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Clinical Cardiology [ALERT]

Critical analysis of the latest clinical research in cardiovascular medicine

Vol. 40, Issue 10, October 2021
ReliasMedia.com

ABSTRACT & COMMENTARY

Screen Older Heart Failure Patients for Transthyretin Cardiac Amyloidosis

By Jamie L. W. Kennedy, MD, FACC

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SYNOPSIS: A screening study of heart failure patients ≥ age 60 years, left ventricular ejection fraction ≥ 40%, and left ventricle wall thickness ≥ 12 mm revealed 6.3% prevalence of transthyretin cardiac amyloidosis, a highly treatable disease.

SOURCE: AbouEzzeddine OF, Davies DR, Scott CG, et al. Prevalence of transthyretin amyloid cardiomyopathy in heart failure with preserved ejection fraction. *JAMA Cardiol* 2021; Aug 25. doi: 10.1001/jamacardio.2021.3070. [Online ahead of print].

Heart failure with preserved ejection fraction (HFpEF) accounts for half of heart failure; yet, evidence-based therapies lag far behind heart failure with reduced ejection fraction. Fortunately, the tide is turning. The FDA has approved sacubitril/valsartan for HFpEF based on the PARAGON-HF study. The authors of the EMPEROR-Preserved study found empagliflozin reduced the number of heart failure hospitalizations and lowered cardiovascular death rates.[1,2] HFpEF is a heterogeneous disease, including patients with underlying coronary, valvular, inflammatory, pericardial, and infiltrative diseases. These potentially treatable conditions can be overlooked if patient evaluations are not comprehensive.

Cardiac amyloidosis results from the deposition of misfolded proteins in the myocardium. The most common form is transthyretin (ATTR). Hereditary ATTR amyloidosis results from mutations in the gene encoding transthyretin and tends to present at younger ages, as early as age 30 years. The Val122Ile mutation is found in 3.4% of African Americans; there are several other less common mutations, too. Wild-type transthyretin also can deposit in the heart, leading to ATTR amyloidosis in older patients (age > 70 years). Pyrophosphate (PYP) scans are highly sensitive (85% to 97%) and specific (95% to 100%) for ATTR cardiac amyloid.

Less commonly, plasma cell dyscrasias producing immunoglobulin light chains lead to amyloid light-chain (AL) amyloidosis. Treatment is directed at the underlying plasma cell dyscrasia, including autologous hematopoietic cell transplantation in appropriate candidates. Of note, AL amyloidosis can result

Financial Disclosure: Dr. Joshua Moss, author, reports he is a consultant for Abbott and Biosense Webster. The relevant financial relationships listed have been mitigated. None of the remaining planners or authors for this educational activity have relevant financial relationships to disclose with ineligible companies whose primary business is producing, marketing, selling, re-selling, or distributing healthcare products used by or on patients.

Clinical Cardiology
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Clinical Cardiology Alert (ISSN 0741-4218) is published monthly by Relias LLC, 1010 Sync St., Ste. 100, Morrisville, NC 27560-5468. Periodicals postage paid at Morrisville, NC, and additional mailing offices. POSTMASTER: Send address changes to *Clinical Cardiology Alert*, Relias LLC, 1010 Sync St., Ste. 100, Morrisville, NC 27560-5468.

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This activity is intended for the cardiologist. It is in effect for 36 months from the date of the publication.

in both positive and negative PYP scans, so appropriate evaluation of suspected amyloidosis includes blood and urine testing for light chains. AA amyloidosis results from the deposition of amyloid A, an acute phase reactant, in patients with chronic inflammatory conditions. Treatment of AA amyloidosis focuses on the underlying disease.

AbouEzzeddine et al sought to understand the prevalence of ATTR amyloidosis in HFpEF patients in the Rochester, MN, area. They identified patients diagnosed with heart failure and recent echocardiograms demonstrating left ventricular ejection fraction (LVEF) ≥ 40% and LV wall thickness ≥ 12 mm. Patients with a history of LVEF < 40% were excluded, as were patients with significant mitral valve disease. This resulted in a community cohort of 1,235 patients, 16 of whom already carried a diagnosis of ATTR amyloidosis for a prevalence of 1.3%. All were men. An additional eight patients had been diagnosed with AL amyloid and two with AA amyloid.

