ORIGINAL ARTICLE ÖZGÜN ARAŞTIRMA

Evaluation of Clinical Features and Prognosis in Children with Supraventricular Tachycardia

Supraventriküler Taşikardili Çocukların Klinik Özellikleri ve Prognozun Değerlendirilmesi

Fahrettin Uysal* (0000-0002-7747-4859), Alper Tunga Özbek (0009-0006-9307-3314), Abdüsselam Genç* (0000-0002-7181-8585), Ergün Çil* (0000-0003-3516-0082)**

*Bursa Uludağ University Faculty of Medicine, Department of Pediatric Cardiology, Bursa, Turkey

**Bursa Medicana Hospital, Clinic of Pediatrics, Bursa, Turkey

Abstract

Introduction: This study aims to investigate the clinical characteristics of pediatric patients diagnosed with supraventricular tachycardia (SVT) and assess their short-term prognosis.

Materials and Methods: Data from 213 patients diagnosed with SVT between 2010 and 2015 at the Department of Pediatric Cardiology, Bursa Uludag University Faculty of Medicine, were retrospectively reviewed.

Results: The ratio of male to female patients was 1: 1.25. Regarding treatment response and prognosis, the recurrence rate of SVT attacks was higher in males. The most common complaint at the time of diagnosis was palpitation. Furthermore, 17.8% of patients were diagnosed due to tachycardia detected during routine check-ups; almost all were under one year of age. In 56.3% of patients, the initial diagnosis was made at the pediatric emergency clinic. In acute treatment, 30% of patients were treated with vagal maneuvers; 61% had their attacks terminated, while 41% received drug therapy. Adenosine was the most used drug, and it successfully terminated attacks in 79% of patients receiving it. In the evaluation of patients' follow-ups after the initial attack, 56.3% of patients experienced recurrences, and 71% of second attacks occurred within the first three months.

Prophylactic drug therapy was initiated in 94.4% of patients, with an average duration of 2.5±1.6 years. After treatment discontinuation, 75.4% of patients remained symptom-free, while 24.6% experienced SVT attacks again. Electrophysiological studies were performed in 16.9% of patients at another centers, and ablation was applied to 15.5%.

Conclusion: Patients with SVT may be asymptomatic during infancy and vagal stimulation and adenosine response was quite good in acute treatment. Prophylactic medical treatment was effective in children whose weight is <15 kg and the recurrences were low after discontinuation especially in infants.

Keywords
Supraventricular tachycardia, children, prophylaxis, recurrences

Anahtar kelimeler
Supraventriküler taşikardi, çocuk, profilaksi, nüks

Received/Geliş Tarihi : 19.07.2023
Accepted/Kabul Tarihi : 05.09.2023

DOI:10.4274/jcp.2023.43799

Address for Correspondence/Yazışma Adresi: Assoc. Prof. Fahrettin Uysal, Bursa Uludağ University Faculty of Medicine, Department of Pediatric Cardiology, Bursa, Turkey
Phone: +90 505 476 95 86
E-mail: fahrettinuysal@uludag.edu.tr

Öz

Giriş: Bu çalışmanın amacı supraventriküler taşikardi (SVT) tanısı alan pediatrik hastaların klinik özelliklerini araştırmak ve kısa dönem prognozlarını değerlendirmektir.

Gereç ve Yöntem: Bursa Uludağ Üniversitesi Tıp Fakültesi Çocuk Kardiyoloji Anabilim Dalı'nda 2010-2015 yılları arasında SVT tanısı alan 213 hastanın verileri retrospektif olarak incelendi.

