AMERICAN HEALTH CONSULTANTS®

Providing Evidence-based Clinical Information for 20 Years

CLINICAL CARDIOLOGY ALERT

A monthly update of developments in cardiovascular disease

American Health Consultants Home Page—http://www.ahcpub.com

CME for Physicians—http://www.cmeweb.com

The Open Artery Hypothesis Revisited

ABSTRACTS & COMMENTARY

There has been considerable interest for many years regarding the potential short- and long-term benefits in patients who have had a myocardial infarction (MI) if they end up with a patent infarct related artery (IRA). No randomized trial to date has been of sufficient size to resolve the question as to whether the infarct vessel should be opened by an interventional procedure in the weeks to months following the MI. Much observational data support the hypothesis that an open IRA is beneficial, and would result in lower morbidity and mortality in post-MI patients, as well as attenuation of adverse left ventricular remodeling. The Mid-America Heart Institute in Kansas City, Mo, a large and experienced coronary intervention program, has reported an observational study of 2000 consecutive patients who underwent a PCI for a chronic total coronary occlusion (CTO) between 1980 and 1999. The CTO cohort was carefully matched to a comparable number of patients who underwent coronary angiography but did not have an occluded vessel. A propensity scoring method was used to optimally match the 2 cohorts for a wide variety of clinical factors. In addition, the 2007 patients who underwent a PCI for CTO were stratified for success or failure of the procedure; long-term (up to 10 year) outcomes were assessed. The matched non-CTO cohort was obtained from the Mid-America Heart Institute registry of almost 26,000 PCI patients. The mean follow-up for the entire group was 91 months; 94% of the CTO cohort were included in this analysis. All patients with a CTO had to be at least 7 days out from an acute MI; some had more than 1 PCI. Technical success was defined as less than 40% residual stenosis. Stent use was extremely low in this report (7% of the CTO cohort). Stented subjects were treated with coumadin for 1 month until 1996, at which time ticlodipine or clopidogrel was used. The end points for analysis included in-hospital complications, procedural success rates, and 10-year cumulative survival.

Results: Of the 2007 CTO patients there were 514 failures. The latter group were clinically similar, but had more CABG and multivessel disease. The CTO vessel was equally divided between the RCA and LAD, with slightly less circumflex procedures. Nintey-six

Volume 20 • Number 9 • September 2001 • Pages 65-72

INSIDE

percent of individuals had only a 1-vessel intervention. The overall technical procedural success rates were approximately 70%, with rates improving over time, without an increase in major coronary events. Major acute hospital coronary events (MACE) were similar between the CTO group and controls. Failed CTO was associated with a higher in-hospital MACE (4.5% vs 3.2%, P = 0.02); there was a trend toward more Q and non-Q wave infarctions with failed CTO. Long-term results showed no difference in survival between the total CTO cohort and the matched non-CTO individuals; 10-year mortality 71%, representing a 3% per year death rate. CTO individuals who had a successful PCI had a somewhat higher 10-year survival, 73.5% vs. 65%, P = 0.001. The CTO patent group had a 10-year survival comparable to the non-CTO matched controls. Furthermore, the patients with single vessel procedures fared better than those with multivessel CTO. After adjustment for baseline differences, an initial CTO success was a significant independent predictor of 10-year survival. Of interest, a small number (64) of individuals with a failed PCI underwent CABG; these had an improved 10-year survival compared to those with failure to open the vessel. Suero and colleagues emphasize that this is the largest series of patients reported to date who had a PCI for a chronically occluded vessel, and they note that successful opening of the CTO was associated with improved 10-year survival. They conclude that these findings justify an aggressive attempt at PCI in eligible CTO patients. The technical success rates recently have been 82%. Short-term morbidity and mortality showed little difference between the CTO intervention group and matched controls, but there were more adverse outcomes in the group with failed CTO. Suero et al state that "a striking survival advantage" occurred in patients with successful opening of an occluded vessel. They recommend careful consideration of selected PCI in chronically obstructed lesions (Suero JA, et al. *J Am Coll Cardiol*. 2001;38:409-414).