Patients in the community cohort who did not carry a diagnosis of amyloidosis were approached to participate in the screening study. A total of 286 enrolled and completed testing, including PYP scan and lab testing for light chains. There were 18 patients with positive PYP scans (15 men and three women). Three of these patients exhibited light chain lab abnormalities, which were investigated further. Ultimately, all 18 patients were diagnosed with ATTR amyloidosis for a prevalence of 6.3%. Genetic testing was performed in 16 of 18 patients. No ATTR mutations were identified. Of note, the population studied was 96% white. The authors speculated more diverse populations will include more patients with hereditary ATTR.

Men were much more commonly affected than women (10% vs. 2.2%). The prevalence increased markedly with age, from 0% of sexagenarians to 21% of nonagenarians. Patients diagnosed with ATTR amyloidosis were more likely to have carpal tunnel syndrome (72% vs. 34%) and less likely to be hypertensive or obese. ATTR amyloid patients recorded higher NT-proBNP and troponin levels and fewer medical problems based on the Charlson Comorbidity Index. The authors concluded patients with HFpEF older than age 60 years with LV wall thickness ≥ 12 mm on echocardiography should be screened for ATTR amyloidosis.

■ COMMENTARY

Tafamidis is a small molecule that binds and stabilizes ATTR tetramers, thereby preventing deposition. The ATTR-ACT trial was a randomized, placebo-controlled study of tafamidis in patients with ATTR amyloid, both hereditary and wild type.[3] Tafamidis lowered the mortality rate from 42.9% to 29.5% and the number of cardiovascular hospitalizations from 0.7 to 0.48 per year over a follow-up period of 30 months. Side effects were not significantly different from placebo.

Heart failure is a progressive disease of exercise intolerance, repeated hospitalizations, and, ultimately, death. Tafamidis offers an effective treatment with minimal side effects for the subset of HFpEF patients with ATTR amyloidosis. Screening for amyloidosis with a combination of PYP scan and lab testing for light chains poses minimal risk to patients, and the potential benefit of treatment is substantial. Cardiac MRI also is a reasonable modality to evaluate for amyloidosis and is excellent for identifying other infiltrative, inflammatory, and pericardial diseases. I tend to reserve endomyocardial biopsy for suspected AL amyloidosis and situations with conflicting information. Following a diagnosis of ATTR amyloidosis, genetic testing should be offered primarily for the benefit of relatives. Tafamidis is prescribed 61 mg daily. No dose adjustments are required for hepatic or renal dysfunction. ■

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ABSTRACT & COMMENTARY

Slow, Steady, and Synchronized Wins the Race

By Joshua Moss, MD

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SYNOPSIS: In patients with atrial fibrillation and heart failure, definitive rate control via atrioventricular junction ablation and biventricular pacing resulted in a significant reduction in all-cause mortality vs. pharmacologic rate control.

SOURCE: Brignole M, Pentimalli F, Palmisano P, et al. AV junction ablation and cardiac resynchronization for patients with permanent atrial fibrillation and narrow QRS: The APAF-CRT mortality trial. *Eur Heart J* 2021;Aug 28:ehab569. doi: 10.1093/eurheartj/ehab569. [Online ahead of print].

Ideal management of atrial fibrillation (AF) in patients with heart failure remains a challenge. Rhythm control via left atrial catheter ablation in this population has been associated with a lower mortality rate compared with medical therapy. However, restoration and maintenance of sinus rhythm in patients with longstanding persistent AF can be much more difficult. Brignole et al studied the effect of atrioventricular (AV) junction ablation plus biventricular pacing (cardiac resynchronization therapy [+CRT]) for rate control of "permanent AF" compared with pharmacologic rate control.

