

EMERGENCY MEDICINE ALERT™

An essential monthly update of developments in emergency medicine

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Abdominal Ultrasound in Trauma Patients: Can We Do It?

ABSTRACT & COMMENTARY

Source: Shackford SR, et al. Focused abdominal ultrasound and trauma: The steep learning curve and proficiency of nonradiologist clinicians.

J Trauma Inj Infect Crit Care 1999;46:553-564.

Shackford and colleagues prospectively evaluated the ability of nonradiologist clinicians to detect hemoperitoneum using focused abdominal sonogram for trauma (FAST). Twelve nonradiologist clinician sonographers (4 surgeons, 8 emergency physicians) performed FAST according to a strictly defined protocol for teaching ultrasound in trauma. The study employed statistical methods to graphically construct a learning curve for the 12 clinicians, plotting both error rate and the number of indeterminate exams as their experience increased.

All sonographers received a minimum of eight hours of didactic training in ultrasound including physics and instrumentation, followed by supervised practice sessions of a minimum of 10 normal examinations of volunteers. In the study, 234 FAST examinations were analyzed—an average of 20 per sonographer. The etiology of trauma was blunt in the majority of cases (all but 2) and the most frequent indication for the performance of the sonogram was a suggestive physical examination. Examinations were categorized as positive, negative, or indeterminate. The gold standard for comparison was diagnostic peritoneal lavage (6 patients), CT scan (211 patients), laparotomy (only 3 patients), or admission to the hospital for serial physical examinations (14 patients).

The adjusted error rate for the entire cohort was 5.9%. The adjustment made to the primary error rate was the subtraction of CTomas, which were injuries of no clinical significance found on CT. After the first 10 examinations, there was a significant reduction in the error rate of the examiners, going from approximately one in five examinations to one in 20 examinations. After 20 examinations, FAST had a sensitivity of 68%, specificity of 98%, positive predictive value of 92%, and negative predictive value of 92%.

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The discussion that follows the article is very thoughtful and thought-provoking. The primary message is that previous recommendations for anywhere up to 500 examinations to demonstrate competency is without basis in the literature and is not warranted. Reasonable positive predictive values and negative predictive values can be achieved after relatively few examinations. The learning curve is steep; performance and accuracy are greatly improved over the first 10 to 20 ultrasound examinations.

■ COMMENT BY JEFFREY W. RUNGE, MD, FACEP

Shackford and colleagues have convincingly shown that surgeons and emergency physicians can gain proficiency in focused abdominal ultrasound for trauma after a series of 10-20 examinations. The exact number required of physicians to learn will vary according to the prevalence of positive sonograms in the specific emergency department (ED) population, but certainly any academic hospital has a sufficient prevalence for this purpose. Community physicians may gain the necessary information through didactic courses and practice sessions, and may be proctored until they demonstrate proficiency through the use of photographic imaging and review at a remote location. Previous rec-

ommendations by the American Institute for Ultrasound in Medicine for 100 hours of didactic learning plus 300 practical examinations are not supported by data and may be motivated by other concerns.

Focused abdominal ultrasound following trauma should be employed in every community hospital that takes care of injured patients. With the reported high sensitivity and specificity, FAST should evolve into the modality of choice for the diagnosis of hemoperitoneum prior to transfer to a trauma center, as well as for triage within trauma centers. Current recommendations for diagnostic peritoneal lavage may be rendered obsolete as technology advances and the proficiency of clinician sonographers increases.

Only a decade ago, emergency physicians were told by many in the anesthesia community that we could not become proficient at rapid sequence intubation techniques, and that neuromuscular blockade was too dangerous for our hands. It is now the standard of care in the ED. There is a familiar echo in the rooms of many credentials committees as ED ultrasound is discussed. As diagnostic techniques like ultrasound get closer to the point of patient care, the quality of care is enhanced. It is incumbent upon emergency physicians to acquire these skills, understand their limitations, and maintain proficiency for the benefit of those we serve. ❖

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Managing Editor: David Davenport.
Associate Managing Editor: Suzanne Zunic.
Marketing Manager: Schandale Kornegay.

