Jurnal
Kardiologi Indonesia
J Kardiol Indones. 2011;32:107-112
ISSN 0126/3773

Case Report

Successful Radiofrequency Catheter Ablation of The Para-Hisian Accessory Pathway in A Patient with Wolf Parkinson White Syndrome

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Radiofrequency catheter ablation of the accessory pathway in Wolff-Parkinson-White (WPW) syndrome is a highly successful mode of therapy. Sudden cardiac arrest survivors associated with WPW syndrome should undergo radiofrequency catheter ablation. Para-Hisian is one of unusual location accessory pathway in WPW syndrome associated with high risk complication of complete AV block during catheter ablation. Here we describe a case of patient who presented with history of palpitation due to WPW syndrome, electrophysiology study identified a para-Hisian accessory pathway so close to His bundle that discrete site between the pathway, the first ablation was unsuccessful and terminated due to the risk of complete AV block. The accessory pathway was successfully ablated in a second session using radiofrequency, although this entailed a great increase in the risk of causing complete atrioventricular block.

(J Kardiol Indones. 2011;32:107-112)

Keywords: *Ablation; WPW syndrome, para-Hisian accessory pathway*

Wolff-Parkinson-White (WPW) is the commonest form of ventricular pre-excitation. It is characterized by the presence of an accessory pathway (AP) between the atria and the ventricles which provides an alternative route for ventricular activation. This bypass tract avoids the atrioventricular node (AVN) permitting premature ventricular activation hence the term pre-excitation. The abnormality of the conduction tissue in which an accessory pathway conducts atrial depolarizations together with normal conduction pathway at the same time. Therefore, a short PR interval, a delta wave, and a widened QRS complex are seen on the surface electrocardiography.[1]

Historically Wolff, Parkinson, and White first described the condition in 1930 in a series of 11 healthy young adults with a functional bundle branch block, an abnormally short PR interval and paroxysms of tachycardia or atrial fibrillation.[2] Radiofrequency catheter ablation of the accessory pathway has been used to treat this type of tachycardias with high success rates. A rather small percentage of accessory

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pathways are located in regions close to the AV node and the His bundle. These are the anteroseptal, midseptal (para-Hisian) pathways, the ablation of which entails an elevated risk of causing complete AV block.[3] We report an interesting case of a patient who presented with history of palpitation due to WPW syndrome with para-Hisian accessory pathway treated via radiofrequency catheter ablation. The first ablation was unsuccessful and terminated due to the risk of complete AV block. The accessory pathway was successfully ablated in a second session using radiofrequency catheter.

Case Report

Previously symptomatic 18 year old male had been admitted to NCCHK outpatient clinic due to sudden onset and self limiting palpitation, shortness of breath and sweating. A 12 lead ECG was performed that demonstrated Sinus Rhythm with a short PR interval, a delta wave, and a widened QRS complex (Figure 1). Other physical examinations are within normal limits, he was planned to get electrophysiology study (EPS) and definitive treatment by radiofrequency catheter ablation of the abnormal electrical pathway.

Three quadripolar catheter were inserted to high Right atrium (HRA), his bundle area and right ventricle (RV) apex. One decapolar electrode catheter was inserted to coronary sinus. EPS mapping and programmed ventricle stimulation showed intermittent orthodromic tachycardia sided to para-Hisian pathway. His parents refused to continue to radiofrequency ablation after been told higher risk of total AV block. Unfortunately, the patient suffered from frequent tachycardia attack despite optimal medication with amiodarone. Two years later, the second EPS was attempted. Two quadripolar catheter were inserted to his bundle area and right ventricle (RV) apex. One steerable multielectrode quadripolar recording catheters positioned at bundle of His area were used for mapping. During incremental pacing from right ventricle orthrodromic atriovetricular reciprocating tachycardia (AVRT) was induced. Tachycardia cycle length was 360 ms and intracardiac electrogram recorded fusion of V and retrograde A waves at his catheter. Para-Hisian atrioventricular accessory pathway was detected (Figure 2). The refractory period of the accessory pathway was 260 msec.

