Abstract

Introduction: Bradycardia in a patient with persistent AF may cause syncope and heart failure and require permanent pacemaker implantation.

Results: Seventy-year-old man with persistent AF with bradycardia was referred for evaluation of pacemaker implantation. Five years ago, he was diagnosed as paroxysmal AF. At that time, total number of heart beats per 24 hours (THB) in sinus rhythm (SR) were 97,959 beats/day (minimum/average/maximum heart rate [HR]): 43/73/120 bpm) without pauses. Two years ago, AF developed persistent with low ventricular response without medications. THB in AF were 62,210 beats/day (min/ave/max: 30/44/86 bpm) with 416 pauses (up to 5.6 seconds). He had mild symptoms with bradycardia, but he refused pacemaker implantation. He had no history of heart failure, hypertension, diabetes mellitus, and stroke (CHA2DS2-VASc score was 1). His left atrial (LA) diameter was 51 mm. He underwent circumferential pulmonary vein isolation with LA modifications. After ablation, he returned to SR without anti-arrhythmic drugs. THB in SR were 114,163 beats/day (min/ave/max: 50/80/101 bpm) without significant pauses. He remained in SR in 1 year of follow up period.

Conclusion: Ablation can be one of the treatment options for persistent AF with bradycardia and may avoid permanent pacemaker implantation.
Successful Radiofrequency Pulmonary Vein Isolation In A Patient With Pneumonectomy

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Abstract

Catheter ablation of Atrial fibrillation (AF) is challenging procedure among invasive electrophysiologic studies. Isolation of all pulmonary veins is a cornerstone of the treatment. The procedure is associated with serious complications like pulmonary vein (PV) stenosis. Herein, we present a technically challenging case of PV isolation in a patient who held left-sided pneumonectomy due to lung cancer.

A 72-year-old man suffered from AF for 2 years was recommended AF ablation because of recurrent symptomatic AF attacks despite antiarrhythmic treatment. An echocardiogram revealed normal left ventricular systolic functions (ejection fraction of 65%) and enlarged left atrium (LA of 44 mm). His medical history was remarkable with chronic obstructive pulmonary disease, hypertension, chronic renal failure, coronary artery disease, ulcerative colitis, and left-sided pneumonectomy for lung cancer ten years ago. He was taking antihypertensive and antiarrhythmic agents. Because of high risk of thromboembolism (CHADS2 score > 2) warfarin was administered. Ten years ago, complete left-sided pneumonectomy was performed for resection of tumor. Three-dimensional image of the left atrium and pulmonary veins showed PV-stumps in the left-superior PV and left-inferior PV via 64-slice computed tomography (Figure 1).

Because of unusual post-operative cardiac rotation, only one transseptal puncture could be performed. EnSite NavX system (St Jude Medical, St Paul, MN, USA) was used for three-dimensional mapping and catheter navigation. Three-dimensional left atrial anatomy was reconstructed (Figure 2). Lasso catheter was inserted into PVs and recorded PV signals in all PVs including PV stumps. Circumferential radiofrequency ablation of ipsilateral PVs was done (30-35 W, 17 mL/min) with irrigated catheter (Sprinklr, Medtronic, Minneapolis, USA) and both, entrance and exit blocks were achieved after the ablation. Interestingly, both left PV stumps were electrically active before the ablation and complete isolation was obtained following RFA. Fluoroscopy and procedure times were 21 min and 125 min respectively. No recurrence of AF was detected during 6 months follow-up period. He had a follow-up CT scan at sixth month and there was no PV stenosis.

Logically, it would be clear that PV ligation following the pneumonectomy could decrease or minimize the risk of AF. As a matter of this fact, previous report demonstrated that PV ligation would eliminate and decrease the sources of AF (1). However, in a report of Konstantinidou and colleagues (2) and as a result of very recent multicenter study remnant PV stumps after pneumonectomy (15 patients) were found electrically active and are frequently the sites of active firing or triggering (3). All PV stumps were electrically active PV potentials and most of them had triggered activity. In addition, they did not observe any PV stenosis following the ablation. In our patient, we also observed that all PVs were electrically active despite PV interruptions.

In conclusion, though AF ablation in patients with pneumonectomy is technically challenging, it is feasible and safe procedure. Besides, PV “stump” is electrically active and should be isolated to maintain long-term sinus rhythm.
References


Transesophageal Echocardiographic Guidance Of Transseptal Puncture During Pulmonary Vein Isolation Reduce The Fluoroscopic Time Of The Procedure

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Abstract

Background: Transeptal puncture is required to perform a pulmonary vein isolation (PVI) and is performed under fluoroscopic guidance with a complication rate of 1%. The transesophageal echocardiography (TEE) guidance of transeptal punctures widely used during catheter-based-procedures.

