiency of information transfer. While we insist on teaching students the classic format that starts with chief complaint and methodically goes through history of present illness, we are impressed when residents and colleagues are able to encapsulate the case quickly, focusing on the chief complaint, diagnosis, treatment, and disposition. The presentation style I teach to all my students and house officers is what I call a journalistic style, or the “Headlines in the Times” approach. As in a news story, the key information is presented at the beginning; amplifying information and details are found later. In that form of presentation, the case might be summarized along the lines of “Man dying of MI in Room 5: Cath lab needed quickly,” which probably says it all. In fact, a sleepy cardiologist, when awakened by the ED staff in the wee hours of the morning, truly appreciates that introduction to the case, and quickly will ask questions that probe for the needed amplifying detail to obtain action-oriented information in an efficient manner.

The ED is a point in the patient’s care where enormous quantities of new information are collected, organized, and transmitted to a great number of health care providers. It is important to communicate all this data in an efficient manner without losing fidelity. The assessment-oriented technique is an excellent approach to this challenge. ❖

## Is There a Role for a Loading Dose of Enoxaparin in Acute Coronary Syndrome?

ABSTRACT & COMMENTARY

**Source:** Bijsterveld NR, et al. The impact on coagulation of an intravenous loading dose in addition to a subcutaneous regimen of low-molecular weight heparin in the initial treatment of acute coronary syndromes. *J Am Coll Cardiol* 2003; 42:424-427.

**L**OW MOLECULAR-WEIGHT HEPARINS (LMWH) NOW ARE used routinely in the emergency department treatment of patients presenting with acute coronary syndromes (ACS). However, clinical trials investigating the efficacy of LMWH in ACS used either subcutaneous (SQ) LMWH

alone or an intravenous (IV) loading dose followed by subcutaneous administration of LMWH. It is unclear which regimen is superior in the treatment of ACS.

The authors of this study sought to quantify the impact of adding an IV loading dose to a SQ regimen of enoxaparin among patients with ACS by examining several in vivo and ex vivo measures of anti-coagulation among patients randomized to one of these two regimens. The measures of anti-coagulation used included anti-factor Xa levels (anti-Xa), prothrombin fragment plasma concentrations (PFC), thrombin generation time (TGT), and tissue factor pathway inhibitor activity (TFPI), a natural anti-coagulant.

Patients admitted to the coronary care unit at this Amsterdam hospital with a diagnosis of unstable angina or non-Q-wave myocardial infarction were eligible. Patients were excluded if they were using any anticoagulant or anti-platelet agent other than aspirin. Enrolled patients were randomized to 40 mg IV enoxaparin initially combined with 1 mg/kg of SQ enoxaparin twice daily (IV+SQ) or to 1 mg/kg of SQ enoxaparin twice daily (SQ). The maximum dose of enoxaparin used was 100 mg. Blood samples were obtained before the initial dose of enoxaparin and at eight other time points throughout the first 24 hours of hospitalization.

Twenty-five patients were randomized, with 14 in the IV+SQ enoxaparin group, and 11 in the SQ enoxaparin-only group. In the group receiving IV LMWH, anti-Xa levels rose within five minutes and remained significantly higher than the SQ group until six hours later. Anti-Xa levels at steady state (> 24 hours) were comparable between the groups. The highest anti-Xa levels achieved in the IV+SQ group were 1.25 U/mL (therapeutic range of enoxaparin, 0.5-1.0 U/mL). In-vitro TGT measurement showed an immediate increase in TGT in the IV+SQ group, which remained significantly higher than the SQ alone group until six hours.

Measuring in-vivo thrombin generation using PFC, the IV+SQ group had significantly lower PFC until two hours after administration. In-vivo natural anti-coagulant levels, as measured by TFPI, were significantly higher among the IV+SQ group for the first two hours, with both groups returning to baseline by six hours after administration.

The authors conclude that IV+SQ enoxaparin results in more rapid inhibition of the coagulation system than SQ enoxaparin alone during the initial phase of treatment for ACS patients. They also conclude that IV+SQ enoxaparin at these doses does not result in unacceptably high anti-coagulation levels.

