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EPS FOR RESIDENT PHYSICIANS

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Atrio-Hisian block precludes preexcitation—What is the mechanism?

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1 | CASE REPORT

A 19-year old asymptomatic gentleman was detected to have preexcitation during an Airforce-recruitment health screening. His electrocardiogram (ECG) suggested preexcitation by a likely superoparaseptal accessory pathway. The exercise test (Bruce protocol) showed persistent and constant preexcitation throughout all the stages, and the recovery phase. An electrophysiology study (EPS) showed sinus cycle length of 690 ms, AH interval of 66 ms and an HV interval of 25 ms, with delta wave morphology suggestive of superoparaseptal pathway, and the earliest V recorded in the His-distal catheter (Figure 1A). The tracings during the EPS are shown in Figure 1(A-D). What is the likely mechanism of preexcitation?

2 | COMMENTARY

A fixed degree of preexcitation at various heart rates during exercise testing, and various pacing cycle lengths and sites, loss of preexcitation with AV block, and constant degree of fusion during atrial fibrillation, are indicative of fasciculoventricular (FVP) accessory pathways.

The ECG in FVP commonly mimics preexcitation through a superoparaseptal (anteroseptal) or midseptal atrioventricular pathways (AVP).[1] Ablation of the latter carries a risk of iatrogenic atrioventricular block, whereas FVP does not need any ablative measures. Thus, differentiating between the two is of paramount importance.

The ECG features that suggest an FVP mainly focus on lead V1, and include: (a) PR interval >110 ms, (b) r wave <35 ms, and (c) S wave <0.20 mV with a notch in its descending limb. The delta wave may be isoelectric or negative in V1 in FVP.[1]

Exercise improves the conduction along the AVN and thus may reduce the delta wave which may even abruptly disappear if the effective refractory period of the AP is relatively long.[2] In contrast, as the input in to the FVP occurs after the conduction through the AVN the amount of preexcitation may not change much with exercise. During a Holter test periods of low heart rate due to vagotonia cause slowing of the AV nodal conduction, whereas conduction through an AVP is unaltered. Hence more preexcitation, a larger delta wave and a broader QRS complex are noted when there is an AVP. But, the degree of preexcitation remains unaltered in the case of an FVP. Similarly, during atrial ectopic beats the preexcitation may increase when there is an AVP whereas it would remain constant in the case of FVP.[3]

The EPS shows a normal AH interval while the HV interval is shortened concordant with the fact that FVP is related to the HPS distal to the AVN. Pacing manoeuvres that increase preexcitation and shorten the HV interval in AVP fail to do so in FVP as it occurs distal to the AVN. Thus, incremental atrial pacing which relies on faster pacing rate to increase preexcitation, pacing from multiple sites which relies on increased preexcitation while pacing closer to the site of atrial insertion site of the AVP all yield a constant degree of preexcitation in FVP.

Any block in AVN conduction either spontaneous, or Adenosine induced- is also associated with loss of preexcitation in FVP (unless there is junctional escape best which is equally preexcited as in sinus rhythm). In contrast, QRS get fully preexcited when there is AV block if there is an AVP. Adenosine stress testing can be a useful non-invasive method in differentiating AVP from FVP.[3] Finally,