Methods: In this retrospective study 14 patients (pts) undergoing PVI under TEE-guidance (TEE-group) and 14 pts without TEE-Guidance (classic group) of the transeptal puncture were analyzed.

Results: Patient characteristics are shown in Table 1. In the TEE-group the average procedure-duration was 112.3 min, the average amount of contrast agent 78.9 ml and the average fluoroscopic time 21.5 min.

In the Classic-group the average procedure-duration was 120.9 min, the average amount of contrast agent 75 ml and the average fluoroscopic time 29.8 min (p<0.01).

Conclusions: TEE guidance of transeptal Puncture significantly reduce the fluoroscopic time but not the length of the PVI or the amount of contrast agent. We recommend TEE during PVI to exclude intracardiac thrombi and for guidance of the transeptal puncture. The duration of the PVI will not be prolonged, the fluoroscopic time shortened and hopefully also reducing the incidence of complications.

Table:

<table>
<thead>
<tr>
<th></th>
<th>TEE-group</th>
<th>Classic group</th>
</tr>
</thead>
<tbody>
<tr>
<td>average age</td>
<td>67 years</td>
<td>64 years</td>
</tr>
<tr>
<td>with/without CAD</td>
<td>4/10</td>
<td>5/9</td>
</tr>
<tr>
<td>Number of Procedure (1./2./3.)</td>
<td>11/2/1</td>
<td>11/2/1</td>
</tr>
<tr>
<td>successful/not complete/failed</td>
<td>9/5/0</td>
<td>11/1/2</td>
</tr>
<tr>
<td>Complication</td>
<td>1x thrombembolicevent</td>
<td>1 x technical problem, 1 x AMI</td>
</tr>
<tr>
<td>Drop out because additional coronaryangiography</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
Abstract

Introduction: Catheter ablation therapy for atrial fibrillation is a commonly used therapeutic method. Given the anatomical complexity of the left atrium, three-dimensional models of this chamber obtained by computed tomography (CT) are employed. Rotational atriography is an imaging technique used to obtain the same data as CT.

Methods: The aim of the study was to compare anatomical parameters of the left atrium obtained by the method of 3D rotational atriography with the data obtained by CT scans in 65 patients undergoing ablation therapy for atrial fibrillation. In addition, we compared the radiation exposure.

Results: The results of measurements showed a good correlation between the two methods. When comparing the dimensions, no statistical difference was found between the use of data from the CT of the heart and from 3D rotational atriography, except for the dimension of the left inferior pulmonary vein measured in the anteroposterior projection. A statistically significant reduction in the radiation exposure was shown with the use of 3D rotational atriography versus CT examination (10.2 ± 2.318 vs. 2.3 ± 0.6 mSV mGy-1cm-1, p < 0.001).

Conclusions: The method of 3D rotational atriography of the left atrium provides the same anatomical information as CT. There is a statistically significant reduction of the radiation exposure.
Esophageal Temperature Control In Atrial Fibrillation Ablation Using Multipolar Pvac Catheter


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Abstract

Background: Atrial fibrillation (AF) is the most frequent supraventricular tachyarrhythmia in clinical practice. Catheter ablation of these arrhythmias has been indicated for recurrent and symptomatic episodes. Atrioesophageal fistula is a rare and seriously complication of the left atrium ablation. The monitoring of the esophageal temperature has allowed to reduce the incidence of this serious complication by withdrawing or titration of energy supply in the posterior wall of the left atrium.

Case Report: 72 year old female was referred to catheter ablation due to symptomatic and amiodarone refractory paroxysmal AF. She had a CHA2DS2VASc score = 3 and the INR value of 2.3. The procedure was performed under general anesthesia and using the multipolar circular ablation catheter (PVAC, Medtronic). Temperature monitoring underwent with multielectrode lead inserted in the distal portion of esophagus. After single venous femoral access, heparin was administrated (100U/kg) with ACT target of >350s. Noncomplicated transeptal puncture was perfomed guided by fluoroscopy and intracardiac ECHO. Pulmonar vein isolation was achieved using bipolar energy offer in the antrum of the each vein (n=4). During ablation on left superior PV, there was elevation of Eso temperature (35,7 to 38,5°C). Complete isolation of these vein was achieved reducing of energy offer (2:1 to 4:1) in the electrode pair of the PVAC catheter without rise of Eso temperature.

