



EMERGENCY MEDICINE ALERT™

An essential monthly update of developments in emergency medicine

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Intubating the Asthmatic: Pre-Treat with Lidocaine?

ABSTRACT & COMMENTARY

Source: Groeben H, et al. Combined intravenous lidocaine and inhaled salbutamol protect against bronchial hyperreactivity more effectively than lidocaine or salbutamol alone. *Anesthesiology* 1998;89:862-868.

Tracheal intubation in patients with asthma can cause or exacerbate life-threatening bronchospasm. Intravenous lidocaine has been recommended to attenuate the response to airway irritation because it has been shown to mitigate the response to histamine inhalation in asthmatics. For the first time, in this study, the effects of prophylactic lidocaine are compared with standard prophylaxis with sympathomimetic aerosols.

Fifteen volunteers with bronchial hyperreactivity were enrolled in this placebo-controlled, double-blind, randomized study. A histamine threshold concentration necessary for a 20% decrease in FEV₁ was calculated for each volunteer. Each subject was then challenged with inhaled histamine on four different days after pre-treatment with either intravenous lidocaine (1.5 mg/kg over 20 minutes then 3 mg/kg/hr), inhalation of salbutamol (1.5 mg diluted in 1.5 mL saline), inhalation of salbutamol plus intravenous lidocaine, or placebo. The mean histamine threshold after intravenous and inhalational administration of placebo was 6.4 ± 4.3 mg/mL. Intravenous lidocaine and inhaled salbutamol each significantly increased the mean histamine threshold to 14.2 ± 9.5 mg/mL and 16.8 ± 10.9 mg/mL, respectively. However, the combination of lidocaine and salbutamol increased the mean histamine threshold even further to 30.7 ± 15.7 mg/mL.

■ **COMMENT BY STEPHANIE B. ABBUHL, MD, FACEP**

This study shows that, in awake volunteers, the combination of intravenous lidocaine and inhaled salbutamol protect against bronchial hyper-reactivity much more effectively than either agent alone. Groeben and colleagues believe that while lidocaine may have some minor direct effect on smooth muscle cells, the main mechanism for the effects of lidocaine is probably neural blockade of vagal

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reflex pathways. The idea that lidocaine and salbutamol attenuate the response to histamine by different mechanisms may explain the marked effect of the combined pretreatment with both agents. This report provides more evidence to support the use of lidocaine in the pretreatment phase of tracheal intubation in patients with reactive airway disease. ❖

Seizures and AIDS: A Serious Combination

ABSTRACT & COMMENTARY

Source: Pesola GR, Westfal RE. New-onset generalized seizures in patients with AIDS presenting to an emergency department. *Acad Emerg Med* 1998;9:905-911.

One of the greatest challenges for emergency physicians caring for patients with AIDS is recognizing the subtle presentations of potentially life-threatening illnesses, many of which present in atypical fashion. Pesola and Westfal, in a retrospective review of adult AIDS patients presenting with new-onset gen-

eralized seizures, sought to determine if previously established American College of Emergency Physicians (ACEP) guidelines, which were published in 1997,¹ could be safely used in the AIDS population. Their two-year review included all 151 patients presenting to the Saint Vincent's Hospital and Medical Center of New York Emergency Department with a complaint of new-onset generalized seizures. Twenty-six of the patients evaluated had AIDS. Of these patients, seizure etiologies were determined as follows: eight, idiopathic; eight, HIV encephalopathy; five, CNS toxoplasmosis; two, alcohol withdrawal; two, progressive multifocal leukoencephalopathy; and one, CNS lymphoma. ACEP guidelines failed to identify the need for admission in four of the six patients (3 patients with CNS toxoplasmosis and 1 patient with CNS lymphoma). Pesola and Westfal conclude that the 1997 ACEP guidelines for the evaluation and management of patients with new-onset generalized seizures would have failed to identify some AIDS patients presenting with new-onset generalized seizures due to treatable etiologies. They recommend neuroimaging, along with lumbar puncture if indicated, or admission work up for all patients with AIDS (or a strong suspicion of AIDS) who present to the emergency department (ED) with new-onset generalized seizures.

