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Current periprocedural management of ablation for atrial fibrillation in Europe: results of the European Heart Rhythm Association survey

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The purpose of this EP Wire survey was to assess clinical practice in periprocedural management of atrial fibrillation ablation. This survey is based on an electronic questionnaire sent to the European Heart Rhythm Association Research Network members. Responses were received from 78 centres in 20 countries. The results of the survey have shown that periprocedural management is generally in accordance with guidelines and consensus recommendations on ablation for atrial fibrillation ablation, although there are some areas of variation. Differences between high- and low-volume centres are observed with respect to patient selection, antiarrhythmic drug management, and heparin bridging.

Keywords Atrial fibrillation • Ablation • Periprocedural management • Anticoagulation • EHRA survey • EP wire

Introduction

Catheter ablation is widely employed in treatment of atrial fibrillation (AF). Ablation techniques, indications, and long-term clinical results have been investigated. Procedure-related complications in various groups of patients have also been well described.[1] Contemporary guidelines have clarified different aspects of the clinical management of the AF ablation procedures, to improve efficacy, safety, and reduce the risks of periprocedural complications.[1–3] However, with the introduction of the new anticoagulants combined with new techniques and technologies for catheter ablation, we need to understand how routine clinical practice has evolved. Clinical guidelines are not always fully implemented into practice[4] and rarely cover every eventuality that can be encountered in clinical practice.

The purpose of this European Heart Rhythm Association (EHRA) Electrophysiology (EP) wire survey was to assess the routine European clinical practice in periprocedural management of AF ablation. We also aimed to investigate differences in practice among centres with different patient volume.

Methods and results

This survey is based on an electronic questionnaire sent out to the EHRA Research Network. Responses were received from 78 centres in 20 countries and of these, 87.2% were university hospitals, 1.3% private hospitals, and 11.5% other type of hospital. Four blank submissions were excluded from analysis. Ten centres (13.5%) performed ≥400 AF ablation procedures per year, 23 (31.1%) performed 200–399, 16 (21.6%) 100–199, and 23 (31.1%) centres 1–99 procedures per year, respectively. Two centres (2.7%) performed no AF ablation.

A χ^2 test and Fisher's exact test were used to compare categorical variables. A $P < 0.05$ was considered to be statistically significant.

Pre-procedural management

The principal factors in deciding on ablation in AF patients are: the presence or absence of symptoms (90.5% of centres), age (79.7%), left atrial diameter or volume (78.4%), type of AF (67.6%), and left ventricular ejection fraction (35.1%). Other factors, such as

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Table 1 Management of periprocedural anticoagulation for atrial fibrillation ablation

Pre-procedural oral VKA administration	
Not necessarily in patients with low $CHADS_2$ or CHA_2DS_2VASC score	16 (21.6%)
>3 weeks	24 (32.4%)
>4 weeks	30 (40.6%)
>6 weeks	4 (5.4%)
VKA management prior to ablation procedure	
Discontinued with LMW heparin bridging	20 (27.0%)
Not discontinued	53 (71.6%)
Discontinued without LMW heparin bridging	1 (1.4%)
NOAC management prior to ablation if used	
Continue NOAC through the ablation procedure	1 (1.4%)
Stop NOAC and change to VKA for at least 3 weeks	8 (11.1%)
Continue NOAC until 12–24 h before ablation procedure	35 (48.6%)
Continue NOAC until >24 h before ablation procedure	13 (18.1%)
Stop NOAC 48 h before ablation procedure and use LMW heparin bridging	8 (11.1%)
Do not use NOAC	7 (9.7%)
Heparin administration during ablation procedure	
First loading dose given before transseptal puncture	13 (18.1%)
First loading dose given after transseptal puncture	50 (69.4%)
First loading dose partly before and partly after transseptal puncture	9 (12.5%)
Anticoagulation therapy post-ablation procedure	
LMW heparin bridging is used routinely	19 (26.4%)
LMW heparin bridging is not routinely used, patients continue oral VKA immediately after procedure	18 (25.0%)
LMW heparin bridging is not routinely used, patients continue oral VKA through ablation procedure	34 (47.2%)
Other strategy	1 (1.4%)

LMW, low-molecular-weight; NOAC, novel oral anticoagulant; VKA, vitamin K antagonist.

comorbidity, obesity, contraindications to anticoagulation, and patient's preference are also considered by 18 (24.3%) centres.

To qualify for AF ablation, 47 (63.5%) centres required that patients should be refractory to or intolerant of ≥1 antiarrhythmic drug before AF ablation, ≥2 in 11 (14.9%), and ≥3 in 1 centre (1.3%). Ablation for AF as first-line therapy without failing an antiarrhythmic drug is accepted in 15 (20.3%) centres. Antiarrhythmic drugs are usually discontinued prior to the ablation procedure in 29 (39.2%), and continued in the remaining centres (60.8%).

Pre-procedural transoesophageal echocardiography (TEE) is performed routinely in all patients in 45 (60.8%) centres, performed only in patients with high $CHADS_2$ or CHA_2DS_2VASC score in 10 (13.5%), patients with *international normalized ratio* (INR) values outside the therapeutic range in 22 (29.7%), and patients with persistent AF in 9 (12.2%). Four (5.4%) centres do not routinely perform TEE.

