ARTYKUŁ ORYGINALNY / ORIGINAL ARTICLE

Quality of life in patients with paroxysmal atrial fibrillation after circumferential pulmonary vein ablation

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Abstract

Background: Atrial fibrillation (AF) is the most common arrhythmia and is associated with a deterioration of quality of life (QoL). Catheter ablation is a therapeutic strategy for some patients with AF. The effectiveness of pulmonary vein isolation is still under assessment.

Aim: To assess the long-term influence of circumferential pulmonary vein ablation (CPVA) on QoL in patients with AF.

Methods: The study population consisted of 33 patients (26 males, age 54.2 ± 9 years) with highly symptomatic (EHRA II–III) drug refractory paroxysmal AF, who underwent CPVA. A clinical examination, electrocardiogram (ECG), and Holter ECG were performed before and during a one-year follow-up. The SF-36 Medical Outcomes Survey Short-Form QoL questionnaire, scored on a 0–100 scale for each of eight domains: bodily pain (BP), general health (GH), mental health (MH), physical functioning (PF), role-emotional (RE), role-physical (RP), social functioning (SF), and vitality (V), was collected before and one year after CPVA.

Results: In the one-year follow-up 27 (82%) patients were free of AF. EHRA symptoms were improved one-year after CPVA regardless of CPVA efficacy. After the follow-up the SF-36 questionnaire results improved significantly in all of the subscales in patients without a recurrence of AF after CPVA. In subjects with a recurrence of AF, all of the subscales did not indicate any statistically significant differences. There was an association between the CPVA and the following QoL domains: GH (p = 0.018), PF (p = 0.042), and V (p = 0.041). The highest values of the GH and V domains were found in the non-recurrence patients one year after CPVA.

Conclusions: CPVA results in the clinical improvement of patients with symptomatic AF regardless of the final arrhythmia termination. Patients after successful CPVA experienced a significant improvement in all of the subscales of the QoL.

Key words: atrial fibrillation, pulmonary vein isolation, quality of life

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INTRODUCTION

Atrial fibrillation (AF) is a common heart arrhythmia, which occurs frequently in the general population with an increasing prevalence that is associated with age. It is well known that AF impairs the quality of life (QoL), which is manifested as a sensation of irregularity of heartbeat, and decreased exercise tolerance and social functioning. AF is associated with a higher frequency of emergency room admissions, hospitalisations, and side effects of the medications that are used to treat the arrhythmia. The evaluation of QoL in patients with paroxysmal, symptomatic AF is an increasingly important aim [1–4]. The SF-36 questionnaire has been proven to assess the patient’s own perception of his/her state of health with satisfactory accuracy [5]. Recently, pulmonary vein isolation

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(PVI) has become a widely used method for AF treatment [6]. The safety and effectiveness of PVI in patients with AF is still under intensive clinical investigation [3, 4, 7]. A previous report [8] on the outcome of the radiofrequency catheter ablation performed in patients with extremely symptomatic premature ventricular contractions suggested that the procedure significantly improves the QoL as well. It could be expected that PVI may be an intervention as a method of treatment of patients with symptomatic AF, which might lead to an improvement in the patient’s well-being and QoL, and a reduction in utilisation of health-care resources.

The aim of this study was to determine the long-term influence of circumferential pulmonary vein ablation (CPVA) on QoL using the SF-36 questionnaire in highly symptomatic patients with drug refractory AF, and to compare the results obtained from SF-36 score in patients with and without a recurrence of AF after CPVA.

**METHODS**

**Study population**

The study population consisted of 33 consecutive patients (26 males, mean age 54.2 ± 9 years, range 24–62 years) with highly symptomatic (EHRA II–III) drug refractory paroxysmal nonvalvular AF, who were referred to our department for CPVA using a three-dimensional (3D) mapping system. The episodes of AF in all of the patients were documented using a Holter electrocardiogram (ECG) and/or surface ECG before the procedure. The treatment with two or more anti-arrhythmic drugs was unsuccessful, and the patients were often admitted to the outpatient clinics and/or hospitalised. In some patients, electrical cardioversions were performed due to persistent AF episodes. The baseline demographic and clinical characteristics of the study population are presented in Table 1. Before and after CPVA all of the patients received oral anticoagulation for at least six weeks, and the international normalised ratio was maintained between two and three.

