

# Influence of ablation therapy on the quality of life in children with supraventricular tachycardia

E. SZAFRAN<sup>1</sup>, A. BASZKO<sup>1</sup>, A. BUKOWSKA-POSADZY<sup>2,3</sup>, A. ŁAŻNIAK<sup>1</sup>, T. MOSZURA<sup>1,4</sup>, A. SIWIŃSKA<sup>1</sup>, J. WALKOWIAK<sup>2</sup>, W. BOBKOWSKI<sup>1</sup>

<sup>1</sup>Department of Pediatric Cardiology, Poznań University of Medical Sciences, Poznań, Poland

<sup>2</sup>Department of Pediatric Gastroenterology and Metabolic Diseases, Poznań University of Medical Sciences, Poznań, Poland

<sup>3</sup>Department of Clinical Psychology, Poznań University of Medical Sciences, Poznań, Poland.

<sup>4</sup>Department of Cardiology, Polish Mother's Memorial Hospital - Research Institute, Łódź, Poland

**Abstract. – OBJECTIVE:** Numerous restrictions, which are imposed on children with arrhythmia, influence their quality of life (QoL) and may have a negative impact on their further development. Ablation is a highly successful treatment leaving patients free from arrhythmia and other related limitations. There are very few studies evaluating the influence of ablation on the QoL in children with arrhythmia, based on small groups of patients. The aim of this study was to evaluate the impact of ablation on the QoL in children with supraventricular tachycardia (SVT).

**PATIENTS AND METHODS:** We included 122 children with SVT who underwent a successful ablation. The QoL was assessed before and after the ablation, using the WHOQOL-BREF and the Pediatric Arrhythmia Related Score (PARS) – a specific questionnaire developed by the authors.

**RESULTS:** Six months after the ablation, WHOQOL-BREF showed a significant improvement in the QoL in the physical (Phd) ( $p < 0.0001$ ), psychological (Psd) ( $p = 0.0014$ ) and social relationships (SRD) ( $p = 0.0165$ ) domains. PARS showed a significant improvement in the QoL in the Phd ( $p < 0.0001$ ), Psd ( $p = 0.0307$ ) and medical satisfaction domains (Msd) ( $p < 0.0001$ ). No improvement in Psd was revealed in children who had been off medications before the ablation. In the youngest children, a significant improvement was observed in all the measured domains in both questionnaires ( $p < 0.05$ ), while in older children the greatest improvement after the ablation was noted in the area of physical functioning.

**CONCLUSIONS:** Ablation in children with SVT significantly improved general satisfaction with health and with the QoL and had a positive impact on QoL scores. The youngest patients and those on antiarrhythmic medication before the ablation, benefit most from the procedure.

*Key Words:*

Quality of life, Questionnaire, Children, Arrhythmia, Ablation.

## Introduction

Supraventricular tachycardia (SVT) is the most common type of arrhythmia in children<sup>1,2</sup>. The most frequent cause of SVT in the pediatric group is atrioventricular reentrant tachycardia (AVRT) related to Wolff-Parkinson-White (WPW) syndrome, and less common causes are atrioventricular nodal reentrant tachycardia (AVNRT) and atrial ectopic tachycardia (AET)<sup>1,2</sup>. Treatment of arrhythmia depends on diagnosis and severity of symptoms<sup>1</sup>. Pharmacotherapy of SVT is not fully effective, requires regular administration and is associated with potential side effects<sup>3,4</sup>. Radiofrequency ablation (RFA) or cryoablation is recommended as a method of choice in patients with SVT, recurring despite pharmacotherapy<sup>5</sup>. Ablation has a high success rate, low procedural risk and leaves patients free of arrhythmia and previous limitations of their daily activities.

Studies performed in pediatric patients indicate that arrhythmia may significantly affect their QoL, cognitive and emotional development. Moreover, the QoL of children with cardiac arrhythmia is poor and comparable to that of children with other chronic diseases<sup>6-8</sup>. There are many studies assessing the QoL of adult patients with various cardiac arrhythmias, documenting a significant improvement in the investigated fields after ablation<sup>3,4,9-13</sup>. However, there are very few studies, based on a small number of cases, in-

investigating the impact of ablation on the QoL in children with arrhythmia<sup>6,14,15</sup>.

According to the Constitution of the World Health Organization (WHO), health is a state of physical, mental and social well-being and not merely the absence of disease or infirmity<sup>16</sup>. The improvement of patients' health or even their complete recovery does not always mean the improvement of psychological functioning; thus, the significance of QoL evaluation is of great importance<sup>17</sup>. The aim of this study was to evaluate the QoL in children with SVT who underwent successful catheter ablation. The QoL was investigated using two methods: a generic questionnaire WHOQOL-BREF and Pediatric Arrhythmia Related Score (PARS) – a new specific questionnaire developed by the authors for the needs of the study group. The second aim of the study was to assess the relations between age, gender, previous medications, frequency of tachycardia episodes, time between diagnosis and ablation, type of arrhythmia and the improvement of QoL, investigated by two methods.

## Patients and Methods

### Patients

The study group included children aged 7-18, with documented SVT and no organic heart disease or other chronic conditions that could interfere with the QoL, who were treated in our institution with RFA or cryoablation. All the children have undergone a standard procedure before ablation, including medical evaluation, blood tests, ECG and echocardiography. The study protocol included the assessment of QoL using questionnaire before the ablation and six months after the procedure. At the baseline assessment, the patients were asked to focus on their condition four weeks before the ablation. After the ablation, the patients sent responses to questionnaire by post. All the patients and their parents provided written consent to participate in the study.

The protocol was approved by the Bioethics Committee of Poznań University of Medical Sciences, Poznań, Poland.

