Ablation for the treatment of Brugada syndrome

English

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Abstract

Introduction: Brugada syndrome (BrS) is an inherited disease characterized by an increased risk of sudden cardiac death (SCD). Therapeutic options in symptomatic patients are limited to implantable cardioverter defibrillator (ICD) and quinidine, but catheter ablation of the right ventricular outflow tract (RVOT) offers a potential cure. Different ablation strategies have been used to treat patients with symptomatic Brugada syndrome. Epicardial radiofrequency substrate ablation of the RVOT/right ventricle (RV) has emerged as a promising tool for the management of the disease.Areas covered: The historical management of BrS, endocardial and epicardial ablation techniques, the use of sodium channel blockers (SCB) and complications are summarized here.

Expert opinion: Ventricular fibrillation (VF)-triggering premature ventricular contractions (PVCs) in patients with BrS are unpredictable, spontaneous ones are rarely present to be mapped, making this approach impractical. Furthermore,

endocardial mapping for BrS substrates does not seem effective due to the epicardial pathological substrate localization. The size variation of the BrS substrate areas during SCB infusion suggests a dynamic process as arrhythmogenic basis and SCB infusion should guide BrS epicardial ablation of all abnormal potentials' areas. If BrS epicardial ablation can truly provide long-term prevention of ventricular arrhythmias it may potentially become an alternative to ICD therapy.

KEYWORDS:

Brugada syndrome; ICD; catheter radiofrequency ablation; epicardial substrate ablation; hybrid thoracoscopic ablation; right ventricle outflow tract conduction delay; sodium channel blockers; sudden cardiac death; ventricular fibrillation triggers

Article highlights

I. **Brugada syndrome is an inherited disease characterized by an increased risk of sudden cardiac death in the absence of structural heart anomalies.**
II. **The cellular mechanisms underlying Brugada syndrome remain debatable. Two principal hypotheses have been proposed: the repolarization hypothesis and the depolarization hypothesis.**
III. **Quinidine is the only drug that has been proven to be effective. ICD is the only therapeutic option found to be effective in preventing death from VF recurrences and it is recommended in BrS symptomatic patients for the prevention of SCD**

IV. **Epicardial radiofrequency substrate ablation over the RVOT/RV has emerged as a promising tool for the management of Brugada syndrome.**

V. **Endocardial substrates mapping and VF-triggering PVCs targeting do not seem effective due to the prevalent epicardial pathological substrate localization in the majority of the patients; BrS substrate is almost exclusively located in the epicardium of the RVOT/RV body and rarely present in the endocardium.**

1. Introduction

Brugada syndrome (BrS) is an inherited disease characterized by an increased risk of sudden cardiac death (SCD) in the absence of structural heart anomalies that was first described in 1992. BrS has been reported to be responsible for 5–40% of sudden deaths in patients without structural heart disease and it is an important cause of death in individuals aged 20 years since the first description of BrS, the clinical characterization of patients has evolved considerably [2,16]. The early reports of patients with Brugada syndrome described individuals with a very expressive form of the disease, who were frequently symptomatic and displayed the type 1 ECG pattern spontaneously [3]. Ventricular arrhythmias were also more frequently induced [2,17]. At present, BrS is diagnosed more often in asymptomatic individuals or after a drug challenge test because of suspicion of the disease [18]. However, most Brugada syndrome registries and studies do not adequately represent this shift in patient characterization [18] and, therefore, management of this ‘new’ subset of patients is not well established. Furthermore, current clinical guidelines and consensus statements offer recommendations for those patients at higher risk [18,19], whereas asymptomatic and drug-induced patients with BrS are almost never

