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Initial Experience Using AutoMark in Atrial Fibrillation Ablation

Krasimir Rosenov Dzhinsov, Tosho Lukanov Balabanski

Evaluation of Surgical Treatment in Patients with Total Anomalous Pulmonary Venous Connection

Gökmen Akkaya, Çağatay Bilen, Osman N. Tuncer, Mehmet F. Ayık, Yüksel Atay

Intraoperative Aortic Dissection Complicating Elective Off-pump Coronary Artery Bypass Surgery

Abdusalom A. Abdurakhmanov

The Relationship Between Quality of Life, Functional Capacity, Physical Activity and Performance Levels in Chronic Venous Disease

Semra Özberk, Didem Karadibak, Özalp Karabay, Muslum Polat

Comparison of Short and Prolonged ACT Groups During Cardiopulmonary Bypass about Postoperative Drainage and Blood Transfusion

Berke Özkan, Gökçen Özkan, Öztekin Oto



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Letter to the Editor

East Mediterranean Experiences in TEVAR | **80**

Alptekin Yasim, Erdiñç Erođlu

Research Articles

Initial Experience Using AutoMark in Atrial Fibrillation Ablation | **83**

Krasimir R. Dzhinsov, Toshio L. Balabanski

Assessment of Surgical Correction at Vascular Ring Anomalies | **89**

Çağatay Bilen, Gökmen Akkaya, Osman Nuri Tuncer, Mehmet Fatih Ayık, Yüksel Atay

The Relationship Between Quality of Life, Functional Capacity, Physical Activity and Performance Levels in Chronic Venous Disease | **97**

Sema Ozberk, Didem Karadibak, Dundar Ozalp Karabay, Muslum Polat

Intraoperative Aortic Dissection Complicating Elective Off-pump Coronary Artery Bypass Surgery | **102**

Abdusalom A. Abdurakhmanov

Excessive Scar Formation After Surgical Operations And Injuries: Experience of Early Diagnosis and Prophylaxis | **107**

Oxana Vladimirova, Vladimir Vladimirov, Karen Amlaev, Peter Lavreshin

Comparison of Short and Prolonged ACT Groups During Cardiopulmonary Bypass about Postoperative Drainage and Blood Transfusion | **111**

Berke Özkan, Gökçen Özkan, Öztekin Oto

Case Report

Application of extracorporeal membrane oxygenation for diffuse alveolar hemorrhage due to Wegener's Granulomatosis | **114**

Özgür Altınbaş, Funda Gök, Mehmet Işık, Ömer Tanyeli, Yüksel Dereli, Niyazi Görmüş

Idiopathic premature ventricular contractions originating from left ventricular summit successfully ablated from the epicardial approach | **117**

Tolga Aksu, Tümer Erdem Güler, Serdar Bozyel

East Mediterranean Experiences in TEVAR

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Dear Editor,

While there are numerous diseases of the thoracic aorta, the two most commonly encountered clinical conditions are dissection and aneurysms. Classic surgical treatment of these conditions is difficult for patients because of its high mortality and morbidity rates, as well as being tiring and laborious for the surgeon. Endovascular methods are therefore becoming increasingly popular in the treatment of these diseases.

It was reported that rates of 30-day and in-hospital mortality, stroke, permanent dialysis, and permanent paraparesis and paraplegia were 4.7%, 2.1%, 0.5%, and 0.5% respectively for thoracic aortic aneurysms.⁽¹⁾ Otherwise thoracic endovascular aneurysm repair (TEVAR) had similar immediate and delayed motor deficits and early mortality but lower dialysis, respiratory failure, and intensive care unit stay compared to open surgical repair. Early mortality after TEVAR was lower in

septuagenarians, glomerular filtration rate of less than 60 mL/min, chronic obstructive pulmonary disease, defined as target population that had fourfold mortality reduction attributable to TEVAR.⁽²⁾

One study comparing open surgery and endovascular therapy in thoracic aorta dissections reported mortality rates of 26.6% and 13.1%, respectively, in thoracoabdominal dissection and of 16.9% and 9.5%, respectively, in thoracic dissection.⁽³⁾ That study also reported significantly higher morbidity rates, including cardiac, respiratory, and genitourinary complications, hemorrhage, and acute renal failure, in patients undergoing open repair.

We also attach particular importance to endovascular interventions in thoracic aorta pathologies in our clinic. Endovascular interventions were performed on 18 patients at the Kahramanmaraş Sütçü İmam University Faculty of Medicine, Cardiovascular Surgery Depart-

Yasim A., Eroğlu E. East Mediterranean Experiences in TEVAR. EJCM 2018; 06 (3): 80-82. Doi: 10.32596/ejcm.18.00380.

ment in 2012-2018. Aneurysm was present in seven of these (six thoracoabdominal and one thoracic), dissection in nine, and aortic tear in two. TEVAR was applied to patients with dissection, aortic tear, and thoracic aorta aneurysm, while patients with thoracoabdominal aortic aneurysm received multilayer stent implantation.

Seventeen patients were men, with one woman. Mean age of the patients with aneurysm was 71.1 (52-82) year, and was 59.4 (32-83) year in the patients with dissection and 27.5 (19-48) year in those with aortic tear. The most common risk factor was hypertension, followed by smoking. Sixteen patients were operated under elective conditions, and two under

emergency conditions. One 82-year-old patient undergoing emergency procedures due to dissection died on the second day postoperatively. **Figure 1** a and b show pre- and post-procedural computed tomography angiography images in a patient receiving TEVAR due to dissection, and **Figure 2** a and b in a patient undergoing multilayer graft implantation. The other 17 patients were followed-up for a mean 5-68 months (mean: 28.4 months). All patients were living and in good condition.

In conclusion, with their low mortality and morbidity rates, endovascular interventions are good alternative to open surgery in thoracic aorta pathologies.

Figure 1 - a



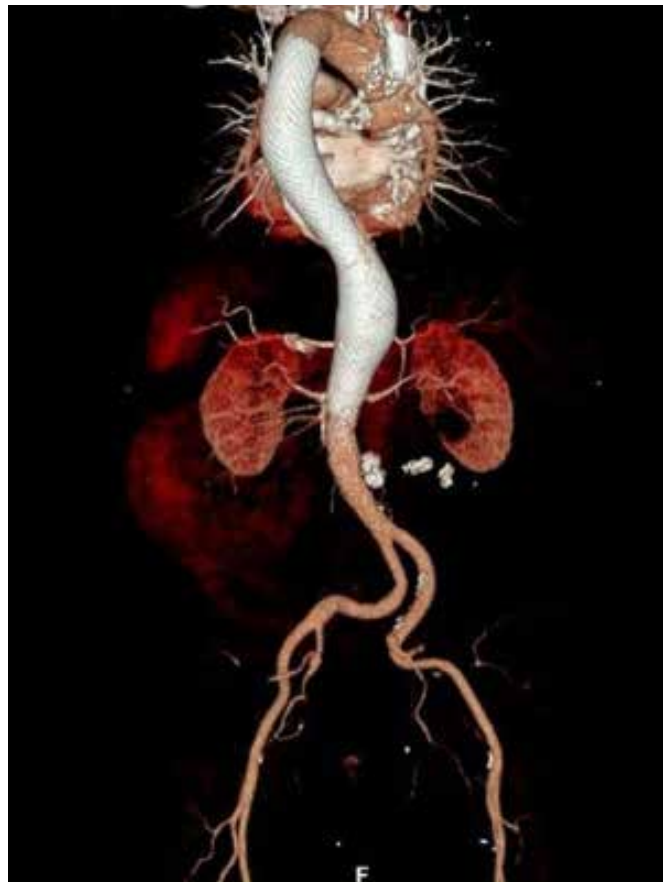
Figure 1 - b



Figure 2 - a



Figure 2 - b



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Initial Experience Using AutoMark in Atrial Fibrillation Ablation

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Abstract

Background: EnSite Precision AutoMark Module (Abbott) refers to automated lesion creating tool. Only lesions meeting user-defined requirements are placed on the map. The amount of ablation is represented by the size and color of marking spheres. The aim of this study is to present our initial experience with AutoMark Module in AF ablation.

Methods: Nine patients with AF underwent electroanatomic mapping and radiofrequency ablation (RF) using AutoMark Module for marking RF lesions. Pulmonary vein isolation was performed in all patients. Cavo tricuspid isthmus ablation was done in 3 patients with atrial flutter. Lesions were marked in different colors depending on force-time integral, absolute impedance drop and RF duration as follows: white (<50 g; <6 Ω ; < 5 s); yellow (50-150 g; 6-8 Ω ; 5-15 s); orange (150-300 g; 8-10 Ω ; 15-30 s); red (>300 g; >10 Ω ; >30 s). An auto-mark was created when catheter remained in a stable location for more than 3 s, with a minimum distance between spheres (center-to-center) of 3 mm. Auto-marks were compared with manually placed spheres. 24-hour Holter ECG monitoring was performed regularly until the end of the follow-up.

Results: Nine patients (mean age of 53 ± 10 years, 3 male) were included in the study with EHRA class 2b (44%) and class 3 (56%). Auto-marks were placed only when user-defined criteria were reached whereas manual points were marked subjectively. The auto-marks numbered 299 ± 82 per procedure and 5.39 ± 1.42 per RF application. Auto-marks provided good visualization of the ablation lines using the predefined criteria. AutoMark Module visualized probable gaps in the ablation line, which appeared as an area without spheres or with white spheres. That was not possible with manual marking because of its subjective nature.

Conclusion: AutoMark is better than manual marking in providing real-time visual feedback on lesion creation. Our preselected lesion parameters ensure a tool to visualize possible gaps in the ablation line.

Keywords: Atrial fibrillation, PVI, autoMark, ablation line gaps, RF ablation

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Introduction

Atrial fibrillation (AF) is the most common arrhythmia in clinical practice.⁽¹⁾ The landmark study by Haisaguerre et al. demonstrated that ectopic beats from the pulmonary veins (PV) often triggered AF.⁽²⁾ This finding focused catheter ablation approaches on PV isolation (PVI). The introduction of electroanatomic guidance technology resulted in a paradigm shift in delivery of therapy for atrial fibrillation.⁽³⁻⁸⁾ EnSite Precision AutoMark Module (Abbott) was introduced in Europe in 2016 and referred to automated lesion creating tool. Only lesions meeting user-defined requirements are placed on the map.⁽⁹⁾ The amount of ablation is represented by the size and color of marking spheres.

Miller et al. accentuated the role of visual gaps in the ablation line during PVI.⁽¹⁰⁾ According to their study, acute electrical isolation was insufficient endpoint for achieving durable PV isolation.⁽¹⁰⁾ Moreover, pulmonary vein reconnection is considered to be the most important reason for atrial fibrillation recurrence.⁽¹¹⁾ Hence, it is important to find a way toward durable PVI. Manual marking is the current widespread practice for visualization of ablation lesions. However, it is subjective in nature and we hypothesized that it could not provide real-time visual feedback on possible gaps in the ablation line.

The aim of this study is to present our initial experience with AutoMark Module in AF ablation and to compare the ability of automatic and manual marking to visualize gaps in the ablation line.

Materials and Methods

Nine patients with drug-resistant or drug-intolerant symptomatic paroxysmal AF underwent electroanatomical mapping and radiofrequency ablation (RF) using AutoMark Module for marking RF lesions between December 2016 and December 2017 in the National Heart Hospital (Sofia, Bulgaria). Informed, written consent was obtained from all patients. Ablation procedures were performed by 3 operators. Pulmonary vein isolation was done under conscious sedation in all patients. Three patients with atrial flutter underwent cavotricuspid isthmus ablation.

Intravenous heparin (80-100 IU/kg) was administered and continuously infused after femoral access and double transseptal puncture with targeted

aPTT>140 s. A decapolar Lasso catheter and an ablation catheter (TactiCath Quartz or Cool Flex, Abbott) were introduced in the left atrium (LA). Respiratory gating was performed afterwards, and electroanatomical map of LA, left atrium appendage (LAA) and PV was created. Finally, point-by-point ostial PVI was performed.

The EnSite operator marked the ablation lesions manually. The power of RF applications was limited to 25 W for the posterior wall and 35 W for the anterior wall. AutoMark module was started but invisible for the operators. Ablation lesions were automatically marked in different colors depending on absolute impedance drop and RF duration as follows: white (<6 Ω ; < 5 s); yellow (6-8 Ω ; 5-15 s); orange (8-10 Ω ; 15-30 s); red (>10 Ω ; >30 s). AutoMark colors were determined by force-time integral (FTI) when TactiCath Quartz catheter was used as follows: white (<50 g); yellow (50-150 g); orange (150-300 g); red (>300 g). An auto-mark was created when catheter remained in a stable location for more than 3 s, with a minimum distance between spheres (center-to-center) of 3 mm. We confirmed entrance and exit block in all PV by pacing from coronary sinus and each PV at the end of the procedure. Procedures were exported and analyzed offline. Auto-marks were compared with manually placed spheres.

Anticoagulation and antiarrhythmic drugs were continued until the third month after the procedure. Anticoagulation was continued afterwards according to the CHA₂DS₂-VASc stroke risk.⁽¹²⁾ 24-hour Holter ECG monitoring was performed regularly until the end of the follow-up. Repeat ablation procedure was advised in case of recurrence.

Statistical analysis was performed with SPSS Statistics 21 (IBM Corporation, Armonk, NY). Descriptive statistical methods (mean, standard deviation) were used for the definition of continuous variables. Fisher's exact test was used in the analysis of the associations among categorical variables. P-values of <0.05 were considered as significant.

Results

Nine patients (mean age of 53.8 ± 10.8 years, 3 male) were included in the study. Baseline clinical characteristics are indicated in Table 1. All patients had drug-resistant or drug-intolerant symptomatic paroxysmal AF. Each one of the PV was successfully, electrically

isolated with entrance and exit block at the end of the procedure. Procedural data are specified in Table 2. Auto-marks appeared only when user-defined criteria were fulfilled. They provided good visualization of the ablation lines (Fig. 1, 2, 3). Furthermore, AutoMark Module visualized probable gaps in the ablation line which appeared as an area without spheres or with white spheres (Fig. 1, 2, 3, 4). That was not possible with manual marking due to its subjective nature (Fig. 5). Gaps in the ablation line were observed in 7 patients with AutoMark versus one patient with manual marking ($p=0.026$).

Figure 1. PVI. Ablation lesions were marked in different colors depending on ablation time as follows: white (< 5 s); yellow (5-15 s); orange (15-30 s); red (>30 s).