Radio frequency ablation (RFA) was performed using a radiofrequency generator via a radiofrequency catheter. A 8-F long sheath (SL-1, St Jude)

Figure 1. Twelve-lead ECG showed Sinus Rhythm with a short PR interval, positive delta wave I, II, aVF, negative delta wave V1, R>S in lead III and a widened QRS complex

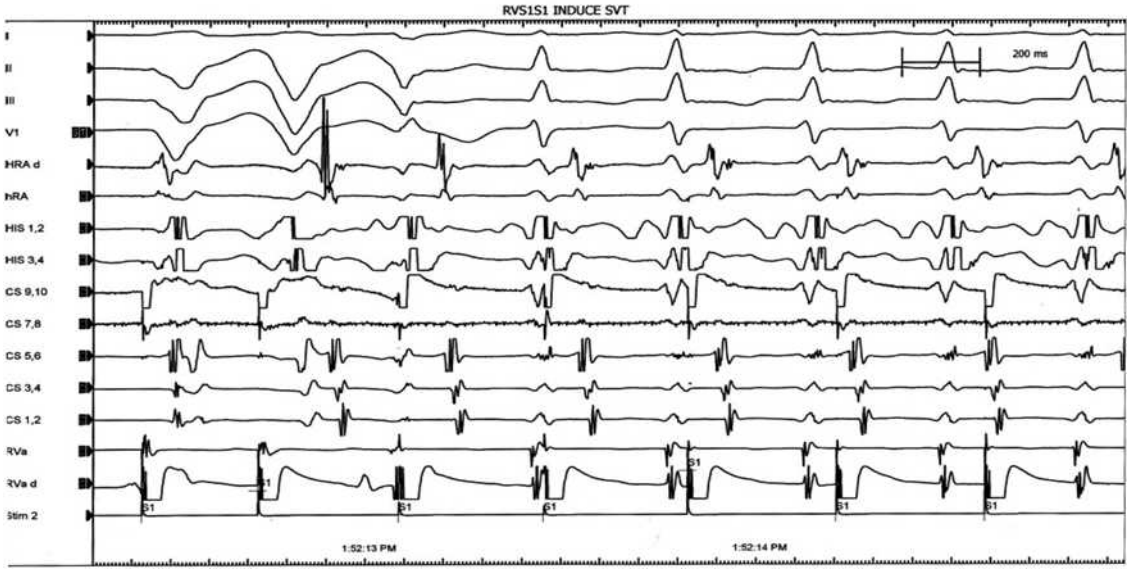

Figure 2. Intracardiac electrograms showed intermittent tachycardia as orthrodromic AVRT can induce by RV extrastimulus. Abl, Ablation catheter electrograms; His, Bundle of His electrograms; H, His; RVA, Ventricle.

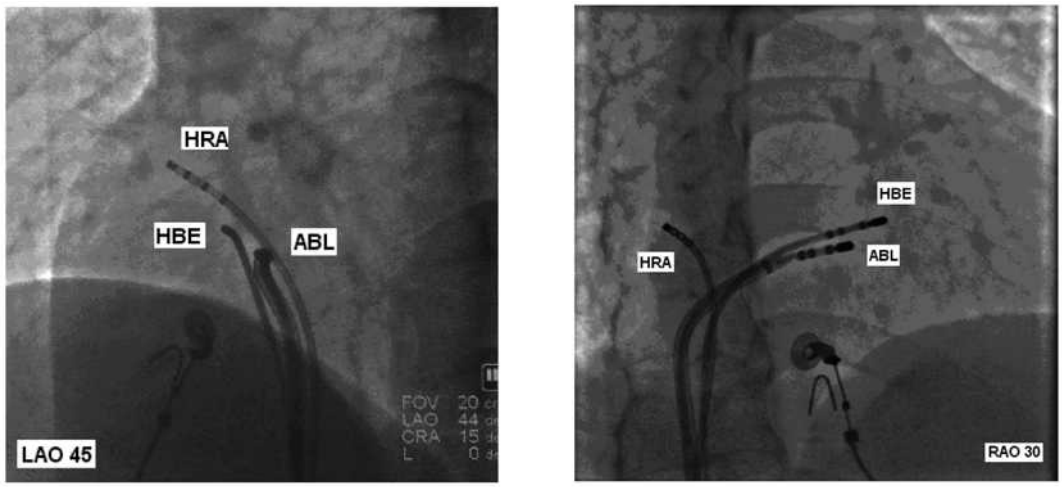

Figure 3. Fluoroscopic image during the successful delivery of RF current [left anterior oblique (LAO 45) and right anterior oblique projection(RAO 30)]. Note the almost tangential position of the ablation catheter (ABL) in relation to the His bundle electrode (HBE). HRA= high right atrium.

was used to stabilized catheter position. Catheter ablation is placed adjacent to His catheter (Figure 3) and showed fused A and V waves (Figure 4). Catheter ablation for the para-Hisian atrioventricular accessory pathway was performed with energy of 30 watt delivered for 60 seconds at a temperature of 50°C. Radiofrequency applications were very carefully performed; RFA application was halted for every single junctional beat occurrence. After the several delivery of radiofrequency energy, the delta wave disappeared and His potential become obvious at ablation catheter (Figure 3). Stimulation protocols were made to induce reciprocating tachycardia; however, no tachycardia was induced. Antegrade and retrograde AV node conduction were intact after complete RFA. Final ECG upon a complete disappearance of accessory pathway showed sinus rhythm with right bundle branch block (RBBB) (Figure 5).

