A COMPARISON OF UNIPOLAR VERSUS BIPOLAR MAPPING IN THE ABLATIAN OF THE MANIFEST ACCESSORY PATHWAYS

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Abstract- ***Accessory pathways (AP) are abnormal myocardial connections between atria and ventricles with electrical conductive properties. We performed radiofrequency (RF) catheter ablation in 66 patients with manifest AP at Dr. Shariati Hospital during 5 years. Bipolar mapping was used in 48 patients and unipalar mapping in 18 patients to find the best site for RF energy delivery. We calculated total duration of the procedures, mean of RF energy dosage and delivery time, number of the lesions, and the success rate in each mode. We found that unipolar mode was preferred one for RF catheter ablation of the free wall accessory pathways.***
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Key Words: ***Accessory pathway (AP), unipolar, bipolar, radio frequency (RF), catheter ablation***

INTRODUCTION

Accessory pathways (AP) are abnormal myocardial atrioventricular connections which have the ability of electrical conduction from the atria to the ventricles and vice versa (1,2). Those with antegrade electrical property cause delta wave in surface ECG. They are called manifest AP (2-4). Because of the different electrophysiologic properties of the normal pathway and AP, they could be a part of macro reentrant circuit in atrioventricular reentrant tachycardia (AVRT), and also act as bystander in all forms of supraventricular tachycardia (5). Among the various forms of paroxysmal supraventricular tachycardia (PSVT), atrial fibrillation (A.Fib) is the most dangerous one in the patients with manifest AP. Because the AP usually has short refractory period and high conductive velocity, the ventriclur electrical response during A. Fib is very fast which could result in ventricular fibrillation (VF) (2). One can detect the manifest AP by the presence of delta wave and short PR interval in surface 12 leads ECG, and even estimate its anatomical site in the heart (3). But electrophysiological study to find the best site for RF energy delivery is the rule before any AP-RF catheter ablation (5). In unipolar method, the exploring electrode is the closest one to the AP and indifferent electrode is far from it (6). Because of the proximity of exploring electrode to the atrial site of AP insertion the deepest deflection between A an V waves (the highest negative dv/dt) is the site of RF energy delivery (5). In bipolar mode, two electrodes are located close to each other, so that the largest delta wave (preexcited deflection) or actually merging A an V waves would be the atrial site of AP insertion.

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MATERIALS AND METHODS

This is a case series study which included 66 symptomatic patients with Wolf-Parkinson-White syndrome. Electrophysiologic studies were performed in a prostabsorptive state after obtaining an informed consent. Antiarrhythmic medications were discontinued at least five half-lives prior to the studies. Using local anesthesia, four multipolar electrodes catheters were inserted percutaneously in the internal jugular (or subclavian) and femoral veins and positioned under fluoroscopic guidance in coronary sinus, high right atrium, His bundle and right ventricle apex. The ablating quadripolar catheter was inserted via right femoral artery in left heart. Intravenous heparin was administered as initial bolous of 5000 IU at the begining and 1000 IU every hour. For recording unipolar electrogram, we usually chose lead V_1 as an indifferent electrode. In this method, the highest deflection between A and V in the electrogram is the target point. In bipolar method the site of shortest VA interval during arrhythmia or RV pacing is the target point for RF energy delivery. Disappearance of delta wave, prolongation of VA interval and no arrhythmia induction is the end of the procedure.

RESULTS

We performed RF catheter ablation in 66 patients (59% male and 41% female), during 5 years at.

Table 1. Relationship between different types of APs and their ablation results

AP site	Patients No.	Lesions (mean) No.	RF energy (mean) watt	Procedure time (Min)
(B) LFW	10	2-5 (3)	30-40 (40)	120-200 (156)
(U) LFW	18	1-3 (2)	20-40 (32)	50-120 (92)
(B) LPS	15	3-9 (6)	25-30 (27)	140-240 (178)
(B) RPS	12	3-6 (4)	15-30 (24)	130-240 (172)
(B) RAS	6	3-12 (6)	25-30 (25)	140-270 (248)
(B) RFW	4	4-11 (6)	22-40 (28)	120-360 (223)
(B) RPL	1	5	30	140

LFW (left free wall) RFW (right free wall) B (bipolar)
RPS (right posteroseptal) RPL (right posterolateral) U (unipolar)
RAS (right anteroseptal LPS (left posteroseptal

Shariati Hospital. Age distribution was 9-64 years, and the most prevalent was left free wall AP. Bipolar electrogram was recorded in 73% and unipolar electrogram was recorded in 27% of the patients (Table 1). In the patients with LFW manifest AP, using uripolar recording caused 30% reduction in the number of RF lesions, 20% reduction of mean RF energy, and 40% reduction of duration of the procedures. Total success rate was 91% and there were no complication in 97% of the patients (Table 1).

DISCUSSION

The unipolar and bipolar electrogram recordings to find the exact location of AP and the target site RF energy delivery have been experienced by many clinical electrophysiologists. Simultaneous recording of intra and extra cellular electrogram have shown that downstroke of the unipolar electrogram, coincides with upstroke of the action potential beneath the exploring electrode. Although the intrinsic deflection is a reliable marker for local activation, its detection may be hamperred by large remote component (6,7). For this reason clinical electrophysiologists often prefer bipolar recording when detection of local activation is of major interest. In bipolar recording mode, the reference electrode is positioned close to the exploring electrode. Because far field effects will induce the same potential at both poles, remote effects will be cancelled (6). Althoug bipolar recordings reduce the influence of distant events, they are difficult to interpret (i.e, fractionated signals). In contrast, the interpretation of unipolar electrogram is usually straight forward, and afford the feasibility to see the exact local activation and the low frequency events (7). Our study disclosed that unipolar electrogram is preferred to eliminate the left and right free wall AP in a shorter duration and with lesser RF lesions. Because of the proximity of AV-node to the septal AP, indentifying the exact target point for RF energy delivery is mandatory (5,6,8) bipolar recording which has the ability to demonstrate the shortest VA interval and also for the absence of far field electrical interferrance is recommended for ablation of septal AP. Although this mode is more time consuming and needs more multipolar catheters but the safety of procedure is high and the rate of complications is low (9).

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