Bulgular: Erkek/kadın hastaların oranı 1: 1.25 idi. Tedaviye yanıt ve prognoza bakıldığında SVT ataklarının tekrarlama oranı erkeklerde daha yüksekti. Tanı anında en sık görülen yakınma çarpıntıydı. Ayrıca hastaların %17,8'ine rutin kontrollerde

tespit edilen taşikardi nedeniyle tanı konuldu ve bu hastaların neredeyse hepsi bir yaşın altındaydı. Hastaların %56,3'ünde ilk tanı çocuk acil servisinde konuldu. Akut tedavide hastaların %30'una vagal manevralar uygulandı ve % 61'inin atakları sonlandırıldı, % 41'i ise ilaç tedavisi gördü. Adenozin en çok kullanılan ilaçtı ve bunu alan hastaların %79'unda atakları başarıyla sonlandırdı. Hastaların ilk atak sonrası takipleri değerlendirildiğinde hastaların %56,3'ünde nüks yaşandığı, ikinci atakların %71'inin ilk üç ay içerisinde gerçekleştiği görüldü. Hastaların %94,4'üne ortalama 2,5±1,6 yıl süreyle profilaktik ilaç tedavisi başlandı. Tedavi kesildikten sonra hastaların %75,4'ünde semptom görülmezken %24,6'sında tekrar SVT atağı yaşandı. Hastaların %16,9'una başka merkezlerde elektrofizyolojik inceleme yapılmış, %15,5'ine ablasyon uygulanmıştır.

Sonuç: SVT'li hastalar bebeklik döneminde asemptomatik olabilir ve akut tedavide vagal manevralar ve adenozin yanıtı oldukça iyiydi. Ağırlığı <15 kg olan çocuklarda profilaktik medikal tedavi etkili olmuş ve özellikle bebeklerde tedavinin kesilmesinden sonra nüks oranı düşük olmuştur.

Introduction

Various rhythm disturbances can develop during childhood, whether associated with congenital or acquired heart diseases or occurring without any underlying pathology. These rhythm disturbances may present with mild clinical symptoms or, in some cases, lead to severe outcomes such as sudden death (1). Arrhythmias can manifest as bradyarrhythmias and tachyarrhythmias (2).

Supraventricular tachycardia (SVT) is a common rhythm disorder in childhood, with an estimated prevalence ranging from 1 in 250 to 1 in 1000. SVT can be attributed to three primary mechanisms: re-entry, abnormal automaticity, and triggered activity (3). In infants and young children, atrioventricular re-entry tachycardia (AVRT) is frequently observed, while atrioventricular nodal re-entry tachycardia (AVNRT) is more common in older children (4). Most SVTs are typically recurrent and often resistant to treatment but rarely threaten life by compromising hemodynamics. Approximately 60% of SVTs occur in early infancy, 80-90% resolve after the age of 1, and 20-30% may recur during follow-up. In patients diagnosed after one year of age, spontaneous resolution has been observed in 20% by the age of 6-8 (5).

Treatment for SVT consists of two phases: acute management to terminate the attack and prophylactic therapy to prevent recurrences. Currently, in cases of stable hemodynamics, vagal maneuvers, and adenosine are the most used methods for acute attack termination, while synchronized cardioversion is the primary treatment option for patients with unstable hemodynamics (6,7). In chronic treatment, medical therapy or ablation is the initial treatment choice, depending on the patient's weight (8-10).

This study aimed to retrospectively evaluate the clinical characteristics and responses to acute and chronic treatment of patients who presented with SVT attacks before the introduction of ablation therapy in our center.

Materials and Methods

Data from 213 patients who presented to the Department of Pediatric Cardiology at Bursa Uludag University Faculty of Medicine between 2010 and 2015 with complaints or were diagnosed with SVT during routine follow-up were recorded for this study. The study was initiated after obtaining approval from the Bursa Uludag University Ethics Committee (decision no: 2015-21/14, date: 08.12.2015).

