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Arrhythmias and Hemodynamics

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(Received for Publication, April 1, 1961)

WE ARE DEEPLY impressed by the elegant works of Dr. Oguro and his collaborators and should like to congratulate them heartily on their complete success.

Since years, hemodynamical studies on various arrhythmias in man have been performed in our clinical department by cardiac catheterizations as well as non-surgical methods such as Wezler-Böger's method, Blumberger-Holldack's method and Eky. The results similar to those in dogs by Dr. Oguro et al. have been also clinically obtained by us and our collaborators (MOMATA, INAGAKI, YOKOTA, KUWAYAMA, UMEMURA et al.).

The following are some of the newer observations in man.

1. Hemodynamics of auricular fibrillation (A.F.)

Quantitatively, more strictly speaking, semiquantitatively hemodynamics of A.F. was known by an analysis of "dominierenden Rhythmus" of it. In spite of our endeavors, little knowledge has been acquired about hemodynamical factors which concern contingency and regularity of ventricular beat of A.F.

Qualitatively, however, as seen in Fig. 1 characteristics of A.F. could be easily elucidated by the relation between preceding cycle length (or preceding diastolic length) and stroke volume, cardiac work or temporal cardiodynamical values (transformation time, rising pressure time, tension period and ejection period). Each stroke volume of A.F. was calculated in this case by Wezler-Böger's method with synchronous determination of the intra-

Fig. 1.

arterial blood pressure. In most cases of A.F., the stroke volume and the cardiac work increased to a certain point, roughly proportioning to the prolongation of the preceding cycle length, which reminded us of "somewhat modified Starling's curve". This was obviously not held in the strict sense, but only in a broad sense that the stroke volume was depending chiefly upon the inflow volume into the ventricle. Shape, slope and height of this curve were characterized by underlying diseases and severity of cardiac decompensation. For example, coronary sclerosis and valvular diseases showed sometimes a difference. With recovery from decompensation, the curve was usually

elevated right or right upwards. In Fig. 1 obtained from a case of mitral valvular disease, [A] showed the curve in decompensation shortly after admission to the hospital, [B], in recompensation maintained by the intravenous administration of k-strophanthin, [C], in relative compensation by the i. v. administration of other digitalis.

As also seen in Fig. 2, oral administration of various digitalis leaves to the same case depicted different curves depending on their efficacies. Thus, utilizing these phenomena,

Fig. 2.

potency and rapidity of action of various cardiac glycosides can be examined in man and moreover, a cardiac patient with A.F. can be controlled most rationally and kept in the best condition.

2. Hemodynamics of the WPW syndrome

Concerning with the hemodynamics of extrasystoles by Dr. Oguro et al., I should like to comment on a case of 26 year-old woman with the transitory WPW syndrome, whose hemodynamical analysis could be obtained quite accidentally but fortunately. She had no proven organic heart disease. She showed two

successive WPW beats in basic beats at first and a little later a long run of the WPW beat developed. Difference of heart rate and blood pressures between basic and WPW beats remained within 10% throughout. As shown in Tab. I, the first beat of the two successive WPW beats showed the slightly less stroke volume, the slightly less systolic and pulse pressures and the slightly increased total peripheral resistance and volume elasticity coefficient than those of the basic beat. However, it was remarkable enough that in the second WPW beat, these hemodynamical disarrangement seemed to be compensated and the hemodynamical values approached those of the basic beat. In the first WPW beat, the rising pressure time ("DAZ") and the tension period (δ_e -I + "DAZ") were longer than those of the basic beat even if either the transformation time was assumed as a period from the beginning of the delta the main portion of wave of the WPW beat to the beginning of the first heart sound (δ_a -I) or as a period from the end of the delta wave of the WPW beat to the beginning of the main portion of the first heart sound (δ_e -I). The ejection period of the first WPW beat was shorter than that of the basic beat. However, in the second WPW beat, these periods were compensated already and got close to those of the basic beat.

In summarizing, the hemodynamical disarrangements of the first WPW beat were, roughly speaking, similar to those seen in a ventricular extrasystole. However, severity of these disarrangements was far slighter in the WPW syndrome than in a ventricular extrasystole. The second beat of the WPW beats showed alleviation of these disarrangements already and the hemodynamical situation approached that of the basic beat. Consequently, if the WPW syndrome appears in a case having no myocardial damage or no valvular heart disease and does not cause noticeable change in heart rate and blood pressure, the hemodynamics of the WPW syndrome is not deviated greatly from that of the basic beat.

We should like to express our deep gratitude to the chairman, Prof. Torii for his allowing our addendum.

TABLE I HEMODYNAMICS OF THE TWO SUCCESSIVE WPW BEATS

Beat	Stroke Volume cc	Minute Volume L/min.	Total Periph. Resistance Dyne·sec. cm ⁻⁵	Volume Elasticity Coefficient Dyne·cm ⁻⁵	Blood Pressure mmHg	Pulse Pressure mmHg	Heart Rate	Preceding Cycle Length σ	Preceding Diastole σ	P- δ_a σ	P- δ_e σ
WPW 1	73.4	5.5	1334	1701	116~69	47	75.3	829	581	107	166
WPW 2	82.5	6.0	1197	1610	116~66	50	73.8	796	583	120	182
Basic	85.6	6.1	1236	1598	121~69	51	71.7	824	570	$\frac{PQ}{175}$	σ

POSTULATED CARDIAC DYNAMICS* OF THE TWO SUCCESSIVE WPW BEATS

Beat	P- δ_a	δ_a-I	"DAZ"	δ_a-I+ "DAZ"	"ATZ"	δ_a-II	"ATZ/ δ_a-I + DAZ"
WPW 1	107	118	39	157	229	387	1.4
WPW 2	120	120	35	156	237	393	1.5
Beat	P- δ_e	δ_e-I	"DAZ"	δ_e-I+ "DAZ"	"ATZ"	δ_e-II	"ATZ/ δ_e-I + DAZ"
WPW 1	166	59	39	98	229	328	2.3
WPW 2	182	58	35	94	237	331	2.5
Beat	PQ	"UFZ"	"DAZ"	"ASZ"	"ATZ"	Q II	"ATZ/ASZ"
Basic	175	65	29	95	279	374	2.9

* Unit : σ (1/1000 sec.)

"UFZ" = transformation time, "DAZ" = rising pressure time,
 "ASZ" = tension period, "ATZ" = ejection period