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Customer Service E-Mail Address:
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Editorial E-Mail Address: suzanne.zunic@medec.com

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Ottawa: From Sprained Ankles to Cardiac Arrest—A Great Place to Keep Living

ABSTRACT & COMMENTARY

Source: Stiell IG, et al. Improved out-of-hospital cardiac arrest survival through the inexpensive optimization of an existing defibrillation program: OPALS study phase II. *JAMA* 1999;281:1175-1181.

It seems obvious to say that emergency medical systems make a difference to communities, but proving how and why has always been difficult. In this article, Stiell and colleagues try to determine if shortening the time to defibrillation can improve survival from pre-hospital cardiac arrest. Their study took place in and around Ontario (an area with 2.7 million people), and examined the implementation and outcomes of a rapid defibrillation program in a large, multicenter, emergency medical services (EMS) system with an existing basic life support and defibrillation (BLS-D) level of care.

They compared survival for 36 months before and 12 months after system optimization and included all patients who had out-of-hospital cardiac arrest and for whom resuscitation was attempted by emergency responders. The goal was for EMS systems to be on scene with a defibrillator in eight minutes or less for 90% of cardiac arrest cases. The program tried to optimize the process by reducing dispatch time intervals, more efficiently deploying existing ambulances, having firefighters defibrillate, subjecting response intervals to continuous quality improvement, as well as revising and implementing standard dispatch policies. The outcome measured was survival to hospital discharge. The results from more than 6000 cases were impressive. The proportion of cases meeting the eight-minute response criterion improved (76.7% vs 92.5%; $P < 0.001$) as did most median response intervals. Overall survival to hospital discharge for all rhythm groups combined improved from 3.9% to 5.2% ($P = 0.03$). In addition, rates of admission to the hospital improved (7.2% to 9.6%) and more patients had return of spontaneous circulation (9.8% vs 12.2%). The neurologic outcome was also satisfying, as 79.7% of the 66 patients who were resuscitated and lived at least a year had scored at level 1 on a five-point cerebral performance scale. The 33% relative increase in survival represents an additional 21 lives saved each year in the study communities (approximately 1 life per 120,000 residents). The costs were estimated to be \$46,900 (U.S.) per life saved for establishing the rapid defibrillation program and \$2400 (U.S.) per life saved annually for maintaining the program.

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

This study should prove helpful to EMS and ED directors who are instituting an automatic external defibrillator (AED) program. When funds for EMS systems are limited, making choices about new initiatives are often difficult. The data presented here can detail the costs in startup and the payoff in very concrete terms. Note that other studies do not always show a benefit from an AED program, but they do not study the effect of a system-wide effort at early defibrillation, which appears to be the key. One difficulty with this study is best described by the “Hawthorn” effect, which essentially states that human performance often improves when it is being measured. Thus, the benefits of this program might decrease when the new system is no longer under investigation. Ultimately, the scientific breakthrough may be that time to defibrillation is a discrete measurement of quality of care, and the AED may be one of several tools to improve. ❖

Comprehensive Drug Screening in Pediatric Patients: Is It Worth It?

ABSTRACT & COMMENTARY

Source: Belson MG, Simon HK. Utility of comprehensive toxicologic screens in children. *Am J Emerg Med* 1999;17:221-224.

In this study on toxicologic screens, belson and Simon evaluated the effect of comprehensive drug screening in pediatric patients. Using a retrospective design, Belson and colleagues determined the clinical and financial impact of 463 comprehensive drug screens performed in 444 patients. In this paper, the comprehensive component evaluated was an extensive chromatographic analysis performed in addition to a urine screen for drugs of abuse and a limited blood screen for common toxins (acetaminophen, salicylates, and ethanol).

The results demonstrated that 227 of the 234 positive screens (97%) were either suspected based on history or physical examination, already detected by the limited drug screen, or were deemed to be clinically insignificant. Although the remaining seven screens found previously unsuspected and undetected toxins, in no case did the results alter management. One example was finding codeine in a patient who had already been given naloxone with a good clinical response. Interestingly, the cost for comprehensive screening in this study was determined to be \$16,205.

■ **COMMENT BY ROBERT S. HOFFMAN, MD**

More than half of the approximately 2 million annual exposures reported to United States poison control centers occur in children younger than the age of 6. Nevertheless, neither severe morbidity nor mortality from poisoning is common in this age group. This low risk largely results from the unintentional nature of childhood exposures. With advancing age, however, substance abuse and suicide attempts increase the risk of poison-related complications.