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Please call **David Davenport**, Managing Editor, at (404) 262-5475 or **Suzanne Zunic**, Copy Editor, at (404) 262-5444 between 8:30 a.m. and 4:30 p.m. ET, Monday-Friday.

■ COMMENT BY FREDERIC H. KAUFFMAN, MD

In our ED, caring for patients with AIDS is a daily occurrence. Over the past 15 years, I have been impressed by how often common illnesses present in atypical fashion in these patients, and how easy it is to miss serious illness in patients who present with relatively benign presentations. For instance, it is common knowledge that new-onset headache in a non-toxic appearing AIDS patient without meningismus, altered mental status, or abnormal routine CSF findings may still be due to cryptococcal meningitis. As such, the question posed by Pesola and Westfal is an important one. Despite the retrospective nature of their study, they have added evidence to support the recently revised ACEP guidelines, which now include emergent neuroimaging for the evaluation of AIDS (or suspected AIDS) patients with new-onset generalized seizures.

Though not necessarily supported by this study, but based on general experience, I would make even more stringent recommendations than Pesola and Westfal. It is well known that non-contrast CT scans can miss potentially treatable lesions in AIDS patients with neurologic complaints. If MRI (the actual neuroimaging study of choice in these patients) is not immediately

available or safe for the AIDS patient with new-onset seizure, CT with contrast is, in my opinion, mandatory. In addition, if neuroimaging is negative, lumbar puncture must be performed to rule out those treatable infectious etiologies that immunocompromised patients are at such great risk for acquiring. Finally, a nonfocal neurologic examination should never be used to decide against pursuing either neuroimaging or lumbar puncture. AIDS patients do not always follow “textbook presentations” of serious illness; a simple new headache or a new seizure may be the earliest clue that a potentially life-threatening condition exists, even in the patient who otherwise does not appear ill. ❖

Reference

1. Clinical policy for the initial approach to patients presenting with a chief complaint of seizure who are not in status epilepticus. *Ann Emerg Med* 1997;29:706-724.

More on the Impact of Right Ventricular Infarction

ABSTRACT & COMMENTARY

Source: Zeymer U, et al. Effects of thrombolytic therapy in acute myocardial infarction with or without right ventricular involvement. *J Am Col Cardiol* 1998;32:876-881.

Zeymer and colleagues performed a retrospective review of patients in the Hirudin for Improvement of Thrombolysis (HIT-4) study investigating the impact of right ventricular infarction (RVI) on the clinical course of individuals with acute inferior wall myocardial infarction (IWMI) treated with streptokinase within six hours of chest pain onset. In addition to the standard 12-lead ECG, patients were evaluated with the right-sided chest lead, RV₄; RVI was diagnosed if RV₄ ST segment elevation (STE) was greater than 0.1mV. IWMI were described as small (inferior lead STE sum ≤ 0.8mV without precordial ST segment reciprocal depression [STD]) or large (sum > 0.8 mV and/or reciprocal precordial STD).

Five hundred twenty-two patients with IWMI were identified, with 169 patients (32%) experiencing RVI. Larger-sized infarcts were encountered more frequently in patients with RVI. Patients with RVI experienced in-hospital complications more often, including malignant tachyarrhythmia and reinfarction; importantly, bradyarrhythmias were not studied in the HIT-4 study. Overall mortality rates were similar considering the presence or absence of RVI, although cardiac mortality was high-

er in the RVI group. Independent predictors of 30-day cardiac mortality included increasing age, history of angina, larger IWMI, and elevated CPK (> than 12 times the norm); the presence of RVI was not an independent predictor of 30-day cardiac mortality.

■ COMMENT BY WILLIAM J. BRADY, MD

Among patients with IWMI complicated by RVI, increased rates of both early complication and 30-day mortality were encountered. Zeymer et al conclude that the use of thrombolytic agents as acute revascularization therapy in the setting of acute IWMI should be questioned. They note that the presence of RVI by itself was not a marker of increased chance of poor outcome; patients with larger-sized infarcts—either with or without RVI—are more likely to achieve benefit in terms of reduced mortality and improved left ventricular function.

