lation (PVS). Underlying diseases were coronary artery disease (17), mitral valve disease (2), dilated cardiomyopathy (1), ARVD (1), and unknown (5).

Base-line electrophysiologic study was performed with PVS using 1-3 (maximum RVRs ≤ 5) was defined as effective drug identified.

According to EPT, 26 pts were classified into 14 (54%) with effective drug identified (EPS-S) and 12 unidentified (EPS-U). There were no differences between 2 groups in clinical, hemodynamic and electrophysiologic backgrounds. The mean number of ineffective drugs given were 2.0 in EPS-S and 3.8 in EPS-U. During a mean follow-up of 14 (6-38) months, in EPS-S sudden cardiac death (SCD) or SVT occurred in 5 pts (36%) including 1 within 6 months. In EPS-U, SCD or SVT occurred in all the 4 pts except 8 pts with amiodarone given, within 2 months in 2 pts. Positive and negative predictive value and predictive accuracy of EPT were 86%, 50% and 78% within 6 months and 64%, 100% and 72% over 6 month.

EPT appears to have a limited value for predicting long-term drug efficacy, however to be useful for confirming drug inefficacy.

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PROGNOSIS OF VENTRICULAR TACHYCARDIA

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We examined the clinical features and prognostic implications of 80 patients with ventricular tachycardia (VT: $\geq$ triplets) detected mainly with 24 hour ambulatory electrocardiograms with a mean follow up of 27 ± 40 months.

The underlying heart disease was ischemic heart disease in 29 patients (36%); cardiomyopathy in 17 patients (21%); valvular heart disease in 2 patients (3%); other heart disease in 3 patients (4%); and apparently normal heart in 29 patients (36%).

There were 16 deaths (20%) during the follow-up period, including 2 noncardiac deaths. Eight of the 14 cardiac deaths were sudden and the remaining 6 patients died of uncontrollable heart failure. The mortality rates (cardiac death) in the groups of diseased heart and normal heart were 28% (14/50) and 0%, respectively ($p < 0.01$). The value of left ventricular dimension at end-diastole and ejection fraction on echocardiograms of the nonsurvivors (cardiac death) and the survivors were 64 ± 11 mm and 54 ± 10 mm ($p < 0.005$), $34 \pm 11\%$ and $55 \pm 9.9\%$ ($p < 0.005$), respectively. Ten of 24 patients with sustained VT (≥ 30 seconds) suffered cardiac death compared with 4 of 56 patients with non-sustained VT ($p < 0.01$). No other characteristics of VT including episode per day, longest run of VT, rate, morphologic characteristics (bundle branch block pattern, monomorphic or polymorphic), or premature ventricular contraction per day was important prognostically. Further, administration of effective drugs on the basis of 24 hour ambulatory electrocardiograms was not a good predictor of survival ($P : NS$).

Thus, underlying heart disease, left ventricular dysfunction, dilated left ventricle, or sustained VT were the predictors of mortality in patients with VT.

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PREVENTIVE EFFECT OF PROPAFENONE ON VENTRICULAR TACHYCARDIA IN A CANINE MODEL OF MYOCARDIAL INFARCTION -A COMPARATIVE STUDY WITH LIDOCAINE-

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Using programmed electrical stimulation and simultaneous epicardial mapping, we examined electrophysiologic effects of propafenone and lidocaine in dogs with 7-day-old myocardial infarction. Induction of ventricular tachycardia (VT) was prevented by intravenous propafenone (2 mg/kg) in 6 of 8 dogs, while in one of 6 dogs by lidocaine of a same dose ($p < 0.05$). Epicardial conduction velocity within the infarction zone (IZ) during basic drive and the second extra-stimulus beats was reduced by both drugs to the same extents. Effective refractory period in the IZ was lengthened by propafenone ($14 \pm 10\%$, $n=9$, $p < 0.01$), while not by lidocaine ($2 \pm 5\%$, $n=7$, NS). Propafenone interrupted the activation wave fronts of reentry circuit that developed in response to programmed stimulation and was located in the surviving epicardial layer within the IZ by abolishing the re-excitation of the proximal site of the arc of functional unidirectional block. On the other hand, lidocaine could not interrupt the circling wave fronts of reentry circuit and failed to prevent the initiation of VT.

In summary, our findings suggest that higher effectiveness of propafenone than lidocaine in prevention of VT induction is attributed to its more potent effect on refractoriness of the myocardium within the IZ.

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STUDIES TO DEVELOP IMPLANTABLE "CCU"; EFFECTIVENESS AND SAFETY FOR DETECTING OF VENTRICULAR TACHYARRHYTHMIA BY CARDIOMOVIOGRAM

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We have attempted to develop the implantable CCU for prevention of sudden cardiac death due to ventricular tachyarrhythmia. In this study, We evaluated effectiveness and safety for detecting of ventricular tachyarrhythmia by Cardiomovio-gram.

Methods: We recorded intracardiac Cardiomovio-gram (CMG) of variable experimental ventricular arrhythmia by handmade Cardiomovio-gram. We evaluated changes of CMG induced by coronary artery occlusion, and β -blocker agent, and change of recording site.

