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ORIGINAL ARTICLE

Elective Cardioversion in the Era of Novel Oral Anticoagulants – Does a Nurse Administered Verbal Questionnaire for Compliance Negate the Need for Routine Transoesophageal Echocardiography?

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Background Anticoagulation prior to elective external direct current cardioversion (EDCCV) is mandatory. The inability to monitor compliance with novel oral anticoagulants (NOACs) raises a potential safety issue. We aimed to evaluate whether a structured, nurse-led assessment of compliance prior to EDCCV ensures safety without the need for routine transoesophageal echocardiography (TOE).

Methods Data was prospectively collected on consecutive patients undergoing EDCCV during 2014–2015. All procedures were supervised by an electrophysiology clinical nurse consultant (EPCNC). Drug compliance was verbally assessed using a standardised questionnaire by the EPCNC. Novel oral anticoagulants compliance was required for a continuous period of 3 weeks prior to EDCCV; otherwise a TOE-guided EDDCV was performed. All patients had follow-up 30 days post-procedure.

Results Three hundred and eleven cardioversions were performed on 256 patients in whom 154 (49.5%) were prescribed a NOAC (rivaroxaban (n = 105; 68.2%), dabigatran (n = 38; 24.7%), apixaban (n = 11; 7.1%)). Median age was 63 yrs (24–94 yrs), mean $CHADS_2$-Vasc score was 2.0 ± 1.5 and 138 (89.6%) were outpatients. One hundred and twenty-nine (83.8%) EDCCV were for atrial fibrillation and 25 (16.2%) for atrial flutter. Sinus rhythm was achieved in 90.3% of cases. Fourteen patients (9%) assessed as non-compliant underwent TOE. 129 (83.8%) EDCCV were performed without prior TOE. No stroke or systemic embolism was identified in any patient treated with either warfarin or a NOAC.

Conclusions A standardised, verbal questionnaire can be administered to detect NOAC non-compliance in patients undergoing EDCCV. With appropriate compliance assessment a nurse-led EDCCV without routine TOE did not significantly compromise safety in this study group.

Keywords Compliance • External cardioversion • Atrial fibrillation • Novel oral anticoagulants • Warfarin

Abbreviations: EDCCV, External direct current cardioversion; NOAC, Novel oral anticoagulant; TOE, Transoesophageal echocardiogram; SSE, Stroke or systemic embolism; EPCNC, Electrophysiology clinical nurse consultant

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Introduction

Atrial fibrillation is the commonest cardiac arrhythmia and affects up to 5% of the population [1]. Patients with atrial fibrillation have an increased rate of stroke and systemic embolism (SSE), greater mortality and impaired quality of life [2,3]. Although there are a number of management modalities for AF, external direct current cardioversion (EDCCV) is a proven, safe and effective way of restoring sinus rhythm when a rhythm control strategy is adopted [4]. Anticoagulation is recommended before and after EDCCV to reduce the risk of thromboembolism which has been reported in up to 6% of early cohorts [5].

Traditionally, warfarin has been the only effective peri-procedural anticoagulant and is administered for a minimum of 3 weeks preceeding and 4 weeks following cardioversion. International normalised ratio (INR) monitoring is mandatory as a sub-therapeutic INR predisposes patients to SSE [6]. In the era of exclusive warfarin usage for anticoagulation we have demonstrated a nurse-led service cardioversion service is safe and effective and includes ensuring therapeutic INR levels [7]. With the advent of novel oral anticoagulant (NOAC) medications, it is likely that EDDCV will increasingly occur on these new agents.

Monitoring of drug levels has not been recommended for NOACs and, given their relatively short half-life, there is concern about patient compliance with the possible adverse outcome of EDCCV [8]. Suboptimal compliance could increase the peri-procedural risk of consequent stroke or systemic embolism. This has raised an issue as to whether routine TOE should be performed in all EDCCV in patients on NOAC to detect LAA thrombus and thereby reduce the possibility of SSE. Current guidelines do not mandate the requirement for TOE but suggest it should be an individual decision and in some centres it is performed in all patients on NOACs [8,9].

We analysed data from our database to determine whether reliance on verbal assessment of compliance with a standardised set of questions for each patient allows EDCCV in patients on NOACs to be safely performed without routine TOE.

Material and Methods

We prospectively entered information into a database for all patients undergoing EDCCV at our institution from 2006 onwards. Data between 2014 and 2015 has been reviewed as the use of NOACs had increased significantly amongst patients referred for EDCCV. All information was de-identified prior to analysis. The establishment and protocol of our nurse led cardioversion service has been described in detail previously [7]. Patient data was prospectively entered into a database including: age, sex, presenting rhythm, outpatient or inpatient status, left atrial diameter, left ventricular ejection fraction, preceding TOE, number of shocks undertaken and total energy delivered, achievement of sinus rhythm and immediate complications such as arrhythmias and thromboembolism. Anti-arrhythmic medication and type of anticoagulant were also recorded. The CHADS2-Vasc score of each patient was retrospectively collected from the patient's medical record. Patients were referred for EDCCV at the discretion of the treating cardiologist. All patients were anticoagulated for a minimum of 3 weeks prior and 4 weeks following EDCCV.

Assessment of NOAC Compliance

The EPCNC contacted all patients by telephone following referral and conducted education about the procedure and structured assessment of medication compliance (Figure 1). This four-item questionnaire was constructed with anticoagulants specifically in mind but resembles other validated scales such as the Morisky medication adherence scale [10]. On the day of procedure, compliance with anticoagulation was again verbally assessed with the same standardised questionnaire and was documented in the medical records. Non-compliance was determined as disclosure of a single missed anticoagulant dose in the last 3 weeks, frequent (once per week or more) missed doses of any medication or sufficient clinical suspicion of the above. Documented evidence of INR >2.0 for 3 weeks was mandatory for patients on warfarin. Transoesophageal echocardiography (TOE) was performed for cases where there was non-compliance, sub-therapeutic INR (<2.0) or inadequate duration of anticoagulation.

All cardioversions were performed in the post-anaesthetic care unit or cardiac catheter laboratory in the presence of a trained anaesthetist administering brief, procedural sedation [7]. Cardioversion was performed using adhesive electrode pads (Philips Heartstart XL) oriented anteroposteriorly. All procedures utilised biphasic R-wave synchronised direct current defibrillation at 200 joules (Heartstart XL, PHILIPS, Amsterdam, Netherlands). A maximum of three attempts at cardioversion were made unless otherwise specified by the EPCNC or treating cardiologist. In cases where a permanent pacemaker or implanted cardioverter defibrillator was present a cardiologist attended to alter device programming as required.

Successful EDCCV was defined as persistence of sinus rhythm over at least 30 minutes of continuous cardiac monitoring following delivery of the successful shock. Thereafter, patients were transferred to the post-surgical unit for a further 90 minutes of observation without ECG monitoring. Patients were discharged 4 hours post-EDCCV. The nurse specialist was the first point of call for any issues during this period. Changes to medication on discharge, or concerns with the safety of discharge, were raised with a member of the treating cardiology team.

Patient Follow-Up

All patients were reviewed by their treating cardiologist in a clinic 1 month after the procedure or, in cases of great

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