After exclusions, 133 heart failure patients (mean age, 73 years; 53% male) from 11 European centers were randomized 1:1 to AV junction ablation +CRT or drug therapy. Patients had to have experienced symptomatic AF for more than six months that was considered unsuitable for AF ablation or for which AF ablation had failed and QRS duration ≤ 110 msec. Randomization was stratified by ejection fraction (EF; ≤ 35% and > 35%). The mean EF was 41%. An implantable cardioverter-defibrillator (ICD) was implanted in both groups if clinically indicated. In the ablation +CRT arm, the procedures were performed within 30 days of randomization. In the drug therapy arm, significantly more patients were on digoxin after a planned 30-day optimization period (60% vs. 32%), with therapy optimized to achieve a resting heart rate < 110 bpm. More than 80% of patients in both arms remained on beta-blocker therapy. Six patients in the ablation +CRT arm either did not undergo ablation or failed cardiac resynchronization therapy implant, and 18 patients in the drug arm crossed over to ablation +CRT. Investigators ended the trial prematurely after interim analysis met prespecified criteria for stopping. The primary outcome measured was all-cause mortality, which occurred in 11% of patients in the ablation +CRT arm and 29% of patients in the drug arm (HR, 0.26; 95% CI, 0.10-0.65; *P* = 0.004) using an intention-to-treat analysis. In prespecified subgroup analysis, the overall mortality benefit was similar in patients with EF > 35% (HR, 0.27; 95% CI, 0.08-0.84; *P* = 0.024) and EF ≤ 35% (HR, 0.34; 95% CI, 0.06-1.92; *P* = 0.22). Appropriate ICD shocks for ventricular tachyarrhythmias occurred in four patients in the ablation +CRT arm and one patient in the drug arm. Five patients experienced inappropriate ICD shocks for AF with rapid ventricular rates, all in the drug arm. Three patients required lead repositioning and one patient required repeat AV junction ablation. A sensitivity analysis to assess the potential interaction of differential digoxin usage was consistent with the primary analysis. The authors concluded AV junction ablation +CRT was superior to pharmacologic therapy alone for preventing mortality in patients with heart failure and AF.

■ COMMENTARY

Several trials have demonstrated improved outcomes with catheter ablation of AF via pulmonary vein isolation (PVI) in patients with heart failure, generally attributed to superior rhythm control and less exposure to potentially toxic antiarrhythmic drugs. For example, the AATAC trial showed a 56% reduction in all-cause mortality with ablation vs. amiodarone.[1] The CASTLE-AF trial showed a 47% reduction in all-cause mortality with catheter ablation vs. any medical therapy (whether rate or rhythm control).[2] However, duration of AF before enrollment in those trials was relatively short overall (mean duration = 8.5 months in AATAC; 71% less than one year in CASTLE-AF).

By contrast, the APAF-CRT trial authors studied patients with "permanent" AF, with a median arrhythmia duration of 19 months in the CRT group and 18 months in the drug group. Patients were, on average, nine years older than CASTLE-AF participants and 12 years older than AATAC participants. They also likely were more ill, with 68% presenting with New York Heart Association class III or worse heart failure symptoms (vs. 29% in

CASTLE-AF). In fact, mortality in the drug therapy arm of APAF-CRT was 29% through a median follow-up of 29 months vs. 25% in the medical therapy arm of CASTLE-AF through a median follow-up of 38 months. Thus, the previously demonstrated benefits of more extensive left atrial catheter ablation likely would not have been expected in the APAF-CRT population. Long-term rhythm control via PVI generally is poor in permanent AF (particularly with only one procedure), and procedural complications are likely more frequent in older patients with less clinically stable heart failure. Ablation of the AV junction plus pacemaker implant typically is simpler and safer, with far less need for repeat procedures. Using a CRT device, even in patients with EF > 35%, alleviates the long-term risks associated with RV-only pacing. Hypothetically, conduction system pacing would produce similar or better results, but longer-term risks and benefits require further study in this population.