mentioned. The HRS/EHRA/APHRS expert consensus statement recommends implantable cardioverter defibrillator (ICD) implantation as a class I indication for patients with type 1 Brugada ECG pattern who present with aborted sudden death and VF-related symptoms such as syncope, seizure, or nocturnal agonal respiration [20]. However, given that Brugada syndrome is usually diagnosed in young and otherwise healthy individuals, the decision to implant an ICD requires thorough evaluations [20] owing to the risk of long-term device complications [21]. Furthermore, inappropriate shocks are likely in this population given their active lifestyle, which might have a negative psychological effect in the long term. In a meta-analysis published in 2016, 20% of patients with BrS who received an ICD presented with inappropriate shocks, and 20% presented with devicerelated complications (12% of which were the result of electrode dysfunction) [21]. Similar findings have been reported in other studies [21,23]. These complications are relevant and should be taken into consideration during the assessment and management of patients with BrS. Nevertheless, life-threatening complications are extremely infrequent. The development of completely extravascular devices that reduce the risk of systemic device-related infections and novel therapies such as epicardial substrate ablation [24,25] might improve the management of patients with BrS. Quinidine, not available in many parts of the world, is the only drug that has been proven to be effective. ICD is the only therapeutic option found to be effective in preventing death from ventricular fibrillation recurrences, but the device does not prevent nonfatal episodes [21,23]. In the past, when patients with BrS were afflicted with frequent ICD discharges from VF recurrences, there were limited therapeutic treatment options. Intravenous isoproterenol and quinidine [26] were the only

treatments; when these drugs were not effective, drastic therapeutic measures were taken, such as cardiac transplantation [27,29].

Brugada syndrome catheter ablation

Different ablation strategies have been used to treat patients with symptomatic events. According to both the depolarization and the repolarization hypothesis the RVOT is the arrhythmogenic substrate site of the disease [2,3,30]. In particular, the anterior wall of RVOT epicardium in BrS was consistently found to be characterized by low voltage, prolonged and fractionated potentials that become more evident under sodium channel blockers (SCB) infusion (Figure 1). Nowadays, elimination of all the pathological substrate is suggested as the endpoint of radiofrequency (RF) ablation, normalizing the ECG type 1 pattern and making VT/ VF non inducible in BrS patients symptomatic for recurrent ventricular arrhythmias and multiple ICD shocks. Epicardial RF substrate ablation has emerged as a promising tool for the management of BrS reports of patients with BrS described individuals with a very expressive form of the disease, who were frequently symptomatic and displayed the type 1 ECG pattern spontaneously [3]. Ventricular arrhythmias were also more frequently induced [2,17]. At present, BrS is diagnosed more often in asymptomatic individuals or after a drug challenge test because of suspicion of the disease [18]. However, most BrS registries and studies do not adequately represent this shift in patient characterization [18] and, therefore, management of this ‘new’ subset of patients is not well established. Furthermore, current clinical guidelines and consensus statements offer recommendations for those patients at higher risk [18,19], whereas asymptomatic and drug-induced patients with BrS are almost never mentioned. The HRS/EHRA/APHRS expert consensus statement recommends

implantable cardioverter defibrillator (ICD) implantation as a class I indication for patients with type 1 Brugada ECG pattern who present with aborted sudden death and VF-related symptoms such as syncope, seizure, or nocturnal agonal respiration [20]. However, given that BrS is usually diagnosed in young and otherwise healthy individuals, the decision to implant an ICD requires thorough evaluations [20] owing to the risk of long-term device complications [21]. Furthermore, inappropriate shocks are likely in this population given their active lifestyle, which might have a negative psychological effect in the long term. In a meta-analysis published in 2016, 20% of patients with BrS who received an ICD presented with inappropriate shocks, and 20% presented with device related complications (12% of which were the result of electrode dysfunction) [21]. Similar findings have been reported in other studies [21,23]. These complications are relevant and should be taken into consideration during the assessment and management of patients with BrS. Nevertheless, life-threatening complications are extremely infrequent. The development of completely extravascular devices that reduce the risk of systemic device-related infections and novel therapies such as epicardial substrate ablation [24,25] might improve the management of patients with BrS.