### Methods of QoL Assessment

#### WHOQOL-BREF

The WHOQOL-BREF is a shorter version of the original instrument that may be more conve-

nient for use in large research studies or clinical trials<sup>18</sup>. The WHOQOL-BREF instrument comprises 26 items, which measure the following broad domains: physical health, psychological, social relationships and the environment. The higher the score obtained in one domain, the higher the QoL. WHOQOL-BREF also includes two questions analyzed separately: the first question, concerning the individual general perception of the QoL and the second question, concerning the individual general perception of their health. Considering the patients' age, the question referring to sexual activity, within the social domain area, was removed from the questionnaire.

#### *Pediatric Arrhythmia Related Score (PARS)*

The second instrument used in this study was the questionnaire regarding patients' feelings and observations connected with arrhythmia (Pediatric Arrhythmia Related Score – PARS), which was developed for the purpose of the scientific project by pediatric cardiologists in collaboration with the clinical psychologist and adjusted to the group of arrhythmic children. This questionnaire had already been used in our study evaluating the QoL in children with SVT<sup>19</sup>. The questionnaire contains 32 questions divided into 3 domains: physical (Phd) – regarding the symptoms perceived as specific or likely to accompany SVT; medical satisfaction (Msd) – concerning the cooperation with medical care professionals; and psychological (Psd) – referring to the emotional condition of the studied individuals<sup>19</sup>. Each domain is assessed on a 1-5-point scale and numeric results of individual areas are negatively directed, i.e., the lower numeric value, the higher the QoL.

#### *Statistical Analysis*

STATISTICA 10 data analysis software (StatSoft, Inc., Tulsa, OK, USA) was used to perform the statistical analysis. A probability level of  $p < 0.05$  was regarded as significant. The study compared the scores obtained in 4 domains of the WHOQOL-BREF questionnaire and 3 domains of the PARS questionnaire before and after the ablation. Moreover, two questions from WHOQOL-BREF and all the questions from PARS were analyzed separately. The Wilcoxon signed-rank test was used to perform comparisons of the above QoL parameters. Additionally, the QoL before and after the ablation was compared in 3 age groups (7-12 years old, 13-15 years old, 16-18 years old) using the Wilcoxon signed-rank test. The results of on- and off-medication patients were compared using the Wilcoxon signed-rank

test. The Spearman's Rank Correlation Coefficient was used to assess correlations between arrhythmia duration and QoL scores. To evaluate how the QoL of children with arrhythmia differs depending on SVT type and the frequency of SVT episodes, the nonparametric Kruskal-Wallis test followed by the Dunn-Bonferroni multiple comparison test was used. Gender differences were analyzed using the Mann-Whitney U test.

## Results

One hundred seventy-seven patients with SVT were included into the study and completed the questionnaires before the ablation. In 10 patients ablation was unsuccessful, 6 patients provided incomplete questionnaires after the ablation and 39 patients did not send their questionnaires after the procedure. Finally, 122 patients with complete data were analyzed. The ablation efficacy was evaluated at the end of the procedure and on discharge. After a mean  $2.9 \pm 1.6$ -year follow-up (median/IQR: 3.0/2.5), the arrhythmia recurred in 7 patients (5.7%). Patient demographics and clinical data are shown in Table I.

### Impact of Ablation on QoL

#### WHOQOL-BREF

The analysis of the provided responses on a 5-point Likert scale showed a significant im-

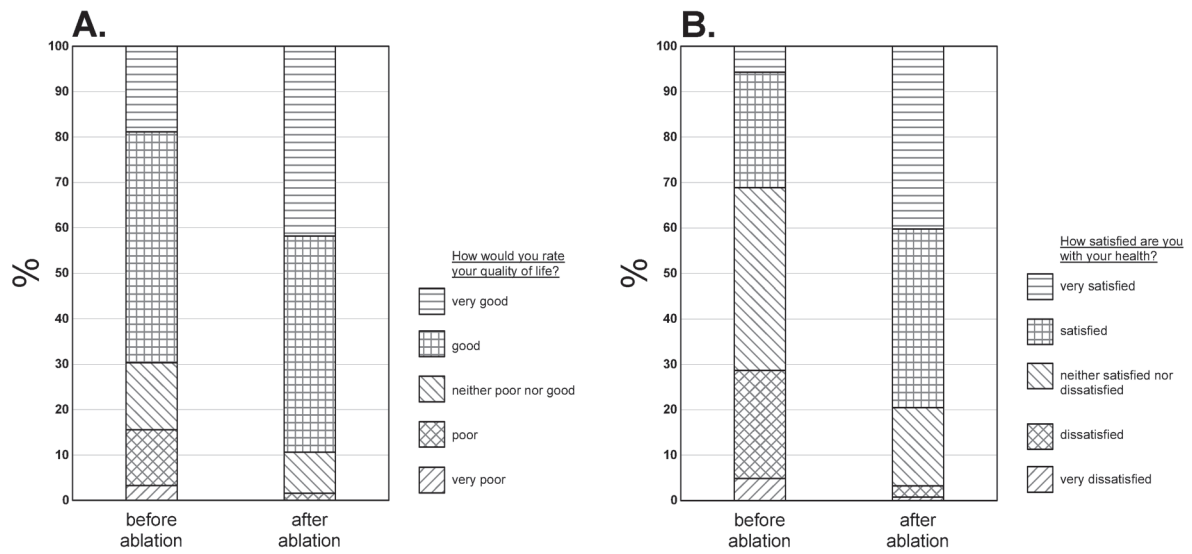
provement in patients' general satisfaction with their health (mean/median/IQR: 3.0/3.0/2.0 vs. 4.2/4.0/1.0;  $p < 0.0001$ ) and general satisfaction with their QoL (mean/median/IQR: 3.7/4.0/1.0 vs. 4.3/4.0/1.0;  $p < 0.0001$ ) after the ablation treatment (Figure 1). QoL scores in the Phd, Psd and social relationships domain (SRD) were significantly higher 6 months after the ablation in comparison with the baseline assessment (the mean $\pm$ SD values on a 0-100 scale before the ablation vs. after the procedure were: 65.0  $\pm$  15.9 vs. 79.4  $\pm$  14.8; 74.2  $\pm$  15.1 vs. 77.8  $\pm$  16.0; 77.0  $\pm$  16.6 vs. 80.7  $\pm$  17.3 respectively); however, the ablation had no significant impact on QoL scores obtained in the environment domain (EnD) (Figure 2).