The APAF-CRT population was small, and medical rate control was not achieved or assessed in a standardized way. However, median resting heart rate in the drug therapy arm was 82 bpm after only 30 days of optimization, suggesting a reasonable degree of control was achieved (with digoxin in many, and amiodarone or sotalol in about 10%). The difference in outcomes was profound despite a relatively high percentage of crossovers. Overall, the APAF-CRT trial confirms an additional tool for lowering the mortality rate in certain patients with heart failure and AF, and a powerful tool at that. For patients without longstanding arrhythmia who are reasonable candidates for PVI, catheter ablation of AF should be strongly considered based on multiple prior studies. For patients with EF ≤ 35% and left bundle branch block, CRT likely is indicated anyway, and AV node ablation clearly can improve biventricular pacing burden. However, for symptomatic heart failure patients in whom the AF is deemed more permanent, even with narrow QRS or EF > 35%, AV junction ablation and CRT implantation may win the race. ■

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ABSTRACT & COMMENTARY

Early Coronary Angiography in Out-of-Hospital Cardiac Arrest

By Jeffrey Zimmet, MD, PhD

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SYNOPSIS: In a trial of immediate vs. delayed coronary angiography for resuscitated out-of-hospital cardiac arrest, researchers found no significant benefit on 30-day mortality.

SOURCE: Desch S, Freund A, Akin I, et al. Angiography after out-of-hospital cardiac arrest without ST-segment elevation. *N Engl J Med* 2021; Aug 29. doi: 10.1056/NEJMoa2101909. [Online ahead of print].

Myocardial infarction is the most common cause of out-of-hospital cardiac arrest (OHCA), in those cases for which a cardiac cause has been identified. One might expect expedient cardiac catheterization and intervention could affect mortality beneficially in this setting. In patients presenting with ST-elevation after successful resuscitation, immediate coronary angiography is the norm. What to do with the larger subset of patients without diagnostic ECGs has been the subject of considerable uncertainty. The authors of a prior study, the 2019 COACT trial, examined the effect of immediate angiography in patients with cardiac arrest with an initial shockable rhythm and demonstrated no improvement in survival at 90 days.[1] Desch et al enrolled 554 patients with resuscitated OHCA who did not record ST-elevation on initial ECG. Of these, 281 were assigned to receive immediate angiography, which occurred in all but 13 of these patients, at a mean of 2.9 hours following cardiac arrest.

The remaining 273 patients were assigned to delayed angiography, which for the purposes of the trial meant transfer to the ICU for management and further diagnostics. These patients could be sent for cardiac cath after a minimum delay of 24 hours. In practice, 62.2% of patients in this group underwent coronary angiography, at a mean of 46.9 hours

after cardiac arrest. Unlike the COACT trial, both shockable and non-shockable rhythms were included; just over half of the entire cohort presented with initial shockable rhythms. Interestingly, coronary lesions were identified that were "considered to be responsible for triggering cardiac arrest" in 38.1% of patients in the immediate angio group and in 43% of the delayed angio patients. Overall, 39.6% of patients underwent coronary revascularization by percutaneous coronary intervention (PCI). Most patients underwent targeted temperature management, with a longer time to initiation of temperature control in the immediate angiography group (median time = 153 minutes vs. 119 minutes for delayed angio patients).

At 30 days, the primary endpoint of all-cause mortality had occurred in 54% of patients in the immediate angio group vs. 46% in the delayed angio group, a difference that did not reach statistical significance. The cause of death was severe neurologic injury or circulatory collapse in most patients. The composite secondary endpoint of all-cause death or severe neurologic deficit was significantly more frequent in the immediate angiography group, with a hazard ratio of 1.16. Safety endpoints did not differ significantly between groups, including bleeding, stroke, or kidney failure, suggesting there was not an increase in harm associated with procedural complications of early angiography. The authors concluded that in patients successfully resuscitated from OHCA without ST-segment elevation, immediate coronary angiography did not show benefit over a delayed or selective approach in terms of 30-day mortality.