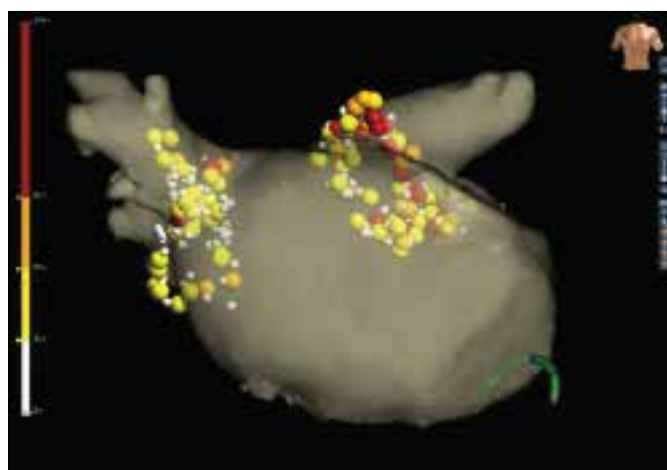


Table 1. Clinical characteristics of the patients

Mean age, years	53.78 ± 10.83
Male sex, n (%)	3 (33.3)
Mean body mass index (BMI), kg/m ²	28.87 ± 5.10
Time from first AF episode to PVI, months	35.89 ± 29.33
EHRA class	
2b, n (%)	4 (44.4)
3, n (%)	5 (55.6)
Mean LA diameter, mm	54.89 ± 8.78
Mean LVEF, %	62.54 ± 5.89
Hypertension, n (%)	6 (66.7)
Smoking, n (%)	5 (55.6)
Atrial flutter, n (%)	3 (33.3)

At the end of the follow-up (mean 10 ± 4.7 months), 2 patients (22.2%) continued the antiarrhythmic drugs and 5 patients (55.6%) received an oral anticoagulant. Recurrence of AF, atrial flutter or tachycardia was documented in 2 patients. Consequently, 77.8% of the patients demonstrated freedom from atrial tachyarrhythmia. Using the AutoMark Module, we discovered that both patients with recurrences had gaps in the ablation line in more than two PV. On the contrary, gaps in more than two PV were established in only one patient without recurrence ($p=0.08$).

Discussion

PV reconnection is considered to be the most important reason for atrial fibrillation recurrence^(11,13-15) while durable PVI results in a high single-procedure arrhythmia-free survival.⁽¹⁶⁾ Lesion depth and contiguity are considered to be important determinants of durable PVI in ablation which is guided by contact-force measurement.⁽¹⁷⁾ FTI more than 400g correlated with a 95% probability of durable PV isolation at 3 months after the index procedure.⁽¹⁸⁾ However, calculation of FTI might be inaccurate because of inadequate calibration, the angle of incidence or contact with neighboring electrodes.⁽¹⁹⁾ Furthermore, a previous study revealed that lesions with FTI value of 300 g at 35 W had three times greater volume than that of lesions created with 20 W and the same FTI.⁽²⁰⁾ Therefore, FTI is not so good predictor of durable lesion formation as was previously thought.⁽²¹⁾

The depth of RF lesions is also dependent on the delivered power and duration of the RF applications.^(22,23)

Table 2. Procedural characteristics

Procedural characteristics	
Procedure time, minutes	263.33 ± 50.25
RF time per procedure, seconds	3856.78 ± 966.67
Mean DAP (dose area product), $\mu\text{Gy}/\text{m}^2$	6370,81 ± 2579,84
Auto-marks per procedure, n	299 ± 82
Auto-marks per RF application, n	5.39 ± 1.42
Transitions between lesions per procedure, n	238 ± 68

Figure 2. PVI. Ablation lesions were marked in different colors depending on absolute impedance drop as follows: white ($<6 \Omega$); yellow ($6-8 \Omega$); orange ($8-10 \Omega$); red ($>10 \Omega$).

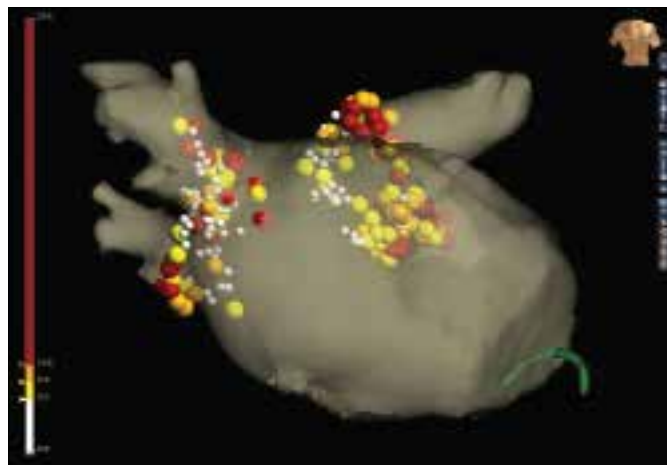
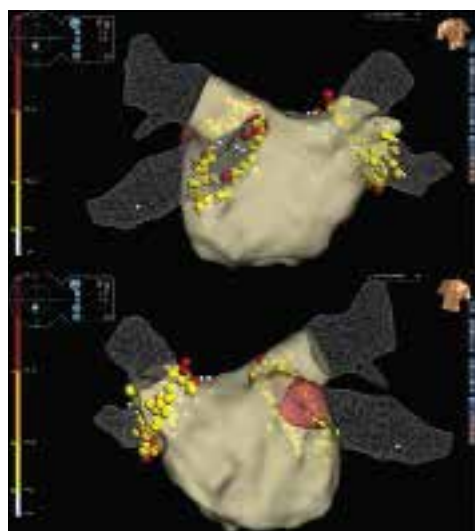


Figure 3. PVI. Ablation lesions were marked in different colors depending on FTI as follows: white ($<50 \text{ g}$); yellow ($50-150 \text{ g}$); orange ($150-300 \text{ g}$); red ($>300 \text{ g}$).



However, RF power is relatively constant during ablation. Therefore, we included RF application duration in the predefined model of ablation lesions (Fig 1).

Experimental studies prove that impedance decrease is a good correlate for RF lesion volume (22-26). Impedance decrease, which is less than 10Ω during point-by-point PVI in humans, is associated with areas of late PV reconnection.⁽²⁷⁾ Moreover, El Haddad et al. showed that obtaining a minimal impedance decrease of $>10 \Omega$ is likely to result in a durable lesion.⁽¹⁷⁾ We have used AutoMark to tag absolute impedance drop with white ($<6 \Omega$), yellow ($6-8 \Omega$), orange ($8-10 \Omega$) and red ($>10 \Omega$) spheres, whereas AutoMark provided good visualization of the ablation lines (Fig.2, 4)

Figure 4. PVI. Ablation lesions were marked automatically in different colors depending on absolute impedance drop as follows: white ($<6 \Omega$); yellow ($6-8 \Omega$); orange ($8-10 \Omega$); red ($>10 \Omega$). Red arrow points to a gap in the ablation line.

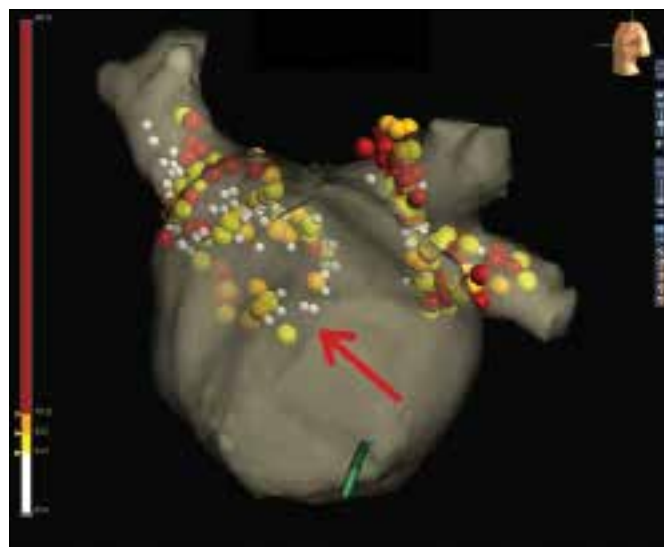
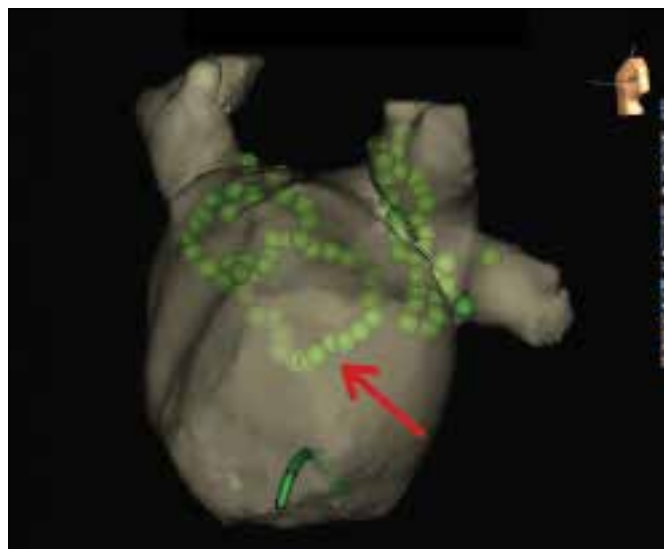


Figure 5. PVI. Same patient as in Figure 4. Ablation lesions were marked manually. Red arrow points to the place of the gap in the ablation line that was observed with auto-marks. There is no gap in the line with manually placed spheres.



Inter-lesion distance was also used as an objective parameter for auto-mark creation in our study. It was defined as center-to-center distance between two neighboring auto-marks. Previous studies demonstrate that inter-lesion distance is predictive for PV reconnection.⁽¹⁷⁾ El Haddad et al. used RF tags which were acquired automatically based on preset criteria of force and stability.⁽¹⁷⁾ They showed that targeting inter-lesion

distance of less than 5 mm might be the missing link toward durable PVI. We used inter-lesion distance of 3 mm in our study as a criterion for auto-marks creation in addition to catheter stability.

According to previous studies, closing the visual gap is essential for acute durable PVI.⁽¹⁰⁾ We observed visual gaps in the ablation line in 7 patients with auto-marking and the preselected parameters. On the contrary, only one patient demonstrated gap in the ablation line with manual marking ($p=0.026$). The endpoint of acute electrical isolation of PV can be achieved despite an incomplete circumferential lesion set.⁽¹⁰⁾ However, it can leave potential conduction gaps between PV and LA.⁽²⁸⁾ Miller et al. determined presence of viable and not fully ablated tissue in the visual gap area.⁽¹⁰⁾ Furthermore, pre-clinical studies revealed that AF propagates through gaps as small as 1.1 mm, and these gaps can be pro-arrhythmic according to several clinical studies.⁽²⁹⁻³²⁾ Therefore, inter-lesion distance ≥ 5 mm may explain acute PV reconnection.⁽³³⁾ However, lesions were marked manually in those studies. Our findings show that AutoMark is significantly better than manual marking in visualization of gaps in the ablation line ($p=0.026$).

In this study, we documented recurrence of atrial tachyarrhythmia in 2 patients at the end of the follow-up (mean 10 ± 4.7 months). Both patients had gaps in the ablation line in more than two PV detected by AutoMark, whereas only one patient without recurrence had similar gaps ($p=0.08$). A study with more patients is needed to verify the statistical significance of that result.

Limitations

There is no single parameter which identifies a durable lesion formation. Therefore, we used a combination of preselected lesion parameters which ensured a tool to visualize possible gaps in the ablation line. However, our study failed to demonstrate that AutoMark gaps in the ablation lines determine AF recurrences. That was an initial study with a small sample size, hence more studies are required to investigate that problem.

Conclusions

AutoMark is better than manual marking in providing real-time visual feedback on lesion creation. Moreover, automatic marking establishes gaps in the ablation line more accurately than manual marking. Our preselected lesion parameters ensure a tool to visualize possible gaps in the ablation line. However, further studies are needed to reveal whether there is a benefit from AutoMark on the occurrence of AF recurrences during long-term follow-up.

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Conflict of Interest Statement

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Assessment of Surgical Correction at Vascular Ring Anomalies

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Abstract

Aim: In this retrospective study, we present our fifteen years of experience in surgical treatment in vascular rings. Thus, we aimed to determine the factors that causing improved both early and late term complications.

Methods: Sixteen patients who underwent surgical treatment with the diagnosis of vascular ring between 2003-2018 were included in this study. Hospital records were analyzed retrospectively. Demographic data of the patients, preoperative symptoms and postoperative outcomes were evaluated.

Results: The patients were mean 43.50 ± 38.61 months of age and weighed 26.00 ± 13.81 kg at the time of surgeries. 6 patients (37.5%) were diagnosed with double aortic arch, 7 patients (43.7%) had left arcus aorta associated with right aberrant subclavian artery and 3 patients (18.7%) had right arcus aorta and left ligamentum arteriosum. The most common symptom was cough followed by shortness of breath, difficulty in swallowing, reflux, recurrent pneumonia respectively. One patient had atrial septal defect, another patient had ductus arteriosus and another patient had ventricular septal defect as a coexisting cardiac disorder. As early complications, we observed cylothorax, pneumothorax and need of tracheostomy due to failure of extubation in three cases. Mean follow up time was 7.00 ± 3.57 years. Patients had no complaints except for one case with asthma. However, there was no pressure measured on trachea in that patient. No patients died during hospitalizations or follow-ups.

Conclusion: Vascular rings can manifest with various symptoms at different ages and many patients also have co-existing cardiac anomalies. However, once the diagnosis is confirmed, surgical approach is essential and leads to satisfactory, uneventful long-term survival results.

Keywords: Vascular ring, double aortic arc, aberrant right subclavian artery

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Introduction

Vascular rings involve an abnormal development of aortic arch and branches during embryological development in neonatal period which causes compression on trachea and/or esophagus; resulting in symptoms such as cough, recurrent respiratory infections, wheezing, dysphagia or respiratory distress. Most frequent ones are wheezing and stridor respectively.^(1,2) Forms of the diseases are mainly divided into two groups according to total or partial encirclement of the trachea and esophagus. The most common vascular rings forms are double aortic arch and right aortic arch with left ligamentum.^(1,3) Vascular rings constitute less than 1% of among congenital cardiac disorder.⁽⁴⁾

However, the recurrent and progressive clinical findings associated with vascular rings, depending on the severity of the trachea-esophageal pressure, may require urgent intervention, and they need to be profoundly examined. The diagnosis can be confirmed using various imaging and endoscopic methods such as computer assisted tomography (CT), magnetic resonance imaging (MRI), bronchoscopy, gastroscopy, echocardiography, cardiac catheterization, and upper GI series.⁽⁵⁾ Once the patient was diagnosed, surgical treatment is required for decompression as a standard therapy. Despite surgical techniques often differ depending on the anatomical features of the disease, several reports indicate satisfactory results with low mortality and event-free long-term outcomes. Nevertheless, the respiratory problem may continue after the operation due to structural defect and acquired tracheomalacia secondary to long-lasting pressure on the airways.^(6,7)

Herein, we present our ten years of early and late results of the patients who were operated at our hospital with the diagnosis of vascular ring. Thus, we aimed to determine the significant points of clinical pattern at presentation, optimal time and efficiency of surgical operations.