#### PARS

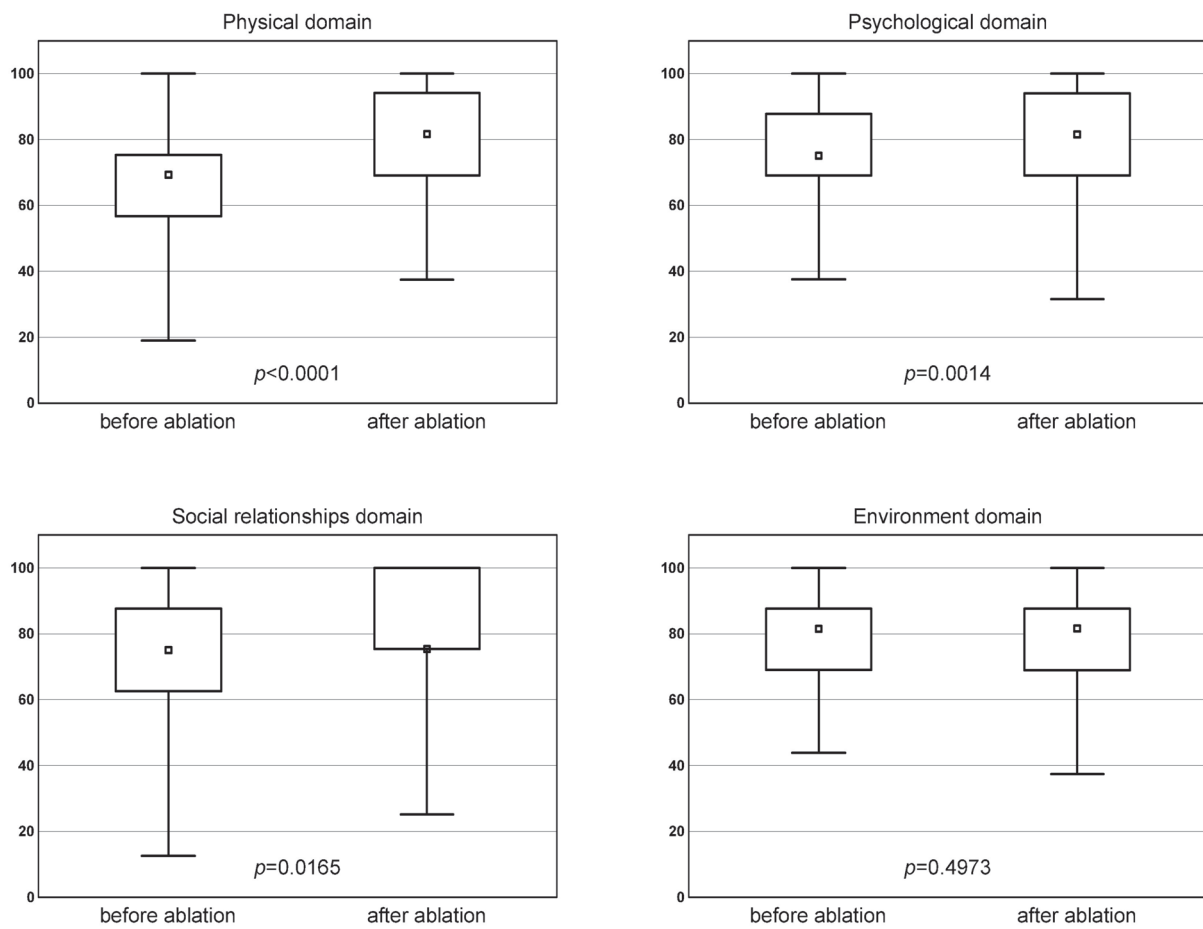
All the studied domains of PARS showed a significant improvement six months after the ablation, in comparison with the pre-treatment period (the mean $\pm$ SD values on a 1-5 scale before the ablation vs. after the procedure were: Phd 2.4  $\pm$  0.7 vs. 1.8  $\pm$  0.5; Msd 2.2  $\pm$  0.4 vs. 2.0  $\pm$  0.5; Psd 2.4  $\pm$  0.7 vs. 2.3  $\pm$  0.7) (Figure 3). All the questions from PARS were also analyzed separately. We noticed a significantly lower intensity of all symptoms in the Phd after the ablation in comparison with the baseline values. Interestingly, with regard to Msd, it was observed that before the procedure the patients demanded more details regarding their disease and its treatment and were more apprehensive about the treatment. Also their confidence about the efficacy of ablation was sig-