The following exclusion criteria were used in the study: persistent or permanent AF, valvular AF, unstable angina, and moderate and severe systemic hypertension.

**CPVA procedure**

The CPVA procedure using a 3D mapping system was done according to the Pappone technique [9]. Circular left atrial linear lesions were created in the left atrium around the ostia of the pulmonary veins using a 3D mapping system. The CPVA procedure was performed using a 3D CARTO mapping system. The mapping/ablation catheter (Navistar Thermocool) was introduced to the left atrium via the trans-septal access. An electroanatomical map of the left atrium and pulmonary veins was performed. Subsequently, it was merged with a computed tomography reconstruction of the left atrium that had previously been done. Circular left atrial linear lesions around the ostia of the pulmonary veins were created. After ablation a second electroanatomical voltage map was done. If low voltage areas appeared inside the lines and no captured stimulation was obtained from these regions, the veins were

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**Table 1. The baseline demographic and clinical characteristics of the study population**

<table>
<thead>
<tr>
<th></th>
<th>All patients (n = 33)</th>
<th>NR group (n = 27)</th>
<th>R group (n = 6)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age [years]</strong></td>
<td>54.2 ± 9</td>
<td>54.2 ± 9</td>
<td>54.9 ± 9</td>
</tr>
<tr>
<td><strong>Sex (male / female)</strong></td>
<td>26 / 7</td>
<td>23 / 4</td>
<td>3 / 3</td>
</tr>
<tr>
<td><strong>AF episodes in history [years]</strong></td>
<td>2–14</td>
<td>2–6</td>
<td>2–14</td>
</tr>
<tr>
<td><strong>AF frequency (episodes/month)</strong></td>
<td>4–15 range (7 mean)</td>
<td>4–6 range (3 mean)</td>
<td>4–15 range (7 mean)</td>
</tr>
<tr>
<td><strong>AAD treatment (number)</strong></td>
<td>1–3 range (2.6 mean)</td>
<td>1–3 range (1.6 mean)</td>
<td>2–3 range (2.4 mean)</td>
</tr>
<tr>
<td><strong>Cardioversion in history (number)</strong></td>
<td>1–9 range (2.6 mean)</td>
<td>1–6 range (2.2 mean)</td>
<td>2–9 range (2.6 mean)</td>
</tr>
<tr>
<td><strong>Hypertension (n / %)</strong></td>
<td>20 / 60%</td>
<td>14 / 52%</td>
<td>6 / 100%</td>
</tr>
<tr>
<td><strong>CHA2DS2-VASC score</strong></td>
<td>0–3 range (1.9 mean)</td>
<td>0–2 range (1.6 mean)</td>
<td>1–3 range (1.9 mean)</td>
</tr>
<tr>
<td><strong>TTE:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>LVEF (%)</strong></td>
<td>50–60%</td>
<td>54–60%</td>
<td>50–55%</td>
</tr>
<tr>
<td><strong>IVS &gt; 12 mm (n / %)</strong></td>
<td>6 / 18%</td>
<td>2 / 8%</td>
<td>4 / 67%</td>
</tr>
<tr>
<td><strong>LA &gt; 40 mm (n / %)</strong></td>
<td>5 / 15%</td>
<td>2 / 8%</td>
<td>3 / 50%</td>
</tr>
<tr>
<td><strong>EHRA I/II/III/IV (n / %):</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Before</strong></td>
<td>n: 0 / 22 / 11 / 0</td>
<td>n: 0 / 21 / 6 / 0</td>
<td>n: 0 / 1 / 5 / 0</td>
</tr>
<tr>
<td><strong>%:</strong></td>
<td>0 / 67 / 33 / 0</td>
<td>0 / 78 / 22 / 0</td>
<td>0 / 17 / 83 / 0</td>
</tr>
<tr>
<td><strong>One-year after CPVA</strong></td>
<td>n: 28 / 5 / 0 / 0</td>
<td>n: 27 / 0 / 0 / 0</td>
<td>n: 1 / 5 / 0 / 0</td>
</tr>
<tr>
<td><strong>%:</strong></td>
<td>82 / 18 / 0 / 0</td>
<td>100 / 0 / 0 / 0</td>
<td>17 / 83 / 0 / 0</td>
</tr>
</tbody>
</table>

AAD — antiarrhythmic drugs; AF — atrial fibrillation; CPVA — circumferential pulmonary vein ablation; IVS — intraventricular septum; LA — left atrium; LVEF — left ventricular ejection fraction; NR — non-recurrence group, R — recurrence group; TTE — transthoracic echocardiography
treated as isolated (procedure end-point). To reduce the risk of left atrial macroreentry tachycardia, no additional lines in the left atrium were done. Each patient underwent only one ablation procedure. No early or late complications after CPVA procedure were observed.