Following the seminal observation that by eliminating pulmonary vein triggers, recurrent AF could be prevented [31], the Bordeaux group pioneered ablation of VF triggers in patients with symptomatic BrS. Their initial experiences demonstrated that a VF trigger, once identified, was readily amendable for ablation and yielded excellent outcomes in preventing VF recurrences [32]. However, VF triggering PVCs in patients with BrS are unpredictable, and spontaneous ones are seldom present to be mapped, making this approach impractical. This led to a search for

others substrate sites as targets for catheter ablation. First described by Nademanee and colleagues in 2011, RFCA of the anterior aspect of the RVOT rendered arrhythmias non inducible during electrophysiological testing, normalized ECG patterns, and patients had an excellent prognosis at 20 months [25]. Nademanee et al initially reported on epicardial ablation in just 9 patients with type 1 BrS and a monthly median of 4 VT episodes requiring frequent ICD shocks. RFCA at epicardial sites rendered VT/VF non inducible in 7 of 9 patients with no clinical recurrence over a mean follow-up of 20 months. In that study [25], the ECG pattern normalized after RFCA in 8 of 9 patients. In an editorial comment, Nademanee updated his preliminary results in >50 BrS patients with complete elimination of BrS-ECG pattern in all the subjects with no recurrent VF during a median follow-up of 3 years. Similar results have also been reported by others [24,33] and available data from highly experienced centers confirmed a low complication rate.

Endocardial BrS ablation In 2018 Talib et al [34] described their retrospective, multicenter, observational study on the endocardial ablation approach of patients with symptomatic BrS. The investigators performed endocardial RFCA in 21 patients with BrS and frequent drug resistant VF/electrical storms from an initial group of 123 patients. Their endocardial ablation strategy was a stepwise approach. First, they attempted to identify and ablate a VF trigger and then performed an endocardial mapping and ablation of VF substrates that exhibited abnormal fractionated low-voltage ventricular electrograms. VF triggering PVCs were localized by mapping the earliest local electrogram relative to the onset of the QRS complex during a ventricular ectopy. To induce the triggering PVC, sodium channel blocker provocation with intravenous pilsicainide infusion was administered.

Ablation was performed using RF energy, with a target temperature of 55°C and a maximum power of 50 W, or using an externally irrigated 3.5-mm-tip catheter (Thermocool, Biosense Webster, Diamond Bar, CA). Locations of abnormal electrograms, defined as fractionated electrograms (multicomponent with an amplitude of 50 ms), or isolated late potentials (inscribed entirely after the QRS complex), and low-voltage electrograms (the authors concluded that their endocardial approach is a reasonable first step for treating symptomatic BrS. The unsurprising aspect of the study [34] is that endocardial mapping of the VF substrates did not uncover any substrates in the majority of their study patients. Even in those with identified endocardial substrates (n = 4), the ablation at those sites did not result in a positive outcome. The authors emphasized that patients with QRS notching in precordial lead V1 did not respond to endocardial ablation. The QRS fragmentation has been previously recognized as a risk factor for recurrent VF in BrS and is likely indicative of more extensive substrate elsewhere. The low yield for the endocardial mapping for Brugada substrates is to be expected, based on previous studies that the BrS substrates are almost exclusively in the epicardium of the RVOT/right ventricle (RV) body and rarely present in the endocardium [35]. 3.2. The rationale behind epicardial ablation The epicardial BrS substrate, characterized by low-voltage fractionated late potentials, has been confirmed by several investigators in different centers, leading to a significant increase in the epicardial approach for RFCA of BrS. Recently, Pappone et al reported intriguing results in a series of 135 consecutive patients with BrS [36]: the ECG pattern normalized in all patients after epicardial ablation of the arrhythmogenic substrate as identified by ajmaline administration and VT/VF was non inducible. Interestingly, the authors