COMMENT BY JONATHAN ABRAMS, MD

This interesting and important database does not directly address the open artery hypothesis, in that it is unknown whether the obstructed coronary vessels subjected to PCI were or were not responsible for prior MI; however, one has to assume that many to most of these were. Their conclusions that a successfully opened CTO results in a 10-year survival comparable to individuals without an occlusion (and was substantially better than in those with a failed attempt), are persuasive that, in selected individuals, efforts to open a coronary occlusion should be considered. This is further supported by the surprisingly high success rates in the later years of the study. It should be noted that stent use was extremely low; it is possible and even likely that had stents been used more widely, the successful PCI cohort would have fared even better with respect to long-term survival.

These results do not clearly support (or refute) the open artery concept, but are indirectly supportive of the view that a patent IRA is in the best interest of the post-MI individuals. Much data in the literature indicate that MI patients who leave the hospital with a patent IRA do better than those with a closed artery, with decreased morbidity and mortality as well as attenuation of LV cavity expansion over time. It has been suggested that an open IRA results in a more sturdy structural framework for the LV myocardium, thus diminishing the likelihood of LV dilatation within and outside the infarct zone. Many other advantages of a patent artery can be postulated. Microvascular perfusion, however, was not studied by the Mid-America Heart Institute, and one must assume that at least some of the individuals who underwent opening of a CTO in this database did not benefit at all from the PCI due to failure of downstream myocardium to enhance its nutrient blood supply and/or undergo improved function of viable myocardial cells. A related study in the July issue of the *Journal of American College of Cardiology* examines long-term post-MI outcomes in a highly sophisticated manner, but without

Clinical Cardiology Alert, ISSN 0741-4218, is published monthly by American Health Consultants, 3525 Piedmont Rd., NE, Bldg. 6, Suite 400, Atlanta, GA 30305.

VICE PRESIDENT/GROUP PUBLISHER: Donald R. Johnston.
EDITORIAL GROUP HEAD: Glen Harris.
MANAGING EDITOR: Robin Mason.
ASSOCIATE MANAGING EDITOR: Neill Larmore.
SENIOR COPY EDITOR: Robert Kimball
MARKETING PRODUCT MANAGER: Schandale Kornegay.

GST Registration Number: R128870672.

Periodical postage paid at Atlanta, GA.

POSTMASTER: Send address changes to ***Clinical Cardiology Alert,*** P.O. Box 740059, Atlanta, GA 30374.

Back issues: $38. Missing issues will be fulfilled by Customer Service free of charge when contacted within one month of the missing issue's date.

AMERICAN HEALTH CONSULTANTS™
THOMSON HEALTHCARE

Subscriber Information

Customer Service: 1-800-688-2421.
Customer Service E-Mail: customerservice@ahcpub.com
Editorial E-Mail: robert.kimball@ahcpub.com

Subscription Prices

United States
1 year *with* Free AMA Category 1 credits: $279 per year
(Student/Resident rate: $140).
Multiple Copies
2-9 additional copies: $206 each. 10 or more copies: $183 each.
Canada
Add GST and $30 shipping.
Elsewhere
Add $30 shipping.

Accreditation

American Health Consultants (AHC) designates this continuing medical education (CME) activity for up to 20 hours in category 1 credit toward the AMA Physician's Recognition Award.

Each physician should claim only those hours of credit that he/she actually spent in the educational activity.

This CME activity was planned and produced in accordance with the ACCME Essentials.

AHC is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians.

Questions & Comments

Please call **Robin Mason,** Managing Editor, at (404) 262-5517, or **Robert Kimball**, Senior Copy Editor, at (404) 262-5413 or e-mail at robert.kimball@ahcpub.com between 8:30 a.m. and 4:30 p.m. ET, Monday-Friday.

