Herz 2024 · 49:69–74
https://doi.org/10.1007/s00059-023-05198-y
Received: 7 April 2023
Revised: 20 May 2023
Accepted: 12 June 2023
Published online: 25 July 2023

The effect of high-power short-duration pulmonary vein isolation on PWPT—a predictor of paroxysmal atrial fibrillation

Meng Wang · Xiaochen Wang · Feng Gao · Pei Bao · Zheng Huang
Department of Cardiology, The Second Affiliated Hospital of Anhui Medical University, Hefei, China

Abstract

Background: The P wave peak time (PWPT) is a predictor of paroxysmal atrial fibrillation (PAF). High-power short-duration ablation has been associated with improved durability of circumferential pulmonary vein electrical isolation (PVI). We investigated the effect of high-power short-duration PVI on PWPT in patients with PAF.
Methods: Out of 111 patients with PAF, 91 received radiofrequency ablation (ablation group) and 20 received medication treatment (control group). A VIZIGO sheath and an STSF catheter (Biosense Webster, CA, USA) were used together for high-power short-duration circumferential PVI at ablation index values of 500 and 400 for the anterior and posterior walls, respectively. The patients were followed up for 12 months.
Results: The preoperative PWPT in the ablation group was similar to that in the control group: PWPT II = 54.38 ± 6.18 ms vs. 54.35 ± 6.12 ms ($p > 0.05$), PWPT V_1 = 54.19 ± 6.21 ms vs. 54.31 ± 6.08 ms ($p > 0.05$), respectively. Circumferential PVI was achieved for all patients in the ablation group during the operation. At the 12-month follow-up, there were seven cases of AF recurrence. The PWPT in the ablation group 12 months postoperatively was shorter than the preoperative value: PWPT II = 49.39 ± 7.11 ms vs. 54.38 ± 6.18 ms ($p < 0.001$), PWPT V_1 = 47.69 ± 7.01 ms vs. 54.19 ± 6.21 ms ($p < 0.001$). The PWPT in the patients with AF recurrence was significantly longer than that in the non-recurrence patients: PWPT II = 50.48 ± 7.12 ms vs. 47.33 ± 6.21 ms ($p < 0.001$), PWPT V_1 = 50.84 ± 7.05 ms vs. 47.19 ± 6.27 ms, ($p < 0.001$). The PWPT of the control group at the 12-month follow-up was similar to the baseline level: PWPT II = 54.32 ± 6.20 ms vs. 54.35 ± 6.12 ms ($p > 0.05$), PWPT V_1 = 53.89 ± 6.01 ms vs. 54.31 ± 6.08 ms ($p > 0.05$).
Conclusion: The results showed that high-power short-duration PVI had a positive effect on PWPT, which is a predictor of PAF.

Keywords
Paroxysmal atrial fibrillation · High-power short-duration ablation · PWPT · Pulmonary vein isolation · Predictor

Atrial fibrillation (AF) has a high incidence and can cause serious consequences such as thromboembolism, heart failure, and myocardial ischemia events [1]. In clinical practice, the focus should be not only on standardized treatment but also on the early prediction and evaluation of this disease. Prediction of AF is important because identifying high-risk patients can support the close monitoring of these patients, more aggressive treatment of risk factors, and even anticoagulation therapy for high-risk patients without documented AF [2, 3].

As a newly introduced electrocardiogram (ECG) parameter in recent years, P wave peak time (PWPT), can effectively reflect atrial electrical conduction [4]. The PWPT represents the time for the conduction of the electrical activity from the sinoatrial node to the maximal summation of positive deflection from both atria [5].