**Table I.** Patient demographics and clinical data.

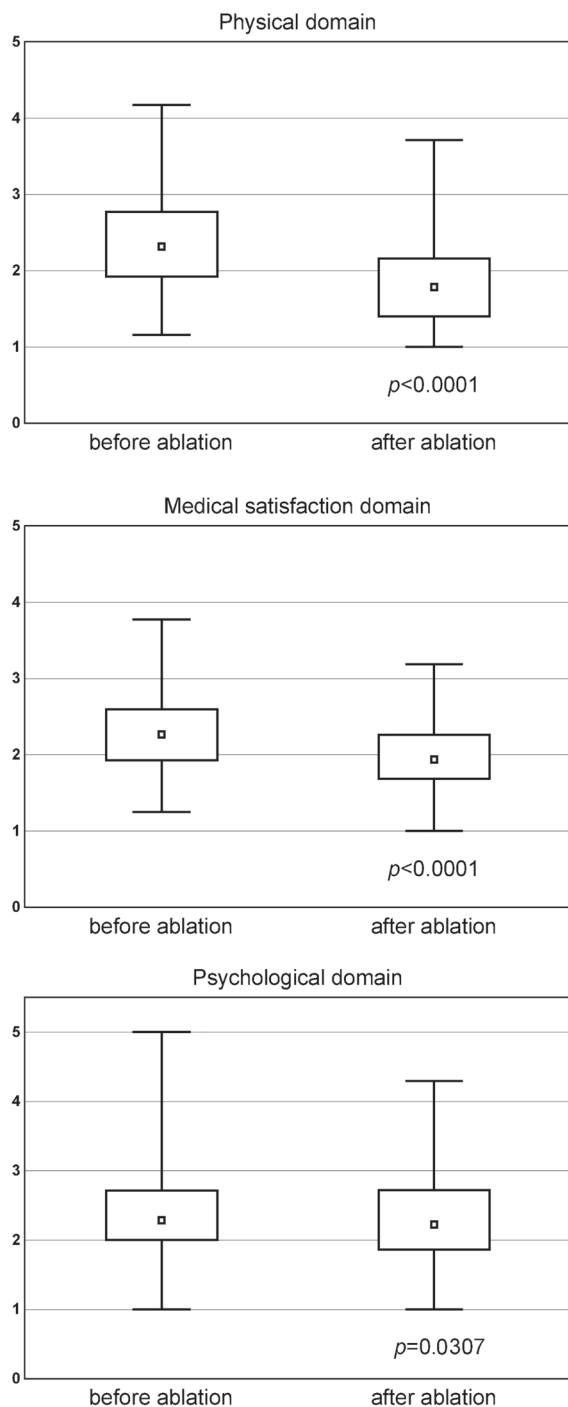
	Study group
<b>Number of patients</b>	122
<b>Age [mean <math>\pm</math> SD (median/IQR)]</b>	13.9 $\pm$ 2.8 (14.5/4.0)
<b>Gender [n (%)]</b>	
Boys	55 (45.1)
Girls	67 (54.9)
<b>Antiarrhythmic drugs [n (%)]</b>	89 (72.9)
<b>First SVT episode - age [mean <math>\pm</math> SD (median/IQR)]</b>	10.1 $\pm$ 4.6 (11.5/8.0)
<b>The duration of arrhythmia (from diagnosis to ablation) [n (%)]</b>	
$\leq$ 1 year	42 (34.4)
> 1 year, < 5 years	45 (36.9)
$\geq$ 5 years	35 (28.7)
<b>Diagnosis (revealed on electrophysiological study) [n (%)]</b>	
AVRT	73 (59.8)
AVNRT	43 (35.3)
AET	6 (4.9)
<b>Frequency of SVT episodes [n (%)]</b>	
At least once a month	55
Less frequently than once a month but at least once every three months	26
Less frequently than once every three months	41



**Figure 1.** The influence of ablation therapy on general satisfaction with QoL (**A**) and with health condition (**B**) in SVT group. Data are presented as percentage of patients.



**Figure 2.** The influence of ablation therapy on the WHOLQOL-BREF domains in SVT group. Values are presented as median; IQR and minimum-maximum.



**Figure 3.** The influence of ablation therapy on the PARS domains in SVT group. Values are presented as median; IQR and minimum-maximum.

nificantly lower before the ablation. After the procedure, there was a significant improvement in patients' perception of ablation. Six months after the ablation procedure children were less nervous and less inclined to cry in comparison

with the baseline values (Psd). The influence of ablation therapy on the PARS answers is shown in Table II.

### Subgroups Analysis

#### *Preablation Antiarrhythmic Medication*

Out of the total group of 122 patients, 89 persons (73%) had been on antiarrhythmic medication before the ablation. The main antiarrhythmic drug was a beta blocker ( $n = 78$ ). There was a significant improvement of Psd in WHOQOL-BREF after the ablation in children who had been on antiarrhythmic therapy (mean  $\pm$  SD/median/IQR:  $73.4 \pm 15.2/68.8/25.0$  vs.  $78.2 \pm 14.7/81.3/25.0$ ;  $p = 0.0007$ ). The improvement of Psd in PARS was less significant in these children (mean  $\pm$  SD/median/IQR:  $2.4 \pm 0.6/2.3/0.7$  vs.  $2.3 \pm 0.6/2.3/0.9$ ;  $p = 0.05$ ). No improvement was noticed in Psd in children who had been off medications before the ablation (WHOQOL-BREF:  $p = 0.6034$  and PARS:  $p = 0.5090$ ).

#### *Frequency of SVT Episodes*

The frequency of SVT episodes and their impact on QoL were evaluated before the ablation procedure. In children who reported the highest frequency of SVT episodes, general satisfaction with health was significantly lower than in patients with the lowest frequency of tachycardia attacks (mean/median/IQR:  $2.8/3.0/2.0$  vs.  $3.4/3.0/1.0$ ;  $p = 0.0162$ ); however, the frequency of episodes had no significant impact on the general satisfaction with QoL and the domains of the WHOQOL and PARS questionnaires. Following the ablation, all values showed no differences between the groups.

#### *Duration and Type of Arrhythmia Before the Ablation*

The duration of arrhythmia (from the moment of diagnosis until the questionnaire completion) as well as the type of SVT had no effect on the parameters of QoL.

#### *Age at the Time of Ablation*

The children were divided into three age groups (7-12 years; 13-15 years; 16-18 years). In the youngest children, a significant improvement was noticed in all the measured domains in both questionnaires. In older children, the greatest improvement after the ablation was noted in the area of physical functioning (Figure 4).