**Follow-up**

Outpatient follow-up visits were scheduled regularly every three months up to one year after the ablation. Long-term efficacy was assessed clinically on the basis of clinical symptoms, the ECG, and a seven-day 24-h Holter recording (performed one year after CPVA). Some of the patients (10 patients) used an “event recorder”. The recurrence of AF was defined as a documented AF episode of at least 30 s duration.

**QoL assessment**

The SF-36 questionnaire, when used as a generic health scale, measures several health domains, including eight variables: bodily pain (BP), general health perception (GH), mental health (MH), physical functioning (PF), social functioning (SF), role limitations related to emotional problems (RE), role-physical (RP), and vitality perceptions (V). The scores range from 0 (indicating the worse health status) to 100 (indicating the best health status). The patients completed the SF-36 questionnaire at the baseline and one year after CPVA. The scores were calculated within the range of 0–100. The EHRA scale was handed out at the same time as the SF-36 questionnaire.

**Statistical analysis**

The baseline clinical parameters and the results of ancillary investigations were compared using the two-sample t-tests for normally distributed continuous variables (Student’s t-test); in the case of an abnormal distribution, the Mann-Whitney U test was used. Categorical variables were compared using the χ² test. All of the text and table results are expressed as means ± standard deviation (SD) or a number (percentage). To compare the change in QoL domain values over time, the data were analysed as a repeated measure analysis of variances, taking into account the recurrence of AF, the intervention factor (CPVA), and time. A value p < 0.05 was considered statistically significant.

**RESULTS**

**Clinical results of CPVA**

After CPVA 27 (82%) patients were free of documented AF (non-recurrence group — NR group). Twenty-two of them (81%) were still being treated with beta-blockers, mostly due to mild hypertension. Seventeen (62%) patients were treated with antiarrhythmic drugs; mainly with propafenone — 14 (83%) patients and sotalol — three (17%) patients. They tended to use the drugs occasionally when they needed them (self-diagnosed palpitations), which in fact were diagnosed in the seven-day Holter ECG and event recorder reports as extra systoles.

Six (18%) patients had documented episodes of AF (recurrence group — R group). Similarly, five (83%) patients were treated with beta-blockers, five (83%) patients with propafenone, and one (17%) patient with sotalol. None of the patients received amiodarone.

All of the patients continued anticoagulation therapy with acenocoumarol.

**EHRA classification**

CPVA improved the clinical status of the patients. Before CPVA, EHRA symptoms were present in 22 (67%) patients — class II, and in 11 (33%) patients — class III. One year after CPVA, the symptoms were as follows: 28 (82%) patients — class I; five (18%) patients — class II; zero (0%) patients — class III. The improvement in EHRA was observed in both the NR and R groups — data are presented in Table 1.

**QoL before and after CPVA**

Before ablation, all of the patients reported lower than expected results in all eight categories of the SF-36 scores (Fig. 1). CPVA improved the results of the QoL assessments of all the subjects (Table 2).

After the follow-up the SF-36 questionnaire results improved significantly in all of the domains in the NR group (Table 3). The greatest improvements were noticed in the PF (34% improvement), RE (46% improvement), RP (79% improvement), and V (30% improvement) domains.

In the R group none of the domains showed statistically significant differences. Figures 1 and 2 illustrate the changes in eight domains in the patients without and with AF recurrence, respectively.
The ANOVA analysis did not reveal a statistically significant association of the QoL domains and the group or the interaction of the group (NR group vs. R group) and intervention (before vs. one year after CPVA).

There was an association between the intervention and the following QoL domains: GH (p = 0.018), PF (p = 0.042), and V (p = 0.041). The highest values of GH and V domains were found in the NR group one year after CPVA (Table 4).
DISCUSSION

In the prospective study, we evaluated the QoL in patients with paroxysmal, nonvalvular AF, who were undergoing CPVA. After CPVA, 82% of patients were free from recurrence of arrhythmia and reported an improvement of QoL. Patients after successful CPVA, especially, experienced a significant benefit in QoL. Unsuccessful CPVA also eliminated some symptoms of AF and improved the clinical status of the patients.