Material and Methods

The patients who were operated with the diagnosis of vascular ring between 2005-2017 were included in this study. Hospital records were retrospectively analyzed. Demographic data of the patients, preoperative symptoms such as cough, dyspnea, dysphagia,

wheezing, stridor or repetitive respiratory infections and postoperative outcomes were evaluated.

The imaging methods which applied aiming to confirm the diagnosis were presented below. Those are consisted on transthoracic echocardiography (TTE), computed thorax angiography (CTA), magnetic resonance angiography (MRA), bronchoscopy and barium esophagography.

For classification of the patients, the classification method which was described and modified afterwards by Congenital Heart Surgery Nomenclature and Database Project was utilized.⁽⁸⁾ According to this, vascular rings were divided into six main subgroups which are defined as double aortic arch, right arcus aorta + left ligamentum arteriosus, compression of the innominate artery, pulmonary artery sling, left arcus aorta + right aberrant subclavian artery, respectively.

Operative technique, duration in intensive care unit (ICU), extubation time, duration in hospital and postoperative complications were recorded.

Operative Techniques

In double aortic arch patients, following posterolateral thoracotomy incision, pleural cavity was accessed through fourth intercostal space. Both aortic arches and ligamentum arteriosum was released and ligamentum arteriosum was divided. Initially, diameters of the arches were evaluated. By dividing the hypoplastic one, trachea and esophagus were decompressed. In the cases where both diameters were similar, blood pressure of limbs were measured, thereafter, the arch which was located at the same side with the lower arterial pressure was divided. Furthermore, right arch division was chosen due to circumscribing trachea, in presence of equality in both diameter size and blood pressure measurement. However, descending part of the divided arch was stabilized at thorax wall via polypropylene stitches, thereby recompression was avoided. Mediastinal pleura was always kept open.^(9,10)

In cases with right arcus aorta and left ligamentum arteriosum, after posterolateral thoracotomy incision, thoracic cavity was accessed through fourth intercostal space and ligamentum arteriosum was cut away. Also, in patients with Kommerell diverticulum, the diverticulum was excised.

Left thoracotomy was performed for surgical approach in patients with aberrant right subclavian artery. Then, aberrant vessel was divided and anastomosed with right carotid artery.

Statistical Analysis

Descriptive data were expressed in mean, standard deviation, median values. The data were recorded on a computerized database and analyzed using SPSS version 20.0 statistical software (SPSS Inc., Chicago, Illinois, USA).

Results

Overall 16 patients were operated for vascular ring anomalies. The patients had mean 43.50 ± 38.61 months of age. Mean weight of the patients was measured as 26.00 ± 13.81 kg preoperatively. Seven out of sixteen patients were female, while nine were male.

There was double aortic arch in six patients, left arcus aorta associated with right aberrant subclavian artery in seven patients, right arcus aorta and left ligamentum arteriosum in three patients. Moreover, one patient had Kommerell diverticle. In addition to these pathologies, associated diseases were diagnosed in four patients; these were atrial septal defect (ASD), ventricular septal defect (VSD), patent ductus arteriosus (PDA) and diaphragmatic hernia. Demographic data and clinic features were shown in **Table 1**.

Most common symptom was coughing among patients. Dyspnea and dysphagia were following respectively. Besides that, acid reflux, cyanosis and recurrent respiratory infections were less frequent. While respiratory symptoms were mostly seen in patients with double aortic arch and right arcus aorta and ligamentum arteriosum, dysphagia was much more common in patients with aberrant right subclavian artery.

All patients were examined via TTE. The definitive diagnosis was made by MRA in three patients and CTA in 13 patients. Due to the tracheomalacia, bronchoscopy and barium esophagography were applied to one patient each. Imaging methods were presented in **Table 2**.

Mean intubation time and duration in intensive care unit were 9.31 ± 16.79 , 32.62 ± 26.33 hours, respectively. Hospitalization time was calculated as 6.31 ± 2.62 days. ASD and VSD closure were performed under cardio-

Table 1. Demographic data and clinic features

Characteristics	Value
Sex (Male/Female)	9/7
Age (Months)	43.50 ± 38.61
Weight (kg)	41.00 ± 63.47
Symptoms %	
Cough	43.75
Shortness of breath	37.5
Difficulty in swallowing	13.75
Recurrent pneumonia	6.25
Reflux	13.75
Echocardiographic findings	
ASD	1
VSD	1
PDA	1
Diagnosis	
Double arch	6
Right arch + right ligamentum	3
Arteriosum	
Aberrant right subclavian artery	7
VSD: ventricular septal defect; ASD: atrial septal defect; PDA patent ductus arteriosus <i>Data are presented as mean \pm SD or number</i>	

pulmonary by-pass, however PDA division was utilized concurrently. Early complications were observed in 3 patients. These were pneumothorax, chylothorax and tracheostomy application due to failure of extubation in one patient who had tracheomalacia preoperatively. Postoperative mean follow-up time was 7.00 ± 3.57 years. Postoperative complications and intensive care parameters were indicated in **Table 3**.

Discussion

Various vascular ring formations requires different surgical approaches; thus, treatment is still challenging. Furthermore, vascular rings manifestation varies from severe respiratory problems occur in postnatal period to

Table 2. Diagnostic tests for vascular ring

Patient ID no.	Bronchog copy	Echocardiography	Barium swallow X-ray	CT angiography	MRI	Bronchoscopy
1		VSD	-	+	-	-
2	-	N/A	+	+	-	-
3	-	N/A	-	+	-	-
4	-	N/A	-	+	-	-
5	-	N/A	-	+	-	-
6	-	N/A	-	-	+	-
7	-	N/A	-	+	-	-
8	+	N/A	-	+	-	-
9	-	N/A	-	+	-	+
10	-	ASD	-	-	+	-
11	-	PDA	-	+	-	-
12	-	N/A	-	+	-	-
13	-	N/A	-	-	+	-
14	-	N/A	-	+	-	-
15	-	N/A	-	+	-	-
16	-	N/A	-	+	-	-

Patients 1–6, double arch; 7–9, right arch; 10–16, aberrant right subclavian artery; VSD: ventricular septal defect; ASD: atrial septal defect; PDA: patent ductus arteriosus

Table 3. Postoperative complications and intensive care parameters

	n
Duration of ventilation (hours)	9.31 ± 16.79
Duration in intensive care unit (hours)	32.62 ± 26.33
Hospital stay (days)	6.31 ± 2.62
Complications	
Pneumothorax	1
Pneumothorax	1
Extubation failure	1

nonspecific findings in school age depending on the degree of the compression over trachea and/or esophagus.

In such cases, the diagnosis may be overlooked and incidentally noticed while examining less typical symptoms. As an example, exercise induced dyspnea and asthma was observed in our patients. Nonetheless, when the literature was reviewed, similarly to us, Sturm and colleagues⁽¹¹⁾ reported an 8 years old case of who was being treated with the diagnosis of asthma over five years. Patients presented in a wide range of age between 4-132 months at the time of diagnosis with a multitude of signs and symptoms; cough was the most common symptom, followed by shortness of breath, difficulty in swallowing, recurrent pneumonia and acid reflux, respectively. In presence of these repetitive signs, pediatrician should be alerted about vascular ring.

Currently, non-invasive methods such as TTE, MRA and BTA replaced previously widely used diagnosis techniques. However, in three of our patients, bronchoscopy,

Figure 1. Computed tomographic angiography image of a double aortic arch. Hypoplastic aortic arch marked in red circle, compressed esophagus circled in yellow.

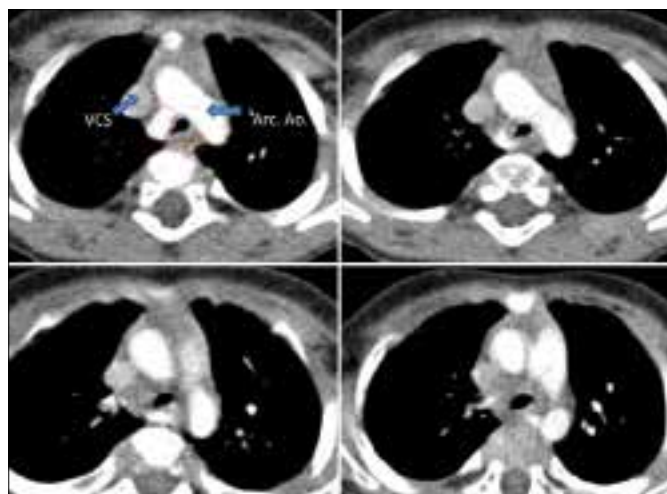
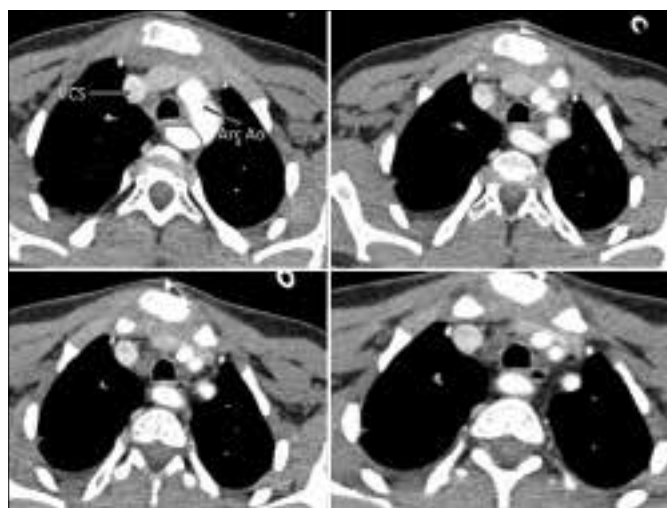


Figure 2. Computed tomographic angiography image an aberrant right subclavian artery. Right aberrant subclavian artery circled in red.



esophagoscopy and barium swallow x-ray are required for diagnosis. Regardless of how the patient was diagnosed, all patients should be initially examined via TTE for concurrent cardiac anomalies. Sometimes TTE may be incapable and further, more detailed methods may be needed. While cardiac catheterization and angiography were mostly utilized in the past, nowadays, they were abandoned in favor of CTA and MRA. We detected three accompanying congenital cardiac diseases; and encountered PDA, VSD and ASD in one patient each. Overall incidence of concomitant cardiac anomalies has been stated between 12-19% in recent studies compatible with our outcomes.⁽⁴⁾

Despite we prefer posterolateral thoracotomy in most cases, in case of cardiopulmonary by-pass requirement owing to intracardiac pathologies, median sternal access is necessary.

Vascular rings are classified under six main sub-groups, which are: double aortic arch occurring due to the persistence of the fourth right aortic arch, right-sided aortic arch + aberrant left subclavian artery developing as a result of persistence of the aortic arch and regression of the fourth left arch between left subclavian artery and the left carotid artery and left aortic arch + aberrant right subclavian artery (ARSA) occurs following regression of the fourth right arch between the carotid and subclavian arteries. Our series include only three of these.

This classification is revised by Becker et al.⁽¹⁾ in 1999 and guided our study. In our series, the most frequent form was aberrant right subclavian artery. Recent articles indicate that the majority of cases with left aortic arch and ARSA stay asymptomatic, whereas some exhibited dysphagia or vomiting owing to esophageal compression.⁽¹²⁾ However, contrary to this, respiratory symptoms dominance in such cases has also been reported.⁽¹³⁾ Possible underlying mechanism is occurrence of complete circumscription in presence of coexisting right ligamentum arteriosum.⁽¹⁴⁾

In surgical treatment, besides, some authors declare that only the excision of the ARSA provides sufficient treatment; afterwards, although rare, limb ischemia may develop. Aiming to avoid this, mostly anastomosis of ARSA to left subclavian artery performed by various authors. Kınoglu et al.⁽¹⁵⁾ reported two cases that limb blood flow was ensured via Gore-Tex graft interposition in one case and end-to-side anastomosis in other. Diversely, we have performed ARSA anastomosis with right carotid artery in three cases so far and no ischemia occurred in those. Therefore, we state that this method is feasible and reliable.

Second most frequent type of vascular ring was double aortic arch in our serial. Before surgical repair a detailed investigation is important to determine which arch is dominant. Surgical approach is recommended to be performed through opposite side of the dominant arch.

We prefer posterolateral thoracotomy using a muscle sparing technique. After entering thoracic space through the fourth intercostal space, followed by lung retraction and opening overlying pleura on the vascular ring, a careful dissection is essential to identify ligamentum arteriosum, the subclavian artery and distal arch.

During this process, surgeons should identify and pay maximal attention to avoid injuring the phrenic, vagal and recurrent laryngeal nerve and the thoracic duct, particularly in the left chest. However, in cases of balanced diameter size in both arches, blood pressure measurement is required to choose which one will be dissected. Another landmark is to leave open the mediastinal pleura at the end of the surgery. Backer et al.⁽¹⁶⁾ state that hereby, surgeons may lead to recurrent scar tissue formation and cause of recurrent stenosis in the area of ring division. In other respects, a compression on the trachea and esophagus caused by any bleeding points or fluid can be avoided.

Other three patients of us had right arch + right ligamentum arteriosum. One of these cases had a Kommerell diverticulum which is a remnant of the posterior left fourth aortic arch in patients with right aortic arch and aberrant left subclavian artery. In addition to the usual surgical method, removal of Kommerell diverticulum is suggested by numerous authors, if left untreated, patients should be kept in close follow-up to detect early aneurysm formation. Evidence of cystic medial necrosis in resected segments strengthen aforementioned hypothesis. Luciano et al.⁽¹⁷⁾ also suggest resection of Kommerell diverticulum in the less frequent cases such as vascular ring with a right aortic arch, a left brachiocephalic artery while a posterior diverticulum attached to a left ductal remnant.

Some centers prefer video-assisted thoracoscopic surgery (VATS) division of vascular rings.^(18,19) Riggle et al.⁽¹⁸⁾ reported that, VAT is a feasible method that can be performed with satisfactory results. They have reduced operative time, decreased ICU admissions, chest tube use, chylothorax and overall short length of stay. Nonetheless, despite they have no experience on VAT surgery, Backer et al.⁽¹⁶⁾ underlying a potential risk of massive bleeding that may not be possible to control by a clip or staple line slip off a vessel, especially the way

the arches locate behind the esophagus. Moreover, they suggest that it should be kept in mind that atretic arch actually has a small patent lumen.