■ COMMENTARY

These authors did not address a sizable proportion of OHCA patients. Specifically, patients with ST-segment elevation after resuscitation or those who are hemodynamically unstable or record recurrent ventricular arrhythmias were excluded from this investigation. These patients almost certainly will continue to go to the cath lab early after presentation. For patients who do match the general inclusion criteria, several lessons are clear. Early mortality for these patients remains quite high, with most succumbing to the effects of anoxic neurologic injury. A minority of study patients were judged to have a culprit coronary lesion at the time of angiography. In this context, the neurologic damage may very well overwhelm any benefit of early coronary diagnostics.

Although approximately 40% of patients enrolled in this trial were labeled with a coronary culprit lesion, this conclusion is questionable and potentially misleading. A similar percentage of patients underwent PCI, but the authors did not explain how many of these presented with acute thrombotic coronary occlusion — the type of lesion where PCI might be expected to help prevent mortality early. In the similar COACT trial, where the inclusion of only shockable rhythms might be expected to result in a population enriched for acute myocardial infarction, only 5% of patients were reported to have acute thrombotic occlusion, with an additional 15% showing lesions that were judged to be acute but not occlusive. Indirect evidence suggests the numbers of patients in the Desch et al study who exhibited ongoing myocardial damage at the time of presentation was low. For example, peak biomarker values were modest, with a peak median troponin I in the delayed angiography group of only 1.10 micrograms/liter.

These observations only cement the overall takeaway message of these trials, which is that, in most cases of OHCA without ST-segment elevation or initial hemodynamic instability, patients can be stabilized in the ICU first, rather than rushing to the cardiac catheterization laboratory early in their course. Later selective coronary angiography after initial stabilization will continue to play a role in the management of these patients. ■

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ABSTRACT & COMMENTARY

First-Line Therapy for Hypertension

By Michael H. Crawford, MD, Editor

SYNOPSIS: When comparing angiotensin-converting enzyme inhibitors and angiotensin receptor blockers (ARBs) to treat hypertension, researchers observed no difference in major cardiovascular events — but a better safety profile for ARBs.

SOURCE: Chen R, Suchard MA, Krumholz HM, et al. Comparative first-line effectiveness and safety of ACE (angiotensin-converting enzyme) inhibitors and angiotensin receptor blockers: A multinational cohort study. *Hypertension* 2021;78:591-603.

Angiotensin-converting enzyme inhibitors (ACEIs) and angiotensin receptor blockers (ARBs) are class I evidence A first-line agents for treatment initiation in hypertension. However, little is known about their comparative effectiveness and safety. Chen et al compared the effectiveness and safety of ACEIs and ARBs for the first-line treatment of hypertension in a global network of eight large observational databases. They used statistical and informatics approaches to reduce confounding and bias.

They generated more than 6 million effect estimates for 55 outcomes comparing all recommended first-line antihypertensives. At least 2,500 patients treated with each drug class met the inclusion/exclusion criteria from 1996 to 2018. Inclusion meant patients treated with one agent, either an ACEI or an ARB, for one year during a period when both agents were available. The authors excluded patients who were exposed to any other antihypertensive either before or within seven days of starting an ACEI or ARB. Four of the 55 outcomes studied were the primary effectiveness outcomes: acute myocardial infarction (AMI), heart failure (HF), stroke, and a composite of these three (plus sudden cardiac death). The 51 secondary outcomes were safety outcomes or adverse effects based on the product labels, including angioedema, cough, hypotension, syncope, and electrolyte abnormalities. For the main on-treatment analysis, continuous exposure to the drug was required.

Propensity score models were used to adjust for comorbidities and other covariates. Also, to further adjust for residual bias, 76 negative control outcomes were analyzed. Finally, sensitivity analyses, including measured blood pressure (BP), were employed. A total of 2,297,881 patients were started on an ACEI and 673,938 an ARB (48% vs. 15%).

After more than 500 days of follow-up, there was no difference between those started on ACEI and ARB in the primary clinical outcomes, which was not changed by sensitivity analysis. The secondary outcomes showed significantly higher incidences of pancreatitis (HR, 1.32), angioedema (HR, 3.31), cough (HR, 1.32), gastrointestinal (GI) bleed (HR, 1.18), and abnormal weight loss (HR, 1.18) on ACEI vs. ARBs. After a Bonferroni correction, only cough and angioedema remained statistically significant. The authors concluded that although the safety profile for ARBs was better for the first-line treatment of hypertension, these drugs were not more effective at preventing major cardiovascular events.