SVT, or supraventricular tachycardia, is characterized by an increased heart rate arising from an anomalous mechanism originating close to the bifurcation point of the bundle of His. In order to be eligible for the study, patients were required to have undergone a minimum of one surface electrocardiogram that exhibited a continuous episode lasting more than one minute, meeting at least one of the following four criteria: (1) Abnormal P wave axis (ranging from 91° to 359°) and a P wave rate that exceeds the normal rate for the individual's age; (2) Normal P wave axis (ranging from 0° to 90°) and a P wave rate exceeding 240 beats per minute, or a P wave rate that is faster than the expected rate for the individual's age, accompanied by sudden onset or sudden termination; (3) Absence of visible P waves, accompanied by a QRS rate that is faster than the expected rate for the individual's age, and normal duration of the QRS complex; (4) Normal P wave axis, presence of P waves, and atrioventricular dissociation, accompanied by a QRS rate that is faster than the expected rate for the individual's age, and normal duration of the QRS complex.

Electronic medical records were scanned to obtain patient data, including age at diagnosis, gender,

presenting complaints, location of initial diagnosis (emergency room, outpatient clinic, intensive care unit), family history (consanguinity, palpitations, dysrhythmia, family history of sudden death), drugs used in acute treatment, intensive care admission, use of prophylaxis, prophylaxis type for patients receiving it, use of multiple drugs, presence and type of congenital heart disease, current clinical symptoms, and post-treatment symptoms. A specific SVT study form was prepared for data collection and documented for each patient. Patients diagnosed with either atrial fibrillation or atrial flutter, as determined exclusively by surface electrocardiogram (ECG), were not included in the study.

Statistical Analysis

Statistical analyses were performed using the "SPSS 22.0 for Windows" statistical analysis package. Categorical data were presented as frequency and percentage (n, %), while continuous variables were presented as mean ± standard deviation (mean ± SD). Descriptive statistics included mean, standard deviation, median, minimum, maximum, frequency, and ratio values. The distribution of variables was assessed using the Kolmogorov-Smirnov test. The Mann-Whitney U test and independent sample t-test were used to analyze quantitative data, and the chi-square test was used to analyze qualitative data.

Results

Two hundred thirteen patients diagnosed with SVT were evaluated: 116 (54.5%) females and 97 (45.5%) males. The mean age was 11.3±6.1 years (min: 0, max: 22, median: 12). Of the 213 patients, 53 experienced their first SVT attack between 0-12 months, 38 between 1-5 years, 42 between 5-10 years, and 80 were older than ten years. Among the patients, 38 (17.8%) had no active complaints and were diagnosed due to tachycardia detected during routine check-ups. All these patients were under two years of age. Among those with active complaints, palpitations were the most common reason 146 patients (68.5%) sought medical attention. The diagnosis was made in 120 patients in the Pediatric Emergency Department, 53 in outpatient clinics, 17 in the Neonatal Intensive Care Unit, and 14 during routine newborn examinations. The demographic characteristics of the patients, presenting complaints, and the locations of initial diagnosis are summarized in Table 1.

The average age of the group with complaints during the first attack was higher than the group without complaints ($p<0.0001$). Palpitations, chest pain, nausea, vomiting, syncope, and presyncope were significantly more common in older patients. Inability to feed and restlessness were significantly lower during the first SVT attack in these patients ($p<0.05$).

Table 1. Demographic characteristics, presenting complaints of patients and the locations of initial diagnosis

	Female (n, %)	116 (54.5)
	Age (years, mean ± SD (min, max)	11.3±6.1 (0, 22)
Complaints (n, %)	No symptom	38 (17.8)
	Palpitation	146 (68.5)
	Chest pain	23 (10.8)
	Presyncope	14 (6.6)
	Discomfort	14 (6.6)
	Syncope	11 (5.2)
	Nausea	11 (5.2)
	Feeding problem	10 (4.7)
	Abdominal pain	3 (1.4)
Location of first attack (n, %)	Emergency	120 (56.3)
	Pediatric Cardiology Outpatient	53 (24.9)
	Newborn Intensive Care Unit	17 (8)
	Newborn outpatient clinic	14 (6.6)
	Postcardiac surgery	6 (2.8)
	Pediatric clinics	3 (1.4)

The relationship between complaints and the age of the first SVT attack is shown in Table 2.