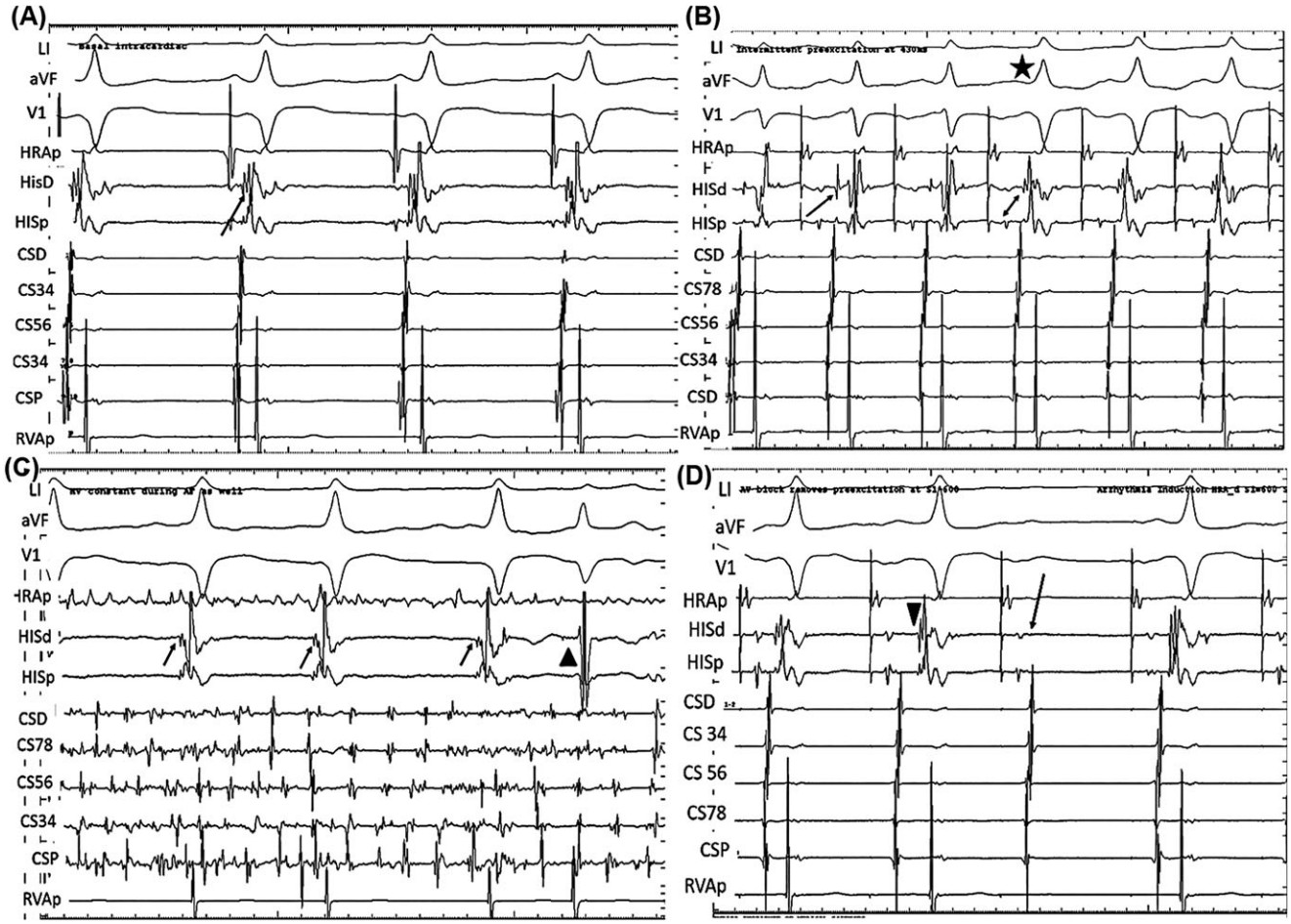

FIGURE 1 Figure shows the intracardiac signals recorded during the electrophysiological study. The paper speed is 100 mm/s in all the tracing. The surface ECG leads I, aVF and V1 are followed by the proximal bipole of the right atrial catheter (HRA), the distal and proximal bipoles of the His bundle catheter, the five bipoles of the coronary sinus (CS) catheter distal (CSD) to proximal (CSP) and the proximal bipole of the right ventricular apical catheter (RVAp). Panel A shows sinus rhythm which showing preexcitation and a negative HV interval. The arrow marks the His potential (H) merged with the local ventricular (V) electrogram (EGM). Panel B shows intermittent preexcitaion during atrialpacing at 430 ms. The first three beats are without preexcitation showing normal HV interval (single-arrow). The asterisk marks the onset of preexcittion and the H merges with the V (double arrow). Panel C shows atrial fibrillation. The preexcitation and the HV interval remain constant in preexcited beats irrespective of the heart rate variation (arrows). The last beat lacks preexcitation and has a normal HV interval (arrow-head). Panel D shows an instance of spontaneous AV block during atrial pacing during which atriohisian block (arrow) precludes the preexcitation as well. The arow-head marks the H in preexcited beats

preexcitation FVP may cause intermittent preexcitation though the exact mechanism is unknown.[4]

Fasciculoventricular is not known to be involved in arrhythmias, and as expected, this patient too did not have any inducible arrhythmia.

CONFLICTS OF INTERESTS

MAP has received the APHRS-Medtronic fellowship grant in electrophysiology. None of the other authors have any competing interests or conflicts of interests to declare.

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