■ COMMENTARY

This report takes observational studies to a new level — or, if you prefer, to the big data level. By amassing eight large observational databases, Chen et al studied more than 3 million patients undergoing initial drug therapy for hypertension with ACEI and ARBs. The results support many clinicians' current approach: start ARBs rather than ACEIs because of the difference in safety. The name of the game in hypertension treatment is adherence, as this is a chronic condition that does not usually cause symptoms. Many clinicians have realized ACEI-associated cough often is enough to sabotage medication compliance. Once ARBs became generic, I abandoned ACEI for the treatment of hypertension for this reason.

Chen et al found another issue with ACEI: angioedema, which is less common than cough but much more serious. Also concerning was the higher incidence of pancreatitis and GI bleeding with ACEI, although these did not survive the Bonferroni correction ($P < 0.01$ vs. $P < 0.05$). However, pancreatitis in this instance may be caused by edema of the pancreatic duct, which can occur with excess bradykinin. ACEIs retard the degradation of bradykinin, which is thought to explain cough and angioedema. GI bleeding is a new adverse effect that has not been reported.

There were limitations to this study, besides its observational nature and the potential for residual confounding and bias. It is not possible to evaluate differences between different drugs in each class. However, most patients in the ACEI arm were treated with lisinopril, which also is the most commonly prescribed antihypertensive. Thus, this study reflects the real-world use of drug therapy for hypertension. In addition, specific drug use one week after initiating first-line therapy was not considered, so some patients may have been prescribed other agents later. In fact, this is highly likely, as most hypertensive patients

require more than one drug to control their BP. Despite these drawbacks, this is the largest study to compare the two drug classes for first-line therapy of hypertension. The results favor the preferential use of ARBs rather than ACEIs when initiating treatment for hypertension. ■

ABSTRACT & COMMENTARY

Progression of Coronary Calcium on Statin Treatment

By Michael H. Crawford, MD, Editor

SYNOPSIS: In those treated with statins vs. those who were not, statins decreased plaque volume in plaques with little or no calcium (plaque regression) and increased calcium density without changes in plaque volume in calcified plaques (plaque stabilization).

SOURCE: van Rosendael AR, van den Hoogen IJ, Gianni U, et al. Association of statin treatment with progression of coronary atherosclerotic plaque composition. *JAMA Cardiol* 2021; Aug 18:e213055. doi: 10.1001/jamacardio.2021.3055. [Online ahead of print].

Statin therapy has been associated with lower levels of lipid-rich coronary plaque and an increase in calcification, but high plaque burden is associated with a high future risk of coronary events. To explore whether higher calcium density associated with statin use results in a lower risk of coronary events, investigators from 13 sites in seven countries enrolled 2,252 consecutive patients with suspected or known coronary artery disease (CAD) from 2013 to 2016.

For this cohort study, the authors excluded those with uninterpretable studies, those without lesions, those who stopped or initiated statins after a baseline coronary CT angiography (CCTA) and those with no information on statin use. The remaining 857 patients formed the study cohort (63% men; mean age, 62 years). The baseline and follow-up CCTAs were read blinded in a core lab. Any plaques detected were categorized by plaque volume and composition based on fixed thresholds of Hounsfield Units (HU). The main outcome was progression of the composition of each individual plaque. The progression or regression of the plaques according to statin use was determined by changes in plaque volume.

To evaluate the association between statin therapy and coronary calcium density, the authors excluded low-density and fibro-fatty plaques. Researchers analyzed 2,458 plaques in the baseline and follow-up CCTAs. Continuous statin use was present in 64% of the cohort. In the untreated group, plaque volume increased for all compositional types. Statin therapy was associated with decreased plaque volume in low attenuation plaques and fibro-fatty plaques, but not in the calcified plaques. Considering the calcium plaques alone, statin therapy was not associated with a change in plaque volume, but rather a transformation to more dense calcium. Also, an interaction analysis of baseline plaque volume and calcium density showed denser plaques were associated with slower plaque progression. The authors concluded statin use was associated with greater rates of transformation to high-density calcified coronary plaque, and there was slower plaque progression with increasing calcium density levels.