WPW syndrome was detected in 47 patients, and 35 had congenital heart disease. Mitral valve prolapse was present in 22 patients. Cardiomyopathy associated with tachycardia was found in a total of 11 patients.

When acute treatment options during the patients' first attack were evaluated, it was observed that 60 patients (28.2%) had their first attack spontaneously resolved, 65 patients (30.5%) received vagal stimulation, and 88 patients (41.3%) were treated with medication. Adenosine was used as medication in 48 patients, digoxin in 24 patients, verapamil in 7 patients, amiodarone in 5 patients, and metoprolol in 4 patients. 163 patients (76.5%) responded to the initial treatment, while 50 patients required a second treatment option. The success rate of treatment with vagal stimulation was 61.5%, while with medication, it was 71.5%. The proportions of patients who responded and did not respond to each treatment and medication are detailed in Table 3.

Prophylactic drug treatment was initiated in 201 patients (94.4%), with an average prophylaxis duration of 2.5±1.6 years. Atenolol was prescribed to 77 patients (36.2%), metoprolol to 73 patients (34.3%), digoxin to 55 patients (25.8%), propranolol to 48 patients (22.5%), sotalol to 36 patients (16.9%), amiodarone to 17 patients (8%), propafenone to 16 patients (7.5%), and verapamil to 3 patients (1%). After the initial attack, 120 patients (56.3%) experienced a second SVT attack, with 42 patients (35%) having a second attack within the first month, 44 patients (36.7%) between 1-3 months, 28 patients (23.3%) between 3-12 months, and six patients (5%) more than one year later. The second attack was significantly more common in males. Among 63 patients receiving combination therapy, 45 (71.4%) experienced a recurrence, while among 150 patients treated with a single drug, 75 (50%) had a recurrence (p=0.004). There was no significant difference between family history and response to initial attack treatment and recurrence (Table 4). Among the 126 patients who discontinued medical treatment, 95 had no complaints after treatment cessation.

Electrophysiological studies were performed in 36 patients (16.9%), and radiofrequency (RF) ablation was performed in 33 of them in another centers.

Table 2. Association between complaints and the age of first SVT attack

		First SVT attack							
		Min-max			Median	Mean ± SD			p
Complaints	(-)	0	-	148	0.0	17.6	±	39.1	**0.000**
	(+)	0	-	213	112.0	105.9	±	63.5	
Palpitation	(-)	0	-	194	1.0	24.6	±	50.2	**0.000**
	(+)	0	-	213	119.0	111.2	±	60.0	
Chest pain	(-)	0	-	213	74.5	79.6	±	69.3	**0.000**
	(+)	35	-	197	150.0	139.0	±	44.8	
Nausea	(-)	0	-	213	87.0	89.6	±	69.4	**0.004**
	(+)	0	-	65	20.0	19.4	±	20.4	
Abdominal pain	(-)	0	-	213	84.5	86.6	±	69.6	**0.362**
	(+)	1	-	88	37.0	42.0	±	43.7	
Syncope	(-)	0	-	213	80.0	82.5	±	68.7	**0.001**
	(+)	37	-	203	173.0	151.1	±	50.8	
Presyncope	(-)	0	-	210	77.0	81.9	±	69.4	**0.002**
	(+)	72	-	213	145.5	144.0	±	39.2	
Feeding problem	(-)	0	-	213	86.0	90.2	±	68.5	**0.000**
	(+)	0	-	4	1.0	1.2	±	1.2	
Discomfort	(-)	0	-	213	90.0	91.6	±	68.4	**0.000**
	(+)	0	-	25	2.0	6.6	±	9.3	

Table 3. Response to the acute SVT treatment			
		Positive response	
		n	%
First treatment	Vagal stimulation	40.0	61.5
	Adenosine	38.0	79.2
	Digoxin	17.0	70.8
	Amiodarone	4.0	80.0
	Verapamil	3.0	42.9
	Metoprolol	1.0	25.0

