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Internal Medicine

Evidence-based summaries of the latest research in internal medicine [ALERT]

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ABSTRACT & COMMENTARY

A Cup of Coffee May Help Patients Live Longer

By Seema Gupta, MD, MSPH

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Dr. Gupta reports no financial relationships relevant to this field of study.

SYNOPSIS: In a prospective cohort of patients coinfected with HIV and hepatitis C virus, drinking three or more cups of coffee per day halved the all-cause mortality risk.

SOURCE: Carrieri MP, Protopopescu C, Marcellin F, et al. Protective effect of coffee consumption on all-cause mortality of French HIV-HCV co-infected patients. *J Hepatol* 2017 Sep 12. pii: S0168-8278(17)32211-0. doi: 10.1016/j.jhep.2017.08.005. [Epub ahead of print].

Next to water, coffee is the leading beverage consumed worldwide. Research has revealed an inverse correlation of coffee consumption with the risks of type 2 diabetes mellitus, several cancers, Parkinsonism, and Alzheimer's disease.[1] The health-promoting properties of coffee often are attributed to its rich phytochemistry, including caffeine and polyphenols such as chlorogenic acid, caffeic acid, and hydroxyhydroquinone. Polyphenols are a rich source of dietary antioxidants that are abundant in coffee as well as red wine, fruits, tea, vegetables, chocolate, and legumes. There also is strong evidence that light-to-moderate coffee consumption is associated with a 14% risk reduction in all-cause mortality.[2] Additionally, the polyphenols and caffeine in coffee have several hepatoprotective properties and may be associated with improved hepatic function, resulting in less fibrosis, cirrhosis, and liver cancer.[3]

This is important in patients with hepatitis C virus (HCV) who also are coinfected with human immunodeficiency virus (HIV) since they are particularly vulnerable to developing liver disease. Not only does the HIV infection modify the natural course of chronic HCV infection, but the immune activation and chronic inflammation with potential exposure

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to antiretroviral therapy accelerates the progression to fibrosis, cirrhosis, and end-stage liver disease. However, with modern treatment options, it is now possible to achieve near universal HCV clearance and a potential regression of histologic lesions in coinfected patients. While this strategy reduces the progression to end-stage liver disease, similar to HIV, these individuals remain at higher risk of death from other conditions, such as cardiovascular events, cancers, and diabetes-related complications. Previous research demonstrated that in patients coinfected with HIV/HCV, those with elevated coffee consumption exhibited a reduced risk of insulin resistance and lower levels of liver enzymes.[4]

In the ongoing French prospective cohort study of patients coinfected with HIV/HCV, Carrieri et al gathered data from a five-year follow-up of 1,028 such patients. At enrollment, one in four patients reported drinking at least three cups of coffee daily. Over the course of the study period, 77 deaths occurred, almost half of which were attributable to HCV-related diseases. Upon further analysis, researchers discovered that consuming at least three cups of coffee each day was linked to a 50% reduction in all-cause mortality risk (hazard ratio [HR], 0.5; 95% confidence interval [CI], 0.3-0.9; $P = 0.032$), even after considering other factors such as HCV clearance, having a steady partner, and not smoking. After multivariable adjustment, an 80% and 60% reduction in mortality risk was observed, respectively, in individuals who cleared HCV post-treatment (HR, 0.2; 95% CI, 0.1-0.7; $P = 0.011$) and individuals treated but not cured (HR, 0.4; 95% CI, 0.2-0.9; $P = 0.036$) compared to those not yet treated and those on treatment.

■ COMMENTARY

Research often highlights the importance of addressing behaviors as an essential part of managing patients. Carrieri et al found that drinking at least three cups of coffee and not smoking daily may halve the risk of mortality in patients infected by both HIV and HCV. While direct-acting antiviral agents can eradicate HCV and provide a cure for nearly all patients, those coinfected with HIV carry a higher risk of death compared to the general population because of an accelerated aging process. Complementing such clinical treatment with behavioral changes, such as exercise and avoidance of alcohol and tobacco, accompanied by consuming three cups of coffee a day may go a long way toward improving the health and survival in these patients. In case some patients cannot tolerate a high intake of caffeine, don't forget the decaffeinated coffee option. ■

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ABSTRACT & COMMENTARY

A Rivaroxaban/Daily Low-dose Aspirin Combination and Cardiovascular Events

By Tim Drake, PharmD, MBA, BCPS

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Dr. Drake reports no financial relationships relevant to this field of study.