Statement of Financial Disclosure

In order to reveal any potential bias in this publication, and in accordance with Accreditation Council for Continuing Medical Education guidelines, we disclose that Dr. Abrams serves on the speaker's bureau for Merck, Pfizer, and Parke-Davis. Dr. DiMarco does research for Medtronic, Guidant/CPI, Pfizer, Bayer, and Wyeth-Ayerst. Dr. Crawford reports no consultant, stockholder, speaker's bureau, research, or other financial relationships with companies having ties to this field of study.

attention to the issue of an open IRA. Gaudron and colleagues were able to link the development of systolic dysfunction and cavity enlargement, with abnormal hemodynamics and electrical instability, all correlating with late sudden death. Gaudron et al do not provide information on the IRA status. However, 28% of the cohort of 434 patients developed significant LV dilatation with an increase in diastolic volume, as well as a markedly increased mortality. This paper is one of many that demonstrate an adverse event rate in individuals who undergo LV remodeling, which occurs less often in subjects with an open IRA. The data are persuasive that electrical as well as mechanical hemodynamic features correlate with each other. As the LV enlarges over time, QTC remains longer in the subjects who ultimately do not survive. The data from the Mid-America Heart Institute, as well as considerable prior animal and human research, indicate that a patent IRA is in the individuals' best interest. The study by Gaudron et al from Germany provides considerable insights into the mechanistic relationships between LV cavity enlargement and death. It is believed by many, but still not proven, that an open artery will prevent the linkage of cavity expansion and sudden death.

Finally, the NHLBI will be conducting a 3-year Occluded Artery Trial (OAT), which will randomize post-MI patients with a closed IRA between 3 and 28 days, to PCI or none. That should finally resolve these perplexing but important issues (Gaudron P, et al. *J Am Coll Cardiol*. 2001;38:33-40). ❖

Use and Benefits of IVUS

ABSTRACTS & COMMENTARY

Synopsis: *Selective IVUS use to optimize coronary interventional procedures might result in improved outcomes without increased procedure time, resource use, or large increases in cost.*

Sources: Choi J, et al. *Am Heart J*. 2001;142:112-118; Moussa I, et al. *Am J Cardiol*. 2001;88:294-296.

Choi and colleagues sought to determine whether the routine use of intravascular ultrasound (IVUS) to optimize stent implantation improved acute and long-term clinical outcomes, and whether such an approach involved more resource use while remaining cost-effective. They analyzed 278 consecutive patients; 178 patients received IVUS and 100 patients had angiographically guided stent implantation. All IVUS imaging was performed at the discretion of the primary operator with the goal of optimizing angiographically guided stent deployment with the angiographic criteria of full stent apposition to the vessel wall, adequate stent symmetry, and acute gain of > 0.80. Assessment of resource use included procedure time, fluoroscopy time, contrast volume, and other equipment used (such as catheters, balloons, stents, and guidewires), as well as overall procedure cost. Clinical outcomes included in-hospital abrupt closure and 6-month major adverse cardiac events (MACE) including cardiac death, myocardial infarction (MI), or target vessel revascularization (TVR).

There were no differences in total procedure time, fluoroscopy time, or contrast use between the groups. While 47% of patients undergoing postimplantation IVUS underwent additional procedures to optimize results, this did not result in increased use of equipment, with the exception of the IVUS catheter itself. Total procedure costs were higher in the IVUS group ($4142 ± 1547 vs $3635 ± 1949, $P = 0.03$), a difference largely attributable to the cost of the IVUS catheter ($575 at this institution). The abrupt closure rate was lower in the patients receiving IVUS guidance (0.6% vs 4%, $P = 0.04$). In addition, there was a trend toward lower 6-month MACE in patients undergoing IVUS (11% vs 19%, $P = 0.08$).