**Table II.** The influence of ablation therapy on the PARS answers; data presented as mean/median.

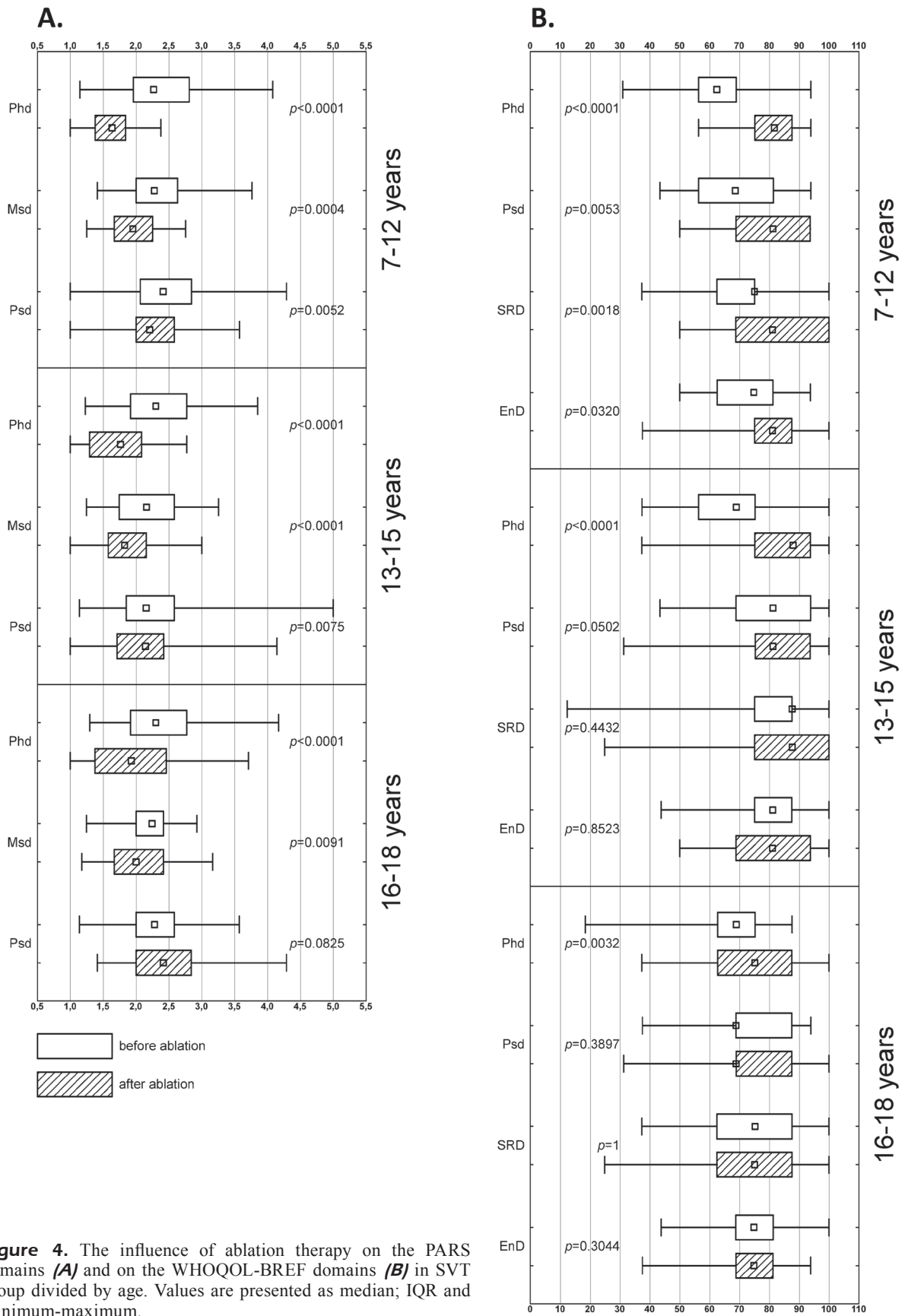
Questions	Baseline	6 months after	p-value
<b>Physical domain</b>			
1. Do you have dyspnea?	2.2/2.0	1.6/1.0	< .0001
2. Do you have palpitations?	3.6/4.0	1.8/1.5	< .0001
3. Do you have chest pain?	2.3/2.0	1.7/1.0	< .0001
4. Do you ever faint?	2.0/2.0	1.2/1.0	< .0001
5. Do you seem to pass urine more frequently than usual?	1.8/2.0	1.5/1.0	.0002
6. Do you ever have a blurred vision? (e.g. scotoma)	2.3/2.0	1.8/1.5	< .0001
7. Do you think you are more pale than your friends or do you happen to become pale suddenly?	2.0/2.0	1.7/1.0	.0035
8. Do you experience situations in which you sweat more than your friends?	2.3/2.0	1.9/1.0	< .0001
9. Do you ever feel nauseous?	2.1/2.0	1.7/1.0	.0007
10. Do you have headaches?	2.7/3.0	2.4/2.0	.0039
11. Do you have stomach aches?	2.2/2.0	1.9/2.0	.0069
12. Do you sometimes feel suddenly cold without a reason?	2.1/2.0	1.8/1.5	.0018
13. Do you think you are weaker than your peers?	3.1/3.0	2.5/2.5	< .0001
<b>Medical satisfaction domain</b>			
1. Would you like to learn more details about your disease?	3.7/4.0	3.2/3.5	.0001
2. Would you like to learn more details about the treatment?	3.7/4.0	3.2/4.0	.0008
3. Do you think that ablation treatment is effective?	4.3/4.0	4.5/5.0	.0024
4. Are you afraid of medical appointments?	1.9/2.0	1.6/1.0	.0023
5. Are you afraid of such examinations as ECG or echocardiography?	1.3/1.0	1.3/1.0	1.0
6. Are you afraid of ablation treatment?	3.3/4.0	2.3/2.0	<.0001
7. Are you afraid of a blood draw?	2.6/2.0	2.5/2.0	.2102
8. Do you understand the idea of ablation treatment?	4.3/4.0	4.5/5.0	.0310
9. Have you ever hidden your disease symptoms from your doctor?	1.3/1.0	1.4/1.0	.3450
10. Have you ever not followed doctor's recommendations?	1.7/1.0	1.6/1.0	.5754
11. Do you always follow all doctor's recommendations regarding the intake of medicines?	4.2/5.0	4.3/5.0	.3498
12. Do you limit your physical exercises if this is recommended by your doctor?	4.1/4.0	4.2/4.0	.3985
<b>Psychological domain</b>			
1. Do you often cry?	2.3/2.0	2.1/2.0	.0521
2. Is it easy to make you cry?	2.7/3.0	2.5/2.0	.0166
3. Do you think you are more nervous than your peers?	2.9/3.0	2.6/2.0	.0061
4. Do you think you are sadder than your peers?	2.0/2.0	1.9/2.0	.2074
5. Do you think you are happier than your peers?	2.8/3.0	2.7/3.0	.6717
6. Do you think you are lonelier than your peers?	1.7/2.0	1.7/1.0	.7563
7. Can you count on your friends?	4.2/4.0	4.0/4.0	.2437

