Rubella Antibody Titres after Rubella Vaccination of Seronegative Patients

	Group A*	Group B**
Rubella HI-titre before vaccination in all patients	<8	<8
Rubella HI-titre three weeks after vaccination; mean geometric titre ± 1 S.D.	16.9 $\pm$ 9.5 (13)	10.4 $\pm$ 6.6 (8)
Rubella HI-titre six weeks after rubella vaccination; mean geometric titre ± 1 S.D. . .	73.5 $\pm$ 2.7 (15)	78.8 $\pm$ 2.4 (10)
P-value (six weeks)	>0.5	

*Patients received rubella vaccine on day 5 post partum.

**Patients having had anti-D immunoglobulin within 48 hours of delivery followed three days later by the rubella vaccination.

Figures in parentheses indicate number of patients.

results agree with those of others.^{2,3} We do not hesitate, therefore, to inject anti-D when needed as well as the rubella vaccine post partum, but we also suggest postponing the rubella vaccination when a blood transfusion is given at delivery.

¹ Alderman, B., and Charles, D. W., *British Medical Journal*, 1974, 2, 724.

² Edgar, W. M., and Hambling, M. H., *British Medical Journal*, 1974, 3, 255.

³ Grillner, L., and Forssman, L., *British Medical Journal*, 1974, 4, 47.

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Glomerular Filtration Rate Estimation Based on a Single Blood Sample

Introduction

Estimates of effective renal plasma flow (E.R.P.F.) and glomerular filtration rate (G.F.R.) are usually derived from analysis of the plasma disappearance curves of radionuclide labelled *o*-iodohippuric acid (Hippuran) and ⁵¹Cr-edetic acid (⁵¹Cr-EDTA), respectively, thus avoiding the necessity for urine collections. It is necessary to determine the entire concentration-time curve from the time of injection until the tracer is completely excreted, and the numerous published techniques represent different methods for reducing the number of blood samples required by introducing various approximations. For E.R.P.F. measurement Tauxe *et al.*^{1,2} extended this process to its logical limit when they showed that the apparent volume of distribution of radio-Hippuran derived from a single blood sample taken 44 minutes after injection (53 minutes in children) correlated very closely with the E.R.P.F. We have found that the same principle applies to the estimation of G.F.R.

Methods and Results

The technique based on the plasma clearance of ⁵¹Cr-EDTA described by Garnett *et al.*,³ with the correction factors evaluated by Chantler *et al.*,⁴ has been in routine use for several years. The logarithmic decay constant of the plasma activity curve is obtained using three blood samples taken over the period two to six hours after injection of the tracer, and multiplied by the initial volume of distribution. The data from 73 consecutive routine G.F.R. measurements were examined and the apparent volume of distribution

(⁵¹Cr-EDTA space) at three, four, five, and six hours postinjection calculated from:

$$(\text{Space})_t = \frac{\text{Activity injected}}{\text{Plasma concentration at time } t}$$

The three-hour ⁵¹Cr-EDTA space is shown plotted against G.F.R. in the figure. From this the G.F.R. can be predicted from the space with a standard deviation of 8 ml/min. Similar regression lines can be obtained for other periods. The best fit is obtained at four to five hours after injection; at six hours the error increases.

Discussion

The sample may be taken at any time during the three to five hour postinjection period, except when the G.F.R. is very low. A three-hour period fits conveniently into a single outpatient session, and additional later blood samples may be taken, if necessary, to confirm the initial estimate. If the regression line for four and five hours is plotted on the same chart, as shown dotted in the fig., the appropriate factor can be obtained by interpolation between the curves. In the absence of renal function, the volume of distribution of ⁵¹Cr-EDTA after the initial two to three hour period of equilibration corresponds approximately to the extracellular fluid volume (E.C.F.)^{3,4} and thereafter remains substantially constant. Provided the patient is not oedematous, the increasing excess ⁵¹Cr-EDTA space reflects the amount of tracer cleared by the kidneys and hence provides an index of the G.F.R.

Experimental correlation between three hour ⁵¹Cr-EDTA space and G.F.R. The least squares fitted polynomial curves for four and five hours are also shown.

At G.F.R. values below 30 ml/min the resulting absolute estimates are virtually useless because variations in E.C.F. between individuals (particularly our geriatric patients) contribute substantially to the scatter of the data. The use of the body surface area to make this factor normal may improve this and is being investigated; there is also some improvement if a five-hour sample can be obtained when the G.F.R. is feared to be low. At present the single sample technique appears to provide an estimate of the G.F.R. whose accuracy is comparable with that of the endogenous creatinine clearance but which is rapid and does not necessitate a 24-hour urine collection.

¹ Tauxe, W. N., Maher, F. T., and Taylor, W. P., *Mayo Clinic Proceedings*, 1971, 46, 524.

² Tauxe, W. N., Hagge, W., and Stickler, G. B., in *Dynamic Studies with Radioisotopes in Clinical Medicine and Research*, p. 265. Vienna, I.A.E.A., 1974.

³ Garnett, E. S., Parsons, V., and Veall, N., *Lancet*, 1967, 1, 818.

⁴ Chantler, C., *Clinical Science*, 1969, 37, 169.

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