Kocaeli Med J 2019; 8; 3:89-94

Atriyal fibrilasyon kateter ablasyonunun ekokardiyografik parametreler üzerine etkisi: tek merkez gözlemsel çalışması

The impact of Atrial Fibrillation Ablation on Echocardiographic parameters: Single Center Experience

Barış Akdemir[1], Enes Elvin Gül[2]
1Bahçeşehir Üniversitesi Tıp Fakültesi, Kardiyoloji Anabilim Dalı, İstanbul, Türkiye
2Medine Kalp Merkezi, Kardiyoloji Anabilim Dalı, Medine, Suudi Arabistan

ÖZ

GİRİŞ ve AMAÇ: *Atriyal fibrilasyon kateter ablasyonunun hastalarda klinik olarak iyileşme sağladığı bilinmektedir. Ayrıca kardiyak fonskiyonları bozulmuş hastalarda da kateter ablasyonunun olumlu etkileri yapılmış olan son çalışmalarla kanıtlanmıştır. Çalışmamızın amacı kateter ablasyonun ekokardiyografik parametreler üzerinde etkisini göstermektir.*

YÖNTEM ve GEREÇLER: *Çalışmaya AF tanısi almış ardışık 97 hasta dahil edilmiştir. Hastaların bazal ve 6.ay ekokardiyografik verileri karşılaştırılmıştır. Ayrıca nüks olan ve olmayan hasta gruplarının da ekokardiyografik verileri karşılaştırılmıştır.*

BULGULAR: *Çalışmaya alınan 97 hastanın yaş ortalaması 65.2 ± 8.6 yıl. Hastaların çoğunluğu paroksizmal AF hastasıdır (50/97, 51 %). Hastaların ortalama SVEF 48.7 ± 11.4 % bulunmuştur. Sol ventrikül ejeksiyon fraksiyon (SVEF) değeri 6.ayda bazal değere göre istatistiksel anlamlı olarak yükselmiştir (53.1 ± 10.1 ve 48.7 ± 11.6, p=0.001). Diğer değerler arasında anlamlı fark gösterilmemiştir. Ayrıca nüks olmayan hastaların SVEF değerleri bazal ve 6.ay karşılaştırmasında istatistiksel olarak anlamlı artış izlenmiştir. (48.3 ± 12.2 ve 54.4 ± 9.9, p=0.008).*

TARTIŞMA ve SONUÇ: *AF katater ablasyonunun sol ventrikül ejeksiyon fraksiyon (SVEF) ve kısmen de sol ventrikül sistol sonu çap (SVSSÇ) üzerine olumlu etkileri izlenmiştir. Klinik olarak bunun yansımasının tespit edilmesi için büyük çaplı randomize çalışmalara ihtiyaç vardır.*

Anahtar Kelimeler: *Atriyal fibrilasyon, Kateter Ablasyon, Ekokardiyografi*

ABSTRACT

INTRODUCTION: *It is known that atrial fibrillation catheter ablation provides clinical improvement in patients. Positive effects of catheter ablation in patients with impaired cardiac function have also been proven in recent studies. The aim of our study is to show the effect of catheter ablation on echocardiographic parameters.*

METHODS: *97 consecutive patients diagnosed with AF were included in the study. Basal and 6th month echocardiographic data of the patients were compared. Echocardiographic data of patient groups with or without recurrence were also compared.*

RESULTS: *The mean age of 97 patients included in the study was 65.2 ± 8.6 years. The majority of the patients was paroxysmal AF patients (50/97, 51%). The mean LVEF of the patients was found 48.7 ± 11.4%. Left ventricular ejection fraction (LVEF) increased statistically significant compared to the basal value in the 6th month (53.1 ± 10.1 and 48.7 ± 11.6, p = 0.001). No significant difference was shown among the other values. Moreover, a statistically significant increase was observed in LVEF values of the patients without recurrence in the comparison of their basal and 6th-month values. (48.3 ± 12.2 and 54.4 ± 9.9, p = 0.008).*

DISCUSSION AND CONCLUSION: *AF catheter ablation was observed to have positive effects on LVEF and partly on LVESD. Large-scale randomized studies are required to detect its clinical repercussion.*

