

## SHORT COMMUNICATION

## Importance of echocardiography in atrial fibrillation

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### Abstract

**Echocardiography influences at present in decisive manner therapeutic approach to atrial fibrillation (AF). The paper discusses current knowledge regarding the role of echocardiography in routine management of cardioversion for AF and regarding the echocardiographic prediction of: 1. the thromboembolism in AF, 2. the efficiency of cardioversion for AF, 3. the maintenance of sinus rhythm after successful cardioversion for AF. The advantage of TEE-guided cardioversion is particularly emphasized.**  
*(Short communication)*

The risk of atrial fibrillation (AF) resides on thromboembolic complications and hemodynamic consequences of bradyarrhythmia and tachyarrhythmia. Echocardiography (ECHO) is currently the essential method ascertained especially for the evaluation of thromboembolic potential in patients with AF. This study is focused on bringing new ECHO aspects in relation to the following principal problems in coincidence with AF:

1. ECHO prediction of thromboembolism in coincidence with AF,
2. ECHO prediction of cardioversion success rate,
3. ECHO in routine management of AF cardioversion,
4. ECHO prediction of sinus rhythm maintenance after successful AF cardioversion.

ECHO in coincidence with AF can be evaluated by means of transthoracic ECHO (TTE) and transesophageal ECHO (TEE). TEE enables, as opposed to TTE, to evaluate in detail the morphology of the left atrial (LA) appendage (thrombi, spontaneous echocontrast, width, length, surface), the function of LA appendage (the filling and emptying velocity, fraction change of surface), morphology of the atrial septum (aneurysms, foramen ovale patens, defects), flow via pulmonary veins, morphology and the flow via parts of thoracic aorta which are TTE inaccessible (arc and descending aorta). The advantage of TTE lies in good accessibility and non-invasiveness, the disadvantage resides on insufficient evaluation of the left atrial appendage, insufficient sensitivity for cardiogenic source of embolisation (33—59 %). The advantage of TEE implies from adequate depiction of areas entirely or partially inaccessible by TTE, excellent evaluation of morphology and left atrial appendage function (the most frequent source of cardiogenic embolisation), high

specificity (97—100 %) and sensitivity (83—100 %) for the detection of thrombi within the left atrium. The disadvantage lies in semi-invasiveness and limited availability in Slovakia.

### ECHO prediction of thromboembolism in atrial fibrillation

According to clinical studies, the relative risk of peripheral/central thromboembolism in atrial fibrillation for individual ECHO parameters is as follows:

- thrombi within left atrium ...3.9 (body and appendage of left atrium) or 2.5 (appendage of left atrium only),
- spontaneous echo contrast in left atrium ...3.7,
- width of left atrial appendage ...3.6,
- left ventricular hypertrophy ...2.8,
- left ventricular systolic dysfunction ...2.5,
- the length of left atrial appendage ...2.4,
- complex plaques of proximal ascending aorta ...2.1,
- rheumatic mitral stenosis ...2.0,
- left atrial appendage emptying velocity  $<0.20$  m/s ...1.7.

The TEE finding of thrombi within left atrium in coincidence with atrial fibrillation is reported in wide range. 8 studies eva-

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luating a set of 56—409 patients presented the occurrence in range of 2.5—14.8 %. The finding of spontaneous echocontrast varies even more: 12—66 %, the fact of which can be explained by the essential impact of the adjustment of echocardiographic imaging controls on the finding. A relatively small number of studies have evaluated the finding of thrombi within the right atrium in coincidence with AF — the range is 2.6—5.9 %.

It is interesting that also the risk of thromboembolic stroke in coincidence with chronic AF is reported in a significantly wide range. Aronow et al have been investigating 312 geriatric patients for 3 years. The incidence of new ischemic attack was 52 %. As opposed to the latter, its incidence in meta-analysis of BAATAF, SPAF I, Veterans Affairs Prevention Atrial Fibrillation Studies (1066 patients, the observation median 1.6 years) was only 4.7 %. In contrast to expectations, the size of left atrium has no predictive value in coincidence with ischemic stroke.

#### **ECHOCG prediction of AF cardioversion success rate**

From the aspect of routine practice, the fact that according to recent knowledge, none of TEE parameters is able to predict a valid success rate of cardioversion, is relatively disappointing. Neither the positive predictive value of length, width or left atrial area, mitral insufficiency, the diameter of the mitral annulus, the presence of spontaneous echo-contrast, the surface of left atrial appendage, blood flow within the latter, nor the left ventricular systolic function have been proved. Out of ECHOCG predictors of success rate, the greatest attention is currently paid to maximal left atrial appendage emptying velocity.