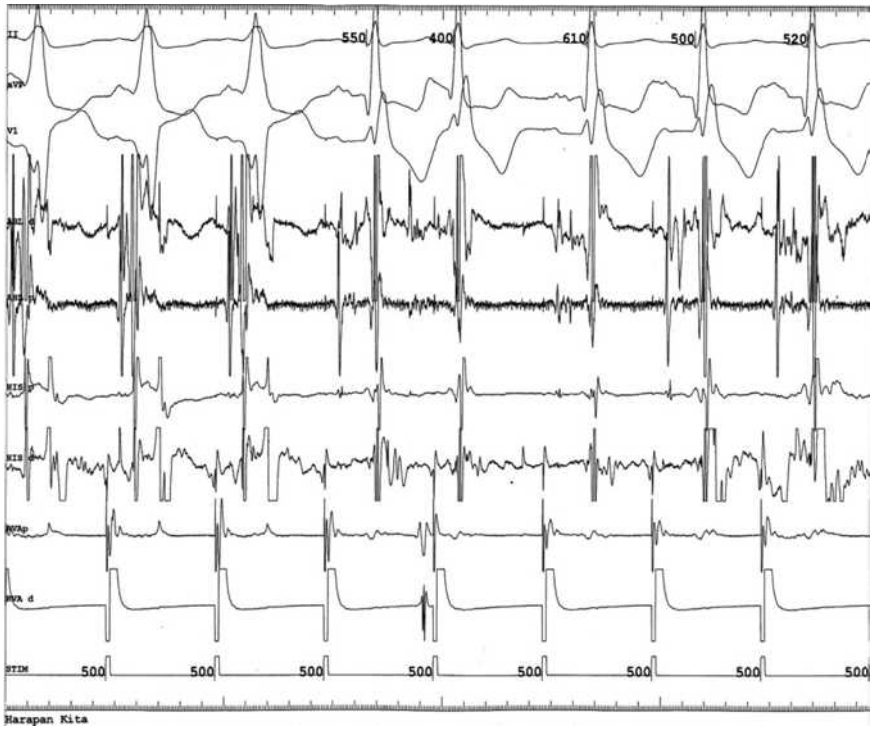

Figure 4. Elimination of accessory pathway during radiofrequency ablation. First three beats show delta wave with short PR interval(arrow). Correspondence intracardiac electrograms at distal pole of ablation catheter (ABLd) show fusion of A and V wave without sign of His potential. Once the delta wave disappeared (arrow head) shows normalization of PR nterval and prominent His potential at its correspondence electrograms. Abl, Ablation catheter electrograms; His, Bundle of His electrograms; H, His; RVA, Ventricle.

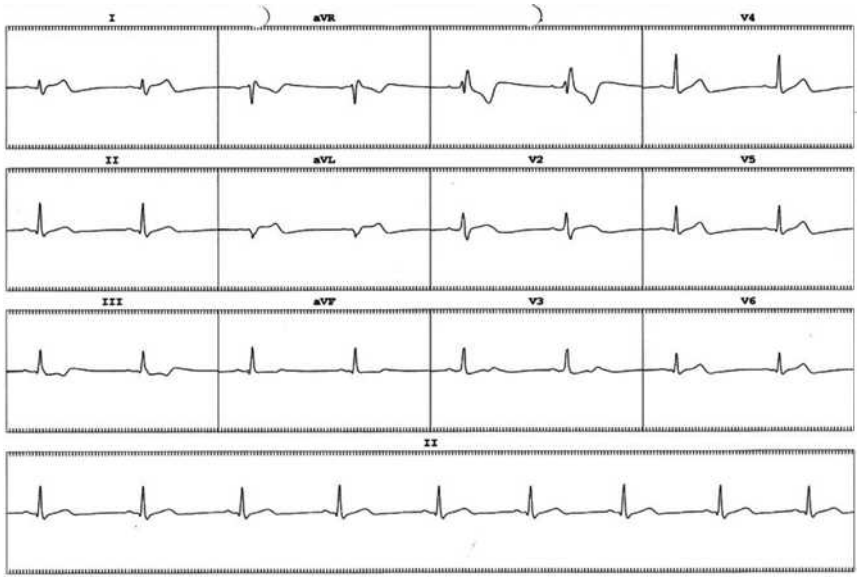

Figure 5. Successful ablation revealed disappearing of delta wave in the surface ECG. Note that patient existing ECG is RBBB