### ■ COMMENTARY BY JACOB W. UFBERG, MD

This small study demonstrates a period (approximately six hours) during which superior anti-coagulation lev-

els are achieved using a 40 mg IV bolus of enoxaparin when initiating a SQ regimen for ACS. What cannot possibly be answered by this small study is whether this earlier anti-coagulation results in any clinical benefit. Even if benefit is demonstrated by further study, we also must quantify any possible increased bleeding risks, and whether they are outweighed by the clinical benefit.

While this study is a step in the right direction, far too many questions remain unanswered to know whether IV+SQ LWMH is clinically superior to SQ LMWH alone in treating patients with ACS. ❖

## Special Feature

# Appendicitis in Pregnancy

By Esther Chen, MD, and Stephanie B. Abbuhl, MD, FACEP

**A**CUTE APPENDICITIS IN PREGNANCY REMAINS A DIAGNOSTIC challenge. The most common non-obstetric surgical emergency in pregnancy, appendicitis occurs in approximately 1 in 1500 pregnancies,<sup>1</sup> an incidence similar to that in the non-pregnant population.<sup>2</sup> It also is slightly more prevalent in the second trimester of pregnancy. The differential diagnosis of abdominal pain in a pregnant patient is complicated by gynecologic and obstetric problems,<sup>3</sup> resulting in diagnostic delay and subsequent higher maternal and fetal morbidity and mortality. In various studies, appendiceal rupture has been noted in 12-55% of pregnant patients at the time of surgery.<sup>1,4,5</sup> A maternal mortality rate as high as 2.8%<sup>6</sup> and a fetal mortality rate of 30%<sup>7</sup> have been reported with appendiceal perforation, as compared to 0.1% and 2%, respectively, with uncomplicated appendicitis. Other complications such as preterm contractions and labor are common, especially in the third trimester; however, actual preterm delivery is rare.<sup>1,5</sup>

### Clinical Presentation

Anatomic and physiologic changes during the normal pregnant state impact the evaluation of appendicitis. Anorexia, nausea, and vomiting are nonspecific symptoms common to both pregnancy and appendicitis and are less helpful than in non-pregnant patients. Abnormalities in vital signs suggestive of a surgical emergency, such as tachypnea (which is normal in pregnancy), can be difficult to interpret. Tachycardia, hypoxia, and hypotension may not be apparent until 30-50% of intravascular volume has been lost, due to physiologic “hypervolemia.”<sup>8</sup> In a recent series of 67 pregnancies with a preoperative diagnosis of probable appendicitis, the mean

maximal temperature was not significantly different for the patients with proven appendicitis compared to those with normal findings (37.6°C vs 37.8°C).<sup>1</sup> Pain location still is most common in the right lower quadrant (RLQ),<sup>1,5,6</sup> despite classic obstetric teaching that appendiceal pain in the pregnant woman migrates laterally and superiorly toward the right upper quadrant with the growing uterus.<sup>9</sup> The presence of leukocytosis also is difficult to interpret in pregnancy, where a white blood cell count of approximately 14,000 cells/mm<sup>3</sup> may be normal in the second and third trimesters, with a range of 20,000-30,000 cells/mm<sup>3</sup> during labor.<sup>8</sup>

### Imaging Modalities

**Conventional Radiography.** Abdominal radiography has such low sensitivity and specificity for acute appendicitis that it plays a limited role in the diagnostic evaluation of suspected appendicitis.<sup>10</sup> Its usefulness lies in detecting intestinal obstruction or perforation.

**Ultrasonography.** Ultrasonography (US) is the diagnostic test of choice in the initial evaluation of abdominal pain in pregnancy to exclude uterine and tubo-ovarian abnormalities and to rule out ectopic pregnancy. US offers several advantages: it is noninvasive, uses no radiation or contrast material, and can be used to detect certain alternative diagnoses. US diagnosis of appendicitis involves visualization of a noncompressible appendix that is greater than 6-7 mm in diameter with a dilated lumen, periappendiceal fluid, and lack of peristalsis. In a carefully performed study in nonpregnant adults, US has been shown to have a sensitivity of 75-90% and a specificity of 85-100%.<sup>2,10</sup> However, the primary limitation of US is that the accuracy of the test requires visualization of the appendix, and the appendix frequently is not seen. In fact, a normal or retrocecal appendix rarely is visualized.<sup>11</sup> In addition, the quality of the examination is highly operator-dependent and the gravid uterus, bowel gas, and body habitus can interfere with the test. In a recent study of confirmed appendicitis in pregnant patients, ultrasound was nondiagnostic in 70% of the cases.<sup>5</sup> It is even more limited when the appendix has perforated.