Choi et al concluded that while procedural costs were somewhat higher in the IVUS-guided group, these costs would be offset somewhat by lower rates of abrupt closure and a trend toward lower rates of MACE at 6 months in the IVUS-treated group. They acknowledge that this study was limited by the nonrandomized use of IVUS guidance (which may have resulted in a higher proportion of "difficult" lesions in the IVUS-guided group) and by a sample size that may have been insufficient to detect a difference in clinical outcomes between the groups at 6 months.

Moussa and colleagues postulated that IVUS would provide the most benefit for patients in whom IVUS data would be inconsistent with coronary angiography. Of particular interest were those patients in whom angiography resulted in underestimation of vessel diameter. In these cases, IVUS data might allow the interventional operator to choose a strategy that might result in a larger minimal lumen diameter at the end of the procedure, which may in turn translate into lower rates of subsequent restenosis. Therefore, Moussa et al sought to determine the clinical and angiographic characteristics that correlated with a discrepancy between IVUS and quantitative coronary angiography (QCA) measurements, thereby defining a population of patients most likely to receive real clinical benefit in undergoing prein-

tervention evaluation by IVUS.

Moussa et al identified 334 patients who underwent high-quality IVUS evaluation prior to coronary intervention. Baseline measurements obtained included minimal luminal cross-sectional area (CSA), reference vessel diameter, and vessel diameter at the lesion site. QCA was performed by an experienced angiographer blinded to the IVUS results. The discrepancy between the IVUS and QCA measurements of vessel diameter at the site of the lesion was calculated. In vessels where there was a large difference (= 1 mm) between the IVUS and QCA images, Moussa et al attribute the discrepancy to 2 factors: diffuse coronary atherosclerosis affecting the reference vessel and, more commonly, compensatory vessel enlargement at the lesion site ("the Glagov effect"). Either of these pathoanatomic features would be underestimated by angiographic "luminology" and more accurately assessed using IVUS. Logistic regression and multivariate analysis of clinical and angiographic characteristics were performed to identify predictors of a difference between measurements obtained by the 2 modalities. Independent predictors of discrepancy between IVUS and QCA assessment were 1) small angiographic reference vessel diameter (< 3 mm); 2) lesion location in a proximal segment of the coronary tree; and 3) presence of diabetes.

Moussa et al suggest that these findings might allow the operator to identify patients who would be most likely to benefit from IVUS imaging. By obtaining a more accurate (and often times larger) estimation of vessel size, an optimal interventional strategy, ideally resulting in larger postprocedural minimal luminal CSA, would be facilitated.

COMMENT BY SARAH M. VERNON, MD

Since the earliest published studies in coronary stenting revealed that larger vessel diameter and stented luminal CSA are associated with lower rates of restenosis and target vessel revascularization, "bigger is better" has become the interventional cardiologist's mantra. Early IVUS studies also revealed high rates of incomplete stent expansion, which could be minimized with high-pressure balloon inflation after deployment. With contemporary stent design and implantation techniques, the potential role of IVUS guidance in optimizing clinical outcomes needed to be redefined. While there is little doubt that IVUS guidance can prove invaluable in performing coronary intervention, it is important that the information obtained translates into improved patient outcomes to justify the additional time and expense of this procedure. Data from the CRUISE study, a large, randomized trial published in August 2000, suggest that optimizing stent implantation with IVUS guidance resulted in larger minimal lumen diameter and larger minimal stent area, both measures that have been shown to correlate with lower restenosis rates.[1] More importantly, patients randomized to IVUS guided stent implantation in CRUISE experienced improved clinical outcomes, with lower TVR at 9 months of follow-up (8.5% vs 15.3%, $P < 0.05$).

Choi et al demonstrate that, in their series of patients, while the cost of performing IVUS-optimized stent implantation was somewhat higher (the cost of the IVUS catheter itself), IVUS was not associated with longer procedure times or increased use of other resources. In addition, the procedural cost of performing IVUS was offset by the costs associated with lower abrupt closure rates and a trend toward lower TVR rates in patients receiving IVUS guided stenting. However, this study was not randomized and may have lacked an adequate sample size to detect a significant difference in clinical outcomes as reported in CRUISE. In addition, their strategy of post-deployment IVUS-guided optimization of stenting may not reflect the utility of preintervention IVUS guided lesion assessment to assist with device selection.