When faced with an ill patient of any age, it is always important to determine whether poisoning could be responsible for the clinical problem. While history, physical examination, and rapid bedside tests will usually suffice to define the likelihood of poisoning, many clinicians request additional assistance from the laboratory. Laboratory testing can be accomplished in several ways: directed quantitative tests for suspected toxins, such as aceta-

minophen or theophylline; rapid qualitative urine screening for drugs of abuse by enzyme technology; or comprehensive qualitative urine screening by chromatography.

Many investigations have demonstrated an extremely limited utility for qualitative testing in adults. These tests are wrought with false-positive and negative results, and even when accurate, only confirm exposure. Since metabolites persist in the urine for days to weeks, the decisions are always clinical. Unfortunately, wide spread use of comprehensive drug screening continues.

Belson et al correctly conclude that routine comprehensive toxicology testing is an unnecessary and costly endeavor in pediatric patients. I would add that routine screening of urine for drugs of abuse is also unnecessary. However, in select cases, laboratory confirmation of clinical suspicions may be required. Specifically, when there is a suspicion of child abuse or neglect, product tampering, or attempted homicide, laboratory results may have significant legal and civil ramifications; although they rarely alter medical decision making. ❖

Examining the Rotator Cuff: Is the Can Empty or Full?

ABSTRACT & COMMENTARY

Source: Itoi E, et al. Which is more useful, the “full can test” or the “empty can test,” in detecting the torn supraspinatous tendon? *Am J Sports Med* 1999;27:65-68.

The authors of this Japanese study sought to better define the physical examination tests used to evaluate tears of the supraspinatous muscle-tendon complex. Under consideration were the “empty can” and “full can” tests. The first involves placing the shoulder in 90° abduction in the scapular plane, and then requesting full internal rotation, as would be seen with the emptying of a can. The second is a newer test involving placement of the shoulder in 90° abduction in the scapular plane, and then requesting 45° of external rotation, as with the holding of a full can.¹ Two questions were addressed in this study: 1) should the physician use pain, weakness, or both as an indicator of a positive test for supraspinatous tear; and 2) which test is more clinically useful for the detection of supraspinatous tear?

One hundred forty-three shoulders from patients of all ages (range, 13-80 years) constituted the study population; subjects were questioned regarding pain with the provocative maneuvers and were graded on a 6-point strength scale (5-zero) such as the one used for motor assessment during

a neurologic examination. All patients then received high-resolution magnetic resonance imaging of the shoulder, which served as the gold-standard for presence or absence of disease (although Itoi and associates admitted that such imaging is only 95% accurate for detection of full-thickness tears of the rotator cuff). There were 35 full-thickness tears found in the rotator cuff; 19 were in the supraspinatous alone, and the other 16 involved that muscle and at least one other. Not surprisingly, defining a positive test as the presence of pain, weakness, or both yielded the highest sensitivity (empty can 89%, full can 86%). Muscle weakness proved to be the most specific indicator of tear (empty can 68%, full can 74%) and also yielded the highest diagnostic accuracy. Itoi et al concluded that muscle weakness should be used as the key to interpreting the two tests. Accepting this, the two tests were found not to differ significantly with regard to specificity and accuracy. Itoi et al hypothesized that the full can test may be more beneficial in the clinical setting because it causes less pain; given that the tests are equivalently accurate, the less painful test would be more desirable.

■ COMMENT BY RICHARD HARRIGAN, MD, FAAEM, FACEP

The can tests, full and empty, are a means to detect occult tears of the supraspinatous tendon. Acute tears may be suspected by history, but the more common chronic tears can be difficult to detect in that an antecedent event is often not recalled. Certainly the drop arm test² is fairly good for the detection of significant tears; if the patient cannot slowly range his arm from 90° abduction to zero, or cannot maintain 90° abduction despite the examiner's gentle downward tap of the abducted arm, it seems intuitive that a tear exists. The drop arm test is more of an all-or-nothing test, whereas a positive test in this study was defined as any muscle weakness detected during these maneuvers. It makes sense not to use pain as evidence of a full-thickness tear, in that pain during the empty can test may be representative of simple impingement as is seen with rotator cuff tendonitis. As Itoi et al point out in their discussion, pain may negatively influence the assessment of weakness. The empty can test, while no doubt sensitive for impingement, may be flawed as an indicator of tear, in that pain may mimic weakness during provocative testing. ❖

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2. Hoppenfeld S. *Physical examination of the spine and extremities*. Norwalk, CT; Appleton and Lange; 1976:33.