SYNOPSIS: The addition of rivaroxaban to daily low-dose aspirin resulted in fewer cardiovascular outcomes and increased major bleeding compared to aspirin alone in patients with stable cardiovascular disease.

SOURCE: Eikelboom JW, Connolly SJ, Bosch J, et al. Rivaroxaban with or without aspirin in stable cardiovascular disease. *N Engl J Med* 2017;377:1319-1330.

Even with the use of highly effective secondary prevention medications such as statins, beta-blockers, renin angiotensin aldosterone system inhibitors, and aspirin, patients with cardiovascular disease continue to experience repeat events at a rate of 5-10% per year.[1] The thrombotic nature of cardiovascular disease promotes study into anticoagulant and antiplatelet medications for primary and secondary prevention of cardiovascular disease. Anticoagulation with vitamin K antagonists in combination with aspirin has been proven to lower risk, but the increased rate of serious, life-threatening bleeding with the combination limited its use.[2] Previous trials with factor Xa inhibitors have shown fewer severe bleeding events compared to warfarin when studied to prevent stroke and venous thromboembolism.

The COMPASS trial prospectively randomized 27,395 patients in a double-blind manner to either rivaroxaban 2.5 mg twice daily plus aspirin 100 mg daily, aspirin 100 mg daily, or rivaroxaban 5 mg twice daily. The primary endpoint was a composite of cardiovascular death, stroke, or myocardial infarction (MI). There were three secondary endpoints, which included: a composite of ischemic stroke, MI, acute limb ischemia, or death from coronary heart disease; a composite of ischemic stroke, MI, acute limb ischemia, or death from cardiovascular disease; or death from any cause. For safety, major bleeding was defined as fatal bleeding, symptomatic bleeding into a critical organ, bleeding into a surgical site requiring reoperation, and bleeding that led to hospitalization or admission to an acute care facility.[4]

The trial ended early because of benefit crossing the predetermined threshold. The primary outcome occurred in 379 patients in the combined rivaroxaban/aspirin group compared to 496 patients in the aspirin-only group and 448 patients in the rivaroxaban-only group. This resulted in a 24% reduced risk (hazard ratio [HR], 0.76; 95% confidence interval [CI], 0.66-0.86; $P < 0.001$) in patients taking both rivaroxaban and aspirin compared to aspirin alone. There was no significant difference between rivaroxaban alone and aspirin alone. For the secondary composite that included coronary heart disease death, the risk was reduced by 28% (HR, 0.72; 95% CI, 0.63-0.83; $P < 0.001$) in the rivaroxaban/aspirin group. The composite that included cardiovascular death resulted in a reduced risk of 26% (HR, 0.74; 95% CI, 0.65-0.85; $P < 0.001$). The rivaroxaban/aspirin group had 313 total deaths compared to 378 deaths in the aspirin-only group, which resulted in a HR of 0.82 (95% CI, 0.71-0.96; $P = 0.01$).[4] Major bleeding occurred in 288 patients in the combined group compared to 170 patients in the aspirin-only group, resulting in a 70% increased risk (HR, 1.70; 95% CI, 1.40-2.05; $P < 0.001$). When looking at individual causes of bleeding, the biggest difference came from gastrointestinal bleeding (HR, 2.15; 95% CI, 1.60-2.89; $P < 0.001$), with no significant difference in fatal bleeding, nonfatal symptomatic intracranial hemorrhage, or nonfatal, symptomatic bleeding into a critical organ. When the primary outcome is combined with fatal bleeding or symptomatic bleeding into a critical organ, the HR was 0.80 (95% CI, 0.70-0.91; $P < 0.001$) in favor of the combination of rivaroxaban and aspirin compared to aspirin alone.[4]

■ COMMENTARY

The COMPASS trial adds evidence to show reduced cardiovascular events in patients with established cardiovascular disease who take an antithrombotic medication (rivaroxaban or warfarin) plus an antiplatelet agenet (aspirin). Previously, warfarin had not been recommended because of the increased risk of intracranial bleeding. The COMPASS trial showed increased rates of major bleeding with the combination of rivaroxaban and aspirin, but no significant difference in fatal bleeding or intracranial bleeding. The authors also gave a net clinical benefit outcome that supported the use of the combination, even with the risk of additional bleeds.

