The phenomenon of 'Gap in A-V Conduction' was originally described by Moe and associates (559). During experiments designed to evaluate conduction characteristics with the canine heart, it was noted that premature atrial beats evoked progressively earlier in the cardiac cycle conducted to the ventricles with prolonged P-R intervals. With decreasing prematurity a zone within the cardiac cycle was reached where in premature atrial responses no longer conducted to the ventricles. However, as the atrial responses were made even more premature, conduction resumed. Within this context, the term 'gap in A-V conduction' as originally used, defined a zone within the cardiac cycle where in premature atrial impulses failed to evoke ventricular responses while atrial beats of greater and lesser prematurity did.

The application of His bundle recordings has aided significantly in the understanding of the mechanisms responsible for antegrade and retrograde gap phenomena.

To date, a total of six types of gaps have been described for antegrade conduction and two for retrograde conduction (5, 7, 8, 10, 102, 222, 289, 927, 946).

METHODS

The techniques used to study gap phenomena in the human heart have been previously described (927). Essentially, it involves recording bundle of His activity from an electrode catheter positioned in the region of the tricuspid valve. For the study of gaps during antegrade conduction, the atria are driven at a basic cycle length (A1-A1) and premature atrial beats (A2) are elicited at progressively decreasing A1-A2 intervals up to the point of atrial refractoriness. For the study of gaps in V-A conduction, the right ventricle is driven at a basic cycle length (V1-V1) and premature ventricular beats elicited at progressively decreasing V1-V2 intervals up to the point of ventricular muscle refractoriness.

DEFINITIONS

A1, H1, V1: The atrial, His bundle, and ventricular depolarizations during the basic atrial drive.

A2, H2, V2: The atrial, His bundle, and ventricular depolarizations resulting from coupled premature atrial stimulation.

1. This work was supported in part by Bureau of Medical Services Grant Py76-1 and National Heart and Lung Institute Grant No. HL-12536-05.

H. J. J. Wellens et al. (eds.), The Conduction System of the Heart
© Martinus Nijhoff Medical Division 1978
Effective refractory period (ERP) of the atrioventricular (A-V) conduction system
The longest $A_1 \ A_2$ interval at which $A_2$ fails to evoke a ventricular response.

ERP of the atrium
The longest $S_1 \ S_2$ interval at which $S_2$ does not cause an atrial depolarization.

ERP of the A-V node
The longest $A_1 \ A_2$ interval at which $A_2$ does not conduct to the bundle of His.

ERP of the His-Purkinje system (HPS)
The longest $H_1 \ H_2$ interval at which $A_2$ blocks within the HPS.

Functional refractory period (FRP) of the atrioventricular (A-V) conduction system
The shortest $V_1 \ V_2$ interval in response to a given range of $A_1 \ A_2$ intervals.

FRP of the A-V node
The shortest $H_1 \ H_2$ interval in response to two successive atrial impulses both propagated through the A-V node.

FRP of the His-Purkinje system
The shortest $V_1 \ V_2$ interval in response to two successive atrial impulses, both propagated through the bundle of His.

Relative refractory period (RRP) of the HPS
The longest $H_1 \ H_2$ interval at which $H_2$ conducts to the ventricles with a longer H-V time than the basic drive beat or with a QRS of aberrant configuration.

Retrograde conduction
The onset of induced ventricular depolarization was measured from the corresponding stimulus artifact. Ventriculo-atrial intervals were measured from the corresponding stimulus artifact to the onset of low atrial electrogram.

Retrograde refractory period measurements
The retrograde His deflection for the basic drive beats during 1:1 V-A conduction was obscured by the ventricular electrogram and could not be identified. Data from experimental studies indicate that for the basic ventricular drive beats the interval between the stimulus artifact and the retrograde His deflection is constant. Thus, $H_1$, was taken from the onset of ventricular activation of the last beat of the basic drive ($V_1$). During ventricular premature stimulation, the retrograde His deflection emerged from the ventricular electrogram and was identified by its morphology and expected physiologic behavior. For purposes of comparison, $V_1 \ H_2$ can be used interchangeably with $H_1 \ H_2$ intervals, since the former interval always exceeds the latter by a constant amount. The following definition of terms during retrograde refractory period studies applies to conduction through the normal pathways in the absence of functional bypass tracts.