rupture, perforation, dissection and thrombosis of the coronary vein (3). Therefore, close hemodynamic monitoring and control echocardiography should be done whenever coronary venous angioplasty is performed. Overinflation should be avoided, and smaller balloon compared to target vein should be chosen for angioplasty to minimize the risks of the procedure (7). This procedure should be applied by physicians who are experienced in the field of coronary angioplasty, and it should be reserved for cases whenever it is strictly necessary.

Conclusion

Implantation of coronary venous lead is technically the most difficult part of biventricular pacing. Strictures in the target vein are rare abnormalities impeding left ventricular lead implantation. Angioplasty for dilation of strictures seems to be the most appropriate solution. However, angioplasty also carries some risks of complications, therefore it should be applied by experienced operators.

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Video 1. A ring-like stricture at the ostium of target coronary vein preventing left ventricular lead insertion
Video 2. Application of balloon angioplasty to dilate stricture

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Electroanatomic mapping-guided radiofrequency ablation of multifocal atrial tachycardia in a child

Multifokal atriyal taşikardi'li bir çocuğun elektroanatomik haritalama sistemi eşliğinde radyofrekans kateter ablasyonu

Introduction

The incidence of multifocal atrial tachycardia (MAT) in infants and children is very low, accounting for approximately 1% of supraventricular tachycardia (SVT) substrates. MAT is a relatively benign disease, and long-term health depends mostly on the underlying conditions (1, 2). Recently, three-dimensional (3D) mapping systems have been used in pediatric patients. Herein, we report a case, which was successfully used 3D mapping in a child during catheter ablation of MAT originating from right pulmonary veins.

Case Report

A 12-year-old girl who had recurrent paroxysmal palpitation attacks despite three years of beta-blocker treatment was referred to our center for an electrophysiology study (EPS) and ablation. On admission, the patient's physical examinations were unremarkable. Surface 12-lead electrocardiogram (ECG) findings were consistent with focal atrial tachycardia (Fig. 1). Echocardiographic examination was normal.

The electrophysiological procedure was performed using 3D mapping system (EnSite mapping system-St. Jude Medical, St Paul, MN). Quadripolar catheters were placed in the high right atrial and right ventricular (RV) and a decapolar catheter in the coronary sinus. Wenckebach cycle length was 260 ms. Activation mapping during focal atrial tachycardia attacks (tachycardia cycle length 320 ms) showed earliest atrial activation in the upper left region of the right atrial septum. After a short application of radiofrequency (RF) catheter ablation (7F- 4 mm tip) the tachycardia speed up and became sustained. As the signals seen here were low-voltage, we considered the possibility of left focal atrial tachycardia. During SVT, atrioventricular dissociation was achieved by RV pacing, and at the site of earliest activation, local atrial electrogram was only 5 ms ahead of the P-wave, which pointed to the origin of tachycardia from the left atrium. As no patent foramen ovale was found, transseptal punction was used to reach the left atrium (Fig. 2), where mapping was continued. Patient received 4000 IU heparin intravenously. As the tachycardia cycle lengths and earliest activation sites were different during activa-

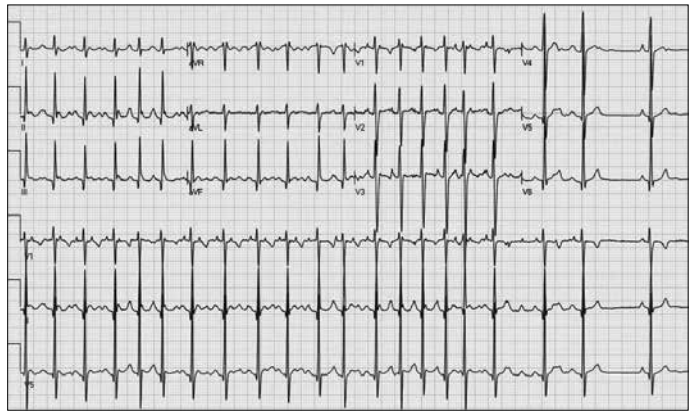

Figure 1. The 12-lead ECG findings consistent with focal atrial tachycardia
ECG - electrocardiogram

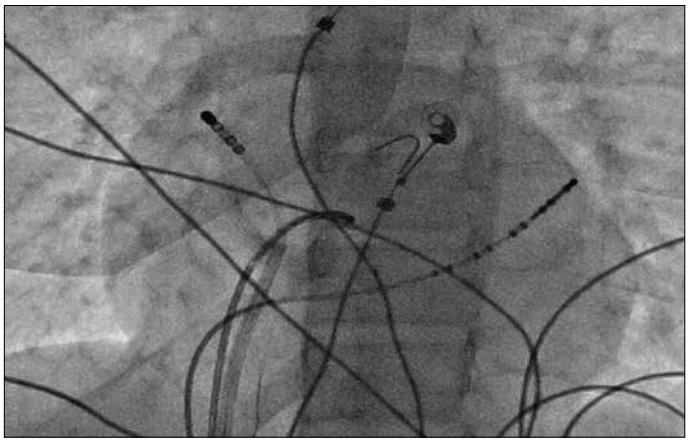

Figure 2. Right anterior oblique fluoroscopic view of mapping and ablation catheters