Results: i) In Ventricular fibrillation (Vf), the amplitude of CMG decreased and regularity of CMG was lost. Within 30 seconds after onset of Vf, amplitude of CMG decreased to less than 50%. While 60 seconds after onset of Vf, we could terminate Vf by handmade endocardial defibrillator. ii) In Ventricular tachycardia

(VT), regularity and frequency of CMG did not change, but amplitude of CMG decreased. The amplitude of CMG was parallel to the systolic blood pressure. We could detect VT by frequency and amplitude of CMG. iii) Coronary artery occlusion and β -blocking agent changed the contour of CMG, but did not affect amplitude of CMG. We could also record intracardiac CMG through floating electrode catheter. In conclusion, intracardiac CMG was very effective to detect the ventricular tachyarrhythmia.

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SURGICAL THERAPY FOR VENTRICULAR TACHYCARDIA/FIBRILLATION ASSOCIATED WITH VENTRICULAR ANEURYSM

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From 1968 to 1985 we operated on 13 patients with chronic sustained or recurrent VT/Vf associated with ventricular aneurysm. All cases were non-responsive to various medical therapy and they could not be controlled with frequent DC countershock.

Until 1983 simple aneurysmectomy (or aneurysmectomy with CABG) was the method we took. From 1984 our strategy was modified to aneurysmectomy with isolation (encircling myotomy) or ablation (endocardial excision or cryoablation) of the VT focus which was determined by the pre- and intra-operative electrophysiological study. In ten patients VT/Vf attacks were completely disappeared after operation and they have been followed-up without medication for arrhythmias. In remaining 3 patients (for whom simple aneurysmectomy was indicated) 9 cases experienced recurrence of VT but was easily controlled with anti-arrhythmic drugs which were ineffective pre-operatively.

One patient died on table because of irreversible Vf. It is remarkable that even with simple aneurysmectomy, satisfactory results have been obtained in 8 out of 9 patients (89%).

Removal of stretch of the boundary myocardium by aneurysm and/or hemodynamic deterioration with simple aneurysmectomy might be sufficient for termination of VT/Vf attack in many patients, although it is our current strategy to perform direct focus ablation or isolation for more complete and satisfactory results.

Chairmen

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S. Mashima, *Tokyo*

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EVOLUTION OF BODY SURFACE ISOPOTENTIAL MAPS DURING VENTRICULAR REPOLARIZATION IN NORMAL CHILDREN

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It is well known that the T wave changes with age in normal children. However, there has been no report dealing with the body surface isopotential maps of the T wave in children of different age groups. We studied the T maps in normal children excepting the newborn infant. Thirty healthy children were divided into 3 age groups; 10 subjects aged from 5 months to 3 years (Group A), 10 subjects from 4 to 9 years (Group B) and 10 subjects from 10 to 15 years (Group C). A single maximum initially appeared on the left anterior chest and stayed there during the T wave in all groups. In all subjects of Group A and one subject aging 4 years in Group B, a single minimum initially appeared nearby the right shoulder and then shifted to the anterior central chest. In other subjects a single minimum stayed nearby the right shoulder during the T wave. The negative area on the right anterior chest became reduced with age and limited around the right shoulder. By QRST area maps, the integral maximum was shown on the left anterior chest in all age groups, and its value increased with age. The integral minimum was shown on the anterior central chest in 4 subjects of Group A and on the right shoulder in the others. The distributions of the positive and the negative area were almost same among each group, but the negative area on the anterior chest decreased with age. These results may indicate that the evolution of the T wave in normal children is brought about by the difference in the ventricular gradient.

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HEART-MODEL USING FINITE ELEMENT METHOD INTENDED TO FIT TO EACH INDIVIDUAL SUBJECT BY ANALYTICAL GEOMETRY -THE EFFECT OF BODY FORM ON FORWARD CALCULATION OF ELECTROCARDIOGRAM-

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Body surface potentials were calculated using finite element method in heart-torso model intended to fit to each individual subject which can be modified easily by analytical definition. The dipole source in the heart and its surrounding field up to the body surface were represented by a model with one innermost sphere and ten outlying ellipsoids encircling in succession like an onion.

On the innermost sphere's surface, 98 points were designated and 98 radiating lines were drawn starting at the sphere's center.

These lines also penetrated the ten outer ellipsoids' surfaces and 98 penetration points were given for each ellipsoidal surface.

So the model comprised 4992 tetrahedrons elements defined by 1079 nodes.

The basic structure of the model, whose diameters of right-to-left, down-to-up, and front-to-back were 34cm, 68cm, and 20cm respectively, was modified to seven models.

Only one dipole was placed samely in these heart-torso models and then each body surface potentials was calculated.

The closer the cardiac dipole was at body surface, the bigger and closer the potentials of maxima and minima were.

As a result, it was suggested that body form was influenced greatly to body surface potential and this model was useful fitting as much as possible to real human torso shape in its three radii.