Previous studies have shown that the SF-36 questionnaire is an appropriate tool for a QoL assessment in patients with cardiac disorders [8, 10, 11]. It is well known that the prevalence of AF is more frequent in elderly patients, with the range of sensitivity of arrhythmia from asymptomatic to symptomatic, which is associated with underlying cardiac diseases. The population that was studied in this research was relatively young (54.2 ± 9 years) and had not experienced significant symptoms of other co-morbid health conditions that may have had an impact on the SF-36 questionnaire results. The effect of the therapy that was applied on health-related QoL in patients with AF has been investigated in several studies [7, 12, 13], and these data are consistent with our findings.

It should be noted that our study population, who had been diagnosed with AF before CPVA, was characterised by a poor level of QoL.

The results are consistent and describe a health-related improvement of the QoL in patients with highly symptomatic drug-resistant AF after CPVA [7, 12, 13]. Eighteen per cent of the patients had documented episodes of AF after CPVA (R group); however, their symptoms were limited. Thus, it has been suggested that the ablation procedure can modulate the feeling of arrhythmia without entirely curing it. Similarly, data reported by Berkowitsch et al. [12] about the QoL outcomes in patients with paroxysmal AF after ablation indicated that the improvement in patients with a recurrence of AF may be caused by a modification of the underlying arrhythmogenic

Table 4. ANOVA analysis

<table>
<thead>
<tr>
<th>QoL domains</th>
<th>R group</th>
<th>NR group</th>
<th>P value</th>
<th>Source of variance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before CPVA</td>
<td>One-year after CPVA</td>
<td>Before CPVA</td>
<td>One-year after CPVA</td>
</tr>
<tr>
<td>BP</td>
<td>62.0 ± 27.0</td>
<td>70.8 ± 19.2</td>
<td>52.9 ± 26.4</td>
<td>63.3 ± 25.1</td>
</tr>
<tr>
<td></td>
<td>Median 68</td>
<td>Median 74</td>
<td>Median 45</td>
<td>Median 74</td>
</tr>
<tr>
<td>GH</td>
<td>36.5 ± 4.2</td>
<td>44.3 ± 6.8</td>
<td>41.0 ± 15.7</td>
<td>59.9 ± 21.1</td>
</tr>
<tr>
<td></td>
<td>Median 36</td>
<td>Median 43.5</td>
<td>Median 35</td>
<td>Median 57</td>
</tr>
<tr>
<td>MH</td>
<td>49.3 ± 15.3</td>
<td>52.7 ± 13.0</td>
<td>47.4 ± 19.9</td>
<td>63.0 ± 21.8</td>
</tr>
<tr>
<td></td>
<td>Median 52</td>
<td>Median 50</td>
<td>Median 44</td>
<td>Median 72</td>
</tr>
<tr>
<td>PF</td>
<td>65.0 ± 41.7</td>
<td>79.2 ± 29.6</td>
<td>52.0 ± 26.7</td>
<td>74.6 ± 24.7</td>
</tr>
<tr>
<td></td>
<td>Median 87.5</td>
<td>Median 87.5</td>
<td>Median 50</td>
<td>Median 85</td>
</tr>
<tr>
<td>RE</td>
<td>4.83 ± 1.17</td>
<td>4.83 ± 0.98</td>
<td>3.89 ± 0.97</td>
<td>5.15 ± 1.38</td>
</tr>
<tr>
<td></td>
<td>Median 5.0</td>
<td>Median 5.0</td>
<td>Median 4.0</td>
<td>Median 6.0</td>
</tr>
<tr>
<td>RP</td>
<td>5.83 ± 1.83</td>
<td>6.33 ± 1.37</td>
<td>5.37 ± 1.71</td>
<td>6.81 ± 1.52</td>
</tr>
<tr>
<td></td>
<td>Median 5.5</td>
<td>Median 6.0</td>
<td>Median 4.0</td>
<td>Median 8.0</td>
</tr>
<tr>
<td>SF</td>
<td>6.50 ± 1.76</td>
<td>6.67 ± 1.21</td>
<td>6.00 ± 1.80</td>
<td>7.44 ± 1.74</td>
</tr>
<tr>
<td></td>
<td>Median 7.0</td>
<td>Median 6.5</td>
<td>Median 6.0</td>
<td>Median 8.0</td>
</tr>
<tr>
<td>V</td>
<td>13.50 ± 2.34</td>
<td>14.67 ± 2.34</td>
<td>12.18 ± 3.77</td>
<td>15.89 ± 3.92</td>
</tr>
<tr>
<td></td>
<td>Median 13.5</td>
<td>Median 14.5</td>
<td>Median 12.0</td>
<td>Median 16.0</td>
</tr>
</tbody>
</table>