Keywords: *Atrial Fibrillation, Catheter Ablation, Echocardiography*

İletişim / Correspondence:

Dr. Barış Akdemir
Bahçeşehir Üniversitesi Tıp Fakültesi, Kardiyoloji Anabilim Dalı, İstanbul, Türkiye
E-mail: barisakdemir75@hotmail.com
Başvuru Tarihi: 21.09.2019
Kabul Tarihi: 11.12.2019

INTRODUCTION

Atrial fibrillation (AF) is the most frequent type of rhythm disorder in clinical practice, and its incidence increases with age (1). Atrial fibrillation catheter ablation (CA) has been shown to be a treatment modality superior to pharmacological treatment (2). It has been shown that patients suffering from atrial fibrillation have a lower life expectancy than those without AF (3). In the general population, the AF incidence ranges from 1% to 9% whereas approximately 40% of heart failure patients are accompanied by AF.

The cause of the impaired heart function in AF patients is like "chicken-egg" situation. AF can be the main reason for the impairment of heart functions and also AF can be observed more frequently in patients with impaired heart functions. Pulmonary vein isolation has been shown to restore cardiac functions of patients with paroxysmal AF and low left ventricular ejection fraction (LVEF). These data also show that impaired left ventricular function may be associated with AF (4). However, the results of a randomized CA study in AF patients with left ventricular dysfunction are contradictory. (5, 6). This study was aimed to investigate the effect of catheter ablation on echocardiographic values.

MATERIAL AND METHODS

Patients who underwent radiofrequency (RF) catheter ablation due to AF between 2016-2019 were included in the study. The study protocol was completed before patient recruitment, and the patients started to be included in the study after the approval of the ethics committee. Patients who did not want to undergo catheter ablation and did not have ablation indication were excluded from the study. Verbal and written consent forms were obtained from all patients. Patients diagnosed with paroxysmal and persistent AF were included in the study. Patients with AF attacks lasting less than 7 days were recorded as paroxysmal AF patients, and patients with AF attacks lasting longer than 7 days were recorded as persistent AF patients.

Echocardiographic examination

The following echocardiographic parameters were obtained before and after the procedure of transthoracic echocardiography: left ventricular end-diastolic diameter (LVEDD), left ventricular end-systolic diameter (LVESD), left ventricular ejection fraction (LVEF), and left atrial diameter (LAD).

Catheter ablation

Catheter ablation was performed after the approval for the procedure. The anticoagulation therapy was ceased 24 hours before the procedure. The antiarrhythmic therapy was ceased 5 days before the procedure. All procedures were performed under general anesthesia. The procedures were performed with 3D mapping system (CARTO 3, Biosense Webster, Irvine, California). After thrombus in the heart had been excluded via transesophageal echocardiography, catheters were inserted into the left atrium after dual transseptal entrance was achieved, and the anatomy of the left atrium, pulmonary veins and left atrial appendix was visualized. During the procedure, the patient was-administered unfractionated heparin through the bolus to achieve an ACT level of 300-350. The anatomy of the left atrium and pulmonary veins was visualized with a 20-pole circular catheter (Lasso, BW), and the catheter ablation was performed with the ablation catheter (SmartTouch, Thermocool, BW) with 3.5-mm irrigation tip via the WACA (wide area circumferential ablation) method. 35 W 42 C energy was applied in the anterior wall of the left atrium, and 25 W 42 C energy was applied in the posterior wall. At least 5 grams were targetted for minimum contact. Oesophagus temperature was also monitored during the ablation in the posterior wall. After the success criterion of the procedure had been shown to be two-way block in pulmonary veins, the procedure was terminated, and the catheters were removed. After the patients were extubated in the catheter laboratory, they were transferred to their beds. The patients were discharged after pericardial effusion had been excluded via transthoracic echocardiography on the day of the procedure and the next day. According to patient's CHA2DS2 Vasc score, a long-term anticoagulation therapy was concluded. Post-procedure PPI and antiarrhythmic

therapy were ceased after 3 months. The patients went for a check up in 1st, 3rd, 6th, and 12th months after the discharge. Recurrence was defined as any AT/AF attack (longer than 30 sec.) developed 3 months after the procedure. AF recurrences were supported by a 12-channel surface ECG.