Although limited as a diagnostic modality, US provides essential fetal information during the management of the pregnant patient with an acute abdomen. It may be used to establish fetal well being when decisions need to be made regarding the use of tocolytics and delivery.<sup>12</sup>

**Computed Tomography.** In the emergency evaluation of RLQ pain in non-pregnant patients, abdominal computed tomography (CT) has become the diagnostic imaging study of choice, with a sensitivity of 90-100% and a specificity of 91-99%.<sup>10</sup> Previous studies cite high diagnostic accuracy with improved clinical outcomes and cost savings.<sup>13</sup> In the pregnant patient, the main dis-

advantage of CT is the exposure of ionizing radiation to the fetus, especially between 10 and 17 weeks of gestation when the central nervous system is most sensitive to teratogenesis. The currently accepted maximum cumulative fetal dose during pregnancy is 5 rad.<sup>14</sup> An abdominal/pelvic CT scan with 10 10-mm cuts causes an estimated fetal exposure of 2.6 rads. For comparison, a two-view chest x-ray exposes the fetus to about 0.00007 rad and a head CT of 10 10-mm cuts is 0.05 rad. Exposure to 1-2 rads has been associated with an increase in the incidence childhood leukemia, from a background rate of 3.6 per 10,000 to 5 per 10,000. Therefore, a fetus safely can be exposed to only one standard abdominal CT scan.<sup>15</sup> Although it is within the acceptable published guidelines, there has been significant reluctance to use this imaging modality unless the benefit of diagnosis overwhelmingly exceeds the potential risks to the fetus. One small series has described the use of "limited helical scanning" where the radiation exposure was approximately 300 mrad.<sup>16</sup>

**Magnetic Resonance Imaging.** Magnetic resonance imaging (MRI), which uses no ionizing radiation, has received little attention as a potential diagnostic modality for the evaluation of appendicitis in pregnancy. Recently, fast MRI techniques have shortened the image acquisition time enough to examine patients with acute conditions without sedation and may be valuable when ultrasound findings are inconclusive.<sup>17</sup>

While there are no known biologic risks from MRI, there is no conclusive evidence for the safety of electromagnetic fields in animal or human embryos. Because of this uncertainty, MRI is not recommended in the first trimester unless the potential benefits outweigh the potential risks. In addition, gadolinium, which crosses the placenta into the fetal circulation, currently has unknown effects on the fetus and, therefore, is not recommended in pregnancy. Despite these unanswered questions, fast MRI without contrast has been shown to have some promise for the evaluation of the pregnant patient with suspected appendicitis as well as other gynecologic and obstetric pathology.<sup>17</sup> More experience and data are needed to evaluate this modality as a possible alternative to CT in the pregnant patient.

## Treatment

**Antibiotics.** Patients with acute appendicitis usually are given intravenous antibiotics with specific coverage for gram-negative aerobes and anaerobes. The patient with possible perforation, appendiceal abscess, or peritonitis definitely requires broad-spectrum antibiotics.<sup>3</sup> Antibiotics that are considered safe in pregnancy are penicillins (including ampicillin/sulbactam), cephalosporins, clindamycin, and gentamicin. One relatively

inexpensive, safe, and effective combination is clindamycin and gentamicin.

**Surgery.** Laparoscopy has been used for several years to rule out ectopic pregnancies in first trimester patients with abdominal pain. In the past, pregnancy was considered a relative contraindication to laparoscopic surgery because of possible deleterious effects of carbon dioxide, obstruction by the enlarged uterus, and the potential for fetal loss. Because the fundus rises to the umbilicus at approximately 20 weeks of gestation (the insertion site of the large port), an open appendectomy procedure usually is preferred in the late second trimester. A recent small study of laparoscopic procedures in pregnancy for nonobstetric emergencies showed that it was safe in the second and third trimesters, without complications of fetal distress, premature labor, or wound infection. The major modification of the procedure was alternative placement of the trocars with relation to the enlarged uterus.<sup>18</sup>