found that after ablation, ajmaline rechallenge revealed additional abnormal potentials requiring further RFCA applications in more than 60% of patients in order to persistently normalize the ECG pattern. These results might explain the ineffectiveness of endocardial ablation alone [34] and the lower success of epicardial ablation performed without SCB administration [27]. The findings of this study [36] suggested that eliminating the influence of transient outward potassium current (Ito) in these areas might produce changes in the RVOT epicardial repolarization, normalizing the relationship in phase I of the AP between INa and Ito, and thus avoiding electric gradients. The abnormal behavior of epicardial ionic channels of the RV/RVOT, in most patients with BrS, could be reversed by eliminating a layer of epicardial tissue described as a ionic epicardial scar [37,38]. Moreover, areas with low-voltage (longer had recurrent VF. Because fragmented electrogram activity is traditionally attributed to conduction abnormalities, the authors concluded that the underlying electrophysiological mechanism in patients with BrS is delayed depolarization over the anterior aspect of the RVOT epicardium [25]. Additionally, Nademanee and colleagues demonstrated [40,41] the presence of epicardial interstitial fibrosis and reduced gap junction expression in the RVOT of patients who died suddenly and had BrS family history with negative routine autopsy. The same group found also a significant increase in collagen content in all ventricular walls of the victims diagnosed with BrS over and above the normal collagen content seen in age and sex matched controls. Interestingly Nademanee observed that if RFCA energy is effective in creating the lesion, the recorded electrogram voltage amplitude drastically reduces and the mid and late components of the fractionated potentials disappears, indicating the elimination of the

intramyocardial substrate. Despite ongoing debate about the underlying pathophysiology of BrS, repolarization abnormality vs depolarization abnormality, there is a consensus that the RVOT epicardium is the arrhythmogenic site for BrS and an intriguing target for catheter ablation. With the knowledge of BrS arrhythmogenic substrate, its electrogram characteristics and location, the ablation strategy can be the mapping of the substrate sites and the subsequent elimination of the latter.

3.3. Hybrid thoracoscopic ablation Hybrid electrophysiology-guided surgical epicardial substrate ablation in BrS, through left-thoracoscopic access, has recently been described from Salghetti et al [42] (Figure 2). This approach allows a direct target region visualization (Figure 3).

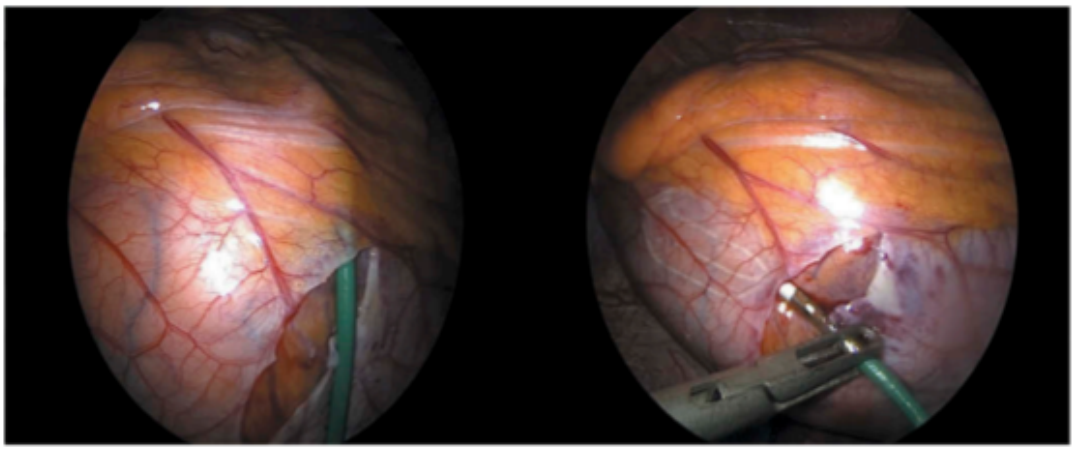

Figure 3. Left thoracoscopic pericardial access and RVOT mapping with multipolar HD-grid catheter (St. Jude Medical Inc., Minnesota, U.S.A.).