Conclusions: Multipolar PVAC catheter allowed safety pulmonary vein isolation using titration energy offer guided esophageal temperature control.
Cardioversion Might Be The End-Point For Radiofrequency Ablation Of Long-Lasting Persistent Atrial Fibrillation Patients: From Mathematical Modeling To Clinical Results Of Ablation

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Abstract

Aim: 1) to estimate theoretical probability of existing of 6-waves re-entry as a model of long-lasting persistent atrial fibrillation (AF); 2) to extrapolate mathematical modeling data to clinical results of linear ablation in patients with long-lasting persistent AF.

Material and methods: Clinical phase. Study was conducted on consecutive 20 pts (6 women, 58.2±10.6 years of age) with long-lasting persistent AF who underwent index ablation. Ablation approach consisted of 3 steps. The first step was antral isolation of PVs, the second step included mitral isthmus ablation and the third step was linear roof ablation. We evaluated AF CL into the CS after each step.

Mathematical phase. As the first step numeric reconstruction of the autowave process in excitable tissues of the LA and the simulation of 6-wave re-entry AF was performed using Fitzhugh-Nagumo equation. A special scanning method was used for calculating characteristics of autowave processes in a 2D mathematical model in left atrium (LA). Then ablation formatting (corresponding to all ablation lines) was performed.

Results: Clinical phase. Organization of AF cycle length (from 112±24 to 204±35 ms) was verified in 12 of 20 pts during ablation. SR was effectively restored after external cardioversion at the end of procedure in all pts.

Mathematical phase. Ablation formatting (corresponding to linear ablation) transformed 6-wave reentry to 4 wave re-entry. Following mathematical simulation of cardioversion effectively terminated 4-wave AF, whereas did not cease 6-wave reentry AF.

Conclusions: 1) Mathematical modeling of 6-wave reentry and linear ablation formatting may simulate long lasting persistent AF and subsequent AF organization due to antral and linear ablation. 2) Conversion of 6-waves re-entry to 4-waves reentry with following AF termination after cardioversion may be successful ablation end-point recording the mathematical approach. Our clinical results are consistent with ablation formatting data.
Impact Of Pre- And Post-Procedural Oral Bepridil Therapy On The Outcome Of Catheter Ablation For Atrial Fibrillation


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Abstract

Introduction: It has been reported that perioperative use of antiarrhythmic agents may improve the outcome of catheter ablation (CA) for atrial fibrillation (AF). We studied the impact of pre- and post-procedural oral bepridil therapy on the outcome of CA for AF.

Subjects and Methods: Study subjects are 69 patients with AF who underwent CA as the first session (mean 58 year-old, 65 males, paroxysmal/persistent AF: 43/26). Pulmonary vein isolation (PVI) was completed in all patients, and roof line ablation was additionally performed in 21 patients (30%). Twenty eight patients were administrated oral bepridil at least 3 months before and after the procedure (Bep. Group), and the remaining 41 patients were not given bepridil or used bepridil for less than 3 months before and after the procedure (Non-Bep. Group). We compared the outcome beyond 6 months after the procedure between 2 groups.

Results: AF recurred in 7 patients (25%) in Bep. Group, but AF recurrence was observed in 25 patients (61%) in Non-Bep. Group. The second session was highly required in Non-Bep. Group (12 patients, 29%) than in Bep. Group (2 patients, 7%) with significant differences (p<0.01). In patients with persistent AF, AF recurrence rate was also significantly higher in Non-Bep. Group (10 patients, 77%) comparing with that in Bep. Group (2 patients, 15%, p<0.01). Between 2 groups, no significant difference in left atrial diameter before and after CA was found, and additional roof line ablation did not affect the outcome of CA. In patients with persistent AF between 2 groups, there was no significant difference in duration of AF before CA, and the outcome of CA did not related to success in pharmacological cardioversion.

Conclusions: Bepridil is considered to have reversed remodeling effects on fibrillated atrium. This study suggested that long term pre- and post-procedural oral bepridil therapy may improve the outcome of CA, especially PVI alone, in patients with paroxysmal and persistent AF.
Comparison Of Radiation Exposure, Contrast Agent Consumption And Cost Effectiveness Between Computer Tomography And 3D Rotational Angiography Of The Left Atrium In Support Of Catheter Ablation Of Atrial Fibrillation


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Abstract

Introduction: Catheter ablation of complex atrial arrhythmias using 3D models of the left atrium derived from CT or 3D rotational angiography (3DRA) is currently a common practice.