## Conclusion

The signs and symptoms of normal pregnancy complicate the history and physical examination in the evaluation of suspected appendicitis, often resulting in diagnostic delay. Despite the presence of the growing uterus outside the pelvis after 10 weeks of gestation, RLQ pain is still the most common presenting symptom, even in late pregnancy. Although US is the imaging study of choice in pregnancy, it is non-diagnostic in the majority of cases. CT is more sensitive and specific than US, but concerns about radiation exposure significantly limit its use. To date, the safety and accuracy of MRI in the evaluation of appendicitis in pregnancy remains uncertain but has some promise and should be further studied. Most obstetricians will manage pregnant patients with suspected appendicitis conservatively with admission for serial abdominal exams in consultation with a general surgeon. ❖

(Dr. Chen is Assistant Professor of Emergency Medicine, University of Pennsylvania School of Medicine, Philadelphia.)

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  - d. superior anticoagulation lasting 48 hours.
  - e. higher rates of fatal arrhythmia.
25. **In treating uncomplicated pyelonephritis:**
    - a. emergency physicians appear unable to select appropriate therapy.
    - b. fluoroquinolone therapy is acceptable.
    - c. trimethoprim-sulfamethoxazole clearly is the most appropriate choice.
    - d. a Gram stain of the urine should guide treatment decisions.
  26. **In a recent study by Maddow and colleagues, the "assessment-oriented" approach to case presentation was found to be \_\_\_\_\_ (with regard to organization by the house-staff), over the "traditional" approach.**
    - a. slower and preferred
    - b. faster and preferred
    - c. slower but not preferred
    - d. faster but not preferred
  27. **The most common site of pain in the pregnant patient with appendicitis is:**
    - a. the right lower quadrant.
    - b. the right upper quadrant.
    - c. the epigastrium.
    - d. the left lower quadrant.
  28. **All of the following statements are true about the use of ultrasound in the evaluation of appendicitis in the pregnant patient except:**
    - a. US can detect certain alternative diagnoses.
    - b. US can confirm the diagnosis of appendicitis when a non-compressible appendix is seen with a diameter greater than 7 mm.
    - c. US can show peri-appendiceal fluid and lack of peristalsis, both findings suggestive of appendicitis.
    - d. US is diagnostic in up to 70% of cases.
  29. **The study by Wainwright et al on infants with acute bronchiolitis found which of following treatments to be beneficial in terms of duration of hospitalization?**
    - a. Nebulized albuterol
    - b. Nebulized epinephrine
    - c. Subcutaneous epinephrine
    - d. None of the above

**Answer Key: 24. a; 25. b; 26. b; 27. a; 28. d; 29. d.**

## Physician CME Questions

24. **In the Bijsterveld et al study, enoxaparin administered as an IV bolus prior to SQ administration resulted in:**
  - a. earlier achievement of anticoagulation when compared with SQ enoxaparin alone.
  - b. higher rates of major intracranial hemorrhage.
  - c. lower long-term re-infarction rates.

### CME Objectives

To help physicians:

- Summarize the most recent significant emergency medicine-related studies;
- Discuss up-to-date information on all aspects of emergency medicine, including new drugs, techniques, equipment, trials, studies, books, teaching aids, and other information pertinent to emergency department care; and
- Evaluate the credibility of published data and recommendations.

