Editorial Comment

Transesophageal Echocardiographic Screening for Atrial Thrombus Before Cardioversion of Atrial Fibrillation: When Should We Look Before We Leap?*

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Many of the uncertainties that physicians were faced with regarding thromboembolic risk in chronic atrial fibrillation 5 years ago have been eliminated by a recent series of multicenter trials demonstrating the benefits of anticoagulation (1). However, inevitably in clinical cardiology as one solves a prominent part of the puzzle, new areas of uncertainty spring forth into puzzling prominence. In the area of thromboembolism associated with atrial fibrillation, including appropriate treatment of the elderly, several key questions remain, such as when to use aspirin versus warfarin, the role of low dose warfarin and how to approach anticoagulation in the patient undergoing cardioversion for atrial fibrillation.

The problem. The risk of stroke or arterial embolism due to clots forming in the thrombogenic milieu of the fibrillating atrium and subsequently being dislodged at the time of return of atrial mecanic function was recognized in early reviews of chemical cardioversion (2). With the development of direct current cardioversion this risk became even more widely recognized. Warfarin usage to reduce this risk became standard practice. In 1968, Bjerkelund and Orning (3) reported on 437 Norwegian patients admitted for electrical cardioversion of atrial dysrhythmias (372 with chronic atrial fibrillation). In that nonrandomized study approximately half of the patients were receiving warfarin anticoagulation and half not, at their physician’s discretion. The rate of embolic events (all systemic arterial emboli) was significantly higher in the group without (-5.3%) than that with anticoagulation (-0.8%). The strikingly lower event rate was even more remarkable given the finding that the group with anticoagulation had baseline cardiac characteristics (heart failure, cardiomegaly, rheumatic valvular disease) that put them at higher risk for thrombus. That study, despite its nonrandomized, nonstandardized design served as the primary basis for the American College of Chest Physicians Consensus Committee on Antithrombotic Therapy Recommendations (4) for the use of anticoagulation in the pericardioversion period. These recommendations state that all patients with atrial fibrillation >2 days in duration should receive warfarin therapy for 3 weeks before and 4 weeks after cardioversion until sinus rhythm has been maintained. There are several practical clinical problems with these recommendations, including bleeding complications related to warfarin, the requirement for a second hospital admission for cardioversion and the delay in reversion of atrial fibrillation to sinus rhythm.

The solution. Because echocardiography demonstrates most cardiac masses with good sensitivity it was natural to try to utilize echocardiographic screening before cardioversion to look for left atrial thrombus. However, transthoracic echocardiography has a low sensitivity for left atrial thrombus because of the small size of the thrombi and their location in the left atrial appendage and thus proved to be of little use in cardioversion screening. By contrast, early studies demonstrated that transesophageal echocardiography (5) had an extremely high sensitivity and specificity for left atrial thrombus.

As a result of these observations, we and several other investigators began using transesophageal echocardiography in 1990 to screen patients who were candidates for cardioversion of atrial fibrillation (6–10). The concept was simple: If thromboembolic events after cardioversion of atrial fibrillation are due to dislodgment of preexisting left atrial thrombus, and no thrombus can be identified before cardioversion, then anticoagulation can be shortened or eliminated. In our experience, these initial studies were performed in patients for a variety of reasons, including 1) contraindication to anticoagulation; 2) need to shorten the anticoagulation course; 3) inadequate duration or extent of anticoagulation; or 4) poor documentation of anticoagulation status.

Several studies (6–10) have established the feasibility and safety of this approach. Over 200 patients were examined by transesophageal echocardiography before cardioversion, thrombus was excluded, and cardioversion was performed without a subsequent embolic event. These observations led to enthusiasm for more widespread utilization of the technique. However, several cautionary notes were quickly sounded. Transesophageal echocardiographic studies by Grimm et al. (11) and Fatkin et al. (12) of patients undergoing electrical cardioversion demonstrated worsened atrial function and in many cases the development or worsening of atrial smoke, a marker for thromboembolic risk. This raised the possibility that left atrial appendage thrombi may develop after electrical cardioversion in the milieu of a "stunned" atrium and subsequently embolize. These observations, in conjunction with case reports (13) of patients without anticoagulation who had embolic events after cardioversion even with negative transesophageal echocardiographic findings, made it clear that some degree of anticoagulation in the pericardioversion period would be necessary to eliminate embolization.
The present study. In this issue of the Journal, Manning et al. (14) report their findings utilizing transesophageal echocardiography to facilitate cardioversion of atrial fibrillation in 230 hospitalized patients. Their study includes the 94 patients from their earlier report (9). Patients were selected for the transesophageal echocardiographic approach if they had atrial fibrillation >2 days in duration or of unknown duration. All but 22 had anticoagulation with intravenous heparin/warfarin. Thrombi were detected by transesophageal echocardiography in 15% of those screened, and cardioversion was deferred. Of the remaining 186 patients, chemical cardioversion was successful in 54% and electrical cardioversion in 46%. After successful cardioversion, all patients were treated with warfarin for 4 weeks, and no thromboembolic events were reported at 3 to 4 weeks of follow-up.