The brief report from Moussa et al, while also somewhat limited by small sample size, helps to clarify subsets of patients (those with smaller vessels, proximal lesion location, or diabetes) in whom preprocedural IVUS evaluation might provide significant benefit by providing a more accurate assessment of vessel size. This, in turn, might significantly alter procedural strategy and device selection (most notably selection of larger stents) that might allow the operator to achieve a larger MLD at the end of the procedure. While previously published data would suggest that it is likely that this would translate into improved clinical outcomes, namely lower restenosis rates, this was not demonstrated in this study. Nonetheless, the simple clinical and angiographic criteria outlined by these studies could be used to reserve preintervention IVUS imaging for the patients most likely to derive clinical benefit from it. Such a "selective" approach to IVUS-guided stent deployment might also prove to be the most cost effective. Taken together, these 2 studies suggest that selective IVUS use to optimize coronary interventional procedures might result in improved outcomes without increased procedure time, resource use, or large increases in cost. ❖

Reference

1. Fitzgerald P, et al. *Circulation*. 2000;102:523-530.

Progression to Chronic Atrial Fibrillation After Pacing

ABSTRACT & COMMENTARY

Synopsis: *Physiologic pacing does not appear to be specific for preventing the development of atrial fibrillation in patients at highest risk.*

Source: Skanes AC, et al. *J Am Coll Cardiol.* 2001;38: 167-172.

The canadian trial of physiologic pacing (CTOPP) randomized 2568 patients undergoing first pacemaker implantation to physiologic, dual chamber, or atrial- vs. ventricular-based pacing. One of the major hypotheses in the trial was that physiologic pacing would reduce the incidence of atrial fibrillation (AF). This report describes those observations.

In CTOPP, 1474 patients received ventricular pacing only implants and 1094 patients received physiologic pacing implants. During the study, AF was defined as any ECG documented episode of AF lasting longer than 15 minutes. Chronic AF was defined to occur when a patient with new onset AF had continued AF on a second recording 1 week later. Physiologic pacing reduced the rate of development of chronic AF from 3.84% per year to 2.8% per year. This reduced risk was essentially linear over time with separation of the curves at approximately 6 months. Three clinical factors predicted the development of chronic AF. Age older than 74 years was associated with an annual risk of 3.83% vs. 2.95% for those younger than 74 years of age. The presence of sinoatrial node disease was associated with annual risk of 5.66% vs. 1.86% for those without sinoatrial node disease. A prior history of AF was associated with an annual risk of 9.64% vs. 2.04% for those without this history. The benefits of physiologic pacing were looked at in certain subgroups. There was a statistical trend for patients free of previous myocardial infarction (MI) or coronary disease and for patients with apparently normal ventricular function to derive the greatest relative risk reduction from physiologic pacing. However, the confidence intervals for the hazard ratios were broad in these groups. Interestingly, patients with prior AF and with sinoatrial node disease did not appear to derive greater relative benefit from physiologic pacing compared to those patients without these findings.

Skanes and colleagues conclude that physiologic pacing produces a small but statistically significant reduction in the annual rate of development of chronic AF. Unfortunately, physiologic pacing does not appear to be specific for preventing the development of AF in patients at highest risk.