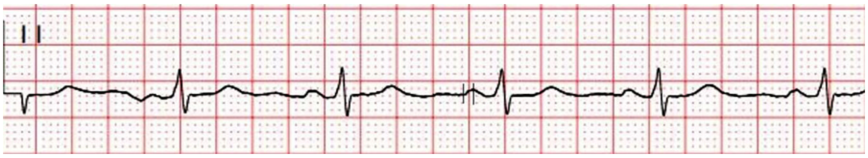

Fig. 1 ▲ Measurement of the P wave peak time

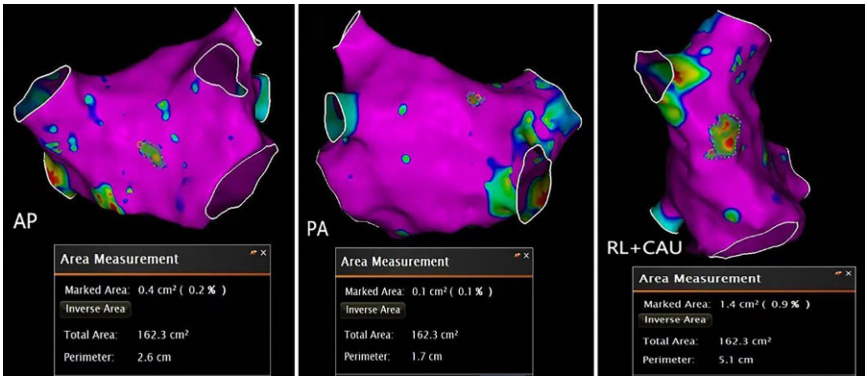

Fig. 2 ▲ Left atria substrate mapping and measurement. *Purple areas* indicate normal area and *multicolor areas* indicate low-voltage zone. Total area refers to the entire left atrial area except for the pulmonary veins and mitral valve. Areas are measured in the anteroposterior (*AP*), posteroanterior (*PA*), and right lateral and caudal (*RL + CAU*) positions

A previous study found that prolonged PWPT is associated not only with no-reflow in patients with acute coronary syndrome but also with the occurrence and development of paroxysmal atrial fibrillation (PAF) [5–7]. Hence, PWPT is closely related to and can be used to predict AF [8].

High-power short-duration ablation can produce transmural myocardial injury and thus has significantly improved the long-term effect of pulmonary vein electrical isolation [1]. The conversion of AF to sinus rhythm can lead to a reversal of atrial structure, such as left atrial diameter, which is closely related to PWPT [7]. This study investigated the impact of high-power short-duration circumferential pulmonary vein electrical isolation on PWPT, a predictor of PAF, aiming to provide a reference for the prediction and evaluation of PAF and the selection of ablation surgical strategies.

Methods

Study population

Patients with PAF who successfully underwent radiofrequency ablation at the Second Affiliated Hospital of Anhui Medical University from January 2021 to October 2021 were retrospectively included considering the following inclusion criteria: (1) age ≥ 18 years old, (2) ECG evidence of recurrent AF, (3) AF not responding to antiarrhythmic drug treatment, (4) patient underwent left atrial substrate mapping, and (5) patient underwent high-power short-duration circumferential pulmonary vein electrical isolation. The exclusion criteria were as follows: (1) valvular AF, (2) thrombus in atrium confirmed by preoperative esophageal ultrasound, (3) anticoagulation contraindication, (4) coronary atherosclerotic heart disease, (5) implantation of permanent pacemaker, (6) heart failure, (7) thyroid disease, (8) cardiomyopathy, (9) malignant tumor, (10) pulmonary hypertension, and (11) electrolyte disorder. On the basis of these criteria, we enrolled 91 PAF patients to the ablation group; 20 patients with PAF who rejected radiofrequency ablation and received medication treatment were recruited as the control group.

The study protocol was approved by the ethics committee of The Second Affiliated Hospital of Anhui Medical University. All patients provided informed consent for radiofrequency ablation in the study group.

Electrocardiography PWPT

A 12-lead ECG (MECG-300, MedEx, Beijing, China) with an amplitude of 10 mm/mv and a frequency of 25 mm/s was generated while each patient was in the supine position at rest. The ECG measurement data obtained were scanned and transmitted to a computer for accurate evaluation in Adobe Photoshop software.

According to the surface ECG during sinus rhythm, the PWPT in lead II (PWPT II) and lead V_1 (PWPT V_1) were averaged from a series of three consecutive beats and performed by two independent cardiologists, each of whom was blinded to clinical information (◘ **Fig. 1**). We used the machine-calculated PWPT and roughly verified the duration manually. The intraobserver and interobserver variations were < 5%. Both of the cardiologists conducting the survey ended with the same margin of error. In the case of any doubt, the two cardiologists would determine the value after discussion.