However, the benefit is not so clear when the number needed to treat (NNT) is compared with the number needed to harm (NNH). The NNT for the primary outcome is 77, and the NNH for major bleeds is 83. That means that 77 patients would need to be treated to prevent one event, but that for every 83 patients treated, one major bleed would occur. The advantage is that the rates of fatal and intracranial bleeds are very low, with no statistical difference compared to aspirin alone.

The conclusion might be that mortality and cardiovascular events can be reduced, with the side effect of clinically manageable nonfatal bleeding. Additionally, the part of the COMPASS trial that did not end early included randomizing patients to the proton pump inhibitor pantoprazole or placebo. It will be interesting to see if the addition of a proton pump inhibitor can prevent increased gastrointestinal bleeds. If this is the case, the balance between harm and efficacy would favor the addition of rivaroxaban to aspirin for secondary prevention. ■

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ABSTRACT & COMMENTARY

Oily Fish Is Associated With Better Sleep

By Concepta Merry, MB, BCh, BAO, BA

Associate Professor, Global Health, School of Medicine, Trinity College, Dublin

Dr. Merry reports no financial relationships relevant to this field of study.

SYNOPSIS: A study in Ecuador showed a strong positive correlation between dietary oily fish intake and sleep quality.

SOURCE: Del Brutto OH, Mera RM, Ha JE, et al. Dietary fish intake and sleep quality: A population-based study. *Sleep Med* 2016;17: 126-128.

In Arianna Huffington's best-selling book *The Sleep Revolution*, which described a global sleep crisis, Dr. Judith Owens, director of the Center for Pediatric Sleep Disorders in Boston, said "sleep is just as important as good nutrition, physical exercise, and wearing your seat belt."[1] Yet, a Gallup poll found that 40% of adult Americans are not getting enough sleep.[2] Given the emerging data on the risks associated with poor sleeping habits, integrative health sleep solutions are needed.[3]

Fish that has more than 5% fat is considered oily fish. Examples include anchovies, sardines, salmon, tuna, and mackerel. Oily fish is a rich source of both long-chain omega-3 polyunsaturated fatty acids (such as docosahexaenoic acid [DHA] and eicosapentaenoic acid [EPA]) and vitamin D.[4,5] Both omega-3 and vitamin D are implicated as important players in the sleep/wake regulation cycle.[5,6] If we join the dots, then oily fish could be a potential integrative health sleep solution. This theory is supported by a study in male prisoners who reported better sleep on a diet of farm-raised oily Atlantic salmon.[7]

Del Brutto et al sought to assess the effects of oily fish consumption on sleep quality. The study was carried out in a closed community of adults living in rural Ecuador. Subjects were residents of Atahualpa, a closed fishing village with no shift work or external sources of polyunsaturated fats or fish oil supplements apart from natural fish. The study was part of the ongoing Atahualpa project, which is a population-based study designed to reduce the burden of non-communicable diseases in the region.

The study had a cross-sectional design and involved a door-to-door survey, using a validated Spanish version of the Pittsburgh Sleep Quality Index. A total of 721 Atahualpa residents > 40 years of age were enrolled. Four people were disqualified from the final analysis because of incomplete data collection.

For the purposes of the study, poor sleep quality was defined as a Pittsburgh Sleep Quality Index score of ≥ 6. Poor sleep was identified in only 28% of the study participants. Oily fish consumption in Atahualpa is high, with < 5% of the adult population consuming less than two servings per week.

The study found that good quality sleep (Pittsburgh Sleep Quality Index score < 6) was associated with a higher number of mean servings per week of oily fish ($P = 0.013$). Additionally, the authors found that the Pittsburgh Sleep Quality Index score improved by 9.3% (95% confidence interval, 2-17%) for every 10-serving increase in dietary fish.

The linear relationship that was noted between improvement in sleep quality with increasing intake in oily fish was noted even in people who already take more than the recommended amount of oily fish per week (one to two portions).