Beyond bleeding, there are several complications for vascular ring surgery described so far, such as vocal cord paralysis, pneumonia, pneumothorax, chylothorax, Horner's syndrome, neuralgia.^(20,21) We had experienced one case each with chylothorax, pneumothorax and tracheostomy application owing to extubation failure who had diagnosed with tracheomalacia preoperatively. In the literature, complications rates have a range of (10-27%),^(4,6,16-19). However, reported mortality rates are below 1%.⁽⁴⁾ We also had no mortality in our 16 patients during hospital stay or follow up. Naimo et al. presented their 36 years of experience in vascular rings and observed no hospital mortality except for 2 cases with Noonan syndrome. Moreover, they indicate that freedom from reoperation rate due to the vascular ring was 96.9%. Only one case was unable to extubate, hence required tracheostomy.

Surgical treatment provides an uneventful survival in most cases. Backer et al.⁽¹⁶⁾ determined that 92% of the cases showed an asymptomatic progress in their late follow-up. Furthermore, when Kommerell diverticulum excluded, they have reported only 8 cases that required re-intervention in overall 350 cases. Similarly, Herrin et al.⁽²²⁾ reported necessity of re-intervention in 8 of total 200 cases (115 VATS and 85 thoracoscopy). Seven of these had aortopexy and only two of them were operated via thoracoscopy previously.

In our series, we performed aortopexy concurrently and we are in opinion that by doing so, we observed less residual late term respiratory complications. In presence of significant tracheal compression for a long time, there may be irreversible damage to the tracheal structure as well as a localized area of tracheomalacia and cause permanent complaint. Approximately, 70-75% of symptoms disappear in early period following surgery.⁽²²⁻²³⁾ Bertolini et al.⁽²³⁾ evaluated that the remaining symptoms, which are approximately 30%, tend to disappear at a later period. We also had no residual symptoms except for one case suffering from asthma. However, in this patient there was no significant pressure measured on trachea.

The current study contains limitations of being a retrospective review and designed without concurrent

control group. In addition, the limited number of patients and lack of data concerning some types of vascular ring classification seem to constitute a separate limitation.

Conclusion

Vascular ring may manifest in various symptoms and different ages, thus requires awareness for diagnosis. Once the patient was diagnosed surgical treatment is es-

sential to prevent irreversible harmful effects. A profound examination and assessment of the anatomy are beneficial regarding the decision of how the surgery should be performed. The goal of the surgery is to relieve the compression over tracheal and/or esophagus by dividing the dislocated vessel while providing sufficient blood flow towards the head. The outcomes after the surgery are satisfactory and lead to uneventful long-term survival.

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The Relationship Between Quality of Life, Functional Capacity, Physical Activity and Performance Levels in Chronic Venous Disease

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Abstract

Objective: In this study we aimed to evaluate the relationship among the quality of life, functional capacity, physical activity and performance levels of individuals with chronic venous disease (CVD).

Methods: 210 individuals with CVD grade I-V according to the CEAP classification were included in the study. Functional capacity of individuals was evaluated by the 6-minute walk test (6MWT) and heart rate, blood pressure and oxygen saturations were assessed before and after the 6MWT. Physical activity level International Physical Activity Questionnaire (IPAQ), performance level sit-to-stand test and Quality of life VEnous INsufficiency Epidemiologic and Economic Study on Quality of Life Questionnaire (VEINES-QoL). The data for the study was calculated using the SPSS 20.0 package program.

Results: The study consisted of 143 (%68,1) female, 67 (%31,9) male individuals. The average of age was 39,2±10,1 and body mass index (BMI) was 27,9±6,32. Quality of life has significant positive and low correlation with performance level ($r = 0.161$ $p < 0.05$), physical activity ($r = 0.178$ $p < 0.05$) and functional capacity ($r = 0.171$ $p < 0.05$). In addition, there was a significant positive and moderate correlation in functional capacity with performance ($r = 0.521$ $p < 0.001$).

Conclusions: CVD has been reported as an important health problem that negatively affects the life quality of individuals (1). In individuals with chronic venous disease, the quality of life decreases when physical activity, functional capacity and performance are low. Considering the negative impact on public health due to high prevalence, we think that the data obtained in more cases can explain the evaluations in this study better.

Keywords: Chronic venous disease, Quality of Life, functional capacity.

Introduction

Chronic Venous Disease (CVD) is a vital health issue with high prevalence and apparent in loss working capacity with high-cost diagnosis and treatment and negative effects on life quality of an individual.⁽¹⁾ There are many factors in its etiology and its foremost ones can be regarded as genetic predisposition, age, gender, obesity, pregnancy, staying up for a long time, intraabdominal malignancies, thrombophlebitis and previous leg injuries.^(2,3) Its incidence is reported in women as 2.6% and in men as 1.9% annually. It is seen in adult females as 25-33%, in males 10-20%.⁽⁴⁾

Most widely used methods in the diagnosis of CVD are doppler ultrasonography (DUS) and CEAP (clinical, etiological, anatomical, pathophysiological) classification. In its treatment, pharmacological approach, compression and elevation treatment, pumping exercises, skin care and surgical techniques are applied. However, CVD's treatment methods have been still discussed, it is not curable completely.^(4,5)

Certain complaints such as venous hypertension that occurs as a result of valve insufficiency and allows blood circulation to retard and varicosis which are formed by impairing tissue nutrition, pain, cramps, edema, itching, pigmentation, venous ulcers are observed. Overall decrease life quality. However, there is no wide study that researched quality of life, functional capacity, physical activity and performance levels in CVD patients. Therefore, the aim of this study to evaluate the relationship between quality of life, functional capacity, physical activity and performance levels of individuals with chronic venous disease.

Materials and Methods

Individuals were 210 CVD survivors, who referred to Research and Education Hospital, Cardiovascular Surgery clinic in Izmir and Gaziantep, Turkey.

Inclusion criteria were (i) aged 18 to 65 years; (ii) confirmed CVD stages I-V. Exclusion criteria were having (i) active ulceration (clinic stage VI), (ii) neurological and musculoskeletal disease history, (iii) metastatic condition presence, (iv) severe cardiac insufficiency and/or rhythm disorder diagnosis, (v) advanced psychological

impairment, (vi) vestibular system problem, (vii) severe visual loss, (viii) chronic alcohol use history, (ix) pregnancy situation or (x) long-term cortisol treatment. Required permissions were obtained from local ethical committee and the patients were informed about the evaluations to be carried out and the purpose of the study and informed consent was acquired before inclusion.

This study was a cross-sectional prospective study. All tests were performed by the same physiotherapist and all evaluations lasted about 30 minutes. The patients were given resting periods between the tests.

Sociodemographic-clinical characteristics and CVD related data were assessed face to face interview and obtained from the records of cardiac surgery archive. The clinical level of participants was described with CEAP. With regard to diagnosis, treatment and screening; CEAP (clinical, etiological, anatomical, pathophysiological) classification is divided into 7 stages including according to the severity of clinical evidence C; CO= Normal, C1= Spider/reticular veins, C2= Varicose veins, C3= Edema, C4= Skin changes, C5= recovered ulcer and C6=Active ulcer. Etiologically, while called as E_c = Congenital, E_p = Primary, E_s = Secondary; anatomically; described as A_s = Superficial veins, A_p = Perforan veins, A_d = Deep veins; according to pathophysiology; P_r = Reflux, P_o = Obstruction, P_{r-o} = Reflux and obstruction, P_n = Pathology unknown.^(1-3,5)

Functional Capacity

The functional capacity of the participants was measured by 6 Minute Walk Test (6MWT) which is a submaximal test. The 6MWT was indicated as a valid, reliable and useful test in patients with at least moderate to severe impairment by American Thoracic Society (ATS). The test was performed under the supervision of a physiotherapist in a flat surface on a 30 meter (every 3 meter is marked) straight corridor. A total of walking distance was written down at the end of 6MWT. Heart rate, blood pressure, dyspnea and fatigue levels were noted prior to the test, at the end of the test and 5 minutes recovery period. Dyspnea and fatigue were measured with Modified Borg Scale (MBS). MBS is conducted with a description corresponding to any number between 0-10. "0" means "none"; "10" means "very severe".^(6,7)

The Quality of Life

The quality of life was assessed using VEnous INsufficiency Epidemiologic and Economic Study on Quality of Life Questionnaire (VEINES-QoL) (2013). VEINES-QOL is a standardized, 26- item, patient-reported questionnaire to assess the severity and frequency of venous insufficiency symptoms (questions 1,7; 10 items: heaviness, pain, leg swelling, night cramps, fatigue, burning sensation, throbbing sensation, itching, numbness in the legs, pain intensity), time of day when the symptoms are most pronounced (1 item, question 2), changes in the severity of symptoms during the past year (1 item, question 3), limitations in daily activities associated with venous insufficiency (9 item, questions 4,5,6), and the psychological impact on the functional status of patients with venous insufficiency measured during the previous 4 weeks (5 items, question 8). Lower scores refer to worse life quality.^(2,8)

Physical Activity Level

The physical activity level assessed using International Physical Activity Questionnaire (IPAQ)-short form which questioned the physical activity in last 7 days. IPAQ-short form is a self-report questionnaire. Calculation of total scores of forms includes period (minutes) spent for walking, mild and severe activity and their frequency (days). From these calculations, a score is obtained as MET-minute. According to calculation result; conditions are determined as follows: < 500 MET-min/week low physical active, 500-2500 MET-min/week moderate physical active, >2500 MET-min/week physical active.⁽⁹⁾

Performance Level

Lower limb performance level was evaluated with repeated sit to stand test. The patient sitting on a chair and stand up and the number of sit down and stand up was noted in 30 seconds.⁽¹⁰⁾

Statistical Analysis

All data were analyzed using SPSS 20.0 package program. Defining criteria were presented as average and percentage distribution. The validity of normal distribution of data was controlled with Kolmogorov-Smirnov test. Pearson and Spearman Correlation Analyses were used to evaluate the correlation. For signifi-

cance level, it was regarded as $p < 0.05$.

Results

Initially, 254 patients diagnosed with CVD were recruited to the study. 226 (89%) fulfilled the inclusion criteria. But, 16 individuals could not complete the tests and questionnaires given to them. Therefore, this allowed data to be obtained only on 210 participants.

The mean age and body mass index (BMI) of 210 (67 male, 143 female) individuals was $39,2 \pm 10,1$ years (mean \pm SD) and $27,9 \pm 6,32$ kg/m², respectively. 47% of individuals were stage II. Demographic and clinical characteristics of individuals are presented in **Table 1**.

Quality of life has significant positive and low correlation with performance ($r = 0.161$ $p < 0.05$), physical activity ($r = 0.178$ $p < 0.05$), functional capacity ($r = 0.171$ $p < 0.05$). In addition, there was a significant positive and moderate correlation in functional capacity with performance ($r = 0.521$ $p < 0.001$) **Table 2**.

Discussion

In this study, we assessed quality of life, functional capacity, physical activity and performance level of CVD patients. Performance level and functional capacity had significant correlation in CVD patients.

When gender distributions of participants with chronic venous disease are examined, women form the majority of the patients. Hence, in a study performed by Fiebig et al. (2010), it was determined that female population accounted for 70% of the cases with venous disease.⁽¹¹⁾ In parallel to this, the number of females was identified to be higher (67%) in the present study, as well.

In a study evaluating physical performance in individuals with and without venous ulcer, it is reported that venous ulcer reflects low performance level. In the study under discussion, it was observed that performance level was one of the primary determinants of functional capacity and so effects the life quality. Performance levels of patients were influenced in a negative way. In this regard, we think that a detailed evaluation is required for lower extremity performance level with specific tests and appropriate objective assessments.^(12,13)

Table 1. Clinical characteristics of the patients according to genders

	Female n=143	Male n=67	Total n=210
Gender (%)	68,1	31,9	
Age (year, X±SD)	39.2±10.1	38.1±12.17	38.7±10.96
BMI (kg/m ² , X±SD)	29.24±5.66	27.35±4.66	28.61±5.41
CEAP			
Stage I	27 (19)	7 (10.4)	34 (16.2)
Stage II	80 (56)	19 (28.4)	99 (47.1)
Stage III	25 (17.5)	21 (31.4)	46 (22)
Stage IV	9 (6.2)	17 (25.3)	26 (12.4)
Stage V	2 (1.3)	3 (4.5)	5 (2.3)
Quality of life Min-max 29-107	63.67±15.37	69.47±16.67	65.62±16.0
Functional capacity (m) Min-max 240-720	420.08±89.41	468.08±99.04	436.17±95.21
Physical activity			
Low active	16 (7.2)	16 (24.6)	32 (13)
Moderately active	50 (26.5)	19 (33.3)	69 (28.8)
Vigorous active	77	32 (42.1)	109 (58.2)
Performance Min-max 5-17	11.46±2.36	12.76±2.07	11.89±2.34

Table 2. Relationship between clinical evaluation parameters of patients

	Quality of life	Functional capacity	Performance	Physical Activity
Quality of life		r=0.171* p <0.05	r=0.161* p <0.05	r=0.178* p <0.05
Functional capacity			r=0.521** p <0.001	r=0.061 p >0.05
Performance				r=0.013 p >0.05
Physical Activity				

** Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).

Although venous disease was emphasized to be a chronic disease affecting the quality of life negatively, it is stated that studies regarding this issue are still needed. In patients with chronic venous disease, it is reported in many studies that since it affects both physical and psychological health negatively, it reduces life

quality.^(14,15) In a study conducted by Dias et al., the quality of life in participants with and without venous ulcer was compared and the group with venous ulcer was discovered to have a connection with lower physical health and insufficient functional capacity.⁽¹⁶⁾ It was noted in this study that when symptom severity and rate

increased in patients, their quality of life decreased and they had lower social and psychological effects.

Conditions such as having more subjective evaluation batteries in the study and lower education level of patients diminish the competency of this paper in terms of that tests could be dealt with adequately and effectively. Nevertheless, as patients with chronic venous disease approached functional sufficiency with a broad perspective, it is an important study that it contributes

to literature.

CVD has been reported as an important health problem that negatively affects the life quality of individuals. In individuals with chronic venous disease, the quality of life decreases when physical activity, functional capacity and performance are low. Considering the negative impact on public health due to high prevalence, we think that the data obtained in more cases can explain the evaluations in this study better.