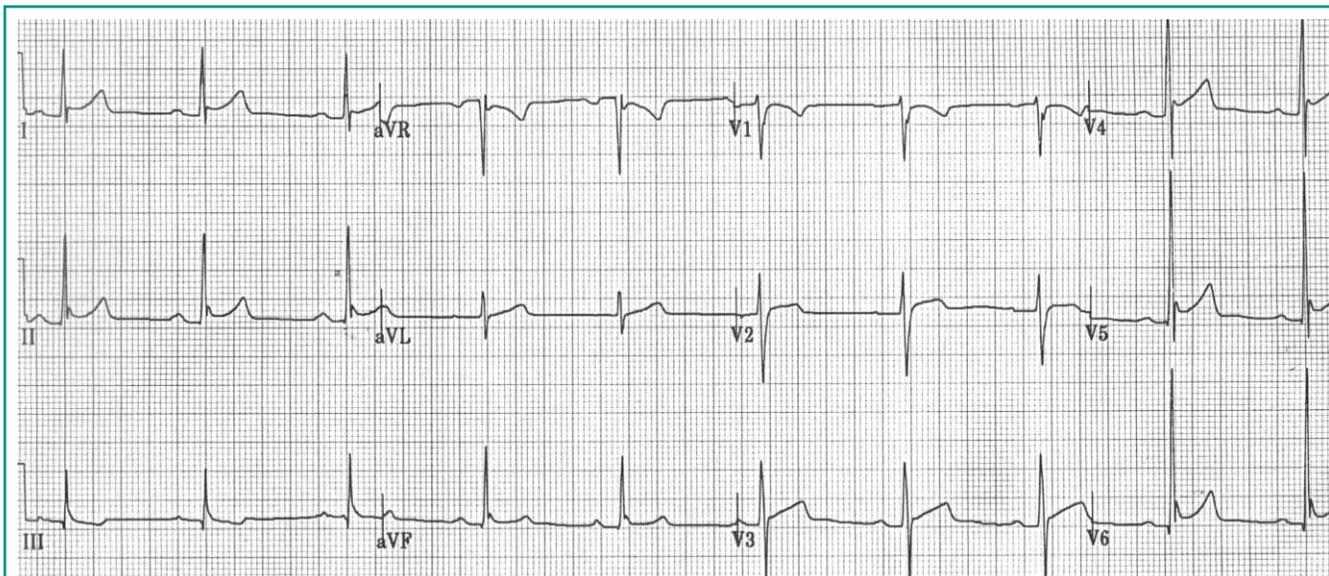
### CME Instructions

Physicians participate in this continuing medical education program by reading the article, using the provided references for further research, and studying the questions at the end of the article. Participants should select what they believe to be the correct answers, then refer to the list of correct answers to test their knowledge.

After completing this activity, *you must complete the evaluation form that will be provided at the end of the semester and return it in the reply envelope provided to receive a certificate of completion.* When your evaluation is received, a certificate will be mailed to you.

### DKA and Acute MI?

By Ken Grauer, MD



**Figure.** 12-lead ECG obtained from a 32-year-old man who presented in DKA.

**Clinical Scenario:** The ECG in the Figure was obtained from a previously healthy 32-year-old African American male who presented in a coma from diabetic ketoacidosis (DKA). Cardiovascular exam was unremarkable. In addition to being treated for DKA, should he also be considered a potential candidate for thrombolytic therapy?

**Interpretation:** The ECG in the Figure shows normal sinus rhythm at a rate of about 60/minute. The PR interval is at the upper range of normal (= 0.21 second). The QRS and QT intervals are normal. The mean QRS axis is  $+60^\circ$ . In view of the patient's age, there is no evidence of chamber enlargement. Perhaps the most remarkable finding on this tracing is the presence of diffuse ST segment elevation. This finding is present in virtually all leads except III, aVR, and V<sub>1</sub>. It is most marked in lead V<sub>5</sub>, where ST segment elevation attains at least 3 mm.

Despite the presence of diffuse ST elevation, it is highly unlikely that this pattern represents acute infarction. ST segment morphology is clearly upsloping (upward concavity), with marked notching of the J point in multiple leads (especially II, V<sub>4</sub>, V<sub>5</sub>, and V<sub>6</sub>). The ST segment appearance that is characteristic of acute infar-

tion is more typically coved (downward convexity) and usually is localized to one or two specific lead areas, rather than being as generalized as it is here. Marked acute ST segment elevation indicative of acute infarction also commonly is associated with reciprocal ST segment depression, which is not seen here. Although Q waves are present in the inferolateral leads, they are quite small and narrow. This is much more consistent with normal septal Q waves rather than acute evolving infarction. Clearly, clinical correlation is needed. However, given the young age of this patient, his negative past medical history, the apparent absence of chest pain, and the ECG picture described above, early repolarization almost is certain to be the cause of diffuse ST elevation in this case.

The *shape* of ST segment elevation provides a key clue to its etiology in this case (upsloping in multiple leads with prominent J-point notching). Admittedly, acute pericarditis at times can produce diffuse ST elevation similar to that seen here. However, the history in this case does not suggest acute pericarditis, tachycardia is absent, no mention of a pericardial friction rub is made, and the ECG picture with prominent J-point notching seen here is much more suggestive of early repolarization. ❖