After having opened the pericardium and exposed the RV/RVOT anterior wall, an epicardial RV/RVOT bipolar voltage map can be performed with a diagnostic

catheter connected to an electro anatomical cardiac mapping system, both baseline and under Ajmaline administration. The culprit area is identified by the presence of abnormal bipolar prolonged and fractionated electrograms that become more evident under SCB infusion (Figure 4).

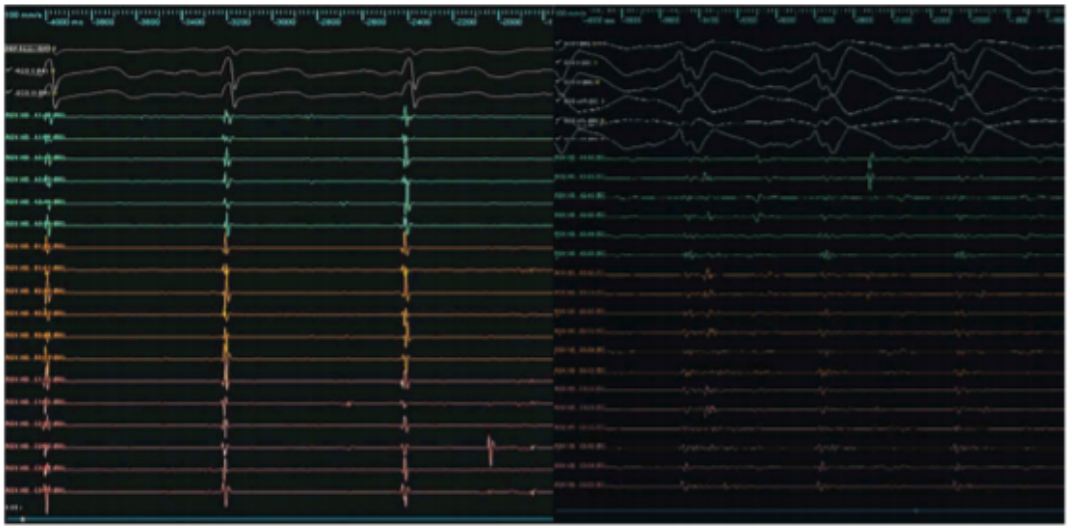

Figure 4. Invasive epicardial mapping of RVOT area with HD-grid catheter (St. Jude Medical Inc., Minnesota, U.S.A.). At baseline there are no evidences of pathological signals (on the left). After ajmaline infusion (on the right), BrS type 1 ECG pattern appears showing on the same area late and fragmented potential

BrS epicardial ablation is then performed using either a bipolar unidirectional RF linear device or with a bipolar 3.5-mm tip ablation catheter (Figure 5).

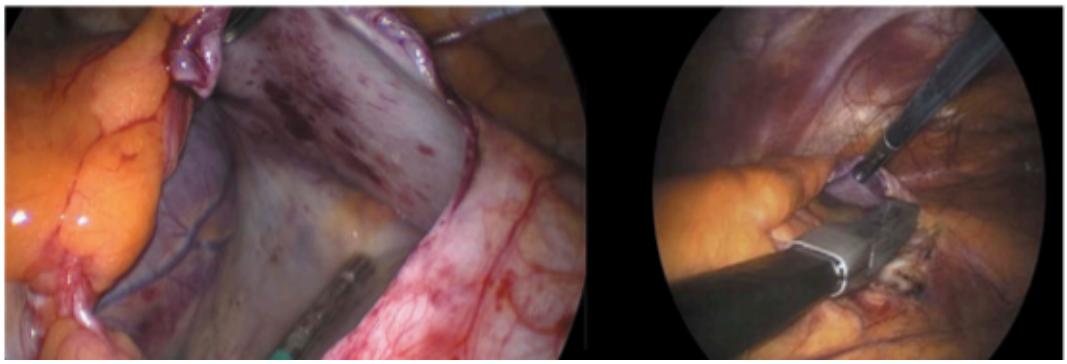

Figure 5. Thoracoscopic RVOT ablation with a bipolar 3.5-mm tip ablation catheter (FlexAbility, St. Jude Medical Inc., Minnesota, U.S.A.) on the left, and with a linear radiofrequency ablator Coolrail, AtriCure Inc, on the right.