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Intraoperative Aortic Dissection Complicating Elective Off-pump Coronary Artery Bypass Surgery

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Abstract

Aim: We conducted this study to identify current trends and risk factors for iatrogenic dissection.

Methods: From December 2013 to November 2017 in Republican Research Center for Emergency Medicine, 711 patients (mean age 54 \pm 2,3 years old) were operated electively. Off-pump coronary artery bypass grafting procedures was performed in all cases. Patients' preoperative risk factors, and operative and postoperative courses were analyzed from the hospital records retrospectively.

Results: Of the 711 patients, who had off-pump coronary artery bypass, 2 (0.28%) developed iatrogenic intraoperative aortic dissection. Patients with the iatrogenic aortic dissection were in older age group (62 and 68 years old). Both patients had dissection extending beyond the aortic arch. IAAD was identified after removing the side clamp from the aorta in both patients; however, the intimal tear was located on the site of proximal anastomosis. Preoperatively, 2 (100%) patients had arterial hypertension and ascending aorta atherosclerosis. No other significant risk factors could be identified. One patient died due to intraoperative complete aortic rupture. In another case the dissected segment was replaced with a graft and proximal anastomoses were replanted in it under the hypothermic circulatory arrest. This patient required inotropic and respiratory support postoperatively. Mortality rate was 100%, second patient died due to respiratory distress on 10th postoperative day.

Conclusions: Intraoperative aortic dissection is an unpredictable and often fatal complication of cardiac surgery. Regarding to our data overall incidence of iatrogenic type A aortic dissections was 0,28%. Increased age, high blood pressure and atheromatous disease of the ascending aorta could be significant risk factors for iatrogenic dissection in our series. Surgical interventions for iatrogenic aortic dissections require further improvement of surgical techniques and perioperative management.

Keywords: Iatrogenic aortic dissection, type A aortic dissection, ascending aortic aneurysm, acute aortic dissection.

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Introduction and Background

Intraoperative aortic dissection during cardiac surgery is infrequent, complicating surgical intervention in 0.04 - 1% of cases. Dissections can occur anywhere, most often as a result of direct mechanical damage at the location of the side clamp, site of cannulation of the aorta or at the site of proximal anastomosis and may manifest as hematoma, bleeding at the cannulation site or bleeding from the proximal anastomoses or aortic suture lines. Delayed diagnosis and treatment can lead to extremely high (23-41%) mortality rate.

To prevent this complication, a number of authors recommend strict control of systolic blood pressure during the performing of proximal anastomoses; avoidance of aortic clamping with the use of total arterial revascularization or mechanical devices of a new generation to avoid any manipulations on aorta; and, in case of complications, aggressive replacement of the aorta with a prosthetic graft is positioned as a best approach. We conducted this study to identify current trends and risk factors for iatrogenic dissection.

Patients and Methods

A retrospective analysis of acute ascending aortic dissections complicating off-pump coronary artery bypass grafting surgery in 711 patients (mean age 54+/-2,3 years old) in Republican Research Center of Emergency Medicine, from December 2013 to November 2017 was performed. Patients' data showed in **Table 1**.

Patients' preoperative risk factors, and operative and postoperative courses were analyzed.

Results

Of the 711 patients, who underwent off-pump coronary artery bypass, 2 (0.28%) suffered iatrogenic intraoperative aortic dissection. In the first case a 68-year-old man was scheduled for triple vessel off-pump bypass. After removal of the proximal partial clamp, the ascending aorta changed to a bluish color and bleeding from the site of proximal anastomosis was observed (**Picture 1**).

Despite of this, the surgery was continued in regular way and three venous grafts to the LAD, OM and RCA was performed. Surgical team made a mistake trying to resolve bleeding using wrapping the aorta. After the patient was transferred to ICU, the bleeding in the drainage tubes was observed, patient was urgently transferred to the operating room. The chest was reopened. After the opening of the chest, the events developed dramatically. There was a complete rupture of the aorta with massive bleeding and cardiac arrest. Despite of resuscitation procedures, patient died on the operating table.

In the second case a 62-year-old woman with triple vessel disease was prepared for elective surgery, three coronary arteries LAD, OM and RCA were planned to bypass on the beating heart. After removal of the proximal partial clamp, the type A aortic dissection was suspected, which was confirmed by epiaortic ultrasonography. Despite of this, the surgery was continued in regular way and three venous grafts to the LAD, OM and RCA was performed.

Surgical team made a mistake trying to resolve bleeding using wrapping the aorta. In early postoperative period, the malperfusion was observed and during computed tomography scan type A dissection of the aorta was diagnosed (**Picture 2**). Patient was urgently transferred into operating room and dissection was treated surgically.

Despite the inexperienced surgical team, the patient successfully underwent surgery and the simple tube graft ascending aorta replacement with the reimplantation of proximal anastomoses into the prosthesis under the hypothermic circulatory arrest was performed (**Picture 3**).

The postoperative period was complicated with respiratory failure as a result of massive transfusion, as well as violations of cognitive functions, on 8-9 postoperative day patient was physically and mentally in good condition. However, the patient died on the 10th day after surgery as a result of respiratory distress syndrome. It is important to underline that both patients were in older age group (62 and 68 years old). In both cases patients had previous history of arterial hypertension and ascending aorta atherosclerosis.

Discussion

Acute type A aortic dissection is a rare but extremely dramatic complication of elective cardiac surgery with a frequency of 0.04 to 1%.⁽¹⁻⁴⁾ In our series, the incidence of this complication was 0.28%. According to the literature, intraoperative dissections are observed more often,^(6,8) although there are data on the dissections in early and late postoperative period⁽⁴⁾. The key factor for survival is on site diagnosis and early surgical correction of the complication,⁽⁵⁾ but some authors describe the long-term survival without surgery.⁽¹²⁾ In our series both cases of aortic dissection were observed intraoperatively, but the reaction of the surgical team, due to lack of experience, was belated, which probably also affected the outcome.

In most cases, as in our series, predisposing factors such as history of hypertension,⁽⁹⁾ atherosclerosis of the aorta, ascending aortic aneurysm, cystic medial necrosis or hereditary connective tissue disorders can be identified, as in spontaneous dissection of the aorta. Direct intimal trauma due to surgical aggression is the main trigger mechanism in combination with abnormal aortic conditions that are often present in the population undergoing the CABG operation. In most

cases place of manipulations such as aortic cannulation or proximal anastomoses site can be the starting point of dissection.^(2,5)

Although OPCABG does not require cannulation and aortic cross-clamping, lateral clamp, can increase the risk of dissection due to the pulsating nature of blood pressure. According to some authors, uncontrolled arterial hypertension is the main subject of the onset of damage to the intima of the aorta.⁽⁵⁾ During conventional CABG using heart-lung machine, a temporary decrease of blood pressure, which is not pulsating, to a safe threshold (50 mm Hg) is possible during the clamping of the aorta, facilitating placement of the clamp and a reduced probability of damage to the aortic clamp and its slipping. This important maneuver is not so easily realized during OPCAB, and lateral clamping of the aorta can be dangerous when there are predisposing factors. During proximal anastomoses with pharmacological agents, the stress caused by a clamp on the aorta can be minimized.

At the same time, avoiding greater curvature of the aorta, the classic dissection site, for placing proximal anastomosis and preferring the inner part of the aorta, can reduce the risk of complications. In the presence of

Table 1. Patients' Characteristics

Patients' data	%
Male/female	84/16
Previous AMI	73,3
DM	67,8
Unstable angina	94,4
Ongoing AMI	5.6
Triple vessel	75,3
LMS	24,7
COPD	36,3
EF	46,6 ± 4,3

Picture 1. IAAD was identified after removing the side clamp from the aorta in both patients, the intimal tear was located on the site of proximal anastomosis.



risk factors such as atherosclerosis of the aorta or its enlargement, it is recommended to minimize manipulation on the aorta. Total arterial revascularization using bilateral internal thoracic arteries and the gastroepiploic artery can be an ideal alternative method in such cases.⁽¹¹⁾

The diagnosis of aortic dissection is a direct indication for immediate reconstruction, this complication diagnosed intraoperative often associated with a better prognosis, as it allows immediate repair of the prosthesis.⁽⁹⁾ In the postoperative period, the diagnosis can be suspected by the widened mediastinum, relapse of chest pain, peripheral ischemic changes, or more subtle visceral ischemic damage leading to a gradual increase in the ratio of lactic acid and urea to creatinine.

In our series, in first case the diagnosis of aortic dissection was suspected based on the postoperative data, whereas in the second case the intraoperatively diagnosed dissection was accompanied by signs of malperfusion in the postoperative period and was confirmed by CT, but echocardiography was not performed in both cases. Transesophageal echocardiography allows to confirm the diagnosis, avoid delays in therapeutic treatment and directs the surgical strategy.

Early postoperative type A dissection usually requires a replacement of an ascending aorta.⁽⁹⁾ In the case of late type A dissection diagnosing, local repair was possible only in 2% of cases.⁽⁵⁾ Vein transplants can be attached using an “island flap” of the ascending aorta

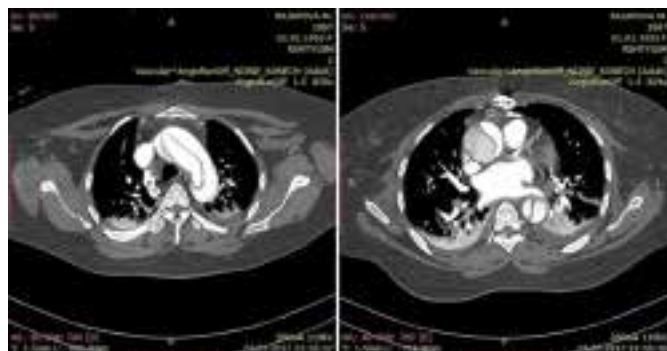
to the prosthesis or use a new subcutaneous vein, either inserted, or as a new shunt.⁽⁸⁾ Postoperative mortality ranges from 15% to 50%.^(2,3,8) In our series mortality rate achieved 100%, one patient died intraoperatively due to acute aortic rupture, second patient died due to acute respiratory distress on 10th postoperative day.

Conclusions

- Intraoperative aortic dissection is an unpredictable and often fatal complication of cardiac surgery. In this series incidence of type A aortic dissection was 0.28%.
- Increased age, high blood pressure and atheromatous disease of the ascending aorta probably are significant risk factors for iatrogenic dissection.
- Surgical interventions for iatrogenic aortic dissections require further improvement of surgical techniques and perioperative management.

Picture 3. The dissected part of ascending aorta including all three proximal anastomoses was excised, the surrounding dissected layers of aortic wall were reattached using “sandwich” technique and first the distal anastomosis using open technique was performed, to avoid wrong lumen perfusion through the dissected right subclavian artery, the cardiopulmonary bypass was reestablished through the additional side graft on prosthesis. After the proximal anastomosis using the “sandwich” technique was done, all three venous grafts were then reattached to the Vascutek graft.

Picture 2. CT scan of the patient with intraoperative acute type A aortic dissection.



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Excessive Scar Formation After Surgical Operations And Injuries: Experience of Early Diagnosis and Prophylaxis

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Abstract

Aim: To show experience in determination of the risk factors of pathologic scars formations, in early diagnosis, to prove the importance of early prophylaxis and to provide the comparison in different prophylaxis schemes.

Material and Methods: According to our studies, more than 40% of patients in surgery and traumatology have an individual tendency to pathological scar formation, which must be taken into account when planning anti-scar therapy or prophylaxis. In addition, there are well-known factors that significantly increase the risk of formation of gross visible scars. Such as: Long-term wounds, inflammation, increased immune reaction of organism, technical specify of operation, strangulation of sutures, allergic reactions on threads and others.

Results: The result was monitored in each case for at least 6 months through clinical examination and dynamic examinations. Evaluation of the effectiveness was carried out by filling in the scar's card, including the subjective part - on the characteristics of the rumen on the basis of the patient's complaints, and objective - the data of the examination and research.

Conclusion: For patients there are no small consequences of operations. Often there are the first things they ask is whether the scar remains. And our aim is to try make traces of surgical intervention as small as possible by easy, fast and effective way.

Keywords: Pathologic scars, prophylaxis, excessive scar

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Introduction

Relevance. Scar formation is problem as ancient as the existence of a human. Attitude to scars varied depending on fashion and century, but at all times the rough scars were like a mark of suffering and ugliness. The person who received such mark at all times understood that he could never get rid of it. But of course at all times people tried to eliminate scars. Nowadays the problem of scar formation continues to be one of the first in the system of rehabilitation treatment of patients after injuries and operations, which is apparently due to increased attention to the quality of life problems and the rapid restoration of working capacity.

Approximately 15 million surgical procedures performed in Russia per annum that may require scar prevention or therapy. From 5 to 16% patients in Russia develop pathological scars. Main problem is not in formation of scar itself, as it is physiological process as a part of wound healing, but in type of scar, that forming after operation. Scars classified on two main types: physiological and pathological.^[1] Our aim after operations is to reach the Normotrophic scar formation – the most physiological type of connective tissue substitution. Pathological scars divided on Hypertrophic scars, Keloids and Atrophic scars.

Patients with scars, especially keloid and hypertrophic, are very much concerned about the problem. Unpleasant persisting scars are significantly affecting patients psychologically, associate negative emotions after operation with scars, and feel insecure in their own skin regardless of operation success. The first problem for surgeons in this area is less information about tactics of early diagnostic and treatment. For example, there are some principal difference in prevention and treatment of keloid and hypertrophic scars. Keloid scars significantly protrude above the level of skin and is clear boundary, dense, sedentary, painful, often occur without previous trauma.

Keloids characterized by ability to constant growth and not ripen, i.e. collagen always remains young immature forms, as a result, the size of scar can be several times more than the wound size, not located, as a rule, in the joints region, do not form contractures. Such scars are very poorly treatable. Surgical excision is ineffective. At the same time, hypertrophic scars protrude above the surface of the skin, are limited to the injury

area, do not occur without prior damage, respond well to treatment and prevention, may sometimes become smaller spontaneously, but often formed contractures and deformations of tissues.

There are many ambiguous approaches to the problem of hypertrophic scars. The effectiveness of most proposed methods of treatment and prevention are confirmed only by widespread use in practice over past years, while only few are tested in prospective studies with adequate control (the presence of reference control groups). For some of the technologies used, even safety data are not available, i.e. frequency of side effects. Some new approaches to scar therapy have shown good results in small trials, but have not been further investigated in large studies with an evaluation of long-term results. Evaluation of effectiveness is hampered by imperfect methods of quantitative measurement of dynamic changes in the appearance of scars, and their tendency to natural improvement over time. As a result, the current management of patients with scarring is based more on the personal experience of practicing physicians than on the results of large randomized controlled trials and other scientific evidence.

