

Cardioversion of atrial arrhythmias: audit of anticoagulation management

ABSTRACT – Patients undergoing cardioversion for chronic atrial fibrillation should receive anticoagulation for three weeks before and four weeks after the procedure. Patients with atrial flutter and acute atrial fibrillation are also at risk of thromboembolic complications, so they too should be anticoagulated for cardioversion. Of the 36 acutely admitted patients who were cardioverted, 18 were in atrial fibrillation and 18 in atrial flutter. All except three of those in fibrillation were anticoagulated with heparin before cardioversion, but only seven received warfarin after cardioversion. Of those in flutter, 10 received heparin and eight received no anticoagulation before cardioversion. One patient underwent transoesophageal echocardiography before cardioversion to exclude atrial thrombi. Only two patients received warfarin for a month after cardioversion. Of the 20 elective cardioversions, 10 were in atrial fibrillation and 10 in atrial flutter. Five of those in fibrillation had received at least three weeks' treatment with warfarin before cardioversion and two underwent transoesophageal echocardiography; the other three received either up to two hours of heparin or no anticoagulation before cardioversion. Only five patients received warfarin for a month after cardioversion. Nine of those in flutter received a few hours of heparin before cardioversion and one was not anticoagulated; none underwent transoesophageal echocardiography or received warfarin after cardioversion. The results of this audit demonstrate that anticoagulation for atrial arrhythmias was inconsistent and often inadequate. A formal anticoagulation policy for cardioversion has now been adopted.

Electrical cardioversion of atrial fibrillation can be complicated by thromboembolism¹⁻⁶. The risk of this can be reduced by anticoagulation⁶. Based on current evidence, it is recommended that when patients who have been in atrial fibrillation for more than two days undergo electrical cardioversion, they should receive warfarin for three weeks before the procedure and continue on it until normal sinus rhythm has been maintained for four weeks¹. It is less clear whether anticoagulation is required for patients who have been in atrial fibrillation for less than two days. It has been assumed that it takes at least 48 hours for atrial thrombus to form, so anticoagulation before cardioversion may not be needed in these patients¹. However, there

is recent evidence of high prevalence (14%) of atrial thrombus in patients with atrial fibrillation for less than three days⁷. There is also some concern that the effect of cardioversion itself may increase the likelihood of atrial thrombus formation⁸. Patients may therefore be at risk of developing atrial thrombus with subsequent embolisation even when no such thrombus exists at the time of cardioversion. All studies suggesting that cardioversion may result in thrombus formation have been carried out in patients with chronic atrial fibrillation. It is less clear whether patients who have been in atrial fibrillation for a short time also have a greater propensity for thrombus formation after cardioversion. However, based on available evidence, it seems prudent to give heparin to patients presenting acutely with atrial fibrillation to prevent atrial thrombus forming in case they require cardioversion. Alternatively, transoesophageal echocardiography to detect atrial thrombi could be performed as a screening test: if patients are then cardioverted this should be followed up by four weeks of anticoagulation to prevent late thrombus formation⁹.

Should patients with atrial flutter also be given anticoagulants for cardioversion? It has been suggested that they are at low risk of developing atrial thrombus¹⁰ because of the synchronised atrial contraction that occurs in atrial flutter, but few studies to test this possibility have been carried out. Those that have been done, although reporting no thromboembolic complication, were on small numbers of patients¹⁰. It is worrying that transoesophageal echocardiographic studies have demonstrated a high prevalence of either thrombus or spontaneous echo contrast (indicating a high risk of developing thrombus) in patients with atrial flutter. In one study, one of eight patients in atrial flutter had atrial thrombus and two had atrial spontaneous echo contrast¹¹. In another study of seven patients, one had atrial thrombus and three spontaneous contrast¹². In view of these findings, we recommend that the anticoagulation management for cardioversion of atrial flutter be similar to that for atrial fibrillation.

Having defined our criteria for optimal standards of practice for the anticoagulation management for the electrical cardioversion of atrial fibrillation and flutter, we audited the actual practice in our institution.

Methods

Hillingdon hospital is a district general hospital serving a population of approximately 155,000. All

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electrical cardioversions are performed on the coronary care unit, and strict records are kept of all admissions to the unit and the reasons for admission. Records of those with a pre-cardioversion rhythm of atrial fibrillation or atrial flutter were examined. The anticoagulant regimen prescribed before and after cardioversion was noted and also whether the patient underwent pre-cardioversion transoesophageal echocardiography.