COMMENT BY JOHN P. DiMARCO, MD, PhD

It has only been in the last few years that randomized trials comparing physiologic pacing and ventricular pacing have been undertaken. In CTOPP and in another smaller trial—the Pacemaker Selection in the Elderly study—no benefit in overall mortality was observed in patients who recived physiologic pacing systems.[1,2] In another study with patients only with sinatrial node dysfunction, atrial rate responsive pacing reduced the long-term incidence of chronic AF when compared to ventricular based rate response pacing.[3] The data from CTOPP presented in this paper confirm that physiologic pacing reduces the incidence of AF but shows only a small, short-term clinical benefit. In this study, the overall reduction was 1% per year for a relative risk reduction of 27.1%. However, it is possible that if the event curves continue to diverge over time that even this small annual reduction can lead to a long-term reduction in stroke or cardiovascular death. This becomes more significant as pacemaker patients live longer due to improved therapy for heart failure and ischemic heart disease. However, it is somewhat disappointing that physiologic pacing seems to have the least significant relative effect in patients, one would suspect they are most likely to benefit from preservation of atrial contractility. In this study, patients with abnormal left ventricular function and prior MI had little benefit with atrial pacing. It is likely that the degree of myocardial dysfunction is so powerful that it overrides any changes that might be produced by atrial pacing alone.

At present, the decision to implant a dual chamber pacemaker or ventricular pacemaker continues to be up to the physician. There seems to be small but statistically significant benefits in terms of quality of life and development of AF. However, pacing is a lifelong therapy and even small annual benefits may be clinically significant when assessed over long intervals. ❖

References

1. Connolly S, et al. *N Engl J Med*. 2000;342:1385-1391.
2. Lamas G, et al. *N Engl J Med*. 1998;338:1097-1104.
3. Andersen H, et al. *Lancet*. 1997;350:1210-1216.

Value of Signal-Averaged ECG in Prior MI Patients

ABSTRACT & COMMENTARY

Synopsis: *SAECG is an effective predictor of mortality in patients with prior myocardial infarction and nonsustained VT.*

Source: Gomes JA, et al. *Circulation*. 2001;104: 436-441.

Gomes and colleagues report data on the predictive value of the signal-averaged ECG (SAECG) from the Multicenter Unsustained Tachycardia Trial (MUSTT). MUSTT was a study designed to test the prognostic significance of inducible sustained ventricular tachycardia at electrophysiologic study and to see if therapy guided by serial electrophysiologic studies would improve survival. The study enrolled 2202 patients for electrophysiologic study. SAECGs were obtained in 1925 of these patients. Tracings from 612 patients with preexisting bundle branch block or intraventricular conduction defects, ventricular pacing or unsatisfactory tracings were excluded. Of the remaining 1268 patients with good quality SAECG's, 364 had inducible sustained ventricular tachycardia and were included in the randomized portion of the trial that compared electrophysiologically guided therapy to no antiarrhythmic therapy.[1] The remaining 904 patients were followed in a registry.[2] The primary end point of MUSTT was cardiac arrest or death from arrhythmia and the secondary end points were cardiac death and total mortality. Deaths were classified by an events committee after review of available records. In this study, various SAECG parameters were analyzed to test their relationship to arrhythmic death or cardiac arrest, cardiac death, or total mortality.

Among the 1268 patients included in this report, there were 230 cardiac arrests or arrhythmic deaths (18%), 341 cardiac deaths (27%), and 457 total deaths (36%). Filtered-QRS duration had an approximately linear relationship with cardiac arrest and arrhythmic death, and with cardiac mortality. There was also a relationship between the terminal root mean square (RMS) voltage but this was not a linear relationship. Duration of the low amplitude signal when analyzed as a continuous variable was not a significant predictor of end points. Since it has been traditional to characterize the SAECG as either normal or abnormal using various cut-off points, analyses using dichotomized variables were performed. A filtered QRS duration cut-off point of 114 msec was significant for all end points. A terminal RMS voltage cut-off of 20 mV was significant for cardiac death but not for arrhythmic death. Low amplitude signal duration dichotomized at 38 msec was significant for cardiac death but not for arrhythmic death. Events were also analyzed by subgroups. Patients with an abnormal SAECG were more likely to be male or white, to have a more remote myocardial infarction, have more severe coronary disease, and have more frequent induction of sustained VT. However, the predictive value of the filtered-QRS duration was seen in all subgroups including both treated and untreated patients. Since ejection fraction (EF) was also a powerful independent predictor of end points in MUSTT, EF and filtered-QRS duration were combined with the EF dichotomized at 30%. Patients with both values abnormal had the highest event rates. Those with either an EF below 30 or a filtered QRS greater than 114 msec had intermediate values and those with EF greater than or equal to 30% and a filtered-QRS duration less than 114 msec had the lowest event rates. Gomes et al conclude that the SAECG is an effective predictor of mortality in patients with prior myocardial infarction and nonsustained VT. The combination of the SAECG with EF permits selection of high risk in patients for intervention.