Alternative Technique for Ring Removal

ABSTRACT & COMMENTARY

Source: Thilagarajah M. An improved method of ring removal. *J Hand Surg* 1999;24B:118-119.

Thilagarajah describes another simple, and perhaps more comfortable, technique to remove a ring from a swollen or oversized finger. First, a length of ribbon gauze 1.25 cm in width is passed under the ring. A paper clip can be used to hook the edge as it passes under the band. Next, the gauze distal to the ring is wrapped around the finger, using firm technique and overlapping each turn one-half the width of the gauze. The wrapping continues until the narrower part of the digit is reached. Finally, the proximal end of the gauze wrap is grasped and unwound with a uniform tension simultaneously applied in a proximal-to-distal direction.

■ COMMENT BY RICHARD HARRIGAN, MD, FAAEM, FACEP

The above described method is a variation of the “string wrap method” described in the Roberts and Hedges text.¹ Intuitively, it seems more comfortable and less time-consuming than using string or suture. There are several ways to approach such a problem, the easiest being to lubricate the ring, and the least desirable (from the patient’s point of view) being the ring cutter.¹ Other alternatives include the use of 2.0 surgical silk in lieu of string (purported to be less traumatic than string), and the passage of an intact, wide rubber band beneath the ring. The latter method, performed on a lubricated digit, involves subsequently pulling the ring distally while holding both loops, and moving circumferentially around the digit. The authors remind us that a digital block may be necessary if the procedure becomes too painful. Whereas I am still awaiting a chance to try this new technique on a real patient, I have found that the gauze technique described above works well on rings that are not stuck. Anecdotally, simple 4 × 4 gauze is not strong enough; the gauze found in cling wraps seems stronger and better suited. ❖

Reference

1. Rudnitsky GS, Barnett RC. Soft tissue foreign body removal. In: Roberts JR, Hedges JR. *Clinical Procedures in Emergency Medicine*, 3rd ed. WB Saunders; Philadelphia; 1998:614-633.

Myocardial Perfusion Imaging vs. Troponin I in Acute MI

ABSTRACT & COMMENTARY

Source: Kontos MC, et al. Comparison of myocardial perfusion imaging and cardiac troponin I in patients admitted to the emergency department with chest pain. *Circulation* 1999;99:2073-2078.

Investigators from the medical college of Virginia in Richmond reviewed data from 721 patients who were admitted to the coronary care unit from the emergency department (ED) and who were at low-to-moderate risk for acute coronary syndrome (ACS). The study cohort consisted of patients who had had both early gated rest myocardial perfusion imaging (PI) with 99mTc sestamibi and serial serum cardiac troponin I (cTnI) sampling. The purpose of the study was to compare the sensitivity and specificity of these two diagnostic tests for predicting MI within one week of admission, significant coronary disease on angiography within six weeks of admission, and performance of revascularization (CABG or PTCA).

Of the final cohort of 620 patients, MI was diagnosed in 59 patients (9%) using CK-MB and relative index as the gold-standard criteria. Sensitivity for detecting MI was not significantly different between perfusion imaging (92%) and serial cTnI (90%), and both were significantly higher than the initial cTnI (39%). The specificity for MI was 67% for PI and 96% for serial cTnI. PI identified many more patients than cTnI who subsequently underwent revascularization or who had significant coronary disease. PI had a lower specificity for all end points. Lowering the cutoff value of cTnI from 2.0 ng/mL to 1.0 ng/mL did not significantly change the results.

■ COMMENT BY STEPHANIE ABBUHL, MD

This is essentially a retrospective study with several design flaws. Only 140 of 620 patients had angiography, leaving the potential for significant bias in conclusions about the end points of significant coronary disease and revascularization. In addition, 71 patients were excluded from the final cohort because only initial cTnI sampling had been done and, therefore, the final sensitivity and specificity calculations to predict all end points may be in error.