The reader must realize that such a treatment recommendation is based on this subset of patients with IWMI who were treated with streptokinase within six hours of onset. Until randomized trials of acute reperfusion therapies in IWMI patients with and without RVI are performed, such treatment statements cannot be fully supported. Rather, the clinician must approach each IWMI patient individually, considering issues such as comorbidity, infarct size, the presence of electrocardiographic reciprocal STD, and the occurrence of arrhythmic and nonarrhythmic complications, when making treatment decisions. ❖

Rattlesnake Envenomation: Tourniquet or Not?

ABSTRACT & COMMENTARY

Source: Amaral CF, et al. Tourniquet ineffectiveness to reduce the severity of envenomating after *Crotalus durissus* snake bite in Belo Horizonte, Minas Gerais, Brazil. *Toxicon* 1998;36:805-808.

A recent article attempted to compare the outcomes of patients who applied tourniquets prior to antivenom therapy with those who received antivenom alone. All patients were envenomated by *Crotalus durissus* (the neotropical rattlesnake), which has both neurologic and tissue toxic effects. The 45 patients who applied tourniquets were similar to the 52 who did not with regard to age, sex, time since bite, and degree of early neurologic findings. In addition, the two groups

had rates of coagulopathy, rhabdomyolysis, and fatality that were not statistically different.

■ COMMENT BY ROBERT HOFFMAN, MD

Despite common beliefs, fatalities following envenomation by North American pit vipers are quite uncommon. This probably results from several factors including the predominant tissue toxicity of the snake venom, the easy accessibility of health care, and the proven benefits of antivenom. Although fatalities are rare, life-threatening, systemic symptoms such as coagulopathy and shock do occur, and the envenomated patient has no way of knowing whether he or she will develop these symptoms prior to obtaining definitive health care. Thus, the search for simple, safe, and effective first aid measures continues.

Arterial or venous tourniquets, or lymphatic constrictors seem sensible in that venom will remain concentrated in that extremity, thereby preventing systemic toxicity. In fact, when primarily dealing with neurotoxic snakes (such as cobras), constricting bandages of varying degrees have been shown to limit weakness and respiratory arrest.^{1,2} Unfortunately, when released, systemic symptoms often rapidly develop. However, when envenomated by a snake with primarily local effects, the debate becomes one of sacrificing a limb or exacerbating local toxicity in order to prevent systemic effects. Under those circumstances, the ischemic damage produced by the tourniquet may be worse than those expected from the original snake bite.³ Although selection bias (why some people applied tourniquets and others did not) prevents any firm conclusions from this study, it appears that tourniquets offer little advantage. For the present time, and especially with North American rattlesnakes, it seems unlikely that application of a tourniquet will significantly improve outcome; it may potentially exacerbate local toxicity. If traveling abroad, or if bitten many hours from health care, a loose-fitting lymphatic constriction bandage may be reasonable. Venous and arterial occlusion are never advisable. If you receive a patient who has a tourniquet applied, it is essential to have antivenom and resuscitation equipment ready prior to releasing the tourniquet. ❖

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3. Trevett AJ, et al. Tourniquet injury in a Papuan snakebite victim. *Trop Geogr Med* 1993;45:305-307.

Intravenous Ketamine and Kids

ABSTRACT & COMMENTARY

Source: Green SM, et al. Intravenous ketamine for pediatric sedation in the emergency department: safety profile with 156 cases. *Acad Emerg Med* 1998;5:971-976.

Green and colleagues, in this retrospective consecutive case series, sought to determine the safety of IV ketamine in the emergency department (ED) when it was used for procedural sedation in pediatric patients. Of the 156 children studied, only two had airway complications. One had a transient period of apnea that responded to bag-valve-mask ventilation. The other had transient respiratory depression with desaturation, again responding to non-invasive treatment. One patient had excessive salivation. Six patients had uncomplicated emesis. Two patients had what was characterized as “mild” recovery agitation. Forty percent of the children studied required only one dose of 1.5 mg/kg. The remainder required repeat doses with a mean total dose of 2.5 mg/kg. Concurrent atropine was given in 88% of the cases, and concurrent midazolam in 31%. Green et al conclude that IV ketamine has a very good safety profile when used in the ED in pediatric patients.