Echocardiography

A Siemens SC3000 color Doppler ultrasound diagnostic instrument was used to take the left-side lying position for cardiac ultrasound examination. The left atrial diameter was measured continuously for three cardiac cycles, and the average value was taken. The left atrial diameter was measured both before the operation and 12 months after the operation.

Substrate mapping and radiofrequency ablation

After routine disinfection, draping, and local anesthesia, a 6-F sheath was inserted into the left femoral vein using the Seldinger method, and a ten-pole steerable mapping electrode was inserted into the coronary sinus. The right femoral vein was punctured twice to place an 8-F fixed-curve long sheath and a steerable long sheath, and the atrial septum was punctured twice with a septal puncture needle through the long sheaths under fluoroscopy. The fixed-curve sheath and the steerable sheath were placed in the left atrium. A star-shaped mapping catheter (PentaRay®; Biosense Webster, Diamond

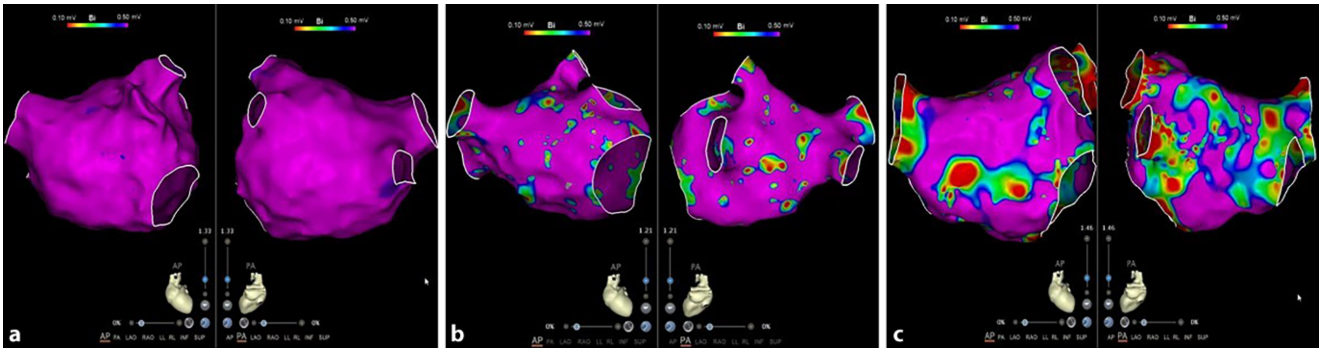

Fig. 3 ▲ **a** Patients with few or even no left atrial low-voltage area; **b** left atrial low-voltage area less than 20%; **c** patients with low-voltage area greater than 20%

Bar, CA, USA) was sent along the fixed-curve long sheath to the left atrium. The left atrial geometry was reconstructed using FAM model under the guidance of Carto 3D electrophysiological mapping system (Carto3, Version 6, Biosense Webster, CA, USA), and the left atrial voltage was mapped in sinus rhythm. The Smart Touch Surround Flow (STSF) ablation catheter (Biosense Webster, CA, USA) was sent along the steerable sheath to the left atrium and connected to a radiofrequency pump tube and a pressure extension tube into which a diluted heparin sodium solution was continuously pumped. Ablation of the peripheral pulmonary vein antrum was performed point by point under the guidance of Carto3 (ablation index values: 500 for the anterior wall and 400 for the posterior wall). Radiofrequency ablation was performed using Visitag (Carto VISITAG™ Module, Biosense Webster, CA, USA) guidance with catheter stability (2.5 mm for 3 s) and contact force (CF; > 3 g for 25% of time) settings. Pulmonary vein activation mapping and pacing mapping were used to verify that circumferential pulmonary vein electrical isolation achieved a bidirectional block. During the procedure, heparin was delivered to maintain an activated clotting time between 300 and 350 s.

For the substrate mapping results, the following colors were used to define the areas: (1) normal area (purple)—the bipolar voltage of the adjacent area exceeded 0.5 mV; and (2) low-voltage area (colored)—the bipolar voltage of the adjacent area was < 0.5 mV. The area of the low-voltage area (cm^2) and the area of the left atrium (the entire area of the left atrium except the pulmonary vein and mitral valve) were measured using the Carto system (Carto3, Version 6, Biosense; ◘ **Fig. 2**), and the proportion of the low-voltage area = area of the low-voltage zone/area of the left atrium. The patients were counted and classified based on the limit of 20% load in the low voltage area, in which greater than 20% indicated that AF was prone to recur after ablation ([9, 10]; ◘ **Fig. 3**).

Postoperative follow-up

The patients were regularly followed up in the outpatient department every 6 months within 1 year after the operation. All patients underwent ECG and dynamic ECG examination, and the occurrence and frequency of atrial arrhythmia were recorded.

Statistical analysis

The statistical analysis was performed by SPSS 25.0 software. The measurement data are expressed as mean ± SD, and the normality of continuous variables was assessed through the Kolmogorov–Smirnov test. Data with a normal distribution were compared through the *t* test, and non-normally distributed data were compared by the Wilcoxon test. Values of $p < 0.05$ suggest a statistically significant difference.

Results

Baseline data of ablation group and control group

The clinical characteristics of the ablation group and control group are presented in ◘ **Table 1**. The preoperative PWPT in the ablation group was similar to that of the control group— PWPT II: 54.38 ± 6.18 ms vs. 54.35 ± 6.12 ms, $p > 0.05$; PWPT V_1: 54.19 ± 6.21 ms vs. 54.31 ± 6.08 ms, $p > 0.05$.

Operation and follow-up of ablation group

All 91 patients achieved circumferential pulmonary vein electrical isolation during the operation. At the 12-month follow-up, there was AF recurrence in seven patients with a left atrial low-voltage area load greater than 20%. The remaining 84 patients maintained sinus rhythm, and their substrate mapping showed that the left atrial low-voltage area load was less than 20%.

Comparison of ECG PWPTand left atrial diameter of ablation group

By comparing the ECG PWPT before and at 12 months after the operation, we found that PWPT II (54.38 ± 6.18 ms vs. 49.39 ± 7.11 ms, $p < 0.001$) and PWPT V_1 (54.19 ± 6.21 ms vs. 47.69 ± 7.01 ms, $p < 0.001$) were markedly decreased at 12 months after operation compared with before operation. By comparing the left atrial diameter before and at 12 months after operation, we found that

Table 1 Clinical characteristics of the ablation group and control group			
Variables	**Ablation group (*n* = 91)**	**Control group (*n* = 20)**	***p***
Age, years	62.29 ± 11.57	61.42 ± 10.14	0.804
Male (%)	49 (53.8)	11 (55)	0.712
Smoking (%)	35 (38.5)	8 (40)	0.703
BMI, kg/m^2	24.8 ± 3.2	24.9 ± 2.7	0.828
PWPT II (ms)	54.38 ± 6.18	54.35 ± 6.12	0.814
PWPT V_1 (ms)	54.19 ± 6.21	54.31 ± 6.08	0.801

BMI body mass index, *PWPT* P wave peak time

Table 2 Comparison between preoperative and postoperative PWPT values of ablation group			
***N* = 91**	**Preoperative**	**Postoperative, 12 months**	***p***
P-wave parameters			
PWPT II (ms)	54.38 ± 6.18	49.39 ± 7.11	< 0.001
PWPT V_1 (ms)	54.19 ± 6.21	47.69 ± 7.01	< 0.001
Left atrial diameter (mm)	40.19 ± 7.09	36.27 ± 6.21	< 0.001

PWPT II from the beginning of P wave to peak in lead II, ***PWPTV₁*** from the beginning of P wave to peak in lead V_1