Despite these limitations, there are some points to be garnered from this study. The low sensitivity to detect MI of the initial cTnI (39%) is a cautious reminder of why

we must avoid the temptation to use this single determination to make decisions about admission or discharge for potential MI patients. Kontos and colleagues point out that troponin values may be negative in patients with MI for a number of reasons, including size of the infarct, timing of the sampling (optimal sensitivity is 8-12 hours after onset of necrosis), the threshold for abnormality, and the particular “gold standard” used to define MI.

At first glance, early PI appears promising, with a sensitivity of 92% to predict MI, and the test results were available about three hours after the initial ED evaluation. However, there were many false positives and the cost of PI was not addressed. While Kontos et al conclude that the information from these two tests is complementary, it appears that we still are searching for the optimal tests (and their timing) to predict the major ACS in ED patients with chest pain. ❖

Pharmacology Update

Trovafloxacin Tablet and Azithromycin for Oral Suspension

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

In december, the fda approved a product for the dual treatment of two common sexually transmitted diseases caused by *Neisseria gonorrhoea* and *Chlamydia trachomatis*. Marketed by Pfizer under the trade name Trovan/Zithromax Compliance Pak, the combination contains a fluoroquinolone, trovafloxacin, and an azalide, azithromycin.

Indications

Trovafloxacin/azithromycin is indicated for the treatment of uncomplicated urethral gonorrhoea in males and endocervical and rectal gonorrhoea in females caused by *N. gonorrhoea* and nongonococcal urethritis and cervicitis due to *C. trachomatis*.

Dosage

The contents of the azithromycin (1 g) packet should be mixed thoroughly with 2 oz of water and taken orally. This should be followed by an additional 2 oz of water to ensure that the complete packet is consumed. The trovafloxacin tablet should be taken with the second portion of the liquid. The product may be taken without regard to meals but

should be taken at least two hours before or two hours after aluminum- or magnesium-containing antacids, sucralfate, citric acid/sodium citrate, formulations containing buffers such as didanosine, or metal cations such as iron.

Patients should refer their sex partners for evaluation, testing, and treatment. Patients should be instructed to abstain from sexual intercourse for seven days after a single-dose regimen.¹

Trovan/Zithromax is supplied as a 100 mg tablet of trovafloxacin and 1 g azithromycin for oral suspension.

Potential Advantages

The Trovan/Zithromax Compliance Pak provides a convenient single-dose dual therapy for gonococcal and chlamydial infections. Trofloxacin has shown in vitro activity against strains of *N. gonorrhoea* that are relatively resistant to ciprofloxacin and ofloxacin.³ Single-dose azithromycin is more convenient than doxycycline, which is dosed for seven days and may actually be cost-effective despite higher initial drug cost.⁵

Potential Disadvantages

Quinolones are contraindicated for pregnant women.¹ Most common side effects associated with the combination of trovafloxacin and azithromycin include nausea (50%), abdominal pain (25%), and dizziness/lightheadedness (15%).³ Although rare (< 1%) in the United States, *N. gonorrhoea* resistant to fluoroquinolones has been reported in other parts of the world, especially in Asia.¹ The prevalence of quinolone-resistant *N. gonorrhoea* is expected to increase in the United States.¹

Comments

Routine dual treatment for *N. gonorrhoea* and *C. trachomatis* is generally recommended, as coinfection is common. Dual treatment may also hinder the development of resistant strains of *N. gonorrhoea* since both doxycycline and azithromycin are active against *N. gonorrhoea*.¹ Current recommendations of the CDC for dual treatment include azithromycin or doxycycline for chlamydia and ceftriaxone 125 mg IM, cefixime 400 mg, ciprofloxacin 500 mg, or ofloxacin 400 mg¹ for gonorrhoea. Azithromycin single dose is more convenient than doxycycline 100 mg twice daily for seven days. Single-dose trovafloxacin has been reported to be equivalent to ofloxacin both bacteriologically and clinically.⁴ Cure rate was 99% for trovafloxacin and 98% for ofloxacin. This compares favorably to ceftriaxone (99%), ciprofloxacin (99.8%), and cefixime (97%).¹

At the time of this printing, Pfizer has not yet launched the product and cost was not available.