■ COMMENTARY

The authors believe this study provides insight into the reduction in coronary events when statins are deployed as secondary prevention in patients with known or suspected CAD. However, coronary event outcomes were not assessed, so this is conjecture. On the other hand, this study expands on their previous publication from this cohort, an examination of patients who experienced an acute coronary event after their first CCTA vs. a matched group that had not. In that work, the authors showed acute coronary syndrome patients had significantly less highly calcified plaques (> 1,000 HU).[1] In this most recent analysis, statin therapy seemed to reduce the size of fibro-fatty and low attenuation (very little calcium) plaques, but increased the calcium density of calcified plaques. These findings imply statins are shrinking the lipid core of plaques, shrinking the non-calcified plaques, and increasing the calcium density of calcified plaques, both of which should reduce coronary events.

There were limitations. This was an observational study. Statin use was not randomized but determined by the patient's physician. Thus, it is not surprising the two groups were significantly different in several characteristics. The statin group was older, included more men, and included more patients with diabetes and hypertension. Although the authors adjusted for it in the multivariate analyses, unmeasured confounders could be present. Also, the decision to prescribe statins may have excluded both low-risk patients (no indication) and high-risk patients who were excluded from the study.

In addition, the interval between CCTA exams was determined clinically, not by protocol. Finally, lesions that had coalesced or occluded between exams were not evaluated, which further limits the generalizability of the results.

Despite these limitations, the results do add to our knowledge about the effects of statins on coronary plaques and probably explain the paradox of increasing calcium scores on serial CCTAs in the face of fewer clinical events. This is of clinical importance because it supports the advice not to repeat CCTAs in patients with high calcium scores who were started on statins because they likely will be higher. This will cause anxiety in patients and does not inform therapy, as this likely is a good sign of plaque stabilization. ■

REFERENCE

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CME/CE QUESTIONS

1. In patients with heart failure with preserved ejection fraction older than age 60 years with left ventricular wall thickness ≥ 12 mm, the incidence of ATTR amyloidosis in a white population was:

a. 3%.

b. 6%.

c. 9%.

d. 12%.

2. A comparison of angiotensin-converting enzyme inhibitors (ACEI) vs. angiotensin II receptor blockers for first-line monotherapy in hypertension demonstrated an increased incidence of:

a. acute myocardial infarction on ACEI.

b. heart failure on ACEI.

c. stroke on ACEI.

d. angioedema on ACEI.

3. Which characterization of patients with heart failure and atrial fibrillation is most likely to record lower mortality rates with atrioventricular junction ablation plus cardiac resynchronization therapy vs. patients on drug therapy alone?

a. Paroxysmal atrial fibrillation

b. Persistent atrial fibrillation

c. Permanent atrial fibrillation

d. Asymptomatic atrial fibrillation

4. Statin therapy in patients with atherosclerotic coronary artery plaques compared to no statin therapy results in:

a. increased plaque volume and decreased calcium.

b. reduced plaque volume of fibro-fatty plaques.

c. reduced calcium density of calcified plaques.

d. higher calcium density of calcified plaques.

5. In patients with resuscitated out-of-hospital cardiac arrest without ST-elevation on ECG, the percentage of culprit coronary lesions identified on either immediate or delayed coronary angiography was about:

a. 10%.

b. 20%.

c. 40%.

d. 60%.

CME/CE OBJECTIVES

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

- discuss the most current information related to cardiac illness and the treatment of cardiac disease;
- explain the advantages and disadvantages, as well as possible complications, of interventions to treat cardiac illness;
- discuss the advantages, disadvantages, and cost-effectiveness of new and traditional diagnostic tests in the treatment of cardiac illness;
- discuss current data regarding outpatient care of cardiac patients.