Follow-up

The patients went for a check up in 1st, 3rd, 6th, and 12th months after the discharge. Recurrence was defined as any AT/AF attack (longer than 30 sec.) developed 3 months after the procedure. AF recurrences were supported by a 12-channel surface ECG. Transthoracic echocardiography was performed 6 months after the procedure. Antiarrhythmic therapy or repeat catheter ablation were performed in patients with recurrence.

Statistic

All data were given as mean ± standard deviation or median (interquartile variables) by distribution. Comparison of echocardiographic values before and after the procedure

After Kolmogorov-Smirnov test determined normal distribution, Student T test was analysed. A p value of <0.05 was considered significant. The statistical analysis of the study was conducted with the SPSS software (SPSS 26.0, Chicago, IL, USA).

Findings

97 consecutive AF patients were included in the study. The mean age of patients was 65.2 ± 8.6 years, and their median CHA2DS2Vasc score was found 2.0. Detailed demographic data of the patients are provided in Table 1. 50 of the patients were recognized as paroxysmal AF and 47 of them were recognized as persistent AF (Table 1). Table 1 also shows the basal echocardiographic data.

Basal and 6th-month echocardiographic data of the patients are compared in Table 2. Left ventricular ejection fraction (LVEF) increased statistically significant compared to the basal value in the 6th month (53.1 ± 10.1 and 48.7 ± 11.6, p = 0.001). No significant difference was shown among the other values. However, a trend of improvement in LVESD value was observed (Table 2).

Table 1. Baseline Characteristics

Variables	Patients data (n=97)
Age, year	65.2 ± 8.6
Sex, M/F, n (%)	56 (58) /41 (42)
CHA_2DS_2Vasc	2.0
Obstructive Sleep Apnea , n (%)	40 (41)
COPD, n (%)	20 (21)
CAD, n (%)	22 (23)
DM, n (%)	25 (26)
HTN, n (%)	80 (82)
CHF, n (%)	30 (31)
TİA/stroke, n (%)	11 (11)
Medications	
BB/CCB, n (%)	78/33 (80/34)
Antiarrhythmic, n (%)	44 (45)
ACEi/ARB, n (%)	54 (56)
Statin, n (%)	56 (58)
Digoxin, n (%)	20 (21)
AF type, n (%)	
Paroxysmal	50 (51)
Persistent	47 (49)
LVEF, %	48.7 ± 11.4
LVEDD, mm	54.4 ± 7.1
LVESD, mm	38.6 ± 8.9
LAD, mm	48.3 ± 6.8

AF, Atrial Fibrillation; BB, beta blocker; CAD, coroner artery disease; CCB, Calcium Channel blocker; CHF, Congestive Heart Failure; COPD, Chronic Obstructive Lung disease; ; DM, diabetes mellitus; HTN, Hypertension; F, Female; LVEDD, Left Ventricular end diastolic diameter; LVESD, Left Ventricular end systolic diameter; LAD, Left atrium diameter; LVEF, Left Ventricular Ejection Fraction; M, Male; TİA, Transient ischemic attack.

Table 2. Echocardiographic parameters (All Patients)

Variable	Basal	6.month	p-value
LVEF, %	48.7 ± 11.6	53.1 ± 10.1	0.001
LVEDD, mm	54.4 ± 7.2	53.3 ± 7.8	0.242
LVESD, mm	39.0 ± 9.3	36.7 ± 9.1	0.057
LAD, mm	48.4 ± 6.7	47.6 ± 7.2	0.336

Table 3 presents the echocardiographic comparison of the patients with or without recurrence. While no significant difference was found between basal and 6th-month echocardiographic values of the patients with recurrence, LVEF values of the patients without recurrence were observed to be significant in the

comparison of basal and 6th-month values (48.3 ± 12.2 and 54.4 ± 9.9, p = 0.008). Furthermore, a trend of statistical significance in the LVESD values was observed in patients without recurrence (Table 3).