Results

There were 56 electrical cardioversions for atrial fibrillation or flutter during the audit period. All but six were successful. No patient suffered a thromboembolic event. All case records were retrievable and reviewed. Three patients had two cardioversions on different occasions during the year: these have been treated as separate procedures. No patient had contraindications to anticoagulation. Thirty-six cardioversions were done as a consequence of an acute presentation with an atrial arrhythmia, while 20 were elective admissions for electrical cardioversion.

Of the 36 patients admitted acutely who were cardioverted, 18 were in atrial fibrillation and 18 in

atrial flutter. It was not always possible to assess clinically the onset of arrhythmia but in the vast majority of cases this was almost certainly within 48 hours of presentation. Of those in fibrillation (Fig. 1(a)), one patient was haemodynamically unstable and so was immediately cardioverted without prior anticoagulation; all but two of the others were anticoagulated with heparin prior to cardioversion although two further patients received a bolus of heparin rather than an infusion immediately before cardioversion. The interval between presentation and start of the heparin infusion was variable. No patient underwent transoesophageal echocardiography before cardioversion to exclude atrial thrombi; only seven received warfarin after cardioversion. Of those in flutter (Fig. 1(b)), 10 received heparin and eight no anticoagulation before cardioversion. One patient underwent transoesophageal echocardiography before cardioversion. Only two patients received warfarin for a month after cardioversion.

Ten of the 20 elective cardioversions were in atrial fibrillation and 10 in atrial flutter. Of those in fibrillation (Fig. 1(c)), five had received at least three weeks' treatment with warfarin before cardioversion and two underwent transoesophageal echocardiography; the