■ COMMENT BY GLENN C. FREAS, MD, JD, FACEP

This study caught my eye soon after one of my senior residents declared that ketamine was the “perfect” agent for conscious sedation in the ED. Seemingly, he had read an article that I missed. However, this was not the one. This study does show that the feared complications of airway compromise and/or excessive secretions are rare. The concomitant administration of atropine certainly decreased the hypersalivation attributed to ketamine. The adverse reaction that continues to concern me is the emergence phenomenon. In sixties parlance, this is apparently similar to a “bad trip” on LSD. The incidence of this reaction is higher in adults but not insignificant in children. Despite the authors’ reassurances that their chart abstractors would have picked up mild, moderate, and severe recovery agitation, I remain skeptical. How does one document such reactions in children, particularly very young children? Do a few whimpers really mean the recovery agitation is merely “mild?” Most of the pediatric emergency medicine specialists that I know routinely use midazolam with ketamine to blunt the emergence phenomenon.

Another issue is whether IV ketamine offers any

advantage over IM ketamine. Green et al admit that recovery times were similar for both routes. They also acknowledge that IM ketamine is efficacious. At our institutions, we routinely use a ketamine “dart” (ketamine, midazolam, and atropine in a single IM injection) for pediatric sedation. It works quickly, lasts long enough for most ED procedures, and is safe. Green et al admit that IV ketamine is probably best reserved for children who already have an IV in place, or for children who require prolonged, titrated sedation. If you do use it, it appears safe. ❖

Warfarin, Needle Aspiration, and Injection: What’s the Risk?

ABSTRACT & COMMENTARY

Source: Thumboo J, O’Duffy JD. *Arthritis Rheum* 1998;41:736-739.

Following the dictum, “first do no harm,” clinicians have generally hesitated to do needle aspiration and joint or soft tissue injections in patients on warfarin. Intra-articular hemorrhage or bleeding into the soft tissues which could complicate the procedure was assumed to be a significant, though unquantified risk.

Thumboo and O’Duffy have tried to provide an estimate of the risk of local hemorrhage following needle insertion into a joint or the soft tissues by assessing, in a prospective fashion, the incidence of bleeding in a group of 25 patients on warfarin, all of whom had INRs less than 4.5, were not on heparin, and did not have evidence to suggest overlying skin infection. Nonsteroidal anti-inflammatory drug (NSAID) use was not a contraindication, nor was mild thrombocytopenia. No special precautions were taken, most aspirations were performed after local injection of 2 mL of lidocaine. Eighteen gauge needles were used for aspiration of large joints, such as the knee, 20 gauge needles for aspiration and injection of other sites, except the great toe, where 25 gauge needles were used. The primary outcome, local hemorrhage, was assessed by telephone interview at a mean of five weeks after the procedure. The results were encouraging, with no patient-reported hemorrhages in the 32 procedures performed. The aspirations were diagnostically useful in 53% of instances, with crystal arthritis being confirmed by microscopic examination of the joint fluid, or infection being ruled out. The authors calculate that the absence of any reported hemorrhage in 32 procedures

indicates an incidence of local bleeding of 0-10% with 95% confidence.

