(3) In 53 subjects, ratios of the peak decrease to the maximum count ranged from 0.048 to 0.152, with a good correlation to stroke volumes calculated by radiocardiography (r = 0.75).

(4) Ratios of decrease in the initial 200 msec to the peak decrease were calculated to evaluate cardiac ejection in the early systole. They were 0.516 ± 0.039 (mean ± s.d.) in normal control group, 0.448 ± 0.088 in ischemic and/or hypertensive heart disease group. These two groups were significantly different (p < 0.01).

(5) ECG synchronized averaging RCG, that is a nontraumatic measurement of the cardiac volume change in one cycle on an averaged basis, enables an evaluation of cardiac ejection in the early systole.

Exercise Radiocardiography

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Hemodynamic responses to supine exercise can be studied by the analog computer analysis of radiocardiograms recorded successively at rest and during exercise.

After the control radiocardiogram is recorded and the first sampling of blood is made for the calculation of blood volume at rest, supine exercise is performed by pedaling the Collins electrically braked ergometer. The workload is adjusted over a range of 25 to 75 watts/second, depending on the severity of the patient. The heart rate reaches a plateau in 1.5 minute, when the second sampling of blood and then the second injection of RISA is performed. When the recording of radiocardiogram is finished for initial 40 seconds, the patient stops pedaling for his safety. Exercise of the same workload is started again around the 7th minute of the second radiocardiography, and the final dilution value is recorded at the same heart rate as before. At the same time, the third sampling of blood is made for the measurement of blood volume during exercise.

After the injection of RISA, the count rate in the plasma was found to decrease exponentially. The exponential curve can be determined for each patient from the count rates of the first and the second blood-samples (C₁ and C₂ cpm, respectively) and the interval between the two samplings (T₁=₂ min.). Rate of decrease during the second and the third samplings (T₂=₃ min.) can be obtained from this exponential curve, and the estimated count rate of background (C₃ cpm) at the time of the third sampling is expressed as follows:

\[
C₃ = C₂ \cdot e^{-\frac{T₂=₃}{T₁=₂}} \ln\left(\frac{C₂}{C₁}\right)
\]

Therefore, if the measured count rate of the third blood sample is C₄ cpm, C₄-C₃ is the true count rate which can be used for the second measurement of the blood volume.

Circulating blood volume thus obtained during exercise was 99.3 ± 4.5% (mean ± SD) of that measured at rest.

In 8 cases of mitral stenosis, the increase of cardiac output was small despite the large increase of heart rate, and the pulmonary blood
volume showed the tendency to increase. No significant difference was found between the normal and the hypertensive groups.

References

Radioimmunoassay of Serum Digoxin Using 1-125 Labeled 3-o-Succinyl Digoxigenin Tyrosine

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In aged patients control of digitalis therapy is frequently difficult. For this reason determination of serum digitalis level is indispensable in elderly patients.

Determination of serum digoxin level using 1-125 labeled 3-o-succinyl digoxigenin tyrosine (Schwarz Mann) was reported in this paper. Use of 1-125 label for digoxin RIA was reported previously only by Horgan and Riley. For routine examination of RIA y emitter labeled tracer is more preferable to soft b emitter such as H-3 in several points.

In brief, assay method is as follows. Fifty microliters of serum, buffer solution, I-125 digoxin and antibody were thoroughly mixed and incubated at room temperature for 30 min. After incubation separation of bound and free digoxin was performed using dextran coated charcoal.

Addition of normal human serum is essential for the purpose of making standard curve. Canine serum could not replace human serum. Thirty minutes period of incubation is not essential. After 30 minutes incubation change to percent bound against time is minimal. The most critical point in this assay system is the time from addition of DCC until centrifuge. Change of bound percent against time after addition of DCC is marked. Delayed separation causes the overestimation of digoxin level. Some other way of Bound and Free separation is desirable and now under investigation in our laboratory. Use of refrigerated centrifuge could raise Bo % about 10%.

Overall reproducibility of this assay system is fairly good. The value of working standard in our laboratory is now 1.08 ng/ml on an average, standard deviation of it is ±0.11 ng/ml and cv is 10.2%. However scatter of within-assay is larger. Coefficient of variation of it is about 20%. This is supposedly caused by difficulty in controlling 5 minutes interval between charcoal addition and separation.

Among total determination of 133 cases, eleven patients had digitalis intoxication. Ten out of 11 cases serum digoxin level was over 3 ng/ml. One case showed 2.5 ng/ml of serum digoxin level. These results coincide well with results in reported papers.