Materials and methods

According to our studies,^[2] more than 40% of patients in surgery and traumatology have an individual tendency to pathological scar formation, which must be taken into account when planning anti-scar therapy or prophylaxis. In addition, there are well-known factors that significantly increase the risk of formation of gross visible scars. Such as: Long-term wounds, inflammation, increased immune reaction of organism, technical specify of operation, strangulation of sutures, allergic reactions on threads and others.

Diagnosis of connective tissue hypertrophy is not very difficult and is based on anamnestic data and clinical manifestations.^[2] At the moment, there are a large number of diagnostic methods, that we used, including ultrasound, dermoscopy and histological examination of wound or scar tissue, which make it possible to determine the type and dynamics of connective tissue growth. The fastest and easiest way to assess the degree of hyperplasia is ultrasound. The risk assessment is based on anamnestic data, features of the surgical wound or trauma and the timing of healing, the area of damaged tissues, the localization of the lesion, the

anatomical and physiological properties of the skin, the detection of concomitant diseases, data on medications taken, the presence of antibodies in blood to scar antigens (author's technique), etc. For already formed scars and control the growth of scar tissue without use of hardware technology and histological examination, the Vancouver Universal Evaluation Scale, modified by us^[2], was used: thickness of tissues, thickness uniformity and vascularization of tissues, pigmentation of the injury zone, the consistence of the scar, itching, paresthesia and ulceration, scarring, and sensitivity.

There are two main directions in scars treatment: conservative methods and operational ones.^[1,2,3] And it is necessary to consider that later to start conservative treatment, more difficult it is to achieve significant effect. And surgical treatment is effective only at the late stages of scar maturation, not earlier than in a year, and is not suitable for all types of scars and all patients.

Moreover, most patients with scars who can be surgically treated simply refuse it for various reasons. And this problem can be solved by using specific original remedies in early stages of scar formation. As a rule, patients need to think about problem within first two years after its appearance, but this is time that most scars are needed for full maturation, and we shouldn't forget that to prevent always easier than to treat.

Since any scar tissue does not begin to form after wound healing, but much earlier, immediately after the inflammation phase, it is necessary to begin as soon as possible an adequate rehabilitation and specific prevention of pathological scar formation and prevent deterioration in the quality of patients life, as well as early recovery of work capacity, since the time factor and the complexity of the approach play an extremely important role in the effectiveness of the preventive measures being taken. In the surgical departments of the Clinical Hospitals of Stavropol Region for 11 years at different times were observed more than 300 patients aged 10 to 64 years of both sex with postoperative wounds and traumas.^[2] Knowing the fact that not in all people develop hypertrophic scars after damage to the skin and not everyone needs preventive treatment, we identified a predisposition for targeted prevention. It turned out that 212 patients, i.e. 69% of all had tendency to form excess connective tissue. All patients were divided into 3 groups. Group I, control, comprised 42 people who had no specific prophylaxis and received traditional

treatment for postoperative wounds and applied elastic compression or silicone patches to the wound area beginning after the removal of the sutures.

In Group II, 114 patients were treated according to a standard regimen. After complete healing, a complex physiotherapy treatment was performed: magneto therapy, ultrasound on the scar with hormonal ointment, electrophoresis of the enzyme from the solution from the thirtieth day after the trauma and the duration of ten procedures per course. Most of the physiotherapy procedures were carried out already in the conditions of polyclinics. The course was repeated after 3 months. From 30 days after the operation, local compression or silicone pressing plasters were applied from 2 to 6 months for 8-14 hours a day. Local patients used nutritional cosmetics, there was no specific medical prevention of pathological scarring.

In the third group, consisting of 163 patients, early primary prevention of pathological scar formation in the early stages was carried out. All patients in the postoperative period were treated with modern wound coverings with protective, stimulating and antiseptic properties. From 3-7 days after the operation, a gel with an onion extract, which is a three-component preparation with a pronounced antihyperproliferative activity, was applied daily on zone around wound (not on the seam line in the presence of intradermal sutures to prevent loss of elasticity)

Since this antiplatelet drug consists of allantoin, heparin and an extract of onions, and only the original German preparation was used, which effectiveness and safety was proved by a large number of studies, side effects from the drug and contraindications in the form of hypersensitivity to parabens were not revealed. [3,4] After removing the sutures, the gel application was continued by the patients themselves 2-3 times a day for 3 to 12 months. When applying the gel, compression bandages on the scar or silicone pressing plates were used, depending on the location of the scar. From 30 days after the operation, the course of physiotherapy began: ultraphoresis with gel with onion extract 10 procedures, laser, and electrophoresis with enzymes 10 procedures. Such courses repeated every 2-3 months.

Results

The result was monitored in each case for at least 6 months through clinical examination and dynamic ex-

aminations. Evaluation of the effectiveness was carried out by filling in the scar's card, including the subjective part - on the characteristics of the rumen on the basis of the patient's complaints, and objective - the data of the examination and research.

The obtained data were distributed as follows:

In the group I, 32 patients developed hypertrophic scars requiring correction, later the patients did not follow the recommendations of the doctors and were excluded from the observation; 6 patients had pathological scars only from the cosmetic point of view, and in four the healing passed with the formation of the normotrophic scarring.

In the second group, observing during 6-18 months, the formation of pronounced hypertrophic scars in 45 patients was noted, while in the third group scar scarring was noted only in 19 patients. At the same time, 53 people from the 2 group noticed discomfort in the area of the formed scars, in the third group similar complaints were detected in 10 patients. The cosmetic defect was disturbed in the second group by 25 people, in the third group - 14. Functional disorders related to the development of scarring and tissue tension developed in group 2 in 39 patients, and in group 3 in 14 patients.

In addition, an assessment was made on the scales for individual signs of development of scars, where the best result was also obtained in group 3 of patients.

Conclusions

1. The problem of pathological scar formation, despite the rapid and progressive pace of development of modern medicine, remains extremely relevant for surgeons and traumatologists.

2. It was also concluded that primary prevention is necessary in all cases of predisposition to pathological scar formation, and taking into account the high frequency of predisposition and complexity, adjust scar at late stages of its maturation, recommend the prevention of scars after operations and injuries already at the stage of treatment of the underlying surgical disease.

3. The greatest effectiveness of complex therapy in the early stages of the formation of scar tissue with the use of modern wound coatings, early use of the original gel with onion extract locally in the form of applications and in ultraphonophoresis is shown.

4. The use of such a complex scheme significantly reduces the need for repeated surgical procedures, achieves a good cosmetic effect and largely eliminates such undesirable consequences of scar development as itching, feeling of tightening, decreasing of the full function of affected areas of the body where the scar is located, in the postoperative period, reduce the time for complete recovery and improve the quality of life of patients.

For patients there are no small consequences of operations. Often there are the first things they ask is whether the scar remains. And our aim is to try make traces of surgical intervention as small as possible by easy, fast and effective way.

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Comparison of Short and Prolonged ACT Groups During Cardiopulmonary Bypass about Postoperative Drainage and Blood Transfusion

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Abstract

Coagulation cascade starts with exsanguination or any contact of blood with an extracorporeal surface⁽¹⁻⁵⁾. Since invention of heparin molecule in 1916, it has been an essential application for cardiopulmonary bypass (CPB). Nowadays during CPB we have been using Activated Clotting Time (ACT) test because it results quicker than other laboratory tests to evaluate anticoagulation of heparin.⁽⁶⁻¹⁰⁾ During CPB, high anticoagulation levels would result with unexpected high rate non-surgical bleeding. However, lower anticoagulation doses would end up with high rate of thromboembolic events. Both situations can be related with high mortality or morbidity.⁽¹³⁾ There have been guidelines about blood conservation in cardiac surgery but clinical management of anticoagulation during CPB is not standardized.⁽¹⁴⁾ In this respect, so far there has not been an ideal universal ACT value. Most clinics sets ACT target as above 400 - 480 seconds during CPB.^(11,12) Over the years most clinics apply 300 IU/kg dose heparin regimen which has been empirically advanced and universally accepted for CPB to reach target ACT values, but this regimen sometimes can lead to higher ACT values.⁽¹³⁾ This situation may cause to more postoperative bleeding, more postoperative blood transfusion and prolonged intensive care staying, although heparin is antagonized with protamine at the end of CPB. In this study we would like to compare retrospectively patients under went open heart surgery whom ACT's during CPB were 400-650 seconds with the patients whom ACT's were 650 seconds and higher during CPB.

Keywords: Activated clotting time, cardiopulmonary bypass, anticoagulation, postoperative bleeding

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Introduction

192 patients underwent CPB over age 18, between October 2014 and May 2014 retrospectively evaluated in our clinic to investigate a comparison of high and low ACT levels patient groups and their postoperative bleeding and related complications.

Materials and Method

In this study, Hospital operating system and archives were browsed, perfusion notes and intensive care unit notes were scanned, patient weight, operation made, body surface area, CPB time, aortic cross clamp time, gender, age, maximum ACT time during CPB, heparin dose managed, blood transfusion amount, postoperative first day drainage and intensive care duration has recorded. Patients whom anticoagulation had started with 200 IU/kg heparin dose regimen with ACT range between 400 and 650 seconds during CPB represented as group I and 50 IU/kg additional heparin dose had been applied when ACT during CPB recorded below 400 seconds. Patients whom anticoagulation had started with 300 IU/kg heparin dose regimen with ACT range 650 seconds and higher during CPB represented as group II. Those two groups compared for postoperative first day drainage, postoperative blood transfusion amount and intensive care unit staying.

Results

No significant difference were found between two groups regarding ages ($p=0,126$), weights ($p=0,526$), body surface areas ($p=0,762$), CPB durations ($p=0,415$), aortic cross clamp times ($p=0,387$) are compared. There is statistical relevance between two groups for postoperative first day drainage ($p=0,000$), postoperative blood transfusion amount ($p=0,010$) and intensive care duration ($p=0,0015$) which favor for the group whom ACT range during CPB is 400-650 seconds.

Discussion

Blood coagulates with extracorporeal circulation and needs to be anticoagulated. With discovery of heparin molecule blood could be anticoagulated so that cardiopulmonary bypass technology became appli-

cable which allowed modern cardiac surgery. Heparin dose management is succeeded with Activated clotting time during Cardiopulmonary bypass in most clinics.

There are studies that shows monitorization and management of anticoagulation with ACT during CPB cause minimum post-operative bleeding and blood transfusion.⁽¹⁵⁻¹⁷⁾ During CPB some studies point that heparin dose and anticoagulation is not proportional but there is an exponential relation between them.^(18,19) There is not a universal figure for an optimal ACT time for CBP, but 400-480 seconds of ACT stands as consensus.^(20, 21)

A study shows us most clinics in USA and Canada targets 400-480 seconds of ACT during CPB.⁽¹¹⁾ Under coagulation during CBP can result with thromboembolic events on the contrary over coagulation can result with non-surgery related bleeding and increased post-operative drainage and need of blood transfusion. During CBP most frequently used method is ACT but there is not a universal ideal ACT level^(11,12) even so an empiric 300 IU/kg dose of heparin to inhibit coagulation during CPB is widely accepted.⁽²¹⁾

In a randomized clinical trial with 195 patients who were divided into four groups respectively; 100, 200, 250 and 300 IU/kg doses of heparin groups by a close perioperative ACT follow-up, ACT was determined to be minimum of 480 seconds, an additional 50 IU/kg heparin administered if necessary to achieve ACT as maintained higher than 480 seconds. The perioperative heparin dose administered associated with postoperative drainage, which means that patients with lower doses of heparin had less postoperative drainage.⁽¹⁴⁾

In another study of 100 patients who were perioperatively heparinized at a dose of 300 IU/kg and 145 patients who started heparinization at a dose of 145 IU/kg with a minimum target of 300 seconds, followed with close ACT monitorization perioperatively and patients applied additional dose of heparin under target ACT. Low dose heparin patients had less blood transfusions and had less postoperative drainage.⁽¹⁶⁾ In this study, we compared two groups of patients⁽²²⁾ whom underwent open heart surgery with CPB and perioperatively close ACT monitored. Group I had anticoagulation started with 200IU/kg heparin dose and additional 50IU/kg

heparin administered below the target 400 seconds ACT and perioperative maximum of 650 seconds ACT. Group II had started anticoagulation with 300 IU/kg dose heparin whom ACT counted above 650 seconds perioperatively during CPB. Between those two groups, there were no significant dif-

ference for age, for weight, for aortic cross clamp time, body surface area and CPB time. Patients during CPB with ACT range between 400 and 650 seconds favors for less postoperative first day drainage, postoperative blood transfusion and intensive care unit staying.

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Application of extracorporeal membrane oxygenation for diffuse alveolar hemorrhage due to Wegener's Granulomatosis

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Abstract

Objective: Wegener's granulomatosis is a systemic vasculitis, characterized by multifocal vascular necrotizing inflammation and granulomatosis that affects small and medium-sized blood vessels. It is associated with antineutrophil cytoplasmic antibody and causes alveolar hemorrhage and renal insufficiency leads to high mortality rates. Extracorporeal membrane oxygenation (ECMO) is a supportive treatment choice for patients with severe respiratory failure. We present an ECMO application to 64 year-old female patient with acute alveolar hemorrhage and respiratory failure due to Wegener's granulomatosis under CPR.

Case Report: A 64 year-old female patient, previously diagnosed with chronic renal failure due to Wegener's granulomatosis, admitted to our hospital for routine hemodialysis programme. At the end of the first hour of hemodialysis a worsening in her general condition occurred and she required intubation and mechanical ventilation. Computerized thorax tomography revealed bilateral intraalveolar hemorrhage. Although proper medical therapy the patient had respiratory arrest. Despite successful CPR, adequate oxygenation couldn't be reached, and ECMO treatment was initiated. Clinical, radiological and laboratory findings showed improvement two days after ECMO initiation but the patient died due to multiorgan failure in the fifth day of the therapy.

Conclusion: Diffuse alveolar hemorrhage is a life-threatening complication associated with Wegener's granulomatosis. Mechanical ventilator dependent respiratory failure may develop and this process can be mortal. ECMO is a reasonable management option for such clinical situations.

Keywords: Wegener's granulomatosis, alveolar hemorrhage, extracorporeal membrane oxygenation, respiratory failure.