The authors describe this technique as safe and feasible to identify and eliminate the pathological substrate areas also using an epicardial linear ablation device, which provides more stability and wider surface contact. Direct visualization of anatomical structures guided ablation makes it safe and as effective as possible. In fact visual real-time monitoring of catheter contact, stability and lesion growing during RF ablation permits to the authors to increase RF power safely up to 70 W without steam pops and to shorten the duration of RF delivery, producing wider and more homogeneous lesions with less edema and shorter procedural time. Direct visualization of anatomical structures during lesion formation allows also to spare coronary arteries and to handle epicardial fat around the RVOT performing an always effective ablation. Interestingly, VA recurrences was observed in 22.2% of patients who underwent substrate ablation for secondary prevention, despite the absence of both residual pathological potentials and of type 1 Brugada pattern after the ablation. 4. Complications Nademanee described an acute hemopericardium in 1

patient (2%) and mild pericarditis in ~35% of patients [40]. The thoracoscopic hybrid approach [42] had a complication rate similar to those reported for conventional transcatheter RF epicardial ablation. One patient presented a left pneumothorax the day after procedure that was managed by pleural drainage. Mild pericarditis was observed in 25% of patients between 2 and 10 days after ablation, 1 patient (2,8%) had a late hemopericardium resulting from the ablation. Conversely, Pappone et al. had a significantly lower incidence of complications, without any major complication [36]. 5. Use of sodium channels blockers In subjects without spontaneous type 1 ECG pattern, SCB challenge is commonly used to unmask the ECG pattern. Ajmaline and flecainide are the most commonly used drugs while procainamide is considered less effective [43,46]. Ajmaline, the most effective among SCB, is an alkaloid, classified as a IA antiarrhythmic agent, found in the root of Rauwolfia serpentine which acts by changing the shape and threshold of cardiac action potentials by inhibition of various currents, including INa, Ito or rapid delayed rectifier potassium current (IKr) [47]. Flecainide is a IC antiarrhythmic agent acting on the same channels but considered less sensitive than ajmaline in BrS diagnosis [48]. Unlike traditional stable substrates, which are characterized by scar or fibrosis as in post-ischemic VT, the impressive variation in size and shape of the BrS substrate, as exposed by ajmaline, during RVOT/RV epicardial mapping suggests also a functional component as arrhythmogenic substrate. Therefore, BrS epicardial ablation of all abnormal potentials areas should be guided by repeated infusion of ajmaline to unmask the entire substrate size in order to eliminate multiple reentrant circuits leading to rapid unstable ventricular arrhythmias and VF [49]. As reported by Nademanee and collegues in their earlier experience of BrS

substrate targeting the authors did not use a SCB infusion [40]. Even though the outcomes of their ablation procedures were satisfactory, BrS substrates remained present after ablation in some patients because the initial ablation procedures did not include all substrate sites, as evidenced by the appearance of a Brugada ECG type 1 pattern after ajmaline provocation test. Additionaly some of the patients of their study with incomplete substrate ablation had VF recurrences necessitating a repeat ablation procedure. BrS substrate mapping using a SCB showed that substrate sites were much larger than those of the first ablation procedure, especially after ajmaline infusion [40]. As reported from Salghetti et al ajmaline infusion was used during hybrid thoracoscopic BrS ablation [42] to identify the presence of abnormal bipolar prolonged and fractionated electrograms that became more evident under drug infusion. Drug provocation with a SCB increases the area of abnormal conduction, which may improve substrate identification before ablation, but it is still not proven that ablation of those areas improves the efficacy of the procedure. Which drug has the best formance in increasing the abnormal area is still unknown. Ajmaline administration should, therefore, be performed after patients are counseled appropriately on the potential arrhythmogenic implications of the drug [50–52]. Chung et al. [53] recently described a new method for BrS substrate enhance using epicardial warm water instillation, achieving an increase in low-voltage zone. This may represent a reliable non-pharmacological strategy for enhancement of the abnormal Brugada substrate, but data on this technique are still very limited. 6. Conclusions Several ablation strategies have been used to treat patients with symptomatic Brugada syndrome. It is conceivable that a substrate-based, epicardial approach can be the way to find a cure for BrS, potentially avoiding the need for