In summary, the investigators not only showed a strong correlation between dietary fish intake and sleep quality, but also showed that an increase in the amount of dietary fish intake was associated with further improvements in the quality of sleep. The authors cautioned against overzealous use of oily fish as a sleep remedy, given that excess intake of oily fish could be associated with a high blood level of methyl mercury.

■ COMMENTARY

This study showed a direct relationship between higher oily fish intake and good sleep quality. The high consumption of oily fish intake in Atahualpa may explain the relatively low percentage of patients (28%) who reported poor sleep quality in the survey. Additionally, the sleep quality index improved with increasing intake of oily fish, even for people who already had consumed more than the recommended amount of oily fish per week.

Study limitations included the fact that the study design did not include blood omega-3 levels or vitamin D measurements. Additionally, because of the cross-sectional study design, it was not possible to fully assess causality. However, the authors noted that it was unlikely that poor sleep quality resulted in a lower dietary fish intake, meaning that reverse causality was unlikely. Therefore, the authors concluded that higher amounts of oily fish consumption are related causally to better sleep quality. This is biologically plausible because oily fish is a rich source of DHA and EPA, which regulate serotonin

production. Oily fish is also a good source of vitamin D, which plays a role in the sleep-wake cycle. There are many health reasons to include oily fish in one's diet, and now it seems that we can add sleep to that list of benefits. Many people are concerned about sleep. Perhaps the results of this study will be a good enough reason for some people to consider including oily fish in their diet. ■

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PHARMACOLOGY UPDATE

Secnidazole Oral Granules (Solosec)

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

Dr. Elliott is Assistant Clinical Professor of Medicine, University of California, San Francisco.
Dr. Chan is Associate Clinical Professor, School of Pharmacy, University of California, San Francisco.

Drs. Elliott and Chan report no financial relationships relevant to this field of study.

The FDA has approved the first oral single-dose treatment for bacterial vaginosis in adult women. Secnidazole is a next-generation 5-nitroimidazole prodrug that is activated after entry into bacterial cells. It was designated by the FDA as a Qualified Infectious Disease Product and was granted priority review. Secnidazole is marketed as Solosec.

INDICATIONS

Secnidazole is indicated for the treatment of bacterial vaginosis (BV) in adult women.[1]

DOSAGE

The recommended dose is a single 2-gram packet of granules once daily.[1] The granules should be sprinkled onto applesauce, yogurt, or pudding and taken within 30 minutes followed by a glass of water. It may be taken without regard to timing of meals.

Secnidazole is not intended to be dissolved in any liquid. It is available as 2-gram, unit-of-use, oral granules.

POTENTIAL ADVANTAGES

Secnidazole offers a single-dose oral treatment for BV. Current treatments recommended by the CDC are oral metronidazole twice daily for seven days, metronidazole vaginal gel once daily for five days, or clindamycin cream intravaginally once daily for seven days.[2]

Alternative regimens include oral tinidazole or clindamycin for two to seven days. Secnidazole does not produce a significant drug-drug interaction with oral contraceptives containing ethinyl estradiol and norethindrone.[1]

POTENTIAL DISADVANTAGES

Secnidazole treatment may result in vulvovaginal candidiasis.[1] In clinical trials, the frequency was 9.6% compared to 2.9% for placebo. This is the most frequently reported adverse reaction. Breastfeeding is not recommended during treatment and for 96 hours after administration.[1]

COMMENTS

The efficacy of secnidazole was evaluated in two randomized, placebo-controlled studies in subjects with BV.[1,3] Diagnosis of BV was defined as: the presence of an off-white (milky or gray), thin homogeneous vaginal discharge; vaginal pH ≥ 4.7; presence of clue cells ≥ 20% of the total epithelial cell on microscopic examination of the vaginal saline wet mount; a positive "whiff" test (detection of fishy odor on addition of 10% potassium hydroxide solution to a sample of vaginal discharge); and a Nugent score (gram stain scoring system) ≥ 4.[1,4] Efficacy endpoints were clinical response (defined as normal vaginal discharge); negative "whiff" test and clue cells < 20%, Nugent score cure (score of 0-3); and therapeutic response, clinical response, and Nugent score cure.