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Introduction

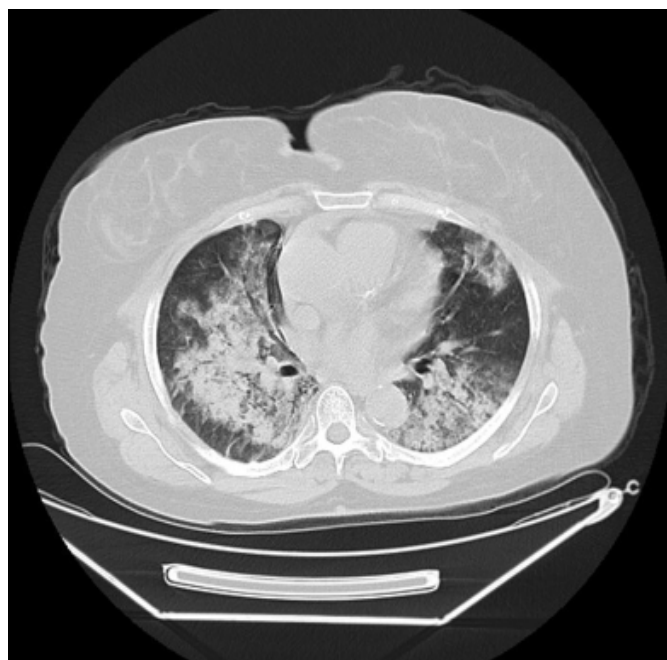
Wegener's granulomatosis is one of the ANCA-associated vasculitis characterized by multifocal vascular necrotizing inflammation and granulomas that commonly present with a pulmonary-renal syndrome.⁽¹⁾ Alveolar hemorrhage and concomitant glomerulonephritis causing renal insufficiency are associated with high mortality.⁽²⁾ In these clinical situations ECMO, which is a mode of extracorporeal life support that augments oxygenation, ventilation and/or cardiac output, can be performed.⁽³⁾

In this study we report an ECMO application to 64 year-old female patient previously diagnosed with Wegener's granulomatosis with acute alveolar hemorrhage and respiratory failure.

Case Report

A 64 year-old female patient, previously diagnosed with chronic renal failure due to Wegener's granulomatosis, admitted to our hospital for routine hemodialysis programme with systemic anticoagulant. At the end of the first hour of hemodialysis therapy, haemoptysis developed in the patient. Her general condition continued to deteriorate and required intubation and mechanical ventilation. Computerized thorax tomography revealed bilateral intraalveolar hemorrhage (**Fig-1**).

Figure 1. Intra alveolar hemorrhage focuses in thorax CT image



Although proper medical therapy the patient had respiratory arrest. The patient gave response to the CPR after 20 minutes, but adequate oxygenation could not be reached, pO₂ was 42 mmHg and pCO₂ was 75 mmHg thus, veno-venous (right subclavian vein-right femoral vein) ECMO treatment was initiated at the bedside of the intensive care unit.

Continue veno-venous hemodiafiltration was started as an additional therapy. Her oxygenation dramatically ameliorated after the beginning of this procedure. pO₂ levels increased to 76 mmHg and pCO₂ levels declined to 41 mmHg. Haemoptysis decreased; clinical, radiological and laboratory findings showed improvement two days after ECMO initiation.

The ECMO lines and oxygenator were not covered. During the ECMO therapy, systemic anticoagulation performed with standart heparine to prevent coagulation in the system of ECMO. Systemic anticoagulation was started just before ECMO set up. APTT levels was tried to kept around 80-100 seconds, thus two-hour APTT controls were performed. There was no serious worsening in clinical situation due to heparine but hemoglobin and hematocrit levels decreased and leaking bleeding at the entrance of the cannula was seen. This clinical situation was achieved with blood transfusion. There was no thrombus or failure in oxygenator in following days.

In the fourth day of the therapy clinical situation got worsening due to multiorgan failure. Although appropriate therapy including liver and kidney protective agents and antibiotics, patient died in the fifth day of ECMO therapy.

Conclusion

A systemic necrotizing vasculitis called granulomatosis with polyangiitis (Wegener's granulomatosis), affects small and medium sized blood vessels. The main clinical characteristics involve the upper and/or lower respiratory tract and kidneys.⁽⁴⁾

Although rare, because of high mortality rates, diffuse alveolar hemorrhage is an important complication.⁽⁵⁾ Mortality rates may up to 80% when the PaO₂/FiO₂ ratio under 100 mmHg in mechanically ventilated patients.⁽⁶⁾

The most of the patients with diffuse alveolar hem-

orrhage present with haemoptysis and may have a hypoxemic respiratory failure, although appropriate positioning, intubation and mechanic ventialtion. ECMO application as a rescue thearpy in patients with severe respiratory failure has shown to improve outcomes.⁽⁷⁾

ECMO can be used as an advanced circulatory and vantilatory support system in patients with refractory hypoxaemia and/or cardiac failure when the conventional treatment fails.⁽⁸⁾

In a study Schmidt et al declared that veno-arterial ECMO is useful in cardiac or cardiorespiratory fail-

ure, while veno-venous is useful in respiratory failure without cardiac compromise. Additionally, respiratory ECMO can be used as a bridge to recovery to gain time for the treatment of underlying disease.⁽⁹⁾ In conclusion, diffuse alveolar hemorrhage can be life-threatening clinical situations of the various vasculitis syndromes. ECMO is a reasonable management option for patients with diffuse alveolar hemorrhage associated severe, refractory hypoxemic respiratory failure as a respiratory support to maintain life and supportive therapy providing time for diagnosis and treatment of the underlying causative disease until its control or resolution.

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Idiopathic premature ventricular contractions originating from left ventricular summit successfully ablated from the epicardial approach

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Abstract

Catheter ablation of ventricular arrhythmias originating from the left ventricular summit can be challenging, given the high risk of vascular injury and low success rates during radiofrequency ablation. In case of failed endocardial ablation attempt, ablation from adjacent structures such as the coronary cusps, coronary venous system, and the septal right ventricular outflow tract should be tried as effective alternative approaches, respectively. Epicardial approach is an effective alternative strategy in failed cases. We report on a 45-year-old man with VAs originated from the LVS who underwent an epicardial ablation.

Keywords: Epicardial ablation, vascular injury, ventricular arrhythmia, venous system.

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Introduction

Idiopathic ventricular arrhythmias (VAs) are usually originated from outflow tract region of right and left ventricles, respectively.⁽¹⁾ The left ventricular summit (LVS) is a special triangular region in the epicardial left ventricular outflow tract bounded by the bifurcation between the left anterior descending and the left circumflex coronary arteries where the great cardiac vein ends and the anterior interventricular cardiac vein begins.⁽²⁾ Due to close proximity to major coronary vessels and

the presence of epicardial fat in this location, radiofrequency catheter ablation (RFCA) of VAs originating from the LVS is quietly challenging.⁽³⁾ In case of failed ablation attempt in the endocardial aspect of basal left ventricle (just below the aortic valve), ablation from adjacent structures such as the left coronary cusp, the great cardiac vein - the anterior interventricular cardiac vein junction, and the septal right ventricular outflow tract should be tried as effective alternative approaches, respectively.⁽⁴⁻⁶⁾ As a last and challenging option, an epicardial approach should be kept in mind in all failed cases.⁽⁷⁾

Herein, we report on a 45-year-old man with VAs originated from the LVS who underwent an epicardial ablation.

Case

A 45-year-old man was referred for catheter ablation of symptomatic idiopathic premature ventricular contractions (PVCs) exhibiting a left bundle branch block and inferior axis QRS morphology (**Figure 1**). Endocardial activation mapping revealed the earliest ventricular activation at the left ventricular summit site where the local ventricular electrogram consisting of two components connected by a fractionated electrogram preceded the QRS onset by 24 ms (**Figure 2A and 3A**). Pacing from this site did not produce an excellent pace map. Irrigated radiofrequency current with a target temperature of 45°C and maximum power output of 45 W was delivered for 120 s at this site, resulting in no interruption of the PVCs but a slight change in the QRS morphology, prolongation of the QRS duration, and appearance of pseudo-delta waves during the

Figure 2. A,B,C

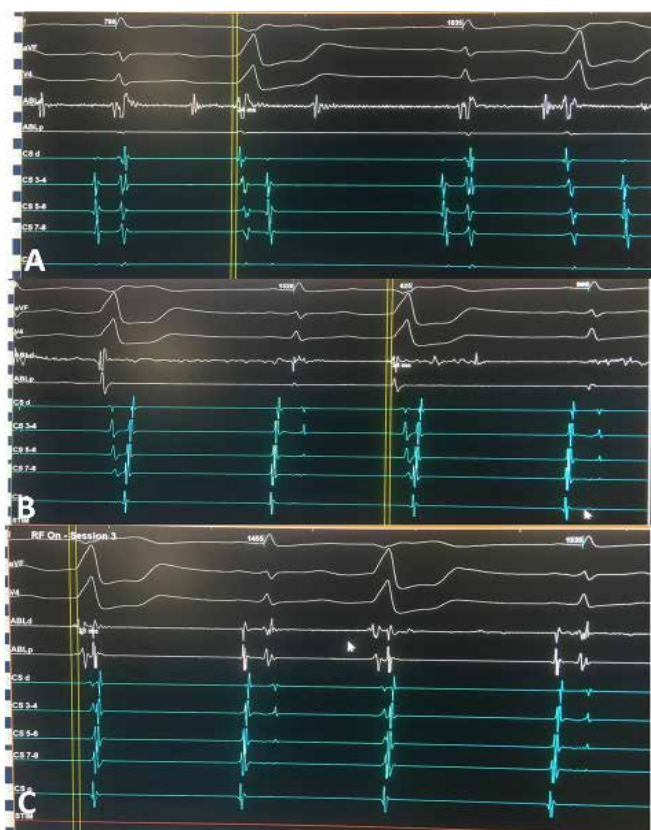
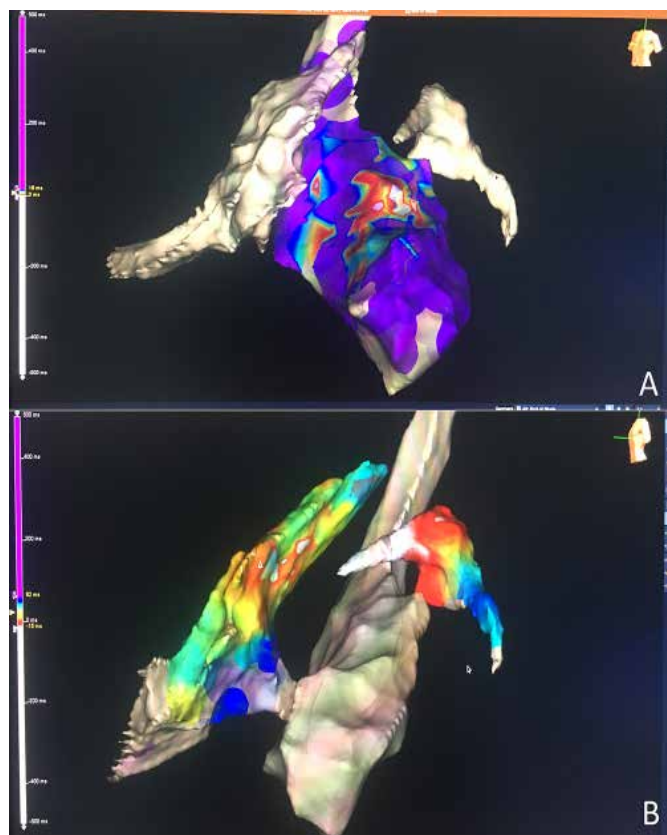


Figure 1.



PVCs. Then, the right ventricular outflow tract was mapped. The local ventricular electrogram consisting of two components connected by a fractionated electrogram preceded the QRS onset by 24 ms, again (**Figure**

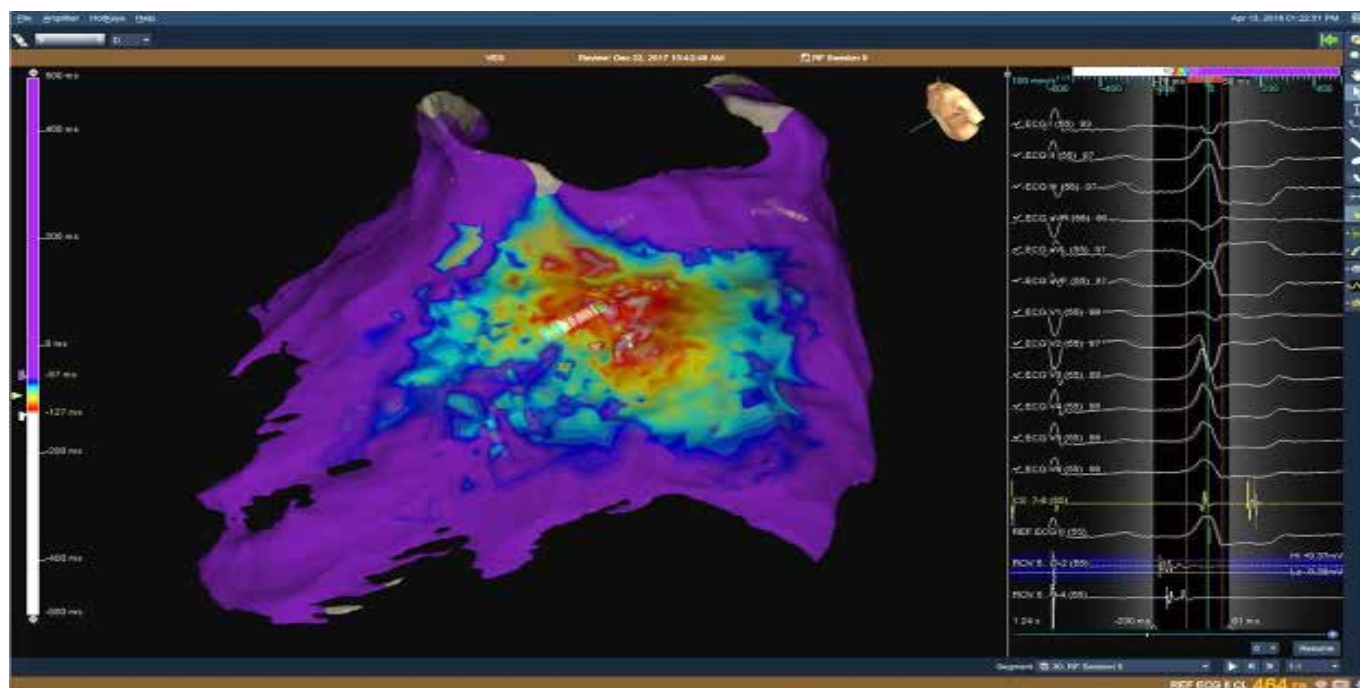
Figure 3. A,B



2B and 3B). We did not apply radiofrequency ablation in that site. Lastly, a deflectable 8-F mapping/ablation catheter that had a 3.5-mm irrigated tip (Thermocool, Biosense Webster, Diamond Bar, CA) was advanced to coronary venous system at the great cardiac vein - the anterior interventricular cardiac vein junction. The local ventricular electrogram preceded the QRS onset by 33 ms (**Figure 2C and 3B**). Irrigated radiofrequency current with a target temperature of 45°C and maximum power output of 35 W was delivered for 120 s at this site, resulting in no interruption of the PVCs. Therefore, we decided to perform epicardial puncture.