#### **ECHOCG in routine management of atrial fibrillation cardioversion**

The principal task of ECHOCG prior to atrial fibrillation cardioversion is to exclude the cardiogenic source of embolism. The sensitivity of TTE, in contrast to TEE, however, is not in this sense sufficient. Therefore, TEE is gradually getting into the forefront in relation to atrial fibrillation cardioversion, since it has the potential to exclude reliably the cardiogenic source of embolisation, including the excellent depiction of left atrial appendage, the role of which has a crucial task after cardioversion. The function of left atrial appendage in contrast to that of the left atrial body after cardioversion deteriorate and the probability of formation of thrombi is higher than prior to cardioversion. This fact entails the necessity of anticoagulation prior to and after intervention.

Two methods of atrial fibrillation cardioversion lasting more than 48 hours exist so far. The conventional type resides on a 4-week anticoagulation preparation prior to cardioversion. The alternative method involving the so-called „TEE guided“ cardioversion (cardioversion guided by the TEE finding) becomes gradually preferred. Regarding the limited space, we do not present this method in extenso as its details are described in the study of Kamensky (1997). The principle resides on the fact that should the TEE finding be negative in sense of the cardiogenic source

of embolism, it is not necessary to wait for 4 weeks, and the cardioversion can be performed immediately after TEE. Anticoagulation can begin just prior to version by intravenous heparinisation, with subsequent transition to oral therapy by warfarin. As several studies have proved, TEE-guided version has advantages in contrast to the conventional method, namely: 1. it shortens the time prior to cardioversion performance, 2. it shortens the period of hemodynamic instability, 3. it shortens the time of anticoagulation, 4. it is significantly cheaper. The TEE-guided cardioversion is safe and easily carried out.

#### **ECHOCG prediction of sinus rhythm maintenance after successful AF cardioversion**

There is no unanimous consensus in ECHOCG prediction of sinus rhythm maintenance after successful AF version. According to some authors, the positive predictive value is ascribed to blood flow within the left atrial auricle, the length, width and left atrial area, the diameter of mitral annulus, the absence of spontaneous echo contrast, the detection of biphasic forward flow within pulmonary veins. The negative predictors include left ventricular systolic dysfunction, and significant mitral insufficiency. Other authors, however, have not detected any TEE/TTE predictor of the sinus rhythm maintenance after AF cardioversion. From the aspect of current routine, it is surprising that neither the size, nor the volume of left atrium in coincidence with TTE predict the relapse of atrial fibrillation.

Our conclusion refers to ECHOCG in coincidence with atrial flutter which frequently accompanies atrial fibrillation. By means of TEE, it was discovered that the function of left atrial appendage deteriorates significantly in 80 % of patients after the cardioversion and in 75 % of patients after the cardioversion of atrial flutter. Due to this fact a serious question arises as to the necessity of anticoagulation prior to/after cardioversion of atrial flutter. At the XXII Congress of European Society of Cardiology (2000), two interesting and opposing studies were presented as to TEE findings in patients with atrial flutter. Illien et al have discovered a 0.75 % occurrence of thrombi in 131 patients (out of whom app 1/3 had also intermittent atrial fibrillation), but no patient had a thromboembolic attack up to 4 weeks after cardioversion of atrial flutter. Therefore, anticoagulation in coincidence with the version of atrial flutter is considered as being necessary only in coincidence with intermittent atrial fibrillation. In contrast to the latter, Corrade et al, in an Italian FLASIEC study of 134 patients with „pure“ atrial flutter have found a thrombus within the left atrium in 1.6 %, in the right atrium in 1 % and spontaneous echo contrast in 13 % of cases. Thromboembolism up to 4 weeks after version of flutter was in 2.1 % patients, out of whom 1 case was fatal. The authors have therefore postulated the conclusion that thromboembolic complications of „pure“ flutter cardioversion are possible. According to current recommendations, anticoagulation in coincidence with flutter is necessary only in co-existing atrial fibrillation, regarding the presented findings, however, this question is still open.

We consider that TTE is inevitable in the management of

patients with atrial fibrillation, and TEE is optimal. The Petržalka Hospital prefers the so-called „TEE-guided“ approach to cardioversion of atrial fibrillation. According to our experience it is safe and easily carried out.

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