At 21-30 days after randomization, clinical response rates were 67.7% for study 1 and 53.3% for study 2, with corresponding placebo rates of 17.7% and 19.3%, respectively. Nugent score cures were 40.3% and 43.9% vs. 6.5% and 5.3%, respectively. Therapeutic response rates were 40.3% and 34.6% vs. 6.5% and 3.5%. Currently, there are no comparative studies with other antibacterial agents. The results were similar to a study of oral metronidazole and oral tinidazole. For subjects with a baseline Nugent score > 7 and evaluated at the

one-month follow-up visit, Nugent score cures were 35.9% for metronidazole (500 mg twice daily for seven days) and 38.1% for tinidazole (500 mg twice daily for seven days).[3]

CLINICAL IMPLICATIONS

BV is a polymicrobial clinical syndrome caused by replacement of *Lactobacillus* spp in the vagina with anaerobic bacteria (e.g., *Gardnerella vaginalis*, *Prevotella* spp, and *Mobiluncus* spp).[2] It is the most prevalent cause of vaginal discharge. Typical treatment is oral or intravaginal treatment for seven and five days, respectively. Secnidazole is the first single-dose treatment for this common condition. It appears to have similar effectiveness to metronidazole and is well tolerated.

Cost is not available as the drug is expected to be available in the first quarter of 2018. ■

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CME QUESTIONS

1. **Based on the results of the study by Carrieri et al, drinking how much coffee per day halves the all-cause mortality risk in patients coinfected with HIV and hepatitis C virus?**
   a. One cup
   b. Three cups
   c. One pot
   d. Coffee does not help

2. **Please choose the correct statement that describes the results of the COMPASS trial.**
   a. Rivaroxaban 5 mg twice daily alone resulted in fewer cardiovascular events compared with aspirin alone.
   b. Rivaroxaban 2.5 mg twice daily alone resulted in fewer cardiovascular events compared with aspirin alone.
   c. Rivaroxaban 2.5 mg twice daily combined with aspirin resulted in fewer cardiovascular events compared with aspirin alone.
   d. There was no difference in cardiovascular events between the groups treated.

3. **Which of the following is true about oily fish?**
   a. It has > 2% fat content.
   b. It is a poor source of vitamin D.
   c. There are no side effects with the consumption of oily fish.
   d. It is associated with better quality sleep.

CME OBJECTIVES

Upon completion of this educational activity, participants should be able to:

- describe new findings in the differential diagnosis and treatment of various diseases;
- describe the advantages, disadvantages, and controversies surrounding the latest advances in the diagnosis and treatment of disease;
- identify cost-effective treatment regimens;
- explain the advantages and disadvantages of new disease screening procedures.

[IN FUTURE ISSUES]

Irritable Bowel Syndrome, Constipation, and Quality of Life in Women

Functional Outcomes After Receiving Life-sustaining Therapy in the ICU

Internal Medicine [ALERT]

Clinical Briefs

By Louis Kuritzky, MD

Opioid-induced Nausea and Vomiting

SOURCE: Raffa RB, Colucci R, Pergolizzi JV. The effects of food on opioid-induced nausea and vomiting and pharmacological parameters: a systematic review. *Postgrad Med* 2017;129: 698-708.

Opioids are highly effective when administered for appropriate indications. Unfortunately, opioid-induced nausea and/or vomiting (OINV) can limit opioid effectiveness. In the immediate postoperative period, OINV can stress wound integrity and prolong hospital stay. In the outpatient setting, some patients are faced with the dilemma of accepting lesser levels of pain control in exchange for less OINV as they consider whether they should decrease their opioid dosing schedule.

A commonly recommended suggestion to reduce OINV is to take the medication with food. Unfortunately, this recommendation rests on historical dogma rather than well-established data. Raffa et al examined studies about OINV to discern whether administration of opioids with food is effective.

The amount and quality of the literature available was quite limited. While some studies reported complete pharmacokinetics and pharmacodynamics of opioids with and without food, the relationship between opioid plasma levels and symptoms often is omitted.