Epicardial mapping via the subxiphoid pericardial approach was then performed using an irrigated ablation catheter and it revealed the earliest ventricular activation at the site adjacent to the prior endocardial ablation site (**Figure 4**). At this site, the local ventricular electrogram was similar in morphology to that recorded from the endocardial ablation site and preceded the QRS onset by 48 ms. Pacing from this site produced an excellent match to the QRS complex of the changed PVCs. Left coronary artery angiography revealed that this site was located on the right and upper side of the left anterior descending coronary artery and more than 2 cm away from that artery (**Figure 5**). A single application of irrigated radiofrequency current in the

Figure 4.



power-control mode at 30 W delivered for 60 s at this site eliminated the PVCs (**Figure 6**). No complications occurred.

During a follow-up of more than 6 months, the patient has not experienced any further palpitations and no VA has been documented on his Holter recordings.

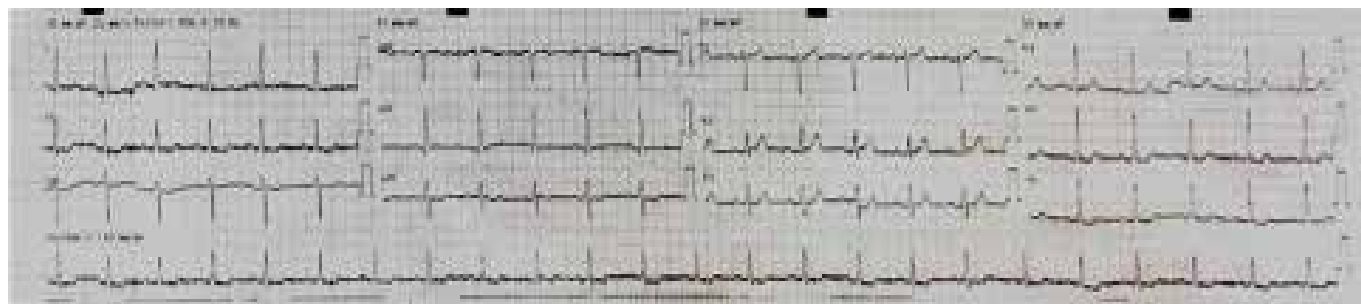
Discussion

Catheter ablation of VAs originating from the LVS can be challenging, due to close the proximity to critical anatomic structures such as major coronary vessels. Furthermore, thick epicardial fat may cause inability to deliver effective radiofrequency lesions.^(3,7,8) To deal with these anatomic obstacles, radiofrequency application from adjacent sites, such as the left coronary cusp region or coronary venous system may be used after failed left ventricular endocardial ablation attempts.⁽⁴⁻⁶⁾

Figure 5.



Figure 6.



Such a stepwise approach is mandatory in case of VAs originating from the LVS to achieve success. Proper evaluation of intracardiac electrograms together with 3-dimensional electroanatomic mapping is especially helpful in defining the best ablation site.

In our case, we used a stepwise approach to find the earliest site. We firstly mapped the left ventricle based on ECG morphology suggesting the left ventricular origin. Then, coronary cusps, the right ventricle, and coronary venous system mapped, respectively. After ablation from adjacent sites failed, we considered a percutaneous epicardial access for mapping and ablation. It should be kept in mind that, in about two-thirds of cases, radiofrequency delivery in the epicardial location might be aborted because of proximity to major epicardial coronary vessels (7). However, in the current case, we verified safe distance from major coronary vessels by using coronary angiography. In our case, to demonstrate whether VA originates from typical LVS region additional scopic views such as left anterior oblique and right anterior oblique should have been used.

Another possible dilemma during RFCA in the LVS region is that the presence of epicardial fat at the tissue-catheter interface may reduce ablation success. It was previously demonstrated that inadequate lesions by radiofrequency energy due to epicardial fat may be overcome with a different source of ablation energy, such as cryoablation.⁽⁹⁾ In rare cases, video-assisted thoracoscopy guided minimally invasive surgical ablation may be used.⁽¹⁰⁾

In patients with VAs originating from the LV summit, the outcome of ablation from both endocardial and epicardial sites may be poor. A stepwise approach to find the earliest activation site is mandatory to achieve success.

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Original articles should consist of sections titled as “Abstract, Introduction, Materials and Methods, Results, Discussion and Conclusion”. For information about the abstract, refer to ‘Manuscript Formatting’ section.

The Introduction section of the manuscript should clearly state the purpose of the manuscript and include a brief summary of the most relevant national and international literature stating the main purposes and research question of the study. Contradictory aspects of the research, if present, should be mentioned. The expected contribution of this study to family medicine and practice should be highlighted.

The Materials and Methods section should describe the study population and the study design, with adequate information on the

techniques, materials and methods used. The section should include information of the study type, population, sample, sample size and selection of the sample. Validity and reliability of scales and questionnaires used also should be referred to. A clear description of the statistical methods should also be given.

The Results section should include a detailed report on the findings of the study. All figures, tables and illustrations should be used in this section. Results should be presented either as text or figures and/or tables and not be replicated.

The Discussion section of the study should emphasize the importance of the results and compare them with the results of other authors with relevant citations from the most recent literature. Study limitations and strengths should be specified. Suggestions for further studies in this area should be added.

The Conclusion should include the main conclusions based on the results of the research, emphasize the contributions of the study to family practice and propose original suggestions. A brief revision of all the results and the discussion should be avoided.

Original articles excluding case reports and systematic reviews should not exceed 3000 words excluding the abstract, references and tables. Case reports should not exceed 1000 words excluding the abstract, references and tables. There are no restrictions for systematic reviews.

Short Reports

Short Reports are accepted when the research topic, aim and results of the study are limited in scope and in cases that do not require writing a full original article. Short Reports can be described as a summarized version that have been prepared according to the structure of research articles. Publishing an article as a short report does not reflect a lower quality. The same rules as relevant to original articles apply to preparing a short report, but structured abstracts are not mandatory references and tables should not exceed 6 and 2 in number, respectively. Abstracts should not exceed 100 words and the text should be restricted to a maximum of 1000 words.

Reviews

Reviews are evidence-based articles about a specific topic using relevant citations from the most recent literature with the authors’ conclusions on this subject. The author is expected to have conducted research on the subject and to have experience in order to discuss and analyze the subject. There is no obligation to follow a particular format and may contain subtitles depending on the subject. The text should not exceed 4000 words excluding the title, abstracts, references and tables. E Journal of Cardiovascular Medicine, only publishes review articles solicited by the editors.

Letters to Editor and Comments

Letters to the editor or comments can be sent to provide commentary and analysis concerning an article published in the journal, to give information about ongoing research, to provide informa-

tion in cardiology and cardiovascular-vascular-endovascular surgery, cardio-metabolic and vascular sciences. Letters to the editor or comments may include an optional title, tables and references. These articles should not exceed 1000 words.

What Would You Do?

These are brief articles discussing cases and situations encountered in cardiology and cardiovascular surgery with a biopsychosocial approach. If necessary, photographs (with permission from the patient/owner) may be added. Sections should consist of a title, case report, discussion, questions and answers. Brief comments can be sent to provide commentary on previous articles and case reports written by other authors. Comments should include the number of the journal the article was published in. The text should not exceed 1000 words.

International Reprints

Translations of important documents, declarations and guidelines prepared by international organizations in the field of cardiology and cardiovascular surgery, may be published in the journal. Presubmission Inquiry to the Editorial Board of the Journal before submitting the article is recommended. It is the translator's responsibility to obtain permission from the owner of the original manuscript for publication and translation.

News

These articles focus on advances and innovations in clinical topics relevant to cardiology and cardiovascular surgery. There is no obligation to follow a particular format. The text should be limited to 1000 words.

Editorials

Editorials usually provide information about the editorial policy of E Journal of Cardiovascular Medicine, give commentary and feedback on articles published in the journal, draw attention to topics of current interest and give information related to and discuss the development of cardiology and cardiovascular surgery in the world. They are mainly written by the members of the Editorial Board. Editorials are limited to 2000 words with some exceptions and may include a title and references when necessary.

MANUSCRIPT FORMATTING

Manuscripts should be designed in the following order:

Title page

Abstract

Main text

References

Tables, figures and illustrations

Title Page

The title page of the manuscript should include: The title, first

and last names of each author. Complete affiliation and title for each author, with the name of department (s) and institution (s) to which the work should be attributed.

The corresponding author should be clearly identified with name, address, telephone- facsimile number and email address for correspondence about the manuscript. Authors should clearly indicate if the article has previously been presented at a congress or scientific meeting. The title should be concise and informative without abbreviations and not exceed 10 words.

Abstract

Abstracts should be exact in English, with a minimum of 150 and maximum of 350 words. Abstracts of original research articles should be structured under subheadings as follows: objectives, methods, results and conclusion. A maximum of 3 key words should be added to English abstracts.

Text

The text contains the rest of the manuscript. It is structured differently according to the type of manuscript (original research article, review, etc.). For example, original research articles should consist of aim and objectives, methods, results, discussion and conclusion.

References

References should be cited in consecutive numerical order as first mentioned in the text and designated by the reference number in parentheses. If the number of authors for the reference is more than 6 authors, list the first three authors and add "et al".

Journal names should be abbreviated as used in Index Medicus. References should be cited in the Vancouver style. For detailed information please visit the relevant link

Examples:

For research articles follow the example below:

– Verschuren WM, Jacobs DR, Bloemberg BP, et al. Serum total cholesterol and long-term coronary heart disease mortality. JAMA 1995; 274(2): 131–6.

For book chapters follow the example below:

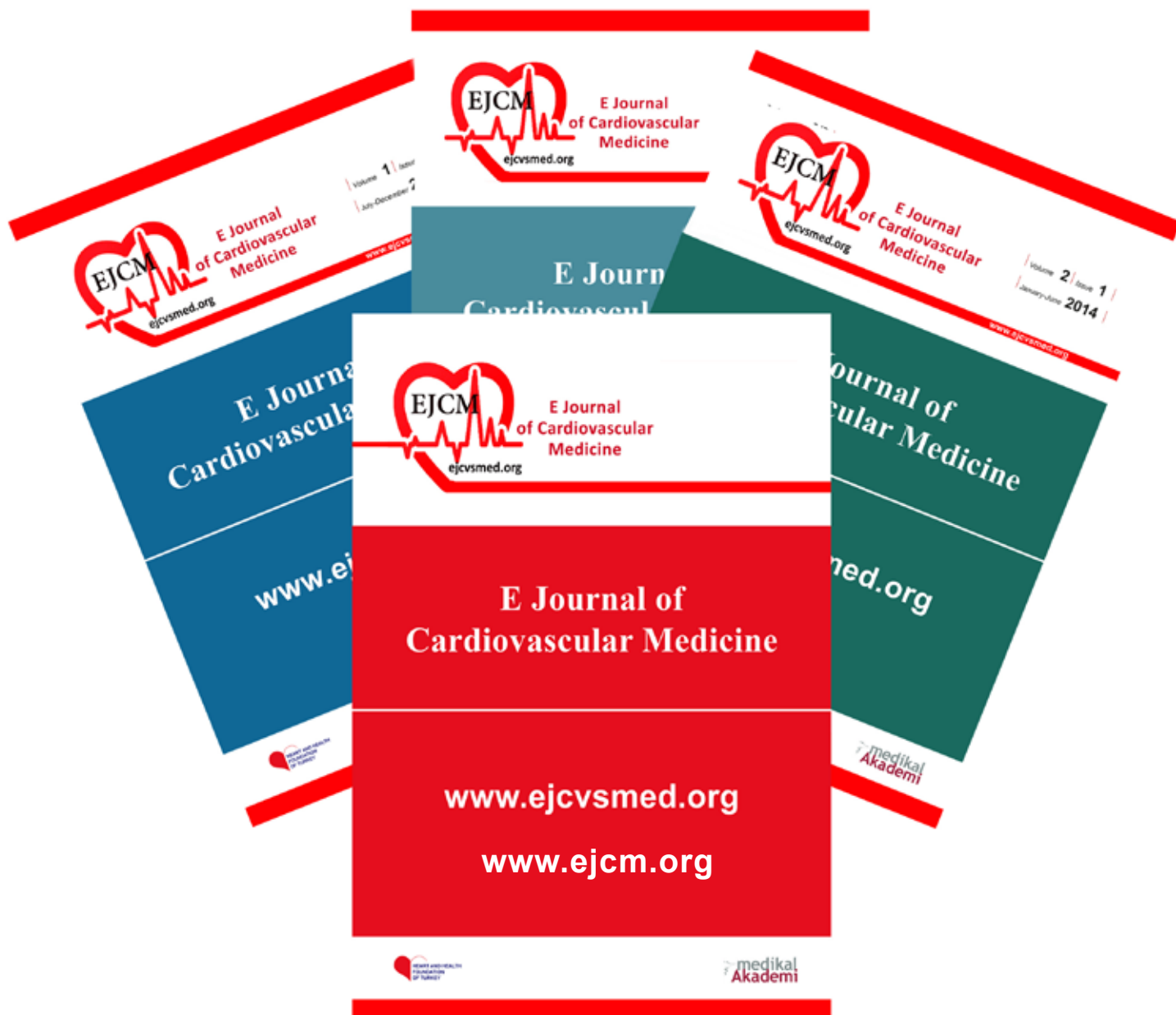
– Rakel RE. The family physician. In: Rakel RE, editor. Textbook of family practice. 5th ed. Philadelphia: W.B. Saunders; 1995. p. 3-19.

For web pages follow the example below:

– Guidance for clinicians. An International Benchmarking Study. <http://www.who.int/topics/surgery/> accessed: 29/09/2002.

Tables and Figures

Legends should take place on the top of the page for tables, and bottom of the page for figures and placed on separate pages. Explain all nonstandard abbreviations in footnotes.



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is a global e-journal targeting articles on:

- clinical cardiology,
- interventional cardiology,
- arrhythmia,
- cardiovascular surgery,
- vascular & endovascular surgery,
- vascular biology