■ COMMENT BY JERRY M. GREENE, MD

Anticoagulation is a relative contraindication to aspiration or injection of joints and soft tissues. The results above are reassuring. When needle aspiration is necessary to help exclude septic arthritis or bursitis, or when more conservative methods for treating joint or soft tissue inflammation have failed or are contraindicated, injection of the joints or soft tissues can be done with a small risk. Whether the risk is acceptable is a decision that must be made by the patient after being counseled. With Thumboo and O’Duffy’s data, it is possible to give a much better estimate of the risk of local hemorrhage. (*Dr. Greene is Instructor in Medicine, Harvard Medical School, Chief, Rheumatology Section, Brockton/W. Roxbury VA Hospital.*) ❖

Special Feature

Injured Intoxicated Drivers, Law Enforcement, and the Emergency Physician

By Jeffrey W. Runge, MD, FACEP

Motor vehicle crash is the leading cause of death in people 15-35 years of age. In 1997, nearly 42,000 people in the United States were killed in motor vehicle crashes, and 3.4 million people were injured. Alcohol was involved in 38.5% of all fatal crashes, and in 7% of all crashes. About three of 10 Americans will be involved in an alcohol-related crash at some point in their lives.¹ Alcohol-impaired driving is a public health problem of mammoth proportion that requires a coordinated effort from all parties involved in the communities of health care, law enforcement, and public policy. Emergency physicians routinely encounter both the perpetrators and the victims of drunk driving crashes as part of every day practice. Not to respond violates the sensibilities and principles of physicians who are mindful of the need to safeguard the public’s health, as well as the individual patient.

Emergency physicians frequently find themselves caught between their roles as the advocate for the individual patient and the guardian of the public health, not to mention the necessity of navigating the same roads as the drunk driver. Emergency physicians are ever mindful

that every healthy person in their community may become a patient when the public health or public safety systems fail. What should one do when confronted with a patient injured in a motor vehicle crash while driving intoxicated by alcohol?

In the United States today, it is very likely that such a patient will not be charged with any offense by the police, and that this will escape detection. The failure of the police to charge injured intoxicated drivers has been well documented. In the emergency department specifically, only 28% of injured intoxicated drivers are charged with DWI, and 17% are convicted.² Moreover, for every 1000 drunk driving episodes, only 3-5 drunk driving arrests are made. Thus, the conscientious emergency physician understands that these patients are at extremely high risk for repeat injury or the injury of others. The future health and well being of such a patient depends on effective intervention with the disease of alcohol abuse or alcohol dependency. Outside of the emergency department environment, the impaired driver has a much higher chance of receiving intervention via legal sanctions and interface with law enforcement officers. What is the duty of the emergency physician in dealing with these patients' risk of future injury?

There are various approaches taken by several states to address this problem. Most states, however, have not dealt with the issue, and, thus, default to patient confidentiality laws. It can be grounds for a tort action in most states if a physician discloses information about alcohol impairment to a police officer without the patient's consent. Such laws have the effect of impeding the police investigation of a potential alcohol related crash, even if it is a felony.

Several states have dealt with the issue by passing legislation that gives physicians the opportunity to ensure that legal intervention occurs for injured drunk drivers. The various approaches include mandatory reporting, elective reporting, referral to medical review for drivers licensing, and other statutes that make it permissible to disclose information to an investigating officer. Physicians should become knowledgeable about their specific state laws about what is prohibited and allowed or mandated with respect to dealing with injured intoxicated drivers. State laws have been changing in many places in recent years, and are subject to further change, as the topic is very popular among state legislatures at this time.

Mandatory Reporting

The state of Hawaii recently passed legislation that requires health care providers to report injured intoxicated drivers to police; it is the only state in the coun-

try to have such a requirement. The mandate refers to "health care providers," which is not limited to physicians. Specifically, the statute states that if a health care provider "becomes aware as a result of any blood tests performed in the course of medical treatment [that the patient is intoxicated] . . . the health care provider shall notify" the officer present or any officer in the county of occurrence of the crash. Furthermore, when the health care provider is aware of any blood tests over the legal limit among drivers or passengers in the vehicle, the health care provider must report all occupants of the vehicle. The effect of this law will not be known for some time, but the short-term advantages include the obvious increase in detection of impaired drivers. The disadvantages of this law include potential erosion of the doctor-patient relationship and of the physician's role as patient advocate. Opponents of the law argue that such laws discourage needed treatment after a motor vehicle crash, providing a disincentive to be examined if one has consumed any alcohol at all, irrespective of impairment. It may preclude the provision of other needed interventions for these patients, such as referral for substance abuse treatment. There may also be legal risk for the physician, in that there is no protection for a physician for not being "aware," of intoxication, regardless of whether a blood alcohol level was drawn. Even so, there is likely to be a decrease in the number of serum alcohol levels performed because the test may create the need to report a patient who shows no clinical signs of impairment.