ICD implantation or chronic quinidine therapy, as suggested by the preliminary results over short-term follow-up reports of >300 patients worldwide [54]. The systematic use of a SCB improves substrate identification before ablation increasing the area of abnormal conduction, but it is still not proven that ablation of those areas can enhance the efficacy of the procedure. 7. Expert opinion Epicardial substrate modification appears to be an effective treatment for symptomatic Brugada syndrome, particularly for patients with ventricular arrhythmias or ICD shocks after standard therapy has failed. VF-triggering PVCs in patients with BrS are unpredictable, and spontaneous ones are rarely present to be mapped, rendering this approach impractical. The low yield for endocardial substrate mapping is to be expected, based on previous studies that showes how BrS substrates are almost exclusively in the epicardium of the RVOT/RV body and rarely present in the endocardium. Indeed, the presence of epicardial interstitial fibrosis, reduced gap junction expression and Figure 4. Invasive epicardial mapping of RVOT area with HD-grid catheter (St. Jude Medical Inc., Minnesota, U.S.A.). At baseline there are no evidences of pathological signals (on the left). After ajmaline infusion (on the right), BrS type 1 ECG pattern appears showing on the same area late and fragmented potentials. Figure 5. Thoracoscopic RVOT ablation with a bipolar 3.5-mm tip ablation catheter (FlexAbility, St. Jude Medical Inc., Minnesota, U.S.A.) on the left, and with a linear radiofrequency ablator Coolrail, AtriCure Inc, on the right. EXPERT REVIEW OF MEDICAL DEVICES 5 a significant collagen content increase in the RVOT of patients who died suddenly and had BrS family history has been demonstrated, making this area an attractive anatomical target for catheter RF ablation. However, epicardial ablation may be associated with potential risks and

complications due to epicardial access and RF applications. Therefore, this procedure should be performed in highly experienced centers. Differently from subxiphoid puncture, the thoracoscopic epicardial approach allows to spare coronary arteries and to handle epicardial fat around the right ventricle and RVOT in order to perform a more effective ablation and avoid complications. Moreover the direct visualization of catheter contact with the epicardial RVOT during RF ablation permits to increase the power safely without steam pops, shortening the duration of RF delivery, producing wider and more homogeneous lesions. Several studies have shown that greater power delivery and longer radiofrequency time increase ablation lesion size. However, compared with a proportional change in radiofrequency duration, the same proportional increase in power produces a significantly larger lesion volume [55–57]. Interestingly if radiofrequency energy is effective in creating the lesion, the recorded electrogram voltage amplitude of pathological sites drastically reduces and the mid and late components of the fractionated potentials disappeares, indicating the elimination of the intramyocardial substrate. Unlike traditional stable substrates, which are characterized by macroscopic scar or fibrosis as in post-ischemic VT, the impressive variation in size and shape of the BrS substrate, as exposed by ajmaline, during RVOT/RV epicardial mapping suggests in addition to the presence of epicardial interstitial fibrosis, the existence of an important functional component as arrhythmogenic substrate. Indeed, according to several authors, BrS epicardial ablation of all abnormal potentials areas should be guided by repeated infusions of sodium channels blockers to unmask the entire substrate size in order to eliminate completely the underling arrhythmogenic substrate and guide ablation therapy to a more tailored approach in each patient.