Table 4. Comparison of patients who relapsed after the first attack and those who did not						
		Recurrence		No recurrence		
		n	%	n	%	p
Gender	Female	58	50.0	58	50.0	**0.041**
	Male	62	63.9	35	36.1	-
Family history	No	115	57.2	86	42.8	0.291
	Yes	5	41.7	7	58.3	-
Positive response to first treatment	No	32	64.0	18	36.0	0.212
	Yes	88	54.0	75	46.0	-
Combination therapy	No	75	50.0	75	50.0	**0.004**
	Yes	45	71.4	18	28.6	-

Discussion

Palpitation are among the most common symptom in patients presenting to pediatric cardiology clinics. The episodic and infrequent nature of tachycardia attacks, sometimes making it difficult for patients to notice their symptoms, the lack of awareness of discomfort in children, and particularly the inability of small children and infants to express their complaints make it challenging to evaluate patients with SVT during childhood. SVT is a critical cardiac problem in childhood, with a prevalence ranging from 1/250 to 1/1000. Our study evaluated SVT patients diagnosed and followed up in our clinic in pre-ablation era regarding clinical features and follow-up results.

When examining gender distribution, it is generally reported as a male-to-female ratio of 3:2. However, our study's ratio was 1:1.25 in favor of girls. Although it is more commonly observed in girls, when looking at the response to treatment and prognosis, the recurrence rate of SVT attacks was significantly higher in boys compared to girls.

The onset of supraventricular tachycardia usually occurs in early infancy (11). In a study conducted by Ücsel et al. (12) with 40 cases, 6 (15%) of the cases were infants under one month old, and in our study, this rate was 19% (41/213). Massin et al. (13) found that the average age of patients at the time of SVT diagnosis was 4.3±5.3 years in a study of 250 patients with tachyarrhythmias. In our study, the average age at the time of diagnosis for 213 patients with SVT was found to be 7.1±5.7 years.

Symptoms in SVT patients vary depending on the patient's age, heart rate during SVT, and the existence of underlying heart disease. Patients with SVT may be asymptomatic during infancy or may present with nonspecific symptoms. Among the symptoms that may suggest the presence of arrhythmia are palpitation, chest pain, syncope, and restlessness. Clausen et al. (14) reported that palpitation was the most common presenting complaint in patients diagnosed with SVT in emergency departments. In our study, palpitation was the most common presenting complaint at the time of SVT diagnosis. Furthermore, 38 patients (17.8%)

were diagnosed with tachycardia incidentally during routine check-ups without any complaints. When this group without complaints was further evaluated, it was observed that all patients except for two were infants under one year of age, and the other two patients were 14 and 16 months old, respectively. Palpitation, chest pain, syncope, and presyncope were statistically significantly more common in older age groups, while restlessness and inability to feed were more common in younger age groups. However, it was also observed that patients diagnosed with tachycardia incidentally during routine check-ups without complaints were mostly in the younger age groups.

The choice of acute treatment option during an SVT attack depends primarily on the patient's hemodynamic status. In patients who are not hemodynamically stable, cardioversion is the first choice. In relatively stable patients, vagal maneuvers and adenosine administration are the most preferred methods (5). The form of treatment may vary depending on the available facilities. Clausen et al. (14) reported that out of 135 patients diagnosed with SVT in the emergency department, 100 (74%) received vagal maneuvers for acute treatment, and 86 (64%) received antiarrhythmic agents. Of the patients who received vagal maneuvers, only 18 responded, while 82 received adenosine. The success rate of vagal stimulation in these patients was relatively low, which the authors attributed to poor documentation in the emergency department. As an antiarrhythmic agent, adenosine is most frequently administered, and it has been observed that SVT can be terminated in 48% of these patients after a single dose of adenosine. In our study, it was observed that the SVT attack resolved spontaneously in 60 of 213 patients (28.2%). It was observed that 40 of 65 patients (61.5%) who received vagal stimulation responded to vagal stimulation, and the adenosine response was found to be 79.2% in our study. During follow-up after the first attack, it was observed that SVT attacks recurred in 120 patients (56.3%) in our study. Over 70% of these patients had a second attack within the first three months after the initial attack. Boys and the group receiving combination therapy had significantly higher recurrence rates.