Elective Reporting

Many of the advantages of mandatory reporting laws are also present with elective reporting laws, such as exists in Illinois. Such laws permit physicians or other health care providers to report intoxicated drivers to law enforcement officers, while providing protection from civil liability for reporting in good faith. The major disadvantage of elective reporting is the opportunity for bias in reporting based on gender, racial, or other social biases. Without strict protocols, reporting is likely to occur only if it is convenient for the health care provider, or perhaps for only those cases that arouse anger or ill feeling among the emergency department staff. Opponents of these laws point out that there may be added legal liability for physicians who treat injured, impaired drivers, and do not report them all. It can be argued that it is a physician's duty to detect drunk drivers in order to protect the population from subsequent alcohol-related crashes. Failure to report a driver who causes injury to innocent parties at a later time may imply causation and legal liability.

Elective Referral for Medical Review

Two states, Connecticut and North Carolina, have state laws that allow elective reporting of patients who, by virtue of a medical condition, cannot operate a motor vehicle safely. The “referral” is made to the state department of motor vehicles medical review panel, which consists of physicians who review the medical record and determine fitness for drivers’ licensure. Such medical conditions include chronic substance abuse, as well as unstable diabetes, seizure disorders, poor visual acuity, and others. While not a legal sanction, the medical review panel has the authority to recommend revocation of a driver’s license until the medical condition is treated successfully. This law was recently passed in both states, and the effects are not yet known.

Other Cooperative Efforts

Some states permit health care providers to disclose to an investigating officer whether a patient appears to be chemically impaired. This judgment may or may not be independent of the blood alcohol level. This type of permission does not make the physician into a “whistle blower,” but rather permits the physician to cooperate with a police officer’s investigation already underway. These laws recognize the similarity between the injured, impaired driver and the patient with a gunshot or stab wound as evidence that a crime was committed. There are already reporting laws for gunshot and stab wounds and other intentional injuries on the books in most states.

The American College of Emergency Physicians (ACEP) developed a policy on this issue, and adopted it as College policy in January 1998. ACEP advocates alcohol testing of drivers by law enforcement officials in all crashes involving fatality or serious injury, but not reporting by emergency physicians. ACEP supports emergency physicians identifying and arranging treatment for individuals suffering from alcohol abuse or alcohol dependency. Furthermore, ACEP opposes legislation providing permissive or mandatory reporting of patient alcohol concentration levels by physicians because “such reporting fundamentally conflicts with the appropriate role of physicians in the physician-patient relationship.”³ This issue represents an opportunity for emergency physicians to become active in their state medical societies and state ACEP chapters to develop and lobby for sound policy on this issue. Only through sound public policy can the need of society to protect itself against the ravages of drunk driving be made consistent with the physician’s need to be the patient’s advocate in every possible way. Such advocacy should recognize the need for intervention in the way most appropriate for that patient, while doing one’s best to ensure that it will be safe to drive home from the shift. ❖