In patients treated with oral anticoagulation, the use of vitamin K antagonist (VKA) prior to AF ablation procedure is a strategy followed by all centres. Management of VKA and low-molecular-weight heparin (LMWH) bridging is shown in *Table 1*. If INR is <2.0 prior to the ablation procedure, several strategies are used: postponing ablation procedure in 14 (18.9%), bridging with LMWH in 23 (31.1%), or performing TEE in 53 (71.6%). Other strategies decided on a case-by-case basis are employed in eight (10.8%). The upper INR limit that can be accepted for AF ablation procedure varies significantly: 2.5 in 21 (28.4%), 3.0 in16 (21.6%), and 3.5 in 31 (41.9%). No upper limit is applied in six (8.1%) centres. If INR is higher than the specific institution's upper limit prior to ablation, several strategies are optionally applied: postponing the procedure in 51 (68.9%); administrating intravenous vitamin K in 19 (25.7%) or plasma in 3 (4.1%). Other strategies have been employed in six (8.1%) based on the clinical situation.

If a novel oral anticoagulation drug (NOAC) is used, the management of pre-procedural anticoagulation varies among the respondents (*Table 1*). The majority (92.3%) of the centres have experience with NOACs. Similar to the situation when VKA is used, TEE is performed routinely in all patients prior to AF ablation procedure in 39 (54.2%) centres, performed only in patients with high $CHADS_2$ or CHA_2DS_2-VASC score in 8 (11.1%), and in patients with persistent AF in 8 (11.1%). Transoesophageal echocardiography is not performed at all in 13 (18.1%) centres. Other strategies have been employed in two (2.8%). The remaining centres do not use NOACs.

Computed tomography (CT) or magnetic resonance imaging (MRI) are routinely performed prior to AF ablation procedure in 30 (41.7%), occasionally in 29 (40.3%), and not at all in 13 (18.0%) centres.

Management during the atrial fibrillation ablation procedure

Ablation for AF is mostly performed under light sedation in 54 (76.1%) centres and routinely under general anaesthesia in 17 (23.9%). If no patent foramen ovale is present, a single transseptal puncture is performed no matter how many catheters are introduced

to the left atrium in 33 (45.2%), multiple punctures in 26 (35.6%), both techniques in 12 (16.4%), and others techniques in 2 (2.7%). Transseptal puncture is performed with the guidance of intracardiac echocardiography or TEE routinely in 12 (16.7%), only in difficult cases in 42 (58.3%), and not at all in 18 (25.0%) centres.

Heparin is used during AF ablation procedure in all the centres. The timepoint of the first loading dose of heparin among the centres is shown in *Table 1*. Activated clotting time (ACT) is monitored during AF ablation procedure routinely in 63 (88.7%), occasionally in 5 (7.1%), and not controlled in 3 (4.2%). If ACT is monitored, a value of >250, >300, and >350 s is employed as a standard target in 14 (19.7%), 49 (69.0%), and 8 (11.3%), respectively.

To prevent atrio-oesophageal fistula, oesophageal temperature monitoring is employed during ablation routinely in 11 (15.5%), occasionally in 15 (21.1%), and not at all in 45 (63.4%). Power setting of radiofrequency energy in the left atrial posterior wall is <25 W in 19 (26.8%), 25–30 W in 34 (47.9%), 30–35 W in 16 (22.5%), and >35 W in 1 (1.4%). One centre (1.4%) uses an alternative energy source.

Post-procedural management

Anticoagulation therapy post ablation is shown in *Table 1*. The majority of centres continue oral VKA through ablation procedure without LMWH bridging.

To exclude procedure-related complications, CT or MRI imaging is performed after AF ablation procedure routinely in 3 (4.2%), occasionally in 7 (9.9%), only when patients have symptoms in 48 (67.6%), and not performed in 13 (18.3%).

After ablation, patients are followed for 3–6 months in 19 (26.8%), 6–9 months in no centre, 9–12 months in 18 (25.3%), and >12 months in 34 (47.9%). Recurrence of AF is routinely screened with a 12-lead electrocardiogram (ECG) in 47 (66.2%) centres, 1-day or 7-day Holter monitoring in 55 (77.5%) (with both 12-lead ECG and Holter monitoring in 33), transtelephonic ECG monitoring in 1 (1.4%), and implantable loop recorders in 4 (5.6%).

Aantiarrhythmic drugs are discontinued immediately after ablation in 9 (12.7%), after 3–6 months in 54 (76.1%), 6–12 months in 6 (8.4%), and only after >12 months in 2 (2.8%) if there is no evidence of AF recurrence. Discontinuation of oral anticoagulants is considered based only on risk factors of stroke ($CHADS_2$ or CHA_2DS_2-VASC scores) in 26 (36.6%), based only on the clinical results of ablation only in none, based on both the risk factors and clinical results in 26 (36.6%), and based on the risk factors, clinical results, and patient preference in 19 (26.8%) centres.