Table 3 Comparison between recurrence group and no-recurrence group			
Variables	**Recurrence group (*n* = 7)**	**No-recurrence group (*n* = 84)**	***p***
Baseline data			
Age, years	62.21 ± 11.62	62.13 ± 11.43	0.887
Male (%)	4 (57.1)	45 (53.6)	0.129
Smoking (%)	3 (42.9)	32 (38.1)	0.101
BMI, kg/m^2	24.2 ± 3.3	24.7 ± 3.7	0.862
Hypertension (%)	3 (42.9)	35 (41.7)	0.764
12 months after operation			
PWPT II (ms)	50.48 ± 7.12	47.33 ± 6.21	< 0.001
PWPT V_1 (ms)	50.84 ± 7.05	47.19 ± 6.27	< 0.001
Left atrial diameter (mm)	38.91 ± 5.41	36.02 ± 6.09	< 0.001
Left atrial low-voltage area load (%)	21	2	< 0.001

BMI body mass index, *PWPT II*, from the beginning of P wave to peak in lead I, *PWPT V1* from the beginning of P wave to peak in lead V_1

the left atrial diameter (40.19 ± 7.09 mm *vs.* 36.27 ± 6.21 mm, $p < 0.001$) was markedly decreased at 12 months after the operation compared with before the operation (**Table 2**).

There were seven patients in the recurrence group and 84 patients in the non-recurrence group. There was no significant difference in the baseline data between groups for. At 12 months after the operation, the ECG PWPT in the recurrence group was significantly higher than that in the non-recurrence group—PWPT II: 50.48 ± 7.12 ms vs, 47.33 ± 6.21 ms, $p < 0.001$; PWPT V_1: 50.84 ± 7.05 ms vs. 47.19 ± 6.27 ms, $p < 0.001$. By comparing the left atrial diameter between the recurrence and non-recurrence groups at 12 months after the operation, we found that the recurrence group had a larger left atrial diameter (38.91 ± 5.41 mm vs. 36.02 ± 6.09 mm, $p < 0.001$; **Table 3**).

Comparison of ECG PWPT of control group

The PWPT at the 12-month follow-up was similar with the baseline level—PWPT II: 54.32 ± 6.20 ms vs. 54.35 ± 6.12 ms, $p > 0.05$; PWPT V_1: 53.89 ± 6.01 ms vs. 54.31 ± 6.08 ms, $p > 0.05$.

Discussion

The occurrence and development of PAF is related not only to pulmonary venous triggers but also closely related to the substrate of the atrium. Clinical practice has confirmed that patients with PAF and substrate in the low-voltage area are prone to recurrence after radiofrequency ablation. Masuda et al. [10] reported that the presence of left atrial hypotension after pulmonary vein electrical isolation predicted the recurrence of AF in patients with persistent AF and in patients with PAF. Vlachos et al. [11] showed that an area of the left atrium with a voltage less than 0.4 mV exceeding 10% of the total left atrial surface area predicted the recurrence of atrial arrhythmia after pulmonary vein antrum isolation in patients with PAF. Another study found that the parameters of the left atrial structure (i.e., left atrial volume index) and function (i.e., left atrial emptying fraction and left atrial strain) were closely related to the degree of left atrial low-voltage area, inducing and maintaining AF [12].

In recent years, research on the correlation between PWPT and AF has attracted much attention. Numerous studies have demonstrated that PWPT is an independent predictor of PAF [13]. Increased PWPT represents prolonged intra-atrial and/or inter-atrial conduction time. The PWPT can predict an increase in the left atrial volume index in patients with diabetes mellitus and patients undergoing hemodialysis [14, 15]. Studies have found that compared with healthy people, patients with PAF have significantly longer PWPT in lead V_1 [16]. Öz et al. [8] reported that there was a significant relationship between PWPT in lead II and PAF in patients with acute ischemic stroke. The PWPT is not only a marker for the development of AF in nonsurgical patients but also predicts the development of AF after coronary artery bypass graft surgery [17].

The strategy of high-power short-duration quantitative ablation for PAF mainly uses impedance heat to produce transmural myocardial injury, which not only can significantly improve the durability of circumferential pulmonary vein electrical isolation but can also have a positive effect on the pulmonary vein antrum [18–20]. The pulmonary vein antrum can serve as the substrate for pulmonary vein–left atrial reentry and plays an important role in triggering the electrical activity of the pulmonary vein cuff and maintaining fibrillation-like conduction [21].

In this study, the use of a VIZIGO sheath and an STSF catheter for high-power short-duration circumferential pulmonary vein electrical isolation at the ablation index values of 500 and 400 for anterior and posterior walls, respectively, significantly improved the surgical efficacy. Of the 61 patients, only five experience recurrence during a 12-month follow-up after ablation. More importantly, the PWPT on ECG, a predictor of PAF, showed that the overall PWPT of the patients at 12 months after the operation was significantly shorter than that before the operation. The main reason for this is related to the reversal of atrial electrical and structural remodeling after converting AF to sinus rhythm [22, 23]. Moreover, in this study, reverse remodeling of the atrium (reduced left atrial diameter) evidenced by echocardiography confirmed the effect of the operation.

For the recurrent AF group in this study, we found that the PWPT and left atrial diameter were significantly higher than those in the non-recurrent group. The main reason for this is related to the load in the low-voltage area of the left atrium. The greater the load in the low-voltage area, the higher the risk of AF recurrence [24]. Recurrence of AF leads to progression of atrial remodeling, which can be characterized by an increase in left atrial diameter and ECG PWPT. In fact, in this study, the low-voltage load in the recurrent group was significantly higher than that in the non-recurrent group. On the other hand, it is supported that PWPT is closely related to the low-voltage area of the left atrium.

Limitations

First, the ECG PWPT was measured manually, which may inevitably have errors. Second, the sample size was relatively small; the follow-up period was also relatively short, which may have affected the evaluation of the surgical effect. Finally, this was a single-center data analysis study, and the findings need to be confirmed by multicenter clinical studies with a large sample.

Conclusion

The results of our study showed that high-power short-duration pulmonary vein electrical isolation had a positive effect on P wave peak time, which is predictor of PAF.

Corresponding address

Meng Wang
Department of Cardiology, The Second Affiliated Hospital of Anhui Medical University
230601 Hefei, China
chidream@sina.com

Funding. This work was supported in part by the Cultivation Plan of Clinical Research, Second Affiliated Hospital of Anhui Medical University (2021LCYB19), and the Scientific Research Foundation of Education Department of Anhui Province of China (2022AH050658).

Author Contribution. Meng Wang and Xiaochen Wang contributed to the conception and design. Meng Wang and Pei Bao contributed to the acquisition, analysis, and interpretation of the data, and the drafting of the article. Meng Wang, Zheng Huang, and Xiaochen Wang revised the article for intellectual content. Meng Wang, Xiaochen Wang, and Feng Gao finally approved the completed article.

Declarations

Conflict of interest. M. Wang, X. Wang, F. Gao, P. Bao and Z. Huang declare that they have no competing interests.

For this article no studies with human participants or animals were performed by any of the authors. All studies mentioned were in accordance with the ethical standards indicated in each case.