COMMENT BY JOHN P. DiMARCO, MD, PhD

The signal averaged ECG was developed almost 20 years ago. It provides a highly amplified signal processed recording which can detect microvolt level electrical potentials in the terminal QRS complex. The potentials are called "late" potentials and have been shown to arise from areas of scarred myocardium. The SAECG's primary use has been for risk stratification after myocardial infarction and for prediction of inducibility of ventricular tachycardia at electrophysiologic study. The value of the SAECG in patients with chronic coronary artery disease, poor left ventricular function, and nonsustained ventricular tachycardia was a planned substudy in MUSTT.

Unfortunately, this paper leaves many questions unanswered. Patients in MUSTT underwent a baseline electrophysiologic study. Patients who did not manifest an inducible arrhythmia were then followed over time with most of them not receiving antiarrhythmic therapy. These patients had a slightly but significantly lower mortality than did patients who had inducible ventricular tachycardia and were not treated. Among the patients with inducible ventricular tachycardia, the treated patients had a lower overall mortality but patients who received antiarrhythmic drugs had a slightly higher mortality. All of the benefit in

the guided therapy group was seen in those patients who received implantable cardioverter defibrillators. In this paper, we are told that a multivariate analysis was performed and that the SAECG is a predictor for all patients with and without inducible ventricular tachycardia and with and without treatment, but it is hard to understand exactly how the SAECG should be used in the future. Is someone with both inducible ventricular tachycardia and a positive SAECG at a higher risk than someone with just inducible ventricular tachycardia? Is there a significant difference in patients without inducible ventricular tachycardia who have positive or negative SAECGs? Although these seem to be obvious questions that would be of value to the clinician, the data to answer them are not presented here even though they should be available.

It is also possible that an abnormal signal averaged ECG may be a predictor of a bad reaction to antiarrhythmic drugs. Most antiarrhythmic drugs prolong conduction and delayed conduction is the parameter measured by the SAECG. Thus, drug therapy might worsen the potential for arrhythmia and cardiac function and be responsible for some of the observations here. Patients treated with a defibrillator only might show a different relationship. We are not given the data to see if prescribing an antiarrhythmic drug to someone with an abnormal SAECG actually had a negative effect on outcome.

Hopefully, Gomes et al will do further analyses of their data in the future. The current data don't really seem to answer the questions clinicians would like to ask. ❖

References

1. Buxton A, et al. *N Engl J Med*. 1999;341:1882-1890.
2. Buxton A, et al. *N Engl J Med*. 2000;342:1937-1945.

Periprosthetic Valve Regurgitation

ABSTRACT & COMMENTARY

Synopsis: *Trivial to mild PPR on intraoperative echocardiograms was not uncommon, often disappeared by 6 weeks after surgery, and, if persistent, was almost always benign.*

Source: O'Rourke DJ, et al. *J Am Coll Cardiol*. 2001;38:163-166.

