

Intravenous Galactose Tolerance Test

Normal Series of Children

A. RELANDER

Aurora Municipal Hospital, Helsinki, Finland

Abstract: RELANDER, A. Intravenous Galactose Tolerance Test. Normal Series of Children. *Scand. J. clin. Lab. Invest.* **22**, 196-198, 1968.

Normal $T\frac{1}{2}$ values obtained with the galactose tolerance test in children are presented. A highly significant positive association is shown between age and $T\frac{1}{2}$ values. In the age group 0-5 years the upper limit of normal is 10 minutes, in the age group 5-10 years 12 minutes, and in the age group 10-15 years 15 minutes. To exclude pathological cases liver function was tested by determining serum bilirubin and GPT and by performing the thymol turbidity test.

Key-words: Children; galactose tolerance test; liver function tests; normal values

The galactose tolerance test for the evaluation of liver function was introduced in peroral form by Bauer (1) in 1906 and in intravenous form by Jankelson & Lerner (5) in 1934. However, it failed to gain widespread acceptance because the existing methods for galactose determination were laborious and unspecific. It was the introduction of the galactose oxidase method by de Verdier & Hjelm (2) in 1962 that made it possible to develop a simple and reliable intravenous galactose tolerance test, which in the form published by Tengström (9) and Tengström et al. (10) has been widely used as a liver function test in adults. The lack of normal values for children has prevented the adoption of this test for children, although the need for an alternative to the bromsulphthalein (BSP) test generally used is important, because hypersensitivity to BSP in children is quite common. The only facts known about the galactose tolerance test in children is that the $T\frac{1}{2}$ values tend to be higher during the first 30 hours of life (4) and that in children over 1 year the $T\frac{1}{2}$ values are lower than in adults (11).

Therefore this article describes a normal series of galactose tolerance test in children.

MATERIAL

The patients used for determining the normal $T\frac{1}{2}$ values of the galactose tolerance test in children had been hospitalized for various reasons, but there was no suspicion of hepatic disease. Their ages were as follows:

1. Thirty patients (18 boys and 12 girls) were between 0.1 years. The youngest patient was 3 weeks old, 7 patients were about 1 month old and the rest of this group between 1-12 months.
2. Sixteen patients (8 boys and 8 girls) between 1-2.5 years old.
3. Thirty-five patients (16 boys and 19 girls) between 2.5-10 years old.
4. Seventeen patients (11 boys and 6 girls) between 10-15 years old.

Besides subjects with hepatic disease, all patients suffering from anaemia, thyroid disease or cardiac failure were also excluded.

METHODS

The tests were performed in the morning after at least 8 hours' fasting.

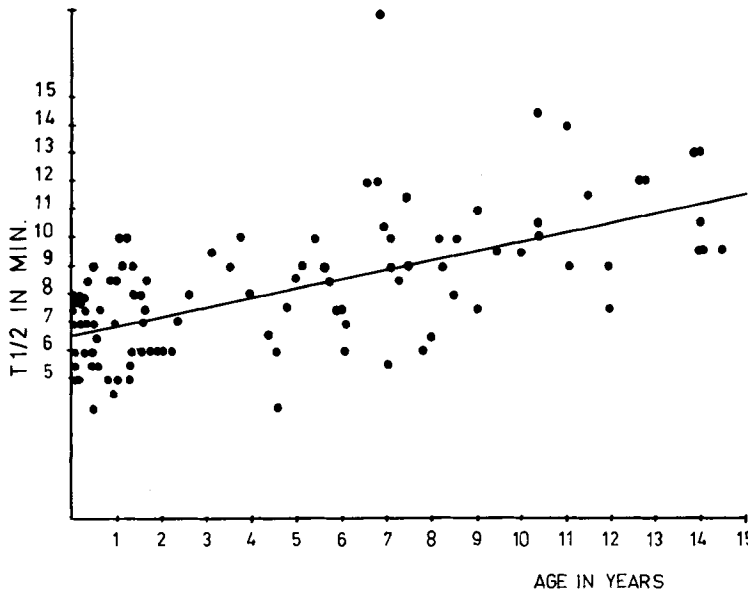


Fig. 1. $T_{1/2}$ values obtained with the galactose tolerance test plotted against age in children.

Galactose, 350 mg/kg body weight, was administered intravenously as a sterile, pyrogen-free 30 per cent (w/v) solution. The injection was given within 3 min. The stop-watch was started when half the volume had been given and capillary blood samples for galactose determination were taken at 10, 15, 20, 30, 40 and 50 minutes. The galactose concentration of the blood samples was determined with the galactose oxidase method (2,3) and the values were plotted against time on semilogarithmic paper. The $T_{1/2}$ values for galactose were determined graphically from the straight line best fitting the curve.

For controlling the function of the liver the following tests were also performed: Serum bilirubin was determined according to Mallow & Evelyn (6), serum thymol turbidity according to Maclagan (7) and serum glutamate-pyruvate-transaminase (SGPT) according to Ordell (8).

RESULTS AND DISCUSSION

Fig. 1 shows the individual $T_{1/2}$ values plotted against age. The regression line for the indi-

vidual values has been calculated as $y = 6.6 + 0.32 \cdot x$ and the correlation coefficient as $r = 0.66$, which shows that there is a highly significant positive association between age and $T_{1/2}$ values ($p < 0.001$). The standard deviation of the residual variation is 1.66. From these results we can deduce that the upper limit of normal (mean $+ 2 \times$ S.D.) is 10 minutes between 0-5 years, 12 minutes between 5-10 years and 15 minutes between 10-15 years. This last age group has $T_{1/2}$ values close to the values of adults, which are 12.0 ± 2.6 minutes according to Tengström (9) and Tengström et al. (10).

Because of the low $T_{1/2}$ values in children under 10 years old, the capillary blood samples should be taken 10, 15, 20, 25 and 30 minutes after the stop-watch is started.

The bilirubin, SGPT and thymol turbidity values were normal in all patients, except that some of the premature had high bilirubin values and two boys over 10 years old suffering from pneumonia had an SGPT value above the upper normal limit, 35 IU/l. The other tests were normal and there was no suspicion of hepatic disease.

ACKNOWLEDGEMENTS

The study was supported by grants from AB Kabi. The author wishes to express his gratitude to the chief physicians of the First and Second Pediatric Departments of Aurora Hospital, Prof. P. G. Forssell and Docent Ruth Wegelius, for allowing him to study their patients.

REFERENCES

1. BAUER, R. Ueber die Assimilation von Galaktose und Milchzucker beim Gesunden und Kranken. *Wien Med. Wschr.* **56**, 20, 1906.
2. DE VERDIER, C.-H. & HJELM, M. A galactose oxidase method for the determination of galactose in blood plasma. *Clin. chim. Acta* **7**, 742, 1962.
3. HJELM, M. