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Rattlesnake Bite—Tourniquet or Not?

ABSTRACT & COMMENTARY

Synopsis: *Tourniquets are not beneficial and should not be used in the initial management of rattlesnake bites.*

Source: Amaral CF, et al. *Toxicon* 1998;36:805-806.

The effect of tourniquet placement on the clinical outcome after a rattlesnake bite on the extremities was assessed by Amaral and associates in 97 patients who had been bitten by the neotropical rattlesnake, *Crotalus durissus*, whose venom has both neurotoxic as well as local tissue effects. In 45 of these patients, a proximal tourniquet was applied as part of acute management; 52 patients did not have tourniquets. Both groups were similar with regard to age, sex, time since bite, and early neurologic findings. On follow-up, there were no differences in the rate of coagulopathy, rhabdomyolysis, and fatality between the tourniquet and nontourniquet groups.

COMMENT BY ROBERT HOFFMAN, MD

Despite common perception, fatalities following bites with envenomation by North American pit vipers (rattlesnakes, cottonmouths, and copperhead snakes) are rare. This probably results from several factors, including the predominant local tissue toxicity of the venom of these snakes, the availability of medical care, and the proven benefits of antivenom. Although fatalities are rare, life-threatening systemic symptoms such as coagulopathies and shock can occur. The snake-bitten person and immediate attendants have no way of knowing whether these symptoms may develop prior to obtaining definitive medical care. Thus, the search for simple, safe, and effective immediate first-aid management continues.

Arterial or venous tourniquets or lymphatic constrictors seem reasonable, in that the venom will remain concentrated in that extremity, preventing systemic distribution and systemic toxicity. In fact, when dealing with primarily neurotoxic snakes such as cobras, constricting bandages and tourniquets have been shown to reduce weakness and respiratory arrest.[1] However, when ultimately released, sys-

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temic toxicity may often develop rapidly.

When envenomation is a result of a bite from a snake such as the rattlesnake, whose toxicity is predominantly local, a clinical dilemma may arise as to the risk of damaging a limb or exacerbating the local toxicity vs. the risk of systemic toxicity. In these circumstances, the ischemic damage produced by a tourniquet may be worse than that expected from the original snake bite.[2]

In this study of a large number of snakebites, there may be selection bias (why some patients had tourniquets applied and others did not) and this prevents any firm conclusions. However, the findings appear to indicate that tourniquets offer little advantage concerning clinical outcome. For the present time, and especially with North American rattlesnakes and other pit vipers, it seems unlikely that application of a tourniquet will significantly improve outcome and may potentially exacerbate local toxicity. If traveling abroad or if bitten a great distance from definitive health care, a loose-fitting lymphatic constriction bandage may be reasonable. Venous and arterial occlusion are not advisable. If you receive a patient who has had a tourniquet applied, it is essential to have antivenom and resuscitation equipment ready prior to release of the tourniquet. (*Dr. Hoffman is Associate Director of the New York City Poison Control Center, Bellevue and New York University Medical Centers, NY.*) ❖

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2. Trevett AJ, et al. *Trop Geogr Med* 1993;45:305-307.

Tourniquet placement following snake bite:

a. should constrict arterial circulation if used.
b. reduces morbidity of bite by North American pit vipers.
c. may be associated with significant complications following release of the tourniquet.
d. is not indicated following the bite of a cobra.

Sticking it to Them

ABSTRACT & COMMENTARY

Synopsis: *A series of five weekly intra-articular injections of hyaluronic acid produced slightly more improvement than did sham injections plus 500 mg of naproxen twice daily for six months. The benefit of the knee injections for subjects with osteoarthritis lasted throughout the 26 weeks of study and fewer gastrointestinal adverse events were noted in those receiving the hyaluronic acid injections than the naproxen group.*

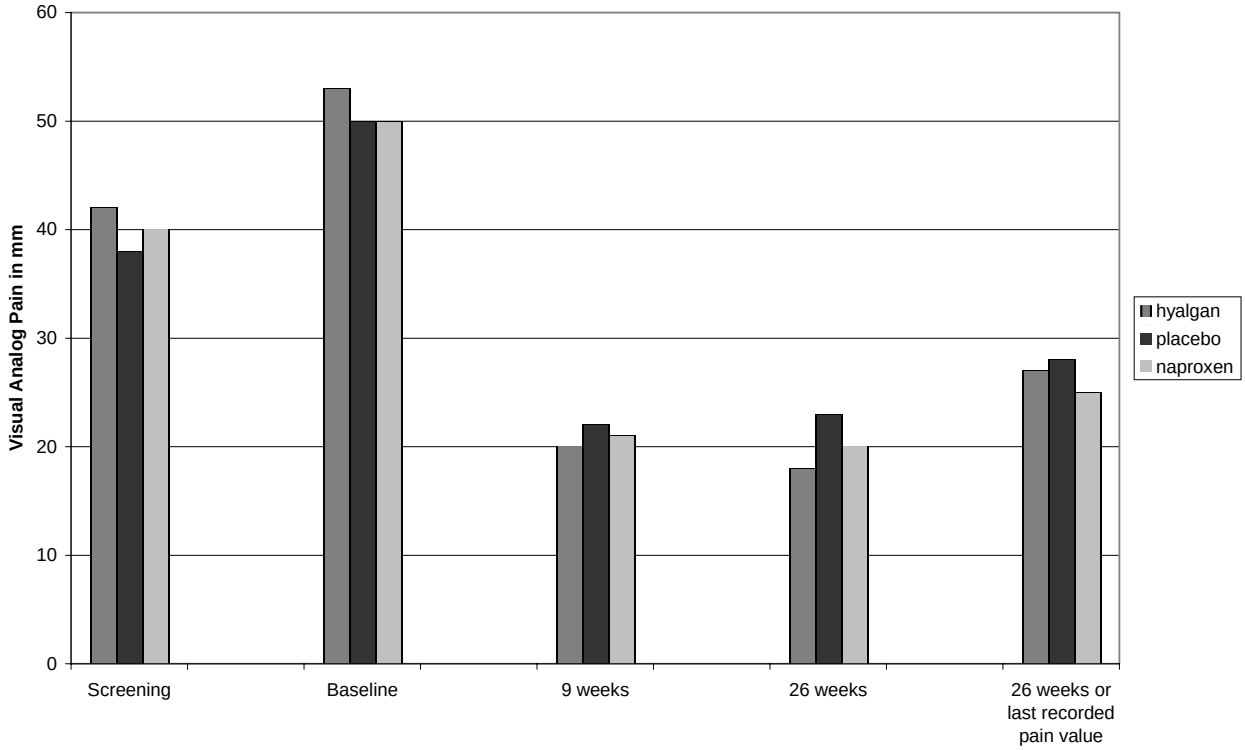
Source: Altman RD, et al. *J Rheumatol* 1998;25:2203-2212.

A patient with osteoarathritis (oa) of the knees once suggested injecting "grease" into his knees. His layman's appreciation of the need for better "lubrication" is supported by the finding that the molecule that is principally responsible for the viscosity of synovial fluid, high molecular weight hyaluronic acid (HA), is decreased in OA.[1] Physicians have two choices of viscous HA containing fluids that may be injected into knees. Altman and colleagues report their experience with one, hyaluronan (Hyalgan). The other FDA-approved product is hylanG-F 20 (Synvisc), a higher molecular weight product.

The efficacy and safety of hyaluronan was the subject of a multicenter, double-blind, randomized, placebo-controlled study that compared three groups. One group received five weekly injections of 20 mg (2 cc) of HA and twice-daily placebo (HA group, 105 completers). The second received five sham injections and oral placebo (placebo group, 115 completers). The third group received sham injections plus naproxen sodium 500 mg twice daily (naproxen group, 113 completers). The primary outcome measure was the amount of pain experienced during a 50-foot walk. Secondary measures included 50-foot walk time, patient and physician global evaluations, amount of additional analgesics used, and adverse effects. All patients had radiographic evi-

Figure

Pain During 50-Foot Walk



dence of OA.

The mean amount of pain reported at selected times by the subjects after a 50-foot walk is indicated in the figure. (*See Figure.*) Pain worsened in all three groups during the two-week washout phase. The amount of pain at the baseline evaluation was not statistically different. All three groups reported progressively less pain during the first five weeks of study. When subjects who completed the 26-week study were analyzed, the HA group had, on average, less pain than the other two groups from five weeks to 26 weeks. The mean difference in pain between the HA and naproxen groups at the end of 26 weeks was 8.8 mm and was statistically robust ($P = 0.004$). However, in a post-hoc, intention-to-treat analysis, which used the last observation recorded for each subject, and included those who withdrew prior to the 26 week visit. Pain means of 27 mm, 28 mm, and 25 mm were recorded at the last visit for the HA, placebo, and naproxen groups, respectively. These were not significantly different. Gastrointestinal (GI) adverse events were more common in the naproxen group (41%) than in the HA (29%) or sham plus placebo (36%) groups. Dropouts were also more frequently due to GI problems in the naproxen group (28%) than the HA (7%) or the sham plus placebo (7%) groups, but total dropouts for all causes were not significantly different for the three groups. In the three groups, 59, 53, and 50 subjects dropped out of the HA, sham plus placebo, and sham plus naproxen groups, respectively.

COMMENT BY JERRY M. GREENE, MD

The remarkable thing in this study is the magnitude of the response to the sham injections. From a baseline of mean of about 50 mm on the 100 mm visual analog pain scale, the completers in the sham plus placebo group ended with a mean of about 20 mm, or about a 60% reduction in pain. The completers in the HA injection group, by comparison, achieved about a 70% reduction in pain. The long-lasting effect of the sham injections is also striking, with relatively sustained pain relief from nine weeks to 26 weeks of study. Whether the roughly 10% increment in improvement with HA, beyond that achieved with sham injection alone seen in the "completers" is worth the $500-600 wholesale cost of HA is an interesting question—especially when the post-hoc intention-to-treat analysis showed no efficacy advantage for HA vs. placebo or naproxen. This suggests to me that the role for HA injections is limited. The patient for whom nonsteroidal anti-inflammatory drugs (NSAIDs) are contraindicated or are not tolerated is one example. A patient at high risk of NSAID adverse effects and who needs continuous ulcer prophylaxis would incur the costs of both NSAIDs and antiulcer therapy is another.

Both the higher and lower molecular weight HA injections have been approved under FDA regulations as medical devices, not as medications. As a result, Medicare and some other third party payors cover the cost of the HA preparations. Payors may fear that physicians, while needling their needy patients' knees, are really tapping the payors' liquid assets. With appropriate indications and for, and in selected patients, one can stick it to them with a clear conscience, backed up by convincing evidence that it is at least as effective as, and is better tolerated than, continuous use of an NSAID. ❖

Reference

1. Balazs E, et al. *Semin Arthritis Rheum* 1981; 11:141-143.

How much improvement in pain was documented in patients with osteoarthritis who received inra-articular injections of hyaluronic acid once weekly for five weeks when evaluated at the end of 26 weeks of study?

a. 12%
b. 20%
c. 30%
d. 50%
e. 60%

Nephrolithiasis and the Risk of Hypertension in Women

ABSTRACT & COMMENTARY

Synopsis: *While there is an increase in hypertension in women with nephrolithiasis, there was no increase in the risk of incident stones in those with pre-existing hypertension.*

Source: Madore F, et al. *Am J Kidney Dis* 1998;32:802-807.

Hypertension and kidney stones are both common important public health problems. About 20% of the U.S. population has hypertension, defined as a systolic blood pressure of 140 mmHg and/or diastolic blood pressure of 90 mmHg. The prevalence of hypertension increases up to 67% in those 65 years of age or older. About 12% of adults in the United States will form a kidney stone sometime in their life. A positive association between nephrolithiasis and hypertension has been observed in cross-sectional and prospective studies of men but the association has been controversial in women. Madore and associates conducted a prospective study to further evaluate the relationship between nephrolithiasis and hypertension in a cohort of 89,376 female registered nurses aged 34-59 years in 1980, who were enrolled in the Nurses Health Study. Data on nephrolithiasis, hypertension, dietary intake, and related factors was gathered by a biennial mail questionnaire. The reliability of the reported data was confirmed by a random sample comparison of self-reported data and physician office medical records.

On cross sectional analysis, 2.86% women reported a history of nephrolithiasis before 1980 and 13.3% reported a diagnosis of hypertension before 1980. The age-adjusted prevalence odds ratio for hypertension for women with a history of nephrolithiasis was 1.49, compared to those without a history of nephrolithiasis. On prospective analysis, 12,540 women reported a new diagnosis of hypertension between 1980 and 1992, and the age-adjusted relative risk for hypertension in women with a history of nephrolithiasis was 1.36 compared to those without a history of kidney stones. After adjustment for body mass index, and dietary intake of calcium, sodium, potassium, magnesium, caffeine and alcohol, the relative risk for hypertension in those with a history of hypertension was slightly reduced to 1.24.

In contrast, there was no increase in the risk of incident stones in those with pre-existing hypertension, compared to those without hypertension.

COMMENT KAMALJIT SETHI, MD, FACP

Men with a history of nephrolithiasis are 29% more likely to develop hypertension compared to those with no history of kidney stone.[1] This prospective analysis reveals a similar risk in women: female subjects with a history of nephrolithiasis are 24% more likely (all variables included) to develop hypertension, compared with those who do not historically have kidney stones. Thus, both sexes are at an equally high risk of developing hypertension if there is a history of nephrolithiasis, even though renal stones occur predominantly in males (male:female ratio, 2-4:1).

What accounts for this association between renal stone disease and hypertension? Hypercalciuria is a frequent abnormality in stone formers and hypertensives have higher urinary calcium excretion compared to normotensives. Furthermore, dietary calcium intake is inversely related to stone risk, and high dietary calcium intake has been reported to be associated with a lower blood pressure. Certainly, it would seem that perturbations in calcium metabolism may be linked to both hypertension and nephrolithiasis, even though much work needs to be done to establish cause and effect.

Given the fact that nephrolithiasis increases the risk for incident hypertension, are there any opportunities for

intervention? In those with recurrent stone disease or single stone formers with a strong family history of kidney stones, the following steps should be considered to prevent kidney stones and attenuate metabolic abnormalities:

1. Metabolic evaluation to include measurement of urinary saturation for calcium, oxalate and uric acid, and urinary inhibitor concentration of citrate. Medical therapy with thiazides or citrate may be necessary.
2. Encourage increased fluid intake so that urinary output is about 2 L/d. This ensures the lowest supersaturation for calcium oxalate and uric acid. Water is the fluid of choice.
3. Continue normal dietary calcium and potassium intake, while reducing excessive salt intake. With regard to calcium and potassium, natural dietary sources are recommended rather than supplements.

These are reasonable interventions that are easy and inexpensive. It may be that the risk for future hypertension can be reduced if we can prevent kidney stones. ❖

Reference

1. Madore F, et al. *Am J Hypertens* 1998;11:46-53.

Which of the following statements is true about the association of hypertension and kidney stones?

a. Nephrolithiasis increases the risk for hypertension.
b. Hypertension increases the risk for nephrolithiasis.
c. There is no association between hypertension and nephrolithiasis.
d. None of the above

Pharmacology Update

Modafinil for the Treatment of Narcolepsy

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

Cephalon inc. has received approval to market modafinil (Provigil), the first nonamphetamine drug approved by the FDA for the treatment of excessive daytime sleepiness associated with narcolepsy. Narcolepsy is a disorder that afflicts about 125,000 Americans and is characterized by inability to stay awake or alert in the daytime, sleep attacks, disrupted nocturnal sleep, and cataplexy. Prior treatment for this disorder has consisted primarily of amphetamine type drugs—agents that are commonly associated with side effects and eventual development of tolerance.

While it is known that modafinil is not an amphetamine, the exact mechanism of action of the drug is not known. It apparently does not appear to bind to receptors associated with sleep/wake regulation, such as norepinephrine, serotonin, dopamine, GABA, melatonin, or benzodiazepine.[1]

Indications

Modafinil is indicated to improve wakefulness in patients with excessive daytime sleepiness associated with narcolepsy.

Dosage

The recommended dose of modafinil is 200 mg as a single dose in the morning. There is no consistent evidence that doses greater than 200 mg confer any additional benefit.[1] Patients with severe hepatic impairment should reduce the dose by half.[1] In the elderly population, consideration should be given to use the lowest effective dose.

Modafinil is supplied as 100 mg and 200 mg tablets. The drug is placed into DEA Schedule IV.

Potential Advantages

The major advantage of modafinil over other drugs, such as amphetamines and methylphenidate, used for narcolepsy is its apparent lower abuse potential. Modafinil is Schedule IV while amphetamine and methylphenidate are Schedule II. In clinical trials (9 weeks with open label up to 40 weeks), modafinil reduced daytime sleepiness, was generally well tolerated, did not affect sleep, and tolerance did not appear to be problematic.[1,2,3] The improvement in average sleep latencies was about 58% based on Maintenance of Wakefulness Test (MWT).

Potential Disadvantages

While modafinil does not appear to have the same abuse potential as amphetamine, it may produce effects similar to other CNS stimulants such as euphoric effects and alteration in mood and/or perception. In addition, monkey studies suggest that modafinil is reinforcing in a manner similar to cocaine.[1] Cocaine is one of the most strongly reinforcing self-administered drugs. A clinical study suggested that modafinil produced psychoactive and euphoric effects and feelings consistent with methylphenidate. Patients should be observed for signs of misuse or abuse.[1]

Albeit rare, chest pain, palpitations, dyspnea, and

transient ischemic T-wave changes have been observed in association with mitral valve prolapse or left ventricular hypertrophy. Modafinil is not recommended in patients with a history of left ventricular or ischemic ECG changes, chest pain, arrhythmia, or significant manifestations of mitral valve prolapse in association with CNS stimulants.[1]

In vitro studies suggest that modafinil has the potential to inhibit cytochrome P450 2C19, suppress the expression of 2C9, and slightly induce 1A2, 2B6, and 3A4. If coadministration of modafinil and drugs that are substrates for one or more of these isoenzymes is clinically indicated, the patient should be monitored for potential toxicity or reduced effectiveness.

In clinical trials, common side effects of modafinil relative to placebo include headache (50% vs 40%), nausea (13% vs 4%), and diarrhea (8% vs 4%).[1] Five percent of patients discontinue therapy in these trials.

Comments

Modafinil is the first nonamphetamine or nonmethylphenidate drug approved for the treatment of excessive daytime sleepiness associated with narcolepsy. Effectiveness was established in two U.S. multicenter, placebo-controlled, double-blind, nine-week trials in more than 550 patients. The primary measures of efficacy were sleep latency as assessed by the MWT and the change in the patient's overall disease status, determined by evaluators, as measured by the Clinical Global Impression of Change (CGI-C). MWT assesses the ability of the subject to remain awake without using extraordinary measures.

It measures latency (in minutes) to sleep onset averaged over four test sessions at two-hour intervals. Modafinil improved average sleep latency from 5.07 to 5.35 for placebo to 8.18 to 8.28 for the 200 mg dose. For CGI-C, 58% to 64% of patients improved compared to 37% to 38% for placebo. There are currently no comparative trials between modafinil and current agents such as amphetamine or methylphenidate, and, therefore, comparative efficacy cannot be assessed. A survey of several agents used to treat narcolepsy suggests that modafinil may be less effective than dextroamphetamine or methylphenidate based on MWT.[4]

The wholesale cost of modafinil is about $7 per day for a 200 mg dose.

Clinical Implications

Narcolepsy is a neurologic disorder of unknown cause characterized by excessive somnolence, cataplexy, sleep paralysis, disrupted nocturnal sleep, and hypnagogic hallucinations.[5] It affects 2-10 individuals per 10,000 and has a gradual onset between the ages of 15 and 35. Sleep paralysis is a paralysis of voluntary muscles that occurs at the entry into or emergence from sleep.[6] Hypnagogic hallucinations are visual hallucinations with auditory and tactile components that occur during onset and emergence from sleep.

Cataplexy is a sudden loss of muscle tone (often dropping of the jaw) triggered by strong emotions such as laughter.[6] The symptoms of this condition have serious personal, social, and economic implications as the ability of the individual to function in normal daily activity can be significantly compromised. Excessive daytime sleepiness is generally the most prominent symptom of narcolepsy. Current pharmacologic treatment includes dextroamphetamine, methylphenidate, and pemoline. These drugs have potential for the development of tolerance and unwanted side effects. Modafinil offers an alternative with milder side effects and may have a lower abuse potential. Long-term safety and efficacy remains to be established. As with other stimulants, it does not affect cataplexy, which is generally managed with tricyclic antidepressants.[5,6] Modafinil is only FDA-approved for use in narcolepsy. Efficacy and safety in improving vigilance in healthy sleep-derived individuals has not been established. Results from a trial of modafinil in sleep apnea patients are expected early next year. ❖

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Potential advantages of modafinil include which of the following?

a. Modafinil reduces daytime sleepiness.
b. Modafinil is generally well tolerated.
c. Modafinil does not affect sleep.
d. All of the above

By Louis Kuritzky, MD

Prevention of Falls in the Elderly Trial (PROFET)

More than one-third of the 8% of persons older than 70 who seek care for fall-related injuries are admitted to the hospital. Improved management tools to prevent fall-related injury would be desirable, but limited, and sometimes, conflicting previous studies fail to fulfill this need. The current randomized, controlled trial evaluated a structured assessment of elderly persons (≥ 65 years), who obtained emergency care because of a fall, to see if such an approach could improve future outcome and reduce future falls.

Evaluation (n = 1031) included general physical status plus details on visual acuity, balance, cognition, effect, prescription medications, and postural hypotension. Each patient was also visited on a single occasion by an occupational therapist, with environmental hazards identified and corrected when possible.

Only one out of six patients had evidence of a cardiovascular or circulatory disorder likely to have contributed to a fall. More than half of the patients had visual impairment, almost two-thirds had poor stereoscopic vision, and more than one-third had cataracts in one or both eyes. Almost three-fourths of the patients were unable to stand on one leg with their eyes open, and cognitive impairments or depression were present in half of patients.

Over the 12-month follow-up period, there were significantly fewer falls in the intervention group. A reduction of 50% in fractures was also noted. Close and colleagues conclude that incorporation of falls and injury prevention strategies provides substantial clinical benefit and should be more widely used. ❖

Close J, et al. Lancet 1999;353:93-97.

Primary Care Physicians' Perceptions of Diabetes Management

Evidence continues to accumulate that better control of diabetes results in better patient outcomes. Unfortunately, more than half of diabetic adults have a glycosylated hemoglobin greater than 9.5%, despite the suggested goal of less than 7%. To gain insight into how primary care physicians view and manage diabetes, a trained research interviewer performed in-depth personal interviews with primary care physicians (FPs and internists), specifically directed toward learning the clinicians' approach to diabetes, feelings about the seriousness of the disorder, observations about patient attitudes toward diabetes, and changes in clinician views about diabetes.

The most consistent emerging theme from clinicians was that diabetes management is a balancing act between ideal medical goals, and realities of patient adherence, preferences, and personal circumstances. Physicians acknowledge that most diabetic patients do not follow management recommendations. Physicians were in agreement with the overall established goals of good glycemic control and complication prevention but did not possess readily accessible tools with which to attain these goals. Helseth and associates suggest that groups that develop guidelines spend additional energies to enhance tools or strategies with which clinicians might better achieve the biochemical and behavioral goals of diabetes management. ❖

Helseth LD, et al. J Fam Pract 1999; 48:37-42.

Sildenafil for Treatment of Erectile Dysfunction in Men with Diabetes

Sildenafil has an established role in the approximately 50% of 40- to 70-year-old men who suffer erectile dysfunction (ED). ED is substantially more common and occurs at a younger age in diabetic men than in the general population. The current randomized, double-blind study specifically examined the role of sildenafil in middle-aged diabetic men (n = 268) with ED.

Patients received 25 mg, 50 mg, or 100 mg of sildenafil or placebo, depending upon efficacy and adverse effect profile, for 85 days. Maintenance dose for 93% of patients receiving an active drug was 100 mg; no patient in this study responded adequately to 25 mg.

Use of sildenafil almost doubled the frequency of adequate erections and intercourse experiences, as well as substantially improving overall satisfaction with sex life. There was no change in frequency of sexual desire. Of these measured factors, placebo only affected overall satisfaction with sex life, though erection rigidity and frequency of satisfactory intercourse did not change. Anticipated side effects of sildenafil (headache and dyspepsia) were proportionally frequent in this population as in previous study populations, but no patient discontinued treatment due to an adverse drug effect. Rendell and colleagues conclude that sildenafil is an efficacious, well-tolerated treatment for ED in diabetic patients. ❖

Rendell MS, et al. JAMA 1999; 281:421-426.