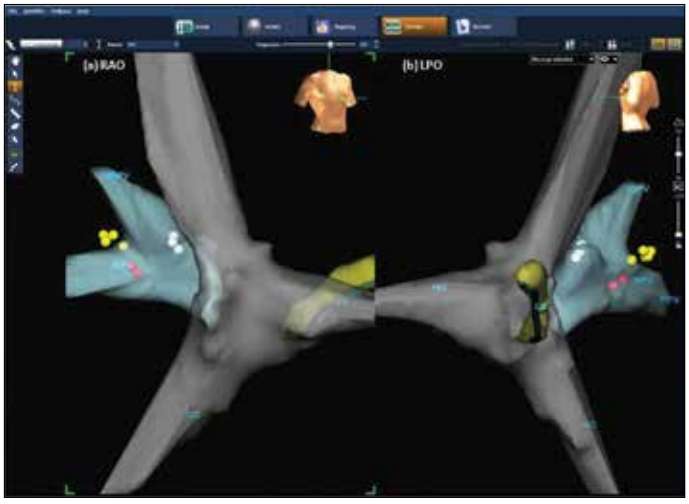

Figure 3. Electroanatomic mapping demonstrating the 3 separate foci in the right-sided pulmonary veins

CS - coronary sinus, HIS - his bundle localization, IVC - inferior caval vein, LPO - left posterior oblique position, RAO - right anterior oblique position, RIPV - right inferior pulmonary vein, RSPV - right superior pulmonary vein

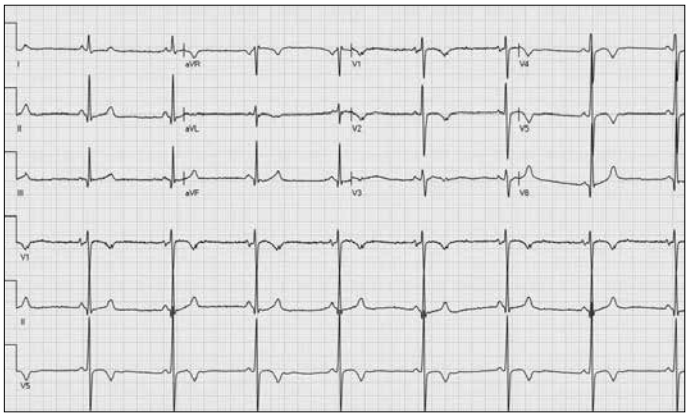

Figure 4. Post-procedural ECG showing normal sinus rhythm

ECG - electrocardiogram

tion mapping, a diagnosis of multifocal atrial tachycardia was made. When ablation was performed at the entrance of the right upper pulmonary vein, where the earliest signals were initially mapped, SVT decreased in frequency but did not disappear. Two other foci were detected, one within the right lower pulmonary vein and second one at the right upper and lower pulmonary vein junction. Following successful ablation, tachycardia stopped completely (Fig. 3). Following 30 minutes of waiting time, SVT could not be re-induced and the procedure was finished. Total procedure time was 210 min and fluoroscopy time was 7 min. A total of 14 RF lesions lasting for 20 s were placed. The patient was monitored during the night and discharged the next day with a sinus rhythm (Fig. 4).

Discussion

MAT is an arrhythmia that rarely occurs in children. The majority of publications on MAT in children are single case reports or small case series. Most of the patients are healthy infants under 1 year of age and small fractions are infants with life-threatening cardiorespiratory diseases. Structural heart diseases are found in 40% of patients (1-4). In adults, MAT is mostly seen in patients with chronic obstructive pulmonary disease, atherosclerosis and diabetes (5, 6). In a paper published by Bradley et al. (1), the oldest patient was 7 years old and has a structural heart disease. Our patient was 12 year old and had no structural heart diseases or chronic conditions. Despite the P-wave morphology on surface ECG pointing to a focal atrial tachycardia, electroanatomic mapping confirmed MAT. If the foci are in close proximity to each other in MAT, P-wave morphologies may be similar, and special attention must be paid in order to differentiate between focal and multifocal tachycardia.

Medical treatment approaches in MAT are currently being debated (1, 2). Bradley et al. (1) recommend treating the underlying condition, observing asymptomatic patients without treatment, and administering amiodarone treatment to symptomatic patients. According to Hsieh et al. (2), antiarrhythmic treatment (especially amiodarone) can be given to symptomatic patients with ventricular dysfunction and fast ventricular response. Our patient was referred to us with tachycardia that continued despite treatment with beta-blockers.