Discussion

Electrophysiologic studies in patients with WPW are useful for confirming the diagnosis, studying the mode of initiation of tachycardias, localizing the bypass tract, demonstrating that the bypass tract participates in the tachycardias, evaluating the refractoriness of the bypass tract and its implication for risk of life-threatening arrhythmias, terminating tachycardias and aiding the development of pharmacologic, pacing, or ablative therapy for arrhythmias associated with WPW syndrome.[4]

Ablation of accessory pathways is the treatment of choice in patients who exhibit episodes of supraventricular tachycardias, while it is also indicated in the case of asymptomatic patients with an ECG pattern of Wolff-Parkinson-White syndrome when an EPS shows the pathway to have a relatively short ante grade refractory period.5 Success rates of 95-99% have been reported for pathway ablation, with a relapse rate of 5-10%. The procedure is quite safe, with a low incidence of complications. One noteworthy complication, however, is the risk of causing complete AV block leading to the need for permanent pacemaker implantation.[1,5-8]

The typical AP (bundle of Kent) is a muscle fiber that bridges the atrioventricular groove providing electrical continuity between the atrium and ventricle in parallel to the AV node-His-Purkinje axis. APs are composed of microscopic strands of morphologically normal myocardium that are located along the cardiac annulus or septum. More than 50% of APs are located at the left free wall, 20% to 30% at the posteroseptum, 10% to 20% at the right free wall, and 5% to 10% at the anteroseptum. It can conduct antegradely, retrogradely or bidirectionally. AV re-entrant paroxysmal tachycardia causes typical symptoms such as palpitations, dyspnea, hypotension and even syncope; the latter is probably neuromediated, rather than due to the low cardiac output secondary to the high heart rate. An extremely low percentage of patients with pre-excitation dies suddenly due to ventricular fibrillation.[4]

Para-Hisian is one of unusual location of Accessory pathway that defined as APs associated with a His bundle potential <0.1mV at its atrial or ventricular insertion site where RF delivery can damage the His bundle. Arruda et al,[9] made a simple ECG algorithm to identify the accessory pathway ablation site. Base on that algorithm, in our patient 12-Lead ECG features showed a positive delta wave in lead I, II, aVF and negative delta waves in leads V1, R/S ratio in lead III: R≥S suggesting accessory pathway from anteroseptal/ right anterior parasepta region. Based on previous reports, the risk of causing complete AV block during an ablation procedure is rather high, reaching 36% in the case of pathways that are located close to the AV node and the His bundle. These are the anteroseptal and midseptal right accessory pathways, according to the standard classification, while a specific subgroup includes the so-called para-Hisian pathways, which are in close proximity to the AV conduction system. Para-Hisian pathways make up 1.4% of the total accessory pathways reported and may be identified by the simultaneous recording of potentials from the accessory pathway and from the His bundle by the same electrode.

Para-Hisian AP are prone to mechanical block leading to the permanent pace maker with catheter manipulation suggesting that they course superficially in the subendocardium in contrast to the deeper penetrating His bundle within the central fibrous body. Recording an AP potential and the smallest possible His bundle potential are important target site criteria for successful ablation without creating AV block. RF delivery with low (initially 5-7 Watts) incremental energy is important and should be terminated immediately with onset of a junctional rhythm or persistence of AP conduction after 10 sec.[10] In the case reported here, the risk of his bundle injury leading to complete AV block and the patient was not ready for it consequence of using permanent pacemaker during the first procedure. After waiting for two years and several recurrent of symptoms the patient underwent second attempted ablation and we used power RF (30 Watt and temperature at 50^{0}C) with the desired result. The appearance of prominent His potential at the tip of ablation catheter upon elimination of delta wave suggests that Kent bundle was really located side by side with AV node. However, we did very careful ablation as RFA application was halted for every single junctional beat occurrence. Using this method, Kent bundle can be ablated completely without any injury to AV node.

RBBB pattern of ECG after complete RFA procedure is not likely due to right bundle branch injury but preexisting RBBB that masked by preexcitation. Upon elimination of preexcitation or delta wave the original QRS pattern becomes obvious. Figure 3 confirmed location of catheters that quiet far from right bundle location.

In conclusion, ablation of the relatively rare accessory pathways that are located close to the normal AV conduction system requires great care, because of the high risk of causing complete AV block, but with a careful of delivery of RF current ablation can be both effective and safe.

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