References

1. Hindricks G, Potpara T, Dagres N et al (2021) 2020 ESC Guidelines for the diagnosis and management of atrial fibrillation developed in collaboration with the European Association for Cardio-Thoracic Surgery (EACTS): The Task Force for the diagnosis and management of atrial fibrillation of the European Society of Cardiology (ESC) Developed with the special contribution of the European Heart Rhythm Association (EHRA) of the ESC. Eur Heart J 42(5):373–498
2. Kornej J, Börschel CS, Benjamin EJ et al (2020) Epidemiology of Atrial Fibrillation in the 21st. Century: Nov Methods New Insightscirc Res 127(1):4–20
3. Bayés de Luna A, Baranchuk A, Martínez-Sellés M (2017) Anticoagulation in patients at high risk of stroke without documented atrial fibrillation. Time for a paradigm shift? Ann Noninvasive Electrocardiol 22(1):e12417
4. Chen LY, Soliman EZ (2019) P wave indices-advancing our understanding of atrial fibrillation-related cardiovascular outcomes. Front Cardiovasc Med 6:53
5. Çağdaş M, Karakoyun S, Rencüzoğulları İ et al (2020) P wave peak time; a novel electrocardiographic parameter in the assessment of coronary no-reflow. J Electrocardiol 50(5):584–590
6. Bayam E, Yıldırım E, Kalçık M et al (2021) Relationship between P wave peak time and coronary artery disease severity in non-ST elevation acute coronary syndrome. Herz 46(2):188–194
7. Chen LY, Ribeiro ALP, Platonov PG et al (2022) P Wave Parameters and Indices: A Critical Appraisal of Clinical Utility, Challenges, and Future Research-A Consensus Document Endorsed by the International Society of Electrocardiology and the International Society for Holter and Noninvasive Electrocardiology. Circ Arrhythm Electrophysiol 15(4):e10435
8. Öz A, Cinar T, Kızılto GC et al (2020) Novel electrocardiography parameter for paroxysmal atrial fibrillation in acute ischaemic stroke patients: P wave peak time. Postgrad Med J 96(1140):584–588
9. Yamaguchi T, Tsuchiya T, Fukui A et al (2018) Impact of the extent of low-voltage zone on outcomes after voltage-based catheter ablation for persistent atrial fibrillation. J Cardiol 72(5):427–433
10. Masuda M, Fujita M, Iida O et al (2018) Left atrial low-voltage areas predict atrial fibrillation recurrence after catheter ablation in patients with paroxysmal atrial fibrillation. Int J Cardiol 257:97–101
11. Vlachos K, Efremidis M, Letsas KP et al (2017) Low-voltage areas detected by high-density electroanatomical mapping predict recurrence after ablation for paroxysmal atrial fibrillation. J Cardiovasc Electrophysiol 28:1393–1402
12. Hohendanner F, Romero I, Blaschke F et al (2018) Extent and magnitude of low-voltage areas assessed by ultra-high-density electroanatomical mapping correlate with left atrial function. Int J Cardiol 272:108–112
13. Ibisoglu E, Boyraz B, Güneş ST et al (2021) Impact of surgical weight loss on novel P-wave-related variables which are nominated as predictors of atrial arrhythmias. Pacing Clin Electrophysiol 44(9):1516–1522
14. Yıldız İ, Yildiz ÖP, Burak C et al (2020) P Wave Peak Time for Predicting an Increased Left Atrial Volume Index in Hemodialysis Patients. Med Princ Pract 29(3):262–269
15. Aslan B, Akyüz A, Işık F et al (2022) The effect of empagliflozin on P wave peak time and other P wave parameters in patients with diabetes mellitus. Pacing Clin Electrophysiol 45(3):323–329

16. Yıldırım E, Günay N, Bayam E et al (2019) Relationship between paroxysmal atrial fibrillation and a novel electrocardiographic parameter P wave peak time. J Electrocardiol 57:81–86
17. Zengin A, Karataş MB, Çanga Y et al (2022) A novel electrocardiographic parameter for the prediction of atrial fibrillation after coronary artery bypass graft surgery "P wave peak time". Ir J Med Sci 191(6):2579–2585
18. Castrejón-Castrejón S, Martínez Cossiani M, Ortega Molina M et al (2020) Feasibility and safety of pulmonary vein isolation by high-power short-duration radiofrequency application: shortterm results of the POWER-FAST PILOT study. J Interv Card Electrophysiol 57(1):57–65
19. Reddy VY, Grimaldi M, De Potter T et al (2019) Pulmonary Vein Isolation With Very High Power, Short Duration, Temperature-Controlled Lesions: The QDOT-FAST Trial. JACC Clin Electrophysiol 5(7:778–786
20. Castrejón-Castrejón S, Martínez Cossiani M, Jáuregui-Abularach M et al (2023) Multicenter prospective comparison of conventional and high-power short duration radiofrequency application for pulmonary vein isolation: the high-power short-duration radiofrequency application for faster and safer pulmonary vein ablation (POWER FAST III) trial. J Interv Card Electrophysiol. https://doi.org/10.1007/s10840-023-01509-9
21. Yamasaki H, Aonuma K, Shinoda Y et al (2019) Initial Result of Antrum Pulmonary Vein Isolation Using the Radiofrequency Hot-Balloon CatheterWith Single-Shot Technique. JACC Clin Electrophysiol 5(3):354–363
22. Maille B, Das M, Hussein A et al (2020) Reverse electrical and structural remodeling of the left atrium occurs early after pulmonary vein isolation for persistent atrial fibrillation. J Interv Card Electrophysiol 58(1):9–19
23. Soulat-Dufour L, Lang S, Addetia K et al (2022) Restoring Sinus Rhythm Reverses Cardiac Remodeling and Reduces Valvular Regurgitation in Patients With Atrial Fibrillation. J Am Coll Cardiol 79(10):951–961
24. Masuda M, Asai M, Iida O et al (2022) Low-Voltage-Area Ablation in Paroxysmal Atrial Fibrillation-Extended Follow-up Results of the VOLCANO Trial. Circ J 86(2):245–252