Clinical Implications

Chlamydial and gonorrheal genital infections are common in the United States and often exist as coinfections. Chlamydial infections are commonly asymptomatic in both males and females, while gonorrhea tends to be asymptomatic in females. Notwithstanding transmission, serious sequelae can result from these infections, including pelvic inflammatory disease, ectopic pregnancy, and infertility. To ensure compliance, medications should be dispensed on site at the time of diagnosis and the administration of the medication should be directly observed. Currently, there are convenient and highly effective dual treatments. Trovan/Zithromax Compliance Pak offers a single-prescription, oral, one-time treatment that is highly effective. Patients do not need to be retested for cure after completing treatment unless symptoms persist or reinfection is suspected. (Dr. Elliott is Chair, Pharmacy Education, California Division of Kaiser Permanente; and Assistant 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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1. *MMWR* 1998;47(RR-1):1-118.
2. Knapp JS, et al. *Antimicrob Agents Chemother* 1995;39(4):987-989.
3. Trovan/Zithromax Product Information. Pfizer 1999.
4. Jones RB, et al. *Am J Med* 1998;104:28-32.
5. Magid D, et al. *Ann Intern Med* 1996;124(4):389-399.

CME questions

7. Which of the following is correct?

- a. Muscle weakness is the most specific indicator of supraspinatous tear in the “empty can test” and the “full can test.”
- b. The “full can test” is more sensitive for teres minor tears than supraspinatous tears.
- c. The “empty can test” is generally less painful than the “full can test” when there is pathology involving the supraspinatous tendon.
- d. The “drop arm test” is very sensitive for detection of tears in the teres major tendon of the rotator cuff.

8. Acceptable methods for removal of rings that are stuck on a digit include all of the following *except*:

- a. lubrication and distal traction.
- b. the string wrap method.
- c. the gauze wrap method.
- d. local anesthetic injection of the PIP joint capsule.

9. Focused abdominal ultrasound in cases of known or suspected trauma, as described by Shackford and colleagues:

- a. has replaced CT imaging.
- b. can be performed only by radiologists.
- c. can be learned by emergency physicians and surgeons in a relatively short period of time with a steep learning curve.
- d. is more sensitive than specific.

10. Comprehensive drug screening in pediatric patients:

- a. is cost-effective.
- b. usually confirms what has been found during the history and physical examination or on limited drug screens.
- c. is mandatory when evaluating a pediatric patient with abdominal pain.
- d. is mandatory when evaluating the pediatric patient who admits to ethanol intake.

11. All of the following were true about early perfusion imaging (PI) in the Kontos study of ED patients at low-to-moderate risk for acute coronary syndromes, *except*:

- a. PI had a sensitivity of 92% to predict MI.
- b. PI had a sensitivity very similar to the initial cardiac troponin I.
- c. PI had a lower specificity for predicting MI than serial cardiac troponin I.
- d. PI results were obtained within about three hours of initial ED evaluation.

12. The implementation of a rapid EMS defibrillation program was shown by Stiell and colleagues to:

- a. significantly improve survival to hospital discharge.
- b. have no significant effect on survival to hospital admission or discharge.
- c. significantly improve survival to hospital admission, but not to discharge.
- d. significantly improve survival to hospital discharge in selected rhythm groups.

13. The combination of trovafloxacin and azithromycin:

- a. is indicated for chlamydia and gonorrhea, respectively.
- b. is effective in males only.
- c. is indicated for pregnant women with cervicitis.
- d. has been found to be effective in treating cervicitis and urethritis, yet is not approved for treatment of pelvic inflammatory disease.

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Funny-Looking "Ectopy" in a Healthy 30-Year-Old Woman

By Ken Grauer, MD

Clinical Scenario: A healthy 30-year-old woman was seen in the office for her "routine city physical." An irregular heart beat was heard on cardiac auscultation. Can you explain the irregularity of her rhythm that is seen in the figure?

Hint: The tracing in the figure was obtained at the same visit as the rhythm strip shown in last month's ECG Review—from the same asymptomatic 30-year-old woman.

Interpretation: The rhythm strip in the figure is clearly irregular. Nearly half the beats are widened and abnormal in appearance. The easiest way to approach interpretation of this complex arrhythmia is to try to identify the *underlying* rhythm first; then assess each abnormal beat.

Focusing attention on lead II, it can be seen that the QRS complex of beats #1, 2, 4, 6, and 8 is narrow and preceded by a fairly similar appearing (upright) P wave with constant PR interval. This defines the underlying rhythm in the figure as sinus.