Successful ablation of MAT in a child was first performed in 2000 by Bevilacqua et al. (7). However, we have not come across any case reports describing successful use of electroanatomic mapping guided RF ablation in children.

Another important feature of the presented case was a very short fluoroscopic exposure despite 210 min procedure time. One of the main advantages of electroanatomical mapping is the ability to navigate catheters without fluoroscopy and thereby help reduce or even eliminate fluoroscopy (8-9).

Conclusion

Our case demonstrates that three-dimensional mapping systems help significantly in the mapping and ablation of focal and multifocal atrial tachycardia besides their advantage of reduced radiation exposure for the patients and catheterization laboratory personnel.

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Percutaneous right internal jugular venous cannulation in minimally invasive cardiac surgery

Minimal invaziv kalp cerrahisinde perkütan sağ internal juguler venöz kanülasyon

Introduction

The applications of cardiac surgery (CS) have progressed most notably with the development of minimally invasive techniques. The usage of smaller diameter venous cannulas and vacuum-assisted venous return (VAVR), greatly provided the opportunity to perform minimally invasive procedures (MIP)(1). This has increasingly led surgeons perform cardiac procedures through smaller than traditional incisions which was suggested by Doty et al. in 1998 (2, 3). Nonetheless, the reduced incision size has been matched by a corresponding increase in technical difficulty and operative time due to the limited cardiac exposure (2). With this regard, taking as much the cannulas off the operation field was a concern in order to ease the manipulation and exposure (4). Moreover, the success and relative ease of peripheral cannulation along with the use of VAVR has permitted the application of cardiopulmonary bypass (CPB) feasible for MIPs (1, 5-7).

The aim of this article is to inform in regard to the advantages and the ease of the application of percutaneous right internal jugular venous cannulation (PRIJVC) in MIPs.

Table 1. The demographic and operative characteristics of the cases'

Characteristics	Case 1	Case 2
Age, years / Gender	17/Female	35/Male
Body surface area, m^2	1.6	2.1
Venous cannulation sites	IVC and RIJV	RFV and RIJV
Arterial cannulation site	Ascending aorta	Right CFA
Volume of prime solution, cc	1200	1450
Flow rate, L/min	3.75	5.16
Duration of CPB	40	45
Duration of ACC, min	14	12
Duration of operation, min	175	140
Duration of ICU stay, hours	20	18
Duration of hospitalization, days	3	4

ACC - aortic cross clamp, CFA - common femoral artery, CPB - cardiopulmonary bypass, ICU - intensive care unit, IVC - inferior vena cava, RFV - right femoral vein, RIJV - right internal jugular vein

Figure 1. Percutaneous right internal jugular venous cannulation 1 (a-c) and 2 (d-f)

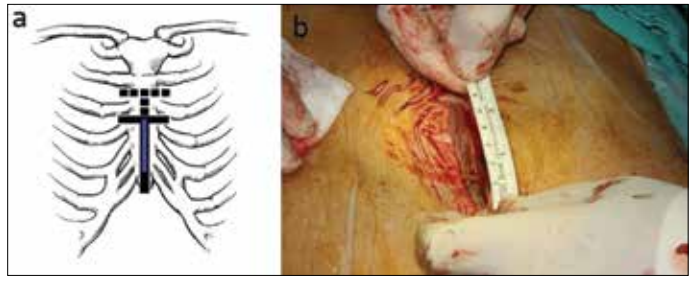

Figure 2. (a) Schematization of the distal partial T sternotomy depicted in black solid line, with extension option of it to second intercostal space depicted in black dotted line. Blue line indicates the skin incision. The 6 cm skin incision (b)

Case Report

In 2011, we performed two minimally invasive secundum atrial septal defect (ASD) closure with PRIJVC. The ASDs were inappropriate for percutaneous device closure due to inadequate antero-superior septal rim. The demographic and operative characteristics of the cases' are summarized in Table 1.

The jugular cannulation in both cases was performed as the first step before sternotomy percutaneously under 1 mg/kg intravenous heparinization with a 20 Fr femoral artery cannula (Edwards Lifesciences, Fem-Flex II, Irvine, CA, USA). The cannulation was performed with Seldinger technique through anterior approach in Trendelenburg's position (Fig. 1). The cannula was secured on the understanding that the final positioning of the tip of the cannula will be adjusted just before the superior caval tourniquet with inspection and palpation during cardiac exposure. The remaining 2 mg/kg intravenous heparin was administered after sternotomy in case 1 and before the femoral arterial cannulation in case 2.

Both operations were performed through 6 cm skin incision with distal partial 'T' sternotomy (Fig. 2) along with the application of -20 to -40 mmHg VAVR (Baxter, Las Vegas, Nevada, USA). In both cases, the ASDs were closed with ePTFE patch and the termination of CPB was