After controlling the acute attack in SVT patients, a decision should be made about whether prophylactic antiarrhythmic treatment should be initiated to prevent recurrences (15). Prophylactic treatment may not be administered in SVTs that are infrequent, short-lived, self-terminating, and do not cause significant symptoms. However, in life-threatening arrhythmias, prophylaxis should be recommended (16). A limited number of studies have provided information regarding the length of SVT prophylaxis or assessed the influence of duration on the likelihood of SVT recurrence (17-19). In a multicenter cohort study, the authors reported that prophylactic medication can be safely shortened from 12 to 6 months in infants with SVT, without the risk of a higher recurrence (20). Prophylaxis duration was found 2.5±1.6 years in our study. It was thought that this period was long since the majority of the patient groups in our study group are >10 years old. Among the patients who received prophylactic treatment, 126 (59.1%) had their prophylaxis discontinued and among them, 95 (75.4%) did not experience any complaints after discontinuation, while 31 patients (24.6%) had recurrent SVT attacks after treatment cessation.

Ablation is recommended for documented SVT, recurrent or persistent when medical therapy is either not effective or is associated with intolerable adverse effects in children weighing >15 kg (21). This study covers the period before ablation was performed in our center. So only 36 (16.9%) of the patients underwent electrophysiological study in another center, and 33 (15.5%) of these patients underwent RF ablation. Since 2015, we also preferred ablation if the patient's weight is >15 kg in recurrent SVT attacks in our center.

Conclusion

Patients with SVT may be asymptomatic during infancy and vagal stimulation and adenosine response was quite good in acute treatment. Prophylactic medical treatment was effective in children whose weight is <15 kg and the recurrences were low after discontinuation especially in infants.

Ethics

Ethics Committee Approval: The study was initiated after obtaining approval from the Bursa Uludag University Ethics Committee (decision no: 2015-21/14, date: 08.12.2015).