References

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CME Questions

8. The study by Green and colleagues showed that the use of IV ketamine in the ED for pediatric patients was:
 - a. safer than IV midazolam and fentanyl.
 - b. safer than IM ketamine.
 - c. associated with an unacceptable rate of airway compromise.
 - d. safe with regard to airway complications and hypersecretion.
 - e. free from any recovery agitation or emergence phenomenon.
9. Among patients with IWMI, the following are all associated with an increased 30-day cardiac mortality, *except*:
 - a. increasing age.
 - b. larger-sized infarct.
 - c. right ventricular infarction.
 - d. occurrence of bradyarrhythmia.
10. All of the following are true regarding the asthmatic patient *except*:
 - a. tracheal intubation can exacerbate bronchospasm.
 - b. the inhalation of salbutamol has been shown to mitigate the bronchospastic response to histamine inhalation.
 - c. intravenous lidocaine has been shown to mitigate the bronchospastic response to histamine inhalation.
 - d. the combination of lidocaine and salbutamol does not mitigate the bronchospastic response to histamine inhalation any more than either agent alone.
11. New-onset generalized seizures in patients with AIDS:
 - a. may be due to focal lesions.
 - b. are always due to definable etiologies.
 - c. can be evaluated on an outpatient basis if neurologic examination and routine laboratory values are normal.
 - d. can be evaluated just like those in immunocompetent patients.
12. Following poisonous snake envenomation:
 - a. fatalities are common.
 - b. arterial tourniquets are mandatory.
 - c. coagulopathy and rhabdomyolysis may occur.
 - d. need for antivenom is obviated by field tourniquet use.
13. Which of the following is a true statement about alcohol-intoxication and vehicular accidents?
 - a. Emergency physicians must report alcohol-intoxicated drivers to police authorities.
 - b. Emergency physicians must report alcohol-intoxicated drivers to police unless the driver is hospitalized.
 - c. ACEP does not advocate the mandatory reporting of alcohol-intoxicated drivers by emergency physicians.
 - d. ACEP advocates mandatory reporting of alcohol-intoxicated drivers by emergency physicians in an anonymous fashion.

Intermittent LBBB?

By Ken Grauer, MD



Figure. Sinus rhythm with intermittent LBBB—or not?

Clinical Scenario: The rhythm in the figure shows intermittent left bundle branch block (LBBB)—or does it? How certain can you be of your diagnosis?

Interpretation: The underlying rhythm in the figure is sinus—as identified by the first three beats in this tracing. These three complexes show a regular rhythm at 68 beats/min with upright P waves in this lead II monitoring lead. The QRS complex then changes in morphology beginning with the fourth beat. A P wave precedes this fourth beat (as indicated by the second arrow in the tracing)—but the PR interval preceding the fourth beat is shorter than it is for the first three sinus beats. If the rhythm in this figure did represent sinus rhythm with intermittent bundle branch block, the PR interval preceding the fourth beat should *not* have changed.

The key to interpreting the rhythm in this month's review resides with recognizing that *regular* atrial activity continues throughout the rhythm strip. Setting your calipers to a P-P interval suggested by the distance between arrows allows you to "walk out" a fairly regular atrial rate on this tracing. As suggested by the third arrow—some P waves are hidden within various portions of the widened QRS complexes. Note in particular that a P wave notches the terminal part of the last widened complex—before resuming normal sinus conduction for the last two beats on this tracing.

The fact that P waves continue at a fairly regular rate (of 65-70 beats/min) throughout this tracing—and are *unrelated* to the widened QRS complexes—establishes

the presence of transient AV dissociation. This strongly suggests that the widened (negatively directed) QRS complexes are likely to be ventricular in etiology. A ventricular origin for these four widened beats is solidified by the fact that the first beat in this run looks like a "cross" between the normally conducted sinus beats and the wider QRS complexes. This fourth beat is a *fusion* beat. Fusion beats reflect *simultaneous* (or *near simultaneous*) occurrence of supraventricular and ventricular impulses. Depolarization wavefronts are therefore initiated at almost the same time in *both* the atria and the ventricles. These depolarization wavefronts meet before they are able to complete their respective path. The ECG appearance of the resultant fusion beat therefore takes on characteristics of *both* the supraventricular and ventricular complex. Depending on whether the wavefronts meet high or low in the ventricles—the fusion beat will take on more characteristics of the supraventricular complex or of the ventricular complex. For example, in the figure shown here, the fourth QRS complex looks less like the normally conducted sinus beats and more like the other negatively directed widened beats. Clinically, the significance of recognizing fusion beats is that it confirms widened complexes in a tracing are of *ventricular* etiology.

Note that the rate of the widened complexes in this figure is about 70 beats/min. This establishes that these four widened beats represent a short run of *accelerated* idioventricular rhythm (AIVR).

In Future Issues:

Use of Ibuprofen to Prevent Recurrence of Febrile Seizures