Although no consistent relationship between OINV and the fed/fasting state was ascertained definitively, the data reviewed suggested that, if anything, high-calorie, high-fat meals tend to exacerbate OINV. Since much of the trial data found that feeding elevates the maximum plasma opioid dose in some patients, and OINV appears to be related to opioid blood levels, it would make sense that feeding might worsen OINV in susceptible individuals.

Currently, methods to address OINV include antiemetics, reduced opioid dose, and switching between opioids to identify agents with less potential to induce OINV. Taking opioids with food was not demonstrated to reduce OINV. ■

Is It Safe to Use PPIs Long Term?

SOURCE: From the Medical Letter on Drugs and Therapeutics. Safety of long-term PPI use. *JAMA* 2017;318:1177-1178.

Proton pump inhibitors (PPIs) are among the most widely used medications in the United States, thanks to a generally favorable combination of efficacy, tolerability, and safety. Because such a large portion of the adult population uses PPIs, even if a small fraction experiences an adverse effect, it becomes a potentially important issue.

Probably the most concerning adverse effect of PPIs is increased fracture risk. Although not all individual studies confirmed increased fracture risk from PPIs, a meta-analysis of 18 trials indicated a 26-33% increased risk. Since PPIs are not associated with osteoporosis, the mechanism by which PPIs incur increased fracture risk is unknown.

The FDA sent a warning letter to clinicians about another potentially serious adverse effect of PPIs: hypomagnesemia. To date, only long-term use has been associated with hypomagnesemia, and the mechanism is unknown.

The severity of consequences ranges from simple fatigue to serious events like seizures and arrhythmias. Monitoring magnesium levels may be appropriate, especially in patients also receiving magnesium-depleting medications (e.g., diuretics).

Other rare but important adverse effects reported include acute kidney injury, chronic kidney disease, reduced vitamin B12 levels, iron deficiency, community-acquired pneumonia, and *Clostridium difficile* infection. The risk:benefit relationship of PPIs is favorable for most patients, but clinicians should remain vigilant for adversities noted above. ■

The Long-term Picture After Bariatric Surgery

SOURCE: Adams TD, Davidson LE, Litwin SE, et al. Weight and metabolic outcomes 12 years after gastric bypass. *N Engl J Med* 2017;377:1143-1155.

While often viewed as a last-resort treatment of obesity, bariatric surgery actually is the only intervention demonstrated to improve obesity-related mortality. Strict criteria for payment by insurers and costs that are inaccessible to most of the uninsured have restricted the population who could benefit from bariatric surgery.

Adams et al enhanced the somewhat sparse literature on long-term outcomes with bariatric surgery. Their 12-year prospective follow-up of patients with severe obesity included a bypass surgery group (n = 418), a group intended for surgery (n = 417) but who ultimately did not undergo surgery (e.g., for lack of insurance coverage), and a matched group of severely obese patients not seeking surgical treatment.

Favorable impact was sustained over the 12-year observation period. Overall weight loss at 12 years was 35 kg (bariatric surgery) vs. 2.9 kg (intended surgery) and 0 kg (no surgery).

For diabetics at the time of bariatric surgery, diabetes remained in remission for more than half of patients at 12 years. The likelihood of new-onset diabetes over 12 years of follow-up among those not diabetic at baseline was reduced by > 90%. The benefits of bariatric surgery are substantial, prompt, and enduring. ■

Internal Medicine [ALERT]