Differences with regard to patient selection, management of antiarrhythmic drugs, heparin bridging, and upper limits of INR are observed among centres with different patient volume (*Table 2*). No differences are found with respect to other periprocedural practices.

Table 2 Comparison of periprocedural management for atrial fibrillation ablation among different volume centres

	Extremely high-volume centre >400/year (*n* = 10)	High-volume centre 200–399/year (*n* = 23)	Medium-volume centre 100–199/year (*n* = 16)	Low-volume centre 1–99/year (*n* = 23)
Atrial fibrillation ablation accepted as a first-line therapy without failing an antiarrhythmic drug	30.0%†	39.1%‡	18.8%	4.3%
Antiarrhythmic drugs discontinued before ablation procedure	70.0%†	43.5%	31.3%	26.1%
Upper limit of INR before ablation procedure 2.5	0%†	13.0%†	37.5%	43.5%
≥3.0 (or no limit)	100%†	87.0%†	62.5%	56.5%
Heparin bridging NOT used before ablation procedure	100%‡	92.3%‡	68.7%	43.5%
Heparin bridging NOT used after ablation procedure	100%‡	91.3%‡	68.7%	50.0%

†$P < 0.05$, ‡$P < 0.01$ compared with the low-volume centre.

Discussion

The AF guidelines have highlighted the importance of symptoms, stage of atrial disease (i.e. AF type, left atrial size, and AF history), the presence and severity of comorbidities, as well as age and patient preferences.[1–3] Most centres are in line with the guidelines and take into account the presence of symptoms, age, and left atrial dimension/volume. The type of AF and left ventricular ejection fraction are considered less important issues probably because AF

ablation has been widely employed to treat different types of AF, and heart failure related to AF can be improved after successful ablation. Interestingly, one-fifth of the centres accept catheter ablation as first-line therapy for AF. As stated in the updated guidelines, catheter ablation is recommended as first-line therapy in selected patients with paroxysmal AF and no structural heart disease.[3]

Over 60% of the centres perform TEE routinely in all patients undergoing AF ablation and the others employ clinical judgement and decide on a case-by-case basis whether to perform a TEE. This choice is similar to that expressed in the expert consensus statement.[1] Three weeks of systemic anticoagulation at a therapeutic level are recommended prior to the procedure. However, many respondents are sceptical about this short duration, and 46% chose to use VKA for more than 4 weeks.

It has been recognized that heparin bridging after oral VKA discontinuation prior to the ablation procedure resulted in a high incidence of bleeding complications, and a new approach of performing AF ablation procedures under uninterrupted VKA and INRs within therapeutic range.[1] This survey shows that over 70% of the centres have adopted this approach, while the rest use the bridging approach. The pre-procedural management, including discontinuation or bridging and TEE utilization, varies significantly if NOACs is used, probably because of the variable results of clinical trials of NOACs and limited experience in the periprocedural setting.[3,5,6] Although counter-intuitive, stroke risk may be slightly increased, according to the initial reports. In this survey, more than half the centres have experience with performing AF ablation procedures on NOACs. However, how the respondents choose NOACs before AF ablation and when they restart NOACs after the procedure was not investigated in this survey. These were partly presented in the previous EP wire survey.[7]

Different techniques are employed during AF ablation procedures, including echo guidance of transseptal puncture, methods of introducing catheters to the left atrium, and administration of the loading dose of heparin. Interestingly, few centres in Europe perform routinely intracardiac echocardiography or TEE for guidance of transseptal puncture. The majority of the respondents do not routinely employ general anaesthesia or oesophageal temperature monitoring. This differs from the consensus statement, but is similar to the result of the previous EP wire survey.[8] Most respondents, however, reduce the output of radiofrequency energy on the posterior wall, and in a sedated patient retain the ability to have feedback from the patient.

Although the follow-up period varies, most centres follow patients at least 12 months. Screening for AF recurrence is mainly based on 12-lead ECGs and Holter monitoring, even though new techniques such as transtelephonic ECG monitoring and implantable loop recorders have been introduced to clinical practice. Most respondents would discontinue antiarrhythmic drugs 3–6 months after successful AF ablation. We found some variations in how and when a patient was evaluated for discontinuation of oral anticoagulation. The consensus recommendations have highlighted that this assessment should be made more than 2 months following ablation based on risk factors for stroke but not on the presence or type of AF.[1] However, clinical success and patient preferences during long-term follow-up play an important role in this process. This requires more clear statements in a new guideline based upon new data from clinical trials.

Differences in practices were found with regard to the indication for AF ablation, antiarrhythmic drug management, and heparin bridging application between high- and low-volume centres. Low-volume centres are more cautious in the periprocedural management of AF ablation procedure, with lower INR cut-offs and less frequent discontinuation of antiarrhythmic drugs pre-procedure. There is little data available regarding the impact of the volume of centres on the safety of AF ablation, with significant complications occurring even in extremely high-volume centres.[9–11]

Conclusion

In conclusion, the results of this survey show variations in clinical practices, but also the adherence to guidelines and consensus recommendations on the periprocedural management of AF ablation. Differences in practices between high- and low-volume centres are observed.

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