Confirming Dextrocardia: Technician Error

By Ken Grauer, MD

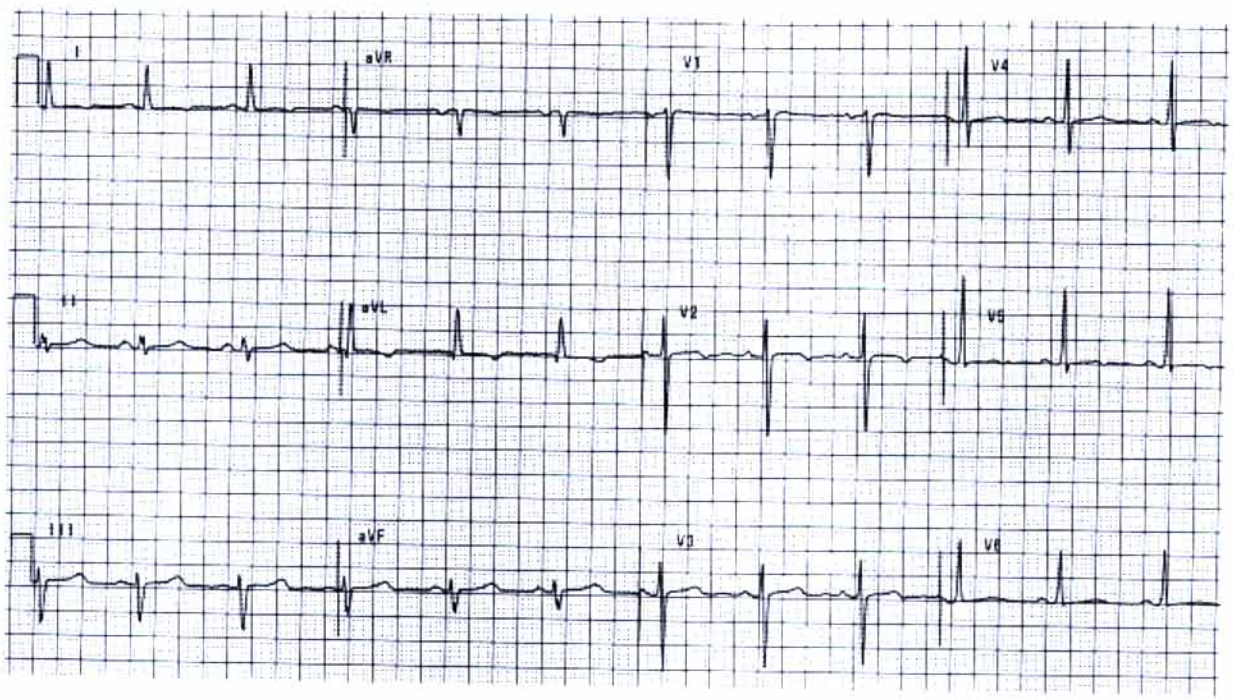

Figure. ECG obtained from a patient with dextrocardia after "reversing the leads." What did the tech do wrong?

Clinical Scenario: The ECG shown in the Figure was obtained from a 60-year-old woman with dextrocardia (it is the follow-up tracing to the ECG shown in last month's ECG Review). In an attempt to cofirm the diagnosis of dextrocardia, the tech had been asked to "repeat the ECG with the leads reversed." How should the tech have been instructed to repeat this ECG? What simpler approach could have been used to confirm dextrocardia?

Interpretation: The finding of complete (or almost complete) negativity of the QRS complex in lead I in association with an upright QRS complex in lead aVR is distinctly abnormal and should always prompt consideration of two clinical entities: 1) dextrocardia; and 2) limb lead misplacement. Practically speaking, the latter is much more common. Assessment of R wave progression in the precordial leads will usually distinguish between these two entities: R wave progression should be normal when there is limb lead reversal, whereas R wave progression is *reversed* when there is dextrocardia (as it was in last month's ECG Review). Verifying correct placement of limb lead electrodes and then repeating the ECG with precordial leads reversed should confirm what the true diagnosis is—in that R wave progression will normalize for a patient with dextrocardia when precordial leads are placed on the right side of the chest (as they do in the Figure). The error the tech made in this case was to also reverse the limb lead electrodes—which is why the QRS complex is now upright in lead I. The simplest way to confirm dextrocardia is to listen for heart sounds on the right side of the chest. ❖

In Future Issues:

A National Survey of End-of-Life Care for Critically Ill Patients

Interleukin-1RA in Rheumatoid Arthritis