Table 3. Comparison of Echocardiographic parameters in patients with and without recurrence

Variable	Recurrence(+)		Recurrence (-)	
	Basal	6.month	Basal	6.month
LVEF, %	49.1 ± 11.1	52.0 ± 10.3	48.3 ± 12.2*	54.4 ± 9.9*
LVEDD, mm	53.9 ± 5.9	53.7 ± 7.9	54.9 ± 8.3	53.1 ± 7.7
LVESD, mm	38.8 ± 8.4	37.7 ± 8.4	39.2 ± 10.1#	35.8 ± 9.7#
LAD, mm	48.9 ± 7.1	48.5 ± 7.8	47.8 ± 6.4	46.8 ± 6.6

**p=0.008*
 # p=0.07

DISCUSSION

In the study the pre-procedure and 6th-month echocardiographic values of patients who underwent AF RF catheter ablation were compared, and statistically significant improvement in their LVEF values was observed. A significant improvement was also observed in LVEF values of the patients without recurrence. However, no difference was observed in the patients with recurrence.

A main problem associated with AF is that persistent and permanent AF forms are accompanied by congestive health failure. AF is observed in 40% of heart failure patients. AF can directly contribute to LV systolic dysfunction or be the main responsible for completely impaired LV functions (7).

Pulmonary vein isolation distinctively improves cardiac functions in paroxysmal AF patients with impaired LVEF. This supports that AF may be the primary responsible for impaired LV functions (4).

A study performed by Khan et al. randomized 81 paroxysmal (46%) or persistent AF (51%) and ischemic cardiomyopathy (71%) patients were randomized into catheter ablation or bi-ventricular pace and AV node ablation therapies and 8% improvement was observed in LVEF in the catheter ablation arm(8). A study performed by Hunter et al. 50 patients were randomized into CA or medical treatment. Significant improvement in LVEF was observed in the patients who underwent ablation (6). In the recent AATAC-AF (Ablation versus Amiodarone for Treatment of Atrial Fibrillation in Patients with Congestive Heart Failure and an Implanted ICD/CRTD) study, patients with AF and LV systolic dysfunction were randomized into CA or amiodarone therapy. In the study, ablation was found superior to amiodarone, and a significant improvement in LVEF was observed in the patient arm in which the sinus rhythm was established (2). A meta-analysis of 1838 patients found that CA improves LVEF, this was especially shown in the idiopathic or dilated CMP group (9). In a study performed by Hsu et al., an improvement was observed in LVEF from 35% to 50% even 1 month after the AF ablation (10). Improvement in LVEF can be explained by improvement of atrial contractility, atrioventricular synchronization and prevention of high ventricular rate (10).

A recent study observed that providing sinus rhythm with catheter ablation provided marked improvement in ventricular function.(11). While an improvement up to 18% in LVEF values was observed in the catheter ablation arm, the difference was found about 4.5% in the medical treatment group (p<0.0001), and the number of patients having reached the normal LVEF value (LVEF 50%) was 58% in the catheter ablation arm and about 9% in the medical treatment group (p = 0.0002). In addition, catheter ablation of the AF patients accompanied by heart failure was found to be significantly associated with low combined endpoint (death due to any cause or hospitalization due to heart failure) (12). In the CASTLE-AF study, while a median increase of 8% (interquartile range, 2.2 to 19.1) was observed in the LVEF value compared to the basal value in the catheter ablation arm at the 60th month of admission, this value was found 0.2% in the medical treatment group. (between -3.0 and 16.1) found (p = 0.005) (12).

Limitations of the study

The main limitation of the study is that the patient population in the study was not high and the

study was not designed as randomized-controlled. Another limitation is that recurrence rate might not coincide with real-life data as AF recurrence of the patients were defined via 12-channel ECG and a more advanced diagnostic method (event recorder, ILR implantation) was not performed. The third limitation is that the echocardiographic values were obtained only with transthoracic echocardiography. However, the accuracy rate of LVEF measurement with TTE was found noncompliant in some studies compared to cardiac MR (13). In another study comparing TTE and Cardiac MR, the difference increased up to 14% in LVEF (13). Finally, since LGE and presence of scar cannot be detected in cardiac MR in patients diagnosed with cardiomyopathy, it is difficult to determine which dilated CMP patients have benefited from catheter ablation (14).

CONCLUSION

AF catheter ablation was observed to have positive effects on LVEF. However, large-scale randomized studies are required to determine clinical repercussion of echocardiographic improvement.