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

References

1. Karpawich PP, Pettersen MD, Gupta P, Shah N. Infants and children with tachycardia: natural history and drug administration. Curr Pharm Des 2008;14:743-52.
2. Jat KR, Lodha R, Kabra SK. Arrhythmias in children. Indian J Pediatr 2011;78:211-8.
3. Clapham D, Keating M. Cardiac Exitability and Heritable Arrhythmias. In: Nadas' Pediatric Cardiology. 2nd ed. Philadelphia: Elsevier Health; 2006. p. 891-906.
4. Etheridge SP, Judd VE. Supraventricular tachycardia in infancy: evaluation, management, and follow-up. Arch Pediatr Adolesc Med 1999;153:267-71.
5. Yıldırım I, Karagöz T. Supraventriküler Taşikardiler. Türkiye Klinikleri J Pediatr Sci 2010;6:39-43.
6. American Heart Association. 2005 American Heart Association (AHA) guidelines for cardiopulmonary resuscitation (CPR) and emergency cardiovascular care (ECC) of pediatric and neonatal patients: pediatric basic life support. Pediatrics 2006;117:e989-1004.
7. Wen ZC, Chen SA, Tai CT, Chiang CE, Chiou CW, Chang MS. Electrophysiological mechanisms and determinants of vagal maneuvers for termination of paroxysmal supraventricular tachycardia. Circulation. 1998;98:2716-23.
8. Kugler JD, Danford DA, Houston KA, Felix G; Pediatric Radiofrequency Ablation Registry of the Pediatric Radiofrequency Ablation Registry of the Pediatric Electrophysiology Society. Pediatric radiofrequency catheter ablation registry success, fluoroscopy time, and complication rate for supraventricular tachycardia: comparison of early and recent eras. J Cardiovasc Electrophysiol 2002;13:336-41.
9. Van Hare GF, Javitz H, Carmelli D, Saul JP, Tanel RE, Fischbach PS, et al. Prospective assessment after pediatric cardiac ablation: demographics, medical profiles, and initial outcomes. J Cardiovasc Electrophysiol 200415:759-70.
10. Kriebel T, Broistedt C, Kroll M, Sigler M, Paul T. Efficacy and safety of cryoenergy in the ablation of atrioventricular reentrant tachycardia substrates in children and adolescents. J Cardiovasc Electrophysiol 2005;16:960-6.
11. Andersen ED, Jacobsen JR, Sandoe E, Videbaek J, Wennevold A. Paroxysmal tachycardia in infancy and childhood. I. Paroxysmal supraventricular tachycardia. Acta Paediatr Scand 1973;62:341-8.
12. Üçsel R, Çıtak A, Karaböcüoğlu M, Aydın F, Ömeroğlu R, Uzel N. Çocukluk çağında supraventriküler taşikardiye acil yaklaşım. İst Tıp Fak Dergisi. 2000. p. 382-6.
13. Massin MM, Benatar A, Rondia G. Epidemiology and outcome of tachyarrhythmias in tertiary pediatric cardiac centers. Cardiology 2008;111:191-6.
14. Clausen H, Theophilos T, Jackno K, Babl FE. Paediatric arrhythmias in the emergency department. Emerg Med J 2012;29:732-7.
15. Schwartz PJ. Practical issues in the management of the long QT syndrome: focus on diagnosis and therapy. Swiss Med Wkly 2013;143:w13843.
16. Yılmaz M, Gürses D, Oğuz M, Kırlı AR, Ök FG, Yurtsev Z. Supraventriküler Taşikardi Tanısı İle İzlenen Hastaların Klinik Özellikleri. Ege Klinikleri Tıp Dergisi 2022;60:253-8.
17. Brugada J, Blom N, Sarquella-Brugada G, Blomstrom-Lundqvist C, Deanfield J, Janousek J, et al. Association for European Paediatric and Congenital Cardiology. Pharmacological and non-pharmacological therapy for arrhythmias in the pediatric population: EHRA and AEPC-Arrhythmia Working Group joint consensus statement. Europace 2013;15:1337-82.
18. Sanatani S, Hamilton RM, Gross GJ. Predictors of refractory tachycardia in infants with supraventricular tachycardia. Pediatr Cardiol 2002;23:508-12.
19. Aljohani OA, Herrick NL, Borquez AA, Shepard S, Wieler ME, Perry JC, et al. Antiarrhythmic Treatment Duration and Tachycardia Recurrence in Infants with Supraventricular Tachycardia. Pediatr Cardiol 2021;42:716-20.
20. Mecklin M, Linnanmäki A, Hiippala A, Leino T, Arola A, Leskinen M, et al. Multicenter cohort study on duration of antiarrhythmic medication for supraventricular tachycardia in infants. Eur J Pediatr. 2023;182:1089-97.
21. Philip Saul J, Kanter RJ; WRITING COMMITTEE; Abrams D, Asirvatham S, Bar-Cohen Y, Blaufox AD, Cannon B, Clark J, et al. PACES/HRS expert consensus statement on the use of catheter ablation in children and patients with congenital heart disease: Developed in partnership with the Pediatric and Congenital Electrophysiology Society (PACES) and the Heart Rhythm Society (HRS). Endorsed by the governing bodies of PACES, HRS, the American Academy of Pediatrics (AAP), the American Heart Association (AHA), and the Association for European Pediatric and Congenital Cardiology (AEPC). Heart Rhythm 2016;13:e251-89.