Data are expressed as the mean ± standard deviation and as median for abnormally distributed variables; NR — non-recurrence group; R — recurrence group; G — group, I — intervention (CPVA), GxI — interaction of the group and intervention; QoL — quality of life; other abbreviations as in Table 2.
process or cardiac denervation, or may originate from the placebo effect. Further studies suggest that the improvement in QoL seems to be caused by changing previously symptomatic events into asymptomatic ones [12, 13]; however, in our study we did not observe asymptomatic episodes of AF during Holter monitoring.

**Limitations of the study**

There are some limitations of our study. The paper represents a prospective, observational study and is subject to limitations of its design. The number of the patients who were examined was limited. Antiarrhythmic medication was used by some of the patients in both study groups one year after CPVA. Therefore, the results of our study should be interpreted with caution.

**CONCLUSIONS**

Circumferential pulmonary vein ablation results in a clinical improvement of patients with symptomatic AF regardless of the final arrhythmia termination. Patients after successful CPVA experienced a significant improvement in all of the domains of the QoL.

**Conflict of interest:** none declared

**References**


Jakość życia pacjentów z napadowym migotaniem przedsionków po ablacji okrążającej żył płucnych

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Streszczenie

Wstęp: Migotanie przedsionków (AF) jest jedną z najczęstszych arytmii i wiąże się z pogorszeniem jakości życia (QoL). Izolacja żył płucnych (CPVA) jest jedną z metod terapeutycznych wykorzystywanych u objawowych pacjentów z AF, a jej kompleksowe efekty są wciąż w fazie oceny.

Cel: Celem pracy była obserwacja odległych wyników CPVA i ich wpływ na QoL chorych z AF przed i po CPVA.

Metody: Badaniem objęto 33 pacjentów (26 mężczyzn), w wieku: 54,2 ± 9 lat z symptomatycznym opornym na farmakoterapię AF (EHRA II–III), którzy byli poddani CPVA. Badania kliniczne, elektrokardiograficzne (EKG) oraz EKG metodą Holtera i SF-36 przeprowadzono przed, a także rok po CPVA. Jakość życia oceniano za pomocą Kwestionariusza SF-36 Survey Short-Form. W formularzu SF-36 zastosowano skalę 0–100 dla każdego z 8 parametrów QoL, takich jak: odczucie bólu (BP), ogólny stan zdrowia (GH), stan zdrowia psychicznego (MH), funkcjonowanie fizyczne (PF), stan emocjonalny (RE), stan cielesny (RP), funkcjonowanie społeczne (SF) i witalność (V).

Wyniki: Po roku od zabiegu CPVA 27 (82%) pacjentów nie miało napadów AF. Objawy AF (w skali EHRA) uległy zmniejszeniu niezależnie od skuteczności CPVA. Analiza QoL wykazała znaczną poprawę w zakresie wszystkich ocenianych parametrów u pacjentów bez nawrotu arytmii. U chorych z nawrotem AF zaden oceniany parametr QoL nie wykazywał istotnych zmian po roku obserwacji. Stwierdzono związek między CPVA i następującymi parametrami QoL: GH (p = 0,018), PF (p = 0,042), V (p = 0,041). Najwyższe wartości GH i V wykazano u chorych bez nawrotu AF w czasie roku po CPVA.

Wnioski: Zabieg CPVA prowadzi do redukcji objawów AF niezależnie od efektu, jakim jest ostateczne ustąpienie arytmii. Pacjenci po skutecznym CPVA odczuwają znaczną poprawę QoL w zakresie każdego ocenianego parametru.

Słowa kluczowe: migotanie przedsionków, izolacja żył płucnych, jakość życia

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