ECG Review

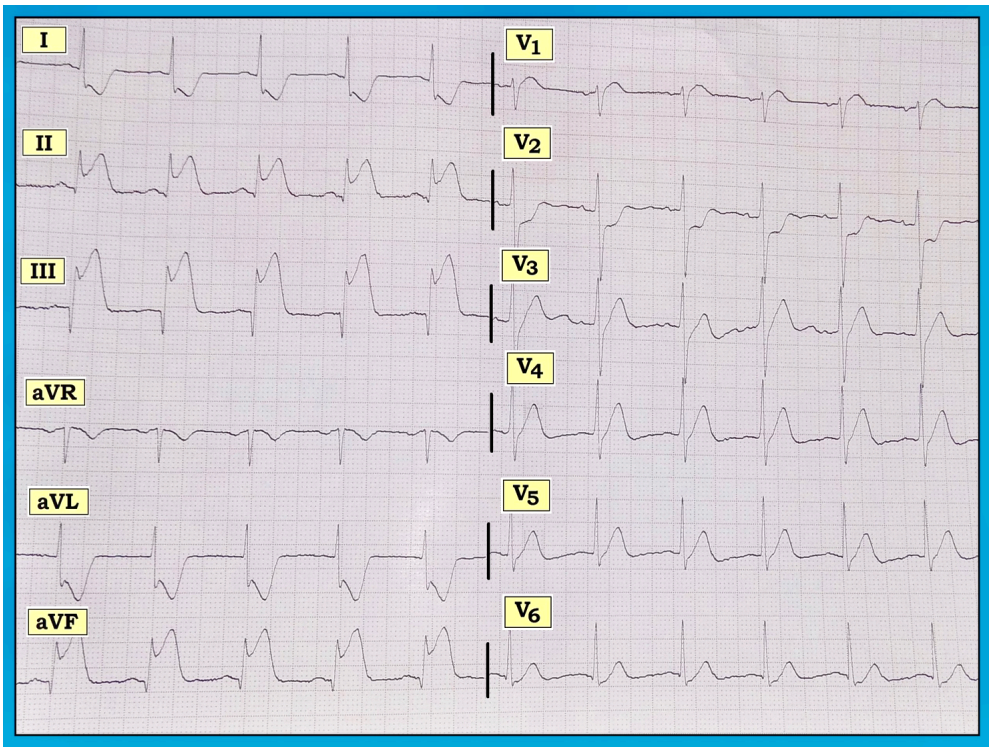
By Ken Grauer, MD

Professor Emeritus in Family Medicine, College of Medicine, University of Florida

Dr. Grauer is the sole proprietor of KG-EKG Press, and publisher of an ECG pocket brain book.

Are Right-sided Leads Needed?

The ECG in the figure below was obtained from a man in his 50s who presented with new severe chest pain. How would you interpret this tracing? What area(s) of the heart are involved? What is the likely culprit artery?



The underlying rhythm is sinus at a rate of 75-80 beats per minute. Intervals and axis are normal. There is no chamber enlargement. Regarding Q-R-S-T changes:

Narrow but fairly deep Q waves are seen in leads III and aVF. There is also a small and narrow Q wave in lead II, and a tiny Q wave in lead V6. Overall R wave progression across the chest leads is appropriate, although R wave amplitude in lead V2 is a bit taller than expected. There is dramatic ST elevation in each of the inferior leads (leads II, III, aVF) with a check-mark appearance that strongly suggests acute injury. As a subtle finding, there is ST segment coving and slight elevation in lead V1. There is marked reciprocal ST depression in leads I and aVL. Note how the shape of this ST depression in lead aVL is a precise mirror image picture of the ST elevation in lead III. There is at least 4 mm of shelf-like ST depression in lead V2, which surprisingly resolves by lead V3. There is a hint of J-point depression in leads V3-V6.

In a patient with new-onset chest pain, the ECG appearance in the figure is diagnostic of a large acute infero-posterior ST elevation myocardial infarction (STEMI). Additionally, there is almost certainly acute right ventricular involvement. This strongly suggests acute right coronary artery (RCA) occlusion. Even before looking at the ECG, there is a ~85% chance that the culprit artery with acute inferior STEMI will be the RCA, because most patients have a right-dominant circulation. ECG features that further increase the likelihood of the RCA as the culprit artery are: ST elevation in lead III that is greater than in lead II; marked reciprocal ST depression in lead aVL; relatively less (or no) lateral ST elevation, with the amount of ST elevation in lead III more than in V6; and evidence of acute RV involvement, as manifested by ST coving and slight elevation in lead V1 that is gone by lead V2. Normally, with acute posterior infarction, ST segments are depressed in leads V1 and V2, unless there is associated right ventricular infarction that attenuates or completely eliminates this by the ST elevation it produces in right-sided lead V1.

While ST elevation in right-sided leads (especially in lead V4R) clearly is the best indicator of acute right ventricular infarction, occasionally lead V1 on a standard 12-lead tracing is all that is needed to make this diagnosis.

For more information about and further discussion of this case, please visit: http://bit.ly/2zwCCR5.