**Gender**

The study group was divided according to gender. Before the ablation, a difference between male and female was noted in the Psd from PARS, where higher intensity of negative feelings related to arrhythmia was noted in females (mean ± SD/median/IQR: 2.2 ± 0.7/2.1/0.7 vs. 2.5 ± 0.6/2.4/0.6 respectively, *p* = 0.0021), and the difference remained after the ablation (mean ± SD/median/IQR: 2.1 ± 0.6/2.0/0.7 vs. 2.4 ± 0.7/2.4/0.7 respectively, *p* = 0.0013). Before the ablation, physical functioning, according to PARS scores, was similar in males and females (*p* = 0.3253), but in the follow-up boys showed greater improvement than girls (mean ± SD/median/IQR: 1.6 ± 0.4/1.6/0.7 vs. 2.0±0.6/2.0/0.8 respectively, *p* < 0.0001).

**Discussion**

During a six-month follow-up period, we noted that a successful RFA/cryoablation had a positive impact on general satisfaction with QoL and general satisfaction with health. Successful elimination of tachycardia substrate improved QoL, particularly with regard to physical functioning of patients. The published studies on pediatric patients with SVT showed the positive effects of ablation on QoL; however, it needs to be stressed that these studies were based on significantly lower numbers of patients in comparison with our study group. Thus, our study is currently the largest available study evaluating QoL of pediatric patients after successful ablation of SVT. Strieper



**Figure 4.** The influence of ablation therapy on the PARS domains (A) and on the WHOQOL-BREF domains (B) in SVT group divided by age. Values are presented as median; IQR and minimum-maximum.

et al<sup>6</sup> evaluated QoL in 27 pediatric patients with SVT after successful ablation, using Pediatric Quality of Life Inventory (PedsQL) cardiac model questionnaire before and 6 months after the procedure. That study confirmed a significant improvement in all the measured areas following a successful elimination of tachycardia substrate when analyzing the whole study group; however, in the younger group, i.e. 5-12 years, the individual scores of emotional, social and school domains did not change significantly<sup>6</sup>. In another study, the authors analyzed whether there was a change in QoL in 38 children with SVT; they demonstrated a significant improvement in all the measured areas one month after a successful RFA as compared with the pre-ablation period; the greatest improvement was in physical functioning, particularly in children older than 12 years of age<sup>15</sup>. The one-month assessment of QoL after the ablation might be too short though, as the arrhythmia occurrence may vary, the obtained results could be a “placebo” effect rather than the real improvement related to tachycardia. The authors of those studies<sup>6,15</sup> used PedsQL cardiac module, which is one of the approved questionnaires validated by Uzark et al<sup>20,21</sup> for pediatric patients with heart conditions. However, that questionnaire is not available in polish language version. Generic questionnaires can be useful, but not thoroughly effective to assess the QoL in patients with cardiac diseases<sup>22</sup>. Therefore, it appears crucial to support QoL evaluation based on a generic questionnaire with a specific questionnaire designed for the studied group. In this study, we used a short version of the WHOQOL-BREF questionnaire, which is an acknowledged tool, referred to in the subject literature<sup>23</sup>, used by scientists to evaluate QoL also in children and teenagers<sup>24,25</sup>. There are several questionnaires developed especially for cardiac patients, such as the previously mentioned PedsQL cardiac module or pediatric cardiac quality of life inventory<sup>26-28</sup>. Those questionnaires were created to assess QoL in children with various heart diseases. Investigators tried to create their own questionnaires adapted to pediatric patients with arrhythmia; one of such questionnaires is the Cardiac Arrhythmia Quality of Life for Youths<sup>29</sup>. We also attempted to develop the questionnaire particularly tailored to the study group. Thus, the PARS questionnaire was developed, which evaluates individual feelings and observations connected with arrhythmia. This questionnaire has already been used in our study to evaluate the QoL in children with SVT.

It has appeared to be a useful tool to complement the generic questionnaire in the evaluation of QoL in patients with SVT<sup>19</sup>. Some investigators analyzed the influence of ablation on QoL only one month after the procedure. In the first period after the ablation there are several limitations imposed on a patient. In most cases, they need to take aspirin for one month and are recommended to refrain from physical activity for the first one to three months. This may definitely influence the QoL assessed within this period. Another important issue is that the occurrence of tachycardia episodes is unpredictable and, therefore, the assessment of QoL should be performed at least 6 months after the procedure to avoid both the placebo effect and the restriction related to postprocedural recommendations. Thus, we decided to perform the follow-up evaluation six months after the ablation. Evaluating the QoL and its relation to age in our study, we noticed that the youngest group reported the most considerable benefit from ablation treatment. In older children ( $\geq 16$  years), despite a significant improvement in their physical functioning and greater satisfaction with health condition and QoL after the ablation, an improvement was not observed with regard to psychological functioning. We believe that the oldest children who are the most aware of the threats related to arrhythmia, despite a successful therapy, may still feel anxiety associated with its relapse. This should support the idea of performing earlier qualification for ablation in children with symptomatic arrhythmia. When analyzing the whole study group, differences in SRD before and after the ablation were observed. However, when evaluating children about their age, the scores in SRD in patients older than 12 years were similar before and after the ablation. In patients under 12 years of age, SRD scores before the ablation were the lowest, and improved in the follow-up period. Thus, it might be assumed that the youngest children deal with social pressures related to the disease least effectively. In this group of patients, ablation treatment resulted in improved social functioning, which was not observed in the group of older children. When analyzing the whole study group, no differences were observed in terms of EnD before and after the ablation. However, when evaluating children with regard to their age, in the youngest group ( $\leq 12$  years) EnD showed improvement after the ablation. No differences before and after the ablation in older groups confirmed that there is no relation between the disease and the above



environmental areas in these patients. The type of SVT (AVRT, AVNRT, and AET) had no impact on QoL. Similar observations were made in the previous pediatric study, but on significantly smaller group of children with SVT<sup>15</sup>. This differed from the studies performed in adults, which have demonstrated that patients with AVNRT had lower QoL scores in physical scales than patients with WPW<sup>30</sup>. The difference in the obtained results between adults and children may derive from the fact that AVNRT in adults more often affects female gender and older age, which results in the impairment in QoL<sup>31</sup>. Our study showed certain gender differences regarding QoL scores in children with SVT. Females dealt less effectively with limitations related to the disease and treatment than males. The previous data based on adult patients had identified some gender differences in QoL scores for patients with SVT<sup>10</sup>. Researchers had noted that<sup>32</sup> women with SVT are referred for ablation later than men, after a longer duration of symptoms, and after having been given more antiarrhythmic drugs, which might impact their QoL. These issues need to be further explored in another study. The results of this research have confirmed that the improvement in physical functioning of patients or even their complete recovery do not always correspond with their psychological condition. The fear of tachycardia recurrence might have a negative impact on the psychological functioning of patients. This might explain why psychological functioning in the oldest children showed no improvement after the ablation procedure. This might be observed particularly often among cardiologic patients who are very concerned about their heart condition. We speculate that a 6-month period might still be too short to evaluate the influence of the ablation therapy on patients' psychological functioning. Further analysis needs to be performed to demonstrate long-term consequences of the ablation therapy on QoL parameters.

The authors acknowledge the following limitations of the performed study: 1- the most important limitation of our study was the fact that the post-ablation evaluation was performed via post. It was related to the fact that many patients live far from the hospital and medical follow-up was performed by referring cardiologists. However, at the initial evaluation, we made a significant effort to clearly explain how the form should be filled out; 2- we suspect that in the group of the youngest children the responses might have been provided with the help of their parents and thus they

may reflect the fears and anxieties of the parents more than the children. This could be proved if the parents completed individual questionnaires with questions regarding their QoL in relation to their child's disease. This might be considered as a limitation of our study, which could be verified when conducting further data collection.

## Conclusions

A six-month observation period showed that ablation significantly improved general satisfaction with health condition, general satisfaction with the QoL in children with SVT and had a positive impact on QoL scores. Regarding the QoL, the younger the patients, the greater benefits from the ablation therapy they obtain. The pre-ablation antiarrhythmic therapy had a negative impact on psychological parameters of QoL. The type of arrhythmia, frequency of episodes and the time between diagnosis and ablation procedure had no significant impact on QoL scores.

## Conflict of Interest

The Authors declare that they have no conflict of interests.

## References

- 1) HANASH CR, CROSSON JE. Emergency diagnosis and management of pediatric arrhythmias. *J Emerg Trauma Shock* 2010; 3: 251-260.
- 2) DONIGER SJ, SHARIEFF GO. Pediatric dysrhythmias. *Pediatr Clin North Am* 2006; 53: 85-105.
- 3) GOLDBERG AS, BATHINA MN, MICKELSEN S, NAWMAN R, WEST G, KUSUMOTO FM. Long-term outcomes on quality-of-life and health care costs in patients with supraventricular tachycardia (radiofrequency catheter ablation vs. medical therapy). *Am J Cardiol* 2002; 89: 1120-1123.
- 4) BATHINA MN, MICKELSEN S, BROOKS C, JARAMILLO J, HEP-  
TON T, KUSUMOTO FM. Radiofrequency catheter ablation vs. medical therapy for initial treatment of supraventricular tachycardia and its impact on quality of life and healthcare costs. *Am J Cardiol* 1998; 82: 589-593.
- 5) CAMPBELL RM, STRIEPER MJ, FRIAS PA. The role of radiofrequency ablation for pediatric supraventricular tachycardia. *Minerva Pediatr* 2004; 56: 63-72.
- 6) STRIEPER M, LEONG T, BAJAJ T, HUCKABY J, FRIAS P, CAMP-  
BELL R. Does ablation of supraventricular tachycardia in children with a structurally normal heart improve quality of life? *Congenit Heart Dis* 2010; 5: 587-593.

- 7) MARYNIAK A, BIELAWSKA A, BIEGANOWSKA K, MISZCZAK-KNECHT M, WALCZAK F, SZUMOWSKI L. Does atrioventricular reentry tachycardia (AVRT) or atrioventricular nodal reentry tachycardia (AVRT) in children affect their cognitive and emotional development? *Pediatr Cardiol* 2013; 34: 893-897.
- 8) CZOSEK RJ, CASSEY AE, WRAY J, WERNOVSKY G, NEWBURGER JW, MUSSATTO KA, MAHONY L, TANEL RE, COHEN MI, FRANKLIN RC, BROWN KL, ROSENTHAL D, DROTAR D, MARINO BS. Quality of life in pediatric patients affected by electrophysiologic disease. *Heart Rhythm* 2015; 12: 899-908.
- 9) MEISSNER A, STIFOUDI I, WEISMEISL P, SCHRAGE MO, MAAGH P, CHRIST M, BUTZ T, TRAPPE HJ, PLEHN G. Sustained high quality of life in a 5-year long term follow-up after successful ablation for supra-ventricular tachycardia. Results from a large retrospective patient cohort. *Int J Med Sci* 2009; 6: 28-36.
- 10) WOOD KA, STEWART AL, DREW BJ, SCHEINMAN MM, FROELICHER ES. Patient perception of symptoms and quality of life following ablation in patients with supraventricular tachycardia. *Heart Lung* 2010; 39: 12-20.
- 11) YILDIRIM O, YONTAR OC, SEMIZ M, ERDEM A, CANAN F, YONTAR G, KUĞU N. The effect of radiofrequency ablation treatment on quality of life and anxiety in patients with supra-ventricular tachycardia. *Eur Rev Med Pharmacol Sci* 2012; 16: 2108-2112.
- 12) KIM YG, SHIM J, CHOI JI, KIM YH. Radiofrequency catheter ablation improves the quality of life measured with a short form-36 questionnaire in atrial fibrillation patients: a systematic review and meta-analysis. *PLoS One* 2016; 11: e0163755.
- 13) NIELSEN JC, JOHANNESSEN A, RAATIKAINEN P, HINDRICKS G, WALFRIDSSON H, PEHRSON SM, ENGLUND A, HARTIKAINEN J, MORTENSEN LS, HANSEN PS; MANTRA-PAF INVESTIGATORS. Long-term efficacy of catheter ablation as first-line therapy for paroxysmal atrial fibrillation: 5-year outcome in a randomised clinical trial. *Heart* 2017; 103: 368-376.
- 14) DEMASO DR, SPRATT EG, VAUGHAN BL, D'ANGELO EJ, VAN DER FEEN JR, WALSH E. Psychological functioning in children and adolescents undergoing radiofrequency catheter ablation. *Psychosomatics* 2000; 41: 134-139.
- 15) ABO-HADED HM. Radiofrequency ablation changes the quality of life of children with supraventricular tachycardias. *Arch Dis Child* 2015; 100: 754-757.
- 16) WORLD HEALTH ORGANIZATION. Constitution of the World Health Organization. *Chron World Health Organ* 1947; 1: 29-43.
- 17) WHOQOL GROUP. Development of the WHOQOL: rationale and current status. *Int J Ment Health* 1994; 23: 24-56.
- 18) WORLD HEALTH ORGANIZATION. Division of Mental Health. WHOQOL-BREF- introduction, administration, scoring and generic version of the assessment: field trial version. WHO Geneva, 1996.
- 19) SZAFRAN E, BASZKO A, BUKOWSKA-POSADZY A, MOSZURA T, WERNER B, SIWIŃSKA A, BANACH M, WALKOWIAK J, BOBKOWSKI W. Evaluation of medical and psychological parameters of quality of life in supraventricular tachyarrhythmia children. A comparison with healthy children. *Arch Med Sci* 2016; 12: 1052-1063.
- 20) UZARK K, JONES K, BURWINKLE TM, VARNI JW. The pediatric quality of life inventory in children with heart disease. *Prog Ped Card* 2003; 18: 141-148.
- 21) UZARK K, JONES K, SLUSHER J, LIMBERS CA, BURWINKLE TM, VARNI JW. Quality of life in children with heart disease as perceived by children and parents. *Pediatrics* 2008; 121: 1060-1067.
- 22) DELAMATER AM, JENT JF. Cardiovascular disease. In: Roberts MC, Steele RG, editors. *Handbook of Pediatric Psychology*. The Guilford Press, 2009.
- 23) SKEVINGTON SM, LOTFY M, O'CONNELL KA; WHOQOL GROUP. The World Health Organization's WHOQOL-BREF quality of life assessment: psychometric properties and results of the international field trial. A report from the WHOQOL group. *Qual Life Res* 2004; 13: 299-310.
- 24) RANA P, MISHRA D. Quality of life of unaffected siblings of children with chronic neurological disorders. *Indian J Pediatr* 2015; 82: 545-548.
- 25) KAHENI S, YAGHOBIAN M, SHAREFZADAH GH, VAHIDI A, GHORBANI H, ABDERAHEMI A. Quality of life in children with  $\beta$ -thalassemia major at center for special diseases. *Iran J Ped Hematol Oncol* 2013; 3: 108-113.
- 26) MARINO BS, SHERA D, WERNOVSKY G, TOMLINSON RS, AGUIRRE A, GALLAGHER M, LEE A, CHO CJ, STERN W, DAVIS L, TONG E, TEITEL D, MUSSATTO K, GHANAYEM N, GLEASON M, GAYNOR JW, WRAY J, HELFAER MA, SHEA JA. The development of the pediatric cardiac quality of life inventory: a quality of life measure for children and adolescents with heart disease. *Qual Life Res* 2008; 17: 613-626.
- 27) WRAY J, FRANKLIN R, BROWN K, CASSEY A, MARINO BS. Testing the pediatric cardiac quality of life inventory in the United Kingdom. *Acta Paediatr* 2013; 102: e68-73.
- 28) WRAY J, FRANKLIN R, BROWN K, BLYTH J, MARINO BS. Linguistic validation of a disease-specific quality of life measure for children and teenagers with cardiac disease. *Cardiol Young* 2012; 22: 13-17.
- 29) PULGARON ER, WILE D, SCHNEIDER K, YOUNG ML, DELAMATER AM. Quality of life and psychosocial functioning of children with cardiac arrhythmias. *Cardiol Young* 2013; 23: 82-88.
- 30) WALFRIDSSON U, STRÖMBERG A, JANZON M, WALFRIDSSON H. Wolff-Parkinson-White syndrome and atrioventricular nodal re-entry tachycardia in a Swedish population: consequences on health-related quality of life. *Pacing Clin Electrophysiol* 2009; 32: 1299-1306.
- 31) BUBIEN RS, KNOTTS-DOLSON SM, PLUMB VJ, KAY GN. Effect of radiofrequency catheter ablation on health-related quality of life and activities of daily living in patients with recurrent arrhythmias. *Circulation* 1996; 94: 1585-1591.
- 32) DAGRES N, CLAGUE JR, BREITHARDT G, BORGGREFE M. Significant gender-related differences in radiofrequency catheter ablation therapy. *J Am Coll Cardiol* 2003; 42: 1103-1107.