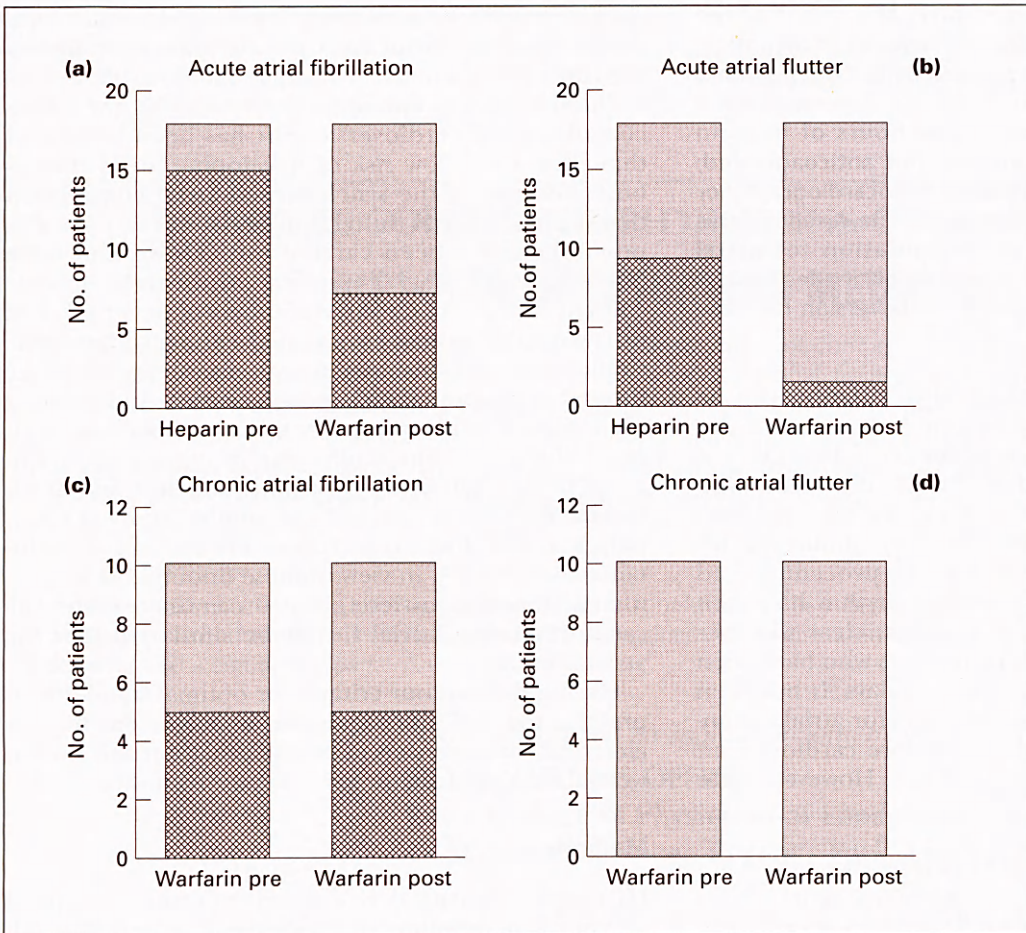


Fig. 1. Anticoagulation usage pre- and post-cardioversion of atrial arrhythmias: (a) acute atrial fibrillation; (b) acute atrial flutter; (c) chronic atrial fibrillation; (d) chronic atrial flutter (⊗ yes; ■ no). One patient cardioverted for acutely presenting atrial flutter and two for chronic atrial fibrillation (none of whom had received pre-cardioversion anticoagulation) underwent transoesophageal echocardiography before cardioversion. No atrial thrombus was visualised.

other three received either up to two hours of heparin or no anticoagulation prior to cardioversion. Only five patients received warfarin for a month after cardioversion. Nine of those in flutter (Fig. 1(d)) received a few hours of heparin before cardioversion and one was not anticoagulated; none underwent transoesophageal echocardiography or received warfarin after cardioversion.

Discussion

This audit demonstrates that anticoagulation for atrial arrhythmias was inconsistent and in general inadequate. For electric cardioversion of chronic atrial fibrillation we would consider either three weeks of warfarin therapy or a negative transoesophageal echocardiogram (ie demonstrating no atrial thrombus) as mandatory before cardioversion. In addition, patients should be anticoagulated for at least four weeks after reversion to sinus rhythm. Applying these guidelines to the 10 patients who underwent cardioversion for atrial fibrillation, three of them received inadequate anticoagulation before cardioversion and five after cardioversion.

The evidence for anticoagulation is less clear for the cardioversion of acutely presenting atrial fibrillation. The assumption that patients presenting within 48 hours of the onset of this arrhythmia are unlikely to have developed thrombus¹ has recently been shown to be incorrect⁷. It is our opinion that such patients should have transoesophageal echocardiography prior to cardioversion to attempt to exclude atrial thrombus, or at least receive intravenous heparin from the time of presentation. Alternatively, cardioversion should be delayed until the patient has had three weeks of adequate warfarin therapy. An additional problem is the exact timing of the beginning of atrial arrhythmia. It is also arguable whether these patients require post-cardioversion warfarin, since the time of recovery of the atria from stunning (and hence the time during which they are presumably more likely to develop thrombus) is related to the length of time the patient has been in atrial fibrillation¹³. Until further studies on this issue are completed, we would advocate that the standard four weeks of warfarin therapy be given.

If these recommendations are accepted, at least four of our 18 patients presenting acutely with atrial fibrillation had inadequate pre-cardioversion anticoagulation: two had none, and two were given a bolus of heparin immediately before the procedure, rather than an infusion starting on admission – this is probably an underestimate since there was often a delay from admission to the start of the heparin infusion. One further patient had no pre-cardioversion anticoagulation, but was immediately cardioverted because she was haemodynamically unstable. Eleven patients received inadequate post-cardioversion anticoagulation.

The anticoagulant recommendations for cardio-

version of patients with atrial flutter are more difficult since there is little guidance in the literature. Because of the significant rate of either atrial thrombus or spontaneous echo contrast demonstrated by transoesophageal echocardiographic studies in patients with atrial flutter^{11,12}, it is our opinion that they should follow the same anticoagulant protocols as those with atrial fibrillation. If this recommendation is accepted seven of the 18 patients presenting acutely with atrial flutter received inadequate anticoagulation before cardioversion (one had a negative pre-procedure transoesophageal echo), and 16 received inadequate post-cardioversion treatment. Of the 10 patients electively admitted for cardioversion of atrial flutter, none received adequate anticoagulation either before or after the procedure.

As a result of this audit, the following protocol has been introduced for anticoagulation for cardioversion of atrial arrhythmias (in patients without special risk of haemorrhage):

- 1 Elective cases for cardioversion of atrial fibrillation or atrial flutter should be anticoagulated for three weeks with warfarin before cardioversion and for one month afterwards.
- 2 Acutely presenting cases of atrial fibrillation or atrial flutter should be anticoagulated on presentation with intravenous heparin. If they do not spontaneously revert to sinus rhythm and electrical cardioversion is contemplated, consideration should be given to pre-procedure transoesophageal echocardiography to exclude atrial thrombus. Warfarin should be started after cardioversion and continued for one month. Heparin should be continued until the international normalised ratio (INR) is 2 or above.

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