Methods: Over the period from 8/2010 to 4/2015, 3DRA and CT of the left atrium were performed in 196 consecutive patients (1:1 ratio). Statistical comparison of radiation exposure, contrast agent consumption and cost effectiveness between computer tomography and 3D rotational angiography of the left atrium were evaluated.

Results: The average effective radiation dose for 3DRA was 2.302 mSv compared to 10.212 mSv for CT; the contrast agent consumption was 22,200 mg of iodine compared to 49,051 mg of iodine in CT. The total cost of these procedures is 136 EUR for 3DRA and 178 EUR for CT.

Conclusions: Radiation exposure, contrast agent consumption and total cost is substantially lower using 3DRA compared to CT.
Usefulness Of Insertable Cardiac Monitor In Arrhythmic Recurrence Surveillance After Atrial Fibrillation Catheter Ablation

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Abstract

Introduction: Atrial fibrillation (AF) relapses after catheter ablation (CA) are often underestimated when evaluated on patients’ symptoms, electrocardiograms or 24-hour Holter recordings. We here report results of AF CA based on insertable cardiac monitor (ICM).

Methods: We enrolled 39 patients affected by paroxysmal or persistent symptomatic AF, who underwent pulmonary vein isolations eventually combined with left linear lesions (Table 1). ICM, subcutaneously implanted during CA, recorded the amount of AF per last follow-up year (AF burden).

Results: Patients were followed for 29±6 months. In 24 patients AF burden was 0% (Group A), in 7 it varied from 0.1% and 1% (Group B), in 2 it varied from 1% and 10% (Group C) and in 6 it was greater than 10% (Group D). Symptoms were present in 2, 3, 2 and 5 patients in Group 1, 2, 3 and 4, respectively (Figure 1). Only 4 patients had CHA2DS2Vasc score >1, the half of which in Group A.

Conclusions: ICM offers greater efficacy in AF recurrence monitoring after CA compared with non invasive recorders and might help in anticoagulant therapy management. In our experience, more than 60% of patients were free from recurrence after first or redo CA after a mean follow up of 24 months.
Abstract

Introduction: Remote magnetic navigation (RMN) has been adopted by many centers. However, RMN catheters remained unchanged after initial improvements.

Methods: Thirteen prototypes with various magnetic volumes, magnet positions and shafts equipped with an irrigatable gold-tip were compared to two commercially available systems. For contact-force (CF) testing they were inserted in a standard sheath, which was centered within a highly sensitive CF sensing instrument in a magnetic lab and maneuvered in parallel and perpendicular orientation by a motor-drive and a magnetic field of 0.1 Tesla. Three measurements were averaged for each position (figure 1A). Flexibility was tested by advancing all catheters out of the sheath to a defined distance, arranging the magnetic field in a 180° orientation and measuring the distance between sheath and electrode tip (figure 1B).

Results: The data for the prototype most advantageous to two commercial versions are detailed in table 1.

Conclusions: CF and flexibility could be improved compared to commercially available RMN catheters. These findings led to the design of a RMN catheter also integrating most recent irrigation technology. Clinical advantages have to be evaluated.

Table 1: Results of Contact Force and Flexibility Measurements: Prototype versus Commercial Versions

<table>
<thead>
<tr>
<th></th>
<th>Commercial product 1</th>
<th>Commercial product 2</th>
<th>Prototype</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distal magnet (in mm³)</td>
<td>19.2</td>
<td>15.3</td>
<td>29.2</td>
</tr>
<tr>
<td>Total magnetic volume (in mm³)</td>
<td>48.7</td>
<td>45.9</td>
<td>59.8</td>
</tr>
<tr>
<td>Contact Force average perpendicular (in g)</td>
<td>10.9 (± 0.2)</td>
<td>10.9 (± 0.1)</td>
<td>14.6 (± 0.4)</td>
</tr>
<tr>
<td>Contact Force average parallel (in g)</td>
<td>4.4 (± 0.1)</td>
<td>6.6 (± 0.1)</td>
<td>5.6 (± 0.00)</td>
</tr>
<tr>
<td>Tip distance to shaft at 180° opposite field orientation (in mm)</td>
<td>41</td>
<td>47</td>
<td>40</td>
</tr>
</tbody>
</table>

Figure 1: CF measuring system placed in RMN environment (A). Set-up for measurement of flexibility (B).