Beats #5, 7, and 9 are all preceded by premature P waves. Support that the small upright deflections in front of beats #5, 7, and 9 truly are premature P waves is forthcoming from analysis of simultaneously recorded lead III, which shows similar deflections in front of these three widened beats. This defines these widened beats as premature atrial contractions (PACs). As noted in last month's ECG Review (*Emerg Med Alert* 1999;1:8), most aberrant beats are conducted with a pattern of either left or right bundle branch block and/or a hemiblock. The morphologic appearance of the QRS complex of beats #5 and 9 is consistent with a *bifascicular* pattern of aberrancy (i.e., the S wave of beats #5 and 9 in lead I is consistent with right bundle branch block; the marked negativity in leads II and III is consistent with left anterior hemiblock). Note, however, that the QRS complex of premature beat #7 is slightly less wide than

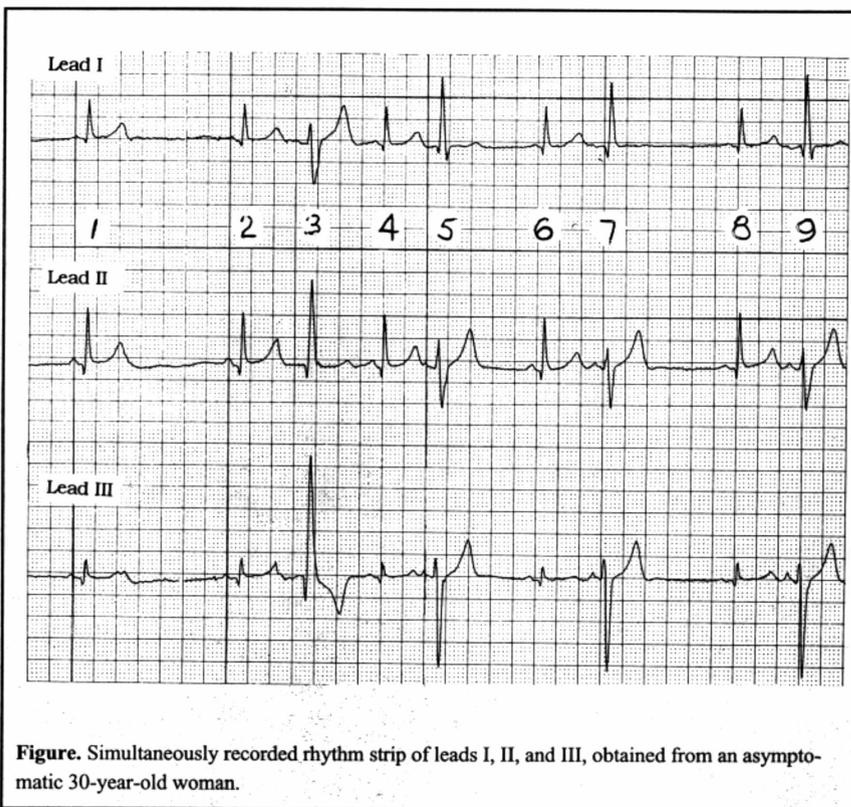


Figure. Simultaneously recorded rhythm strip of leads I, II, and III, obtained from an asymptomatic 30-year-old woman.

the QRS of beats #5 and 9 and that the S wave in lead I of beat #7 is missing! This is because the QRS complex of this PAC (beat #7) is conducted with a left anterior hemiblock pattern of aberrancy, but *without* right bundle branch block.

The final two points to explain in this tracing relate to the relative pause between beats #1 and 2, and the different morphology of premature beat #3. Once again, the lesson from last month's ECG Review holds true: When there are some PACs, there will often be more. Careful inspection in lead III of the T wave of beat #1 shows notching that confirms the presence of a hidden and "blocked" PAC. Peaking of the T wave that precedes beat #3 in lead III confirms that beat #3 is also a PAC, in this case conducted with the bifascicular pattern of right bundle branch block and left *posterior* hemiblock aberration. Thus, as was the case last month, the rhythm in the figure is atrial bigeminy in which PACs are either blocked or manifest differing patterns of aberrant conduction. ♦

In Future Issues:

Postpartum Toxemia