Zusammenfassung

Auswirkung der Hochenergie-Kurzzeit-Pulmonalvenenisolation auf die PWPT als einem Prädiktor des paroxysmalen Vorhofflimmerns

Hintergrund: Die Zeitdauer vom Beginn bis zum Gipfel der P-Welle („P wave peak time", PWPT) ist ein Prädiktor des paroxysmalen Vorhofflimmerns (PVF). Die Hochenergie-Kurzzeit-Ablation wurde mit einer besseren Dauerhaftigkeit der zirkumferenziellen elektrischen Pulmonalvenenisolation (PVI) in Verbindung gebracht. In der vorliegenden Arbeit wurde die Auswirkung der Hochenergie-Kurzzeit-PVI auf die PWPT bei Patienten mit PVF untersucht.
Methoden: Von 111 Patienten mit PAF erhielten 91 eine Behandlung mittels Radiofrequenzablation (Ablationsgruppe) und 20 eine medikamentöse Therapie (Kontrollgruppe). Ein VIZIGO-Schleuse (Fa. Biosense Webster, Irvine, CA, USA) und ein Smart-Touch-Surround-Flow(STSF)-Katheter (Fa. Biosense Webster) wurden zusammen für die zirkumferenzielle Hochenergie-Kurzzeit-PVI mit Ablationsindexwerten von 500 bzw. 400 für die Vorder- und Hinterwand verwendet. Die Patienten wurden 12 Monate lang nachbeobachtet.
Ergebnisse: Die präoperative PWPT in der Ablationsgruppe war ähnlich wie die in der Kontrollgruppe: PWPT II = 54,38 ± 6,18 ms vs. 54,35 ± 6,12 ms ($p > 0,05$) bzw. PWPT V_1 = 54,19 ± 6,21 ms vs. 54,31 ± 6,08 ms ($p > 0,05$). Bei sämtlichen Patienten in der Ablationsgruppe wurde eine zirkumferenzielle PVI während der Operation erzielt. Beim 12-Monats-Follow-up gab es 7 Fälle mit Wiederauftreten des VF. Die PWPT in der Ablationsgruppe war 12 Monate postoperativ kürzer als der präoperative Wert: PWPT II = 49,39 ± 7,11 ms vs. 54,38 ± 6,18 ms ($p < 0,001$); PWPT V_1 = 47,69 ± 7,01 ms vs. 54,19 ± 6,21 ms ($p < 0,001$). Die PWPT bei den Patienten mit VF-Rezidiv war signifikant länger als die bei den Patienten ohne VF-Rezidiv: PWPT II = 50,48 ± 7,12 ms vs. 47,33 ± 6,21 ms ($p < 0,001$); PWPT V_1 = 50,84 ± 7,05 ms vs. 47,19 ± 6,27 ms; ($p < 0,001$). In der Kontrollgruppe war die PWPT beim 12-Monats-Follow-up ähnlich wie der Ausgangswert: PWPT II = 54,32 ± 6,20 ms vs. 54,35 ± 6,12 ms ($p > 0,05$); PWPT V_1 = 53,89 ± 6,01 ms vs. 54,31 ± 6,08 ms ($p > 0,05$).
Schlussfolgerung: Den Ergebnissen zufolge hat die Hochenergie-Kurzzeit-PVI positive Auswirkungen auf die PWPT, die einen Prädiktor für PVF darstellt.

Schlüsselwörter
Paroxysmales Vorhofflimmern · Hochenergie-Kurzzeit-Ablation · PWPT · Pulmonalvenenisolation · Prädiktor