REFERENCES

1. Wilke T, Groth A, Mueller S, Pfannkuche M, Verheyen F, Linder R, Maywald U, Bauersachs R, Breithardt G. Incidence and prevalence of atrial fibrillation: an analysis based on 8.3 million patients. Europace. 2013; 15 (4):486–93.
2. Di Biase L, Mohanty P, Mohanty S, Santangeli P, Trivedi C, Lakkireddy D et al. Ablation Versus Amiodarone for Treatment of Persistent Atrial Fibrillation in Patients With Congestive Heart Failure and an Implanted Device: Results From the AATAC Multicenter Randomized Trial. Circulation. 2016; 133(17):1637-44
3. Serpytis R, Navickaite A, Serpytiene E, Barysiene J, Marinskis G, Jatuzis D, et al. Impact of Atrial Fibrillation on Cognitive Function, Psychological Distress, Quality of Life, and Impulsiveness. Am J Med. 2018; 131(6):703.e1-703
4. Lutomsky BA, Rostock T, Koops A, Steven D, Müllerleile K, Servatius H, et al. Catheter ablation of paroxysmal atrial fibrillation improves cardiac function: a prospective study on the impact of atrial fibrillation ablation on left ventricular function assessed by magnetic resonance imaging. Europace. 2008; 10(5):593-9
5. MacDonald MR, Connelly DT, Hawkins NM, Steedman T, Payne J, Shaw M, et al. Radiofrequency ablation for persistent atrial fibrillation in patients with advanced heart failure and severe left ventricular systolic dysfunction: a randomised controlled trial. Heart. 2011; 97(9):740-7
6. Hunter RJ, Berriman TJ, Diab I, Kamdar R, Richmond L, Baker V, et al. A randomized controlled trial of catheter ablation versus medical treatment of atrial fibrillation in heart failure (the CAMTAF trial). Circ Arrhythm Electrophysiol. 2014; 7(1):31-8
7. Prabhu S, Voskoboinik A, Kaye DM, Kistler PM. Atrial Fibrillation and Heart Failure - Cause or Effect? Heart Lung Circ. 2017; 26(9):967-974
8. Khan MN, Jaïs P, Cummings J, Di Biase L, Sanders P, Martin DO, et al. Pulmonary-vein isolation for atrial fibrillation in patients with heart failure. N Engl J Med. 2008; 359(17):1778-85
9. Anselmino M, Matta M, D'Ascenzo F, Bunch TJ, Schilling RJ, Hunter RJ, et al. Catheter ablation of atrial fibrillation in patients with left ventricular systolic dysfunction: a systematic review and meta-analysis. Circ Arrhythm Electrophysiol. 2014; 7(6):1011-8
10. Hsu LF, Jaïs P, Sanders P, Garrigue S, Hocini M, Sacher F, et al. Catheter ablation for atrial fibrillation in congestive heart failure. N Engl J Med. 2004; 351(23):2373-83
11. Prabhu S, Taylor AJ, Costello BT, Kaye DM, McLellan AJA, Voskoboinik A, et al. Catheter Ablation Versus Medical Rate Control in Atrial Fibrillation and Systolic Dysfunction: The CAMERA-MRI Study. J Am Coll Cardiol. 2017; 70(16):1949-1961
12. Marrouche NF, Brachmann J, Andresen D, Siebels J, Boersma L, Jordaens L, et al. Catheter Ablation for Atrial Fibrillation with Heart Failure. N Engl J Med. 2018; 378(5):417-427
13. Heuschmid M, Rothfuss JK, Schroeder S, Fenchel M, Stauder N, Burgstahler C, et al. Assessment of left ventricular myocardial function using 16-slice multidetector-row computed tomography: comparison with magnetic resonance imaging and

echocardiography. Eur Radiol. 2006; 16(3):551-9.

14. Ling LH, Taylor AJ, Ellims AH, Iles LM, McLellan AJ, Lee G, et al. Sinus rhythm restores ventricular function in patients with cardiomyopathy and no late gadolinium enhancement on cardiac magnetic resonance imaging who undergo catheter ablation for atrial fibrillation. Heart Rhythm. 2013; 10(9):1334-9