Periprosthetic valve regurgitation is not infrequently observed following left heart valve replacement, but its clinical significance and prognosis are unclear. Thus, O'Rourke and colleagues evaluated intraoperative and follow-up echocardiograms in 608 patients undergoing left heart valve replacement at their institution. Periprosthetic regurgitation (PPR) was observed on intraoperative postcardiopulmonary bypass transesophageal echocardiography in 113 (18%) of these patients. PPR was trivial or mild in all cases since moderate or severe PPR was corrected before the patient left the operating room. A 6-week postoperative transthoracic echocardiogram showed no PPR in 56 patients and persistent, but unchanged, PPR in 44 of the 100 patients remaining. At late (2 years on average) follow-up 92 patients remained and echoes were performed on 50 patients. Four of these 50 showed progression of PPR (8%) and all 4 had bioprosthetic valves. Three of the 4 had no PPR on early follow-up. Of these 3, 2 had endocarditis and 1 had primary valvular degeneration. Thus, only 1 of the 50 patients remaining at late follow-up had progression of PPR (2%) and eventually at 3 years had their bioprosthetic valve replaced. Only small patient body size and use of a bioprosthetic valve were significant correlates with PPR by multivariate analysis. O'Rourke et al concluded that trivial to mild PPR on intraoperative echocardiograms was not uncommon, often disappeared by 6 weeks after surgery and, if persistent, was almost always benign.

COMMENT BY MICHAEL H. CRAWFORD, MD

Trivial to mild PPR is usually ignored at surgery due to the belief that it is not important hemodynamically and may disappear as the spaces between sutures are obliterated by clotted blood or tissue ingrowth in the near future. The 6-month echo data in this study confirm that belief as the majority of the PPRs disappeared. Even when it persisted, it had no affect on 6-week morbidity or mortality and only 1 patient with PPR eventually underwent valve re-replacement due to progressive PPR.

The natural history of moderate or severe PPR cannot be deduced from this study since these patients routinely were put back on pump and repaired. It is possible that some moderate PPR may disappear or be well tolerated for years, I have certainly seen this, but predicting which patients will do well is uncertain, so O'Rourke et al's surgical policy is not unreasonable. Presumably PPR is not highly likely to lead to infectious endocarditis, since the 2 endocarditis cases in this series did not have intraoperative PPR. However, the number of patients is relatively small for this determination.

Since the overall prognosis with PPR is excellent, the fact that all the cases in this study were observed with bioprosthetic valves is of little clinical importance. How-

ever, it is in keeping with the recent release of the 15 year VA valve surgery trial results showing the overall superiority of mechanical vs. bioprosthetic valves. ❖

CME Questions

11. Mild periprosthetic valve regurgitation:
a. often disappears at 6 weeks.
b. is almost always benign.
c. is common.
d. All of the above

12. Angioplasty of chronic total coronary artery occlusions:
a. increases long-term survival.
b. subsequent CABG reduces survival.
c. reduces major coronary events.
d. can be achieved in more than 80%.

13. An indication for IVUS during percutaneous coronary interventions are:
a. small size of reference vessel.
b. proximal lesion location.
c. diabetes.
d. All of the above

14. Routine IVUS with coronary interventions:
a. decreases costs.
b. reduces the abrupt closure rate.
c. reduces major coronary events.
d. increases fluoroscopy time.

15. Physiologic pacing vs. ventricular pacing:
a. reduces the incidence of AF.
b. reduces long term mortality.
c. increases functional capacity.
d. All of the above

Attention Readers . . .

American Health Consultants is happy to announce that we are opening up our *Primary Care Reports* author process to our readers. A biweekly newsletter with approximately 5000 readers, each issue is a fully referenced, peer-reviewed monograph.

Monographs range from 25-35 Microsoft Word document, double-spaced pages. Each article is thoroughly peer reviewed by colleagues and physicians specializing in the topic being covered. Once the idea for an article has been approved, deadlines and other details will be arranged. Authors will be compensated upon publication.

As always, we are eager to hear from our readers about topics they would like to see covered in future issues. Readers who have ideas or proposals for future single-topic monographs can contact Managing Editor Robin Mason at (404) 262-5517 or (800) 688-2421 or by e-mail at robin.mason@ahcpub.com.

We look forward to hearing from you. ❖