Given the possible arrhythmogenic risk, sodium channels blockers administration should be performed after appropriate patient counseling on the potential implications of these drugs. Despite evidence that the use of sodium channels blockers might help targeting arrhythmogenic sites it is currently still not proven that ablation of those areas really improves the efficacy and the outcome of the procedure and which drug has the best formance in increasing the abnormal substrate. Although effective for preventing sudden cardiac death, ICD carries a relevant risk of complications over the patient's lifetime, particularly if the patient is young at the time of device implantation. If radiofrequency substrate ablation can truly provide long-term prevention of VT/VF in BrS, this may even become an alternative to ICD therapy, which does not prevent but only treats malignant ventricular arrhythmias.

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Portuguese Summary

Rizzo A1, de Asmundis C1, Brugada P1, La Meir M1, Chierchia GB1. Ablation for the treatment of Brugada syndrome: current status and future prospects. Expert Rev Med Devices. 2020 Jan 27:1-8. doi: 10.1080/17434440.2020.1719831

Ressumo

Introdução: A síndrome de Brugada (BrS) é uma doença hereditária caracterizada por um risco aumentado de morte cardíaca súbita (DF). As opções terapêuticas em pacientes sintomáticos são limitadas ao cardioversor-desfibrilador implantável (CDI) e à quinidina, mas a ablação por cateter da via de saída do ventrículo direito (RVOT) oferece uma cura potencial. Diferentes estratégias de ablação têm sido utilizadas para tratar pacientes com síndrome de Brugada sintomática. A ablação do substrato por radiofrequência epicárdica do RVOT / ventrículo direito (RV) emergiu como uma ferramenta promissora para o manejo da doença. Áreas

cobertas: Manejo histórico de BrS, técnicas de ablação endocárdica e epicárdica, uso de bloqueadores dos canais de sódio (SCB) e as complicações são resumidas aqui. Opinião do especialista: As contrações ventriculares prematuras (PVCs) desencadeadas por fibrilação ventricular (FV) em pacientes com BrS são imprevisíveis, e espontâneas raramente estão presentes para serem mapeadas, tornando essa abordagem impraticável. Além disso, o mapeamento endocárdico para substratos BrS não parece eficaz devido à localização patológica epicárdica do substrato. A variação de tamanho das áreas do substrato BrS durante a infusão de SCB sugere um processo dinâmico como base arritmogênica e a infusão de SCB deve orientar a ablação epicárdica de BrS em todas as áreas de potenciais anormais. Se a ablação epicárdica por BrS puder realmente fornecer prevenção a longo prazo de arritmias ventriculares, pode potencialmente se tornar uma alternativa à terapia com CDI.

PALAVRAS-CHAVE:

Síndrome de Brugada; CDI; ablação por radiofrequência por cateter; ablação epicárdica do substrato; ablação toracoscópica híbrida; atraso na condução do trato de saída do ventrículo direito; bloqueadores dos canais de sódio; morte cardíaca súbita; gatilhos de fibrilação ventricular PMID: 31986921 DOI: 10.1080/17434440.2020.1719831

Destaques do artigo

I. **A síndrome de Brugada é uma doença hereditária caracterizada por um risco aumentado de morte cardíaca súbita na ausência de anomalias estruturais do coração.**

II. **Os mecanismos celulares subjacentes à síndrome de Brugada permanecem discutíveis. Duas hipóteses principais foram propostas: a hipótese de repolarização e a hipótese de despolarização.**

III. **A quinidina é a única droga que provou ser eficaz. O CDI é a única opção terapêutica que se mostra eficaz na prevenção da morte por recorrências de FV e é recomendada em pacientes sintomáticos com BrS para a prevenção de DF**

IV. **A ablação do substrato por radiofrequência epicárdica sobre a RVOT / RV emergiu como uma ferramenta promissora para o tratamento da síndrome de Brugada.**

V. **Mapeamento de substratos endocárdicos e direcionamento de PVCs desencadeantes de VF não parecem eficazes devido à localização patológica epicárdica predominante de substratos na maioria dos pacientes; O substrato BrS está quase exclusivamente localizado no epicárdio do corpo da RVOT / RV e raramente presente.**