The additional patients in the Manning et al. (14) study add to the body of evidence that transesophageal echocardiographic screening before cardioversion of atrial fibrillation is a safe and effective alternative to standard anticoagulant therapy for 3 weeks. Manning et al. appropriately emphasize several key features of this approach: 1) the need for therapeutic heparinization followed by warfarin anticoagulation in the pericardioversion period. Although 22 patients with physician-perceived contraindications to heparin safely underwent cardioversion, this approach cannot be recommended routinely.

2) Exclusion of patients receiving long-term (>3 weeks) anticoagulation. The low risk of embolic events in these patients makes transesophageal echocardiographic screening cost-ineffective.

3) Utilization of multiplane transesophageal echocardiographic probes by experienced operators. Although 50 patients were screened by single-plane probes, we believe that biplane and multiplane probes allow much greater confidence in detecting smaller atrial appendage thrombi and that 110° to 130° planes obtainable by multiplane probes in particular aid in discriminating between pectinate muscles and thrombus. In addition, this approach can only be recommended when the transesophageal echocardiographic probe is in the hands of a very skilled and experienced operator who has performed >100 transesophageal echocardiographic studies.

However, as can be expected, there are still many uncertainties regarding anticoagulation in the pericardioversion period:

1) How long should warfarin therapy be continued? Manning et al. (14) continued warfarin therapy for 3 (according to their algorithm) or 4 weeks (according to their text) after cardioversion on the basis of their previous observations that atrial function may not return to normal for as long as 4 weeks. However, it is possible that return of, for example, 25% of atrial function seen at 24 h after cardioversion is adequate to prevent thrombus formation and thus eliminate the need for posthospital warfarin therapy altogether.

2) Is it a cost-effective approach? Although on the surface the transesophageal echocardiography-guided approach would appear to be more efficient and cost-effective, this is not necessarily the case. For example, one relatively hidden cost to the transesophageal echocardiography-guided approach to cardioversion is the discovery of previously undiagnosed atrial thrombi in 10% to 20% of patients. There are two possible approaches to the management of these patients. The first would be to give anticoagulation for 3 weeks and then proceed to cardioversion with the assumption that any residual clot has been safely endothelialized, minimizing its potential for dislodgment and embolization. However, we and other investigators (6) have seen cases where 3 weeks of anticoagulation not only failed to eliminate or endothelialize left atrial clots, but appeared to convert them to a higher risk appearance.

The second approach to the thrombus would be to give the patient anticoagulation and repeat the transesophageal echocardiography at an arbitrary time (3 to 6 weeks) later. However, this adds considerable cost and delay to the transesophageal echocardiography-guided approach.

3) Is it safer or as safe as the conventional approach? Manning et al. (14) believe that the additional 140 patients included in their present study, which also includes the 94 patients from their previously published study (9), “validate the safety of this strategy” and show that the approach has “a proved safety profile equal to conventional therapy.” Unfortunately, without a randomized simultaneous comparison group undergoing the conventional approach, this statement cannot be justified. Given the infrequency of embolic events, statistical power calculations indicate at least 2,800 patients are needed to prove comparative safety (Klein A, personal communication, February 1995). The majority of patients in the present study underwent chemical cardioversion, which may have a less “stunning” effect on the atrium than electrical cardioversion. In addition, it is not clear how long patients received anticoagulation before successful chemical cardioversion. A prolonged (36 to 72 h) precardioversion infusion of heparin in the patients undergoing chemical cardioversion may have substantially reduced their embolic risk compared with those undergoing immediate electrical cardioversion.

The real solution. An ongoing prospective, randomized and controlled multicenter trial entitled the Assessment of Cardioversion Using Transesophageal Echocardiography (ACUTE) is currently under way to address these questions. The results of the pilot study in 123 patients indicated the safety and feasibility of this study and the transesophageal echocardiographic approach, and a preliminary assessment suggests that a transesophageal echocardiography-guided approach may be 39% more cost-effective than conventional therapy (15). Patient enrollment in this study has been good, but several interesting obstacles have been encountered. At many centers, like our own, the transesophageal echocardiography-guided approach has been accepted as the preferred approach to the patient with new-onset atrial fibrillation, shortening the need for anticoagulation and eliminating readmission to the hospital. Thus, some physicians are unwilling to accept the prospect of their patient not being randomized to the transesophageal echocardiography arm. In other centers, where there is less transesophageal echocardiographic expertise or experience with this approach, physicians may be unwilling to submit their patients to an
unproved approach. These difficulties only serve to emphasize the need to truly resolve the question.

Clinical approach. Several recommendations can be made regarding the use of transesophageal echocardiography to guide cardioversion of atrial fibrillation based on the present study and the previous body of work in this area. We would strongly recommend that physicians practicing at institutions participating in the ACUTE trial make every effort to enroll patients in the study. The organized collection of data from a large series of patients will add greatly to our clinical knowledge as well as give great insight into the pathophysiology of left atrial thrombus and atrial thromboembolic disorders. For patients not enrolled in the ACUTE study, clinicians will have to choose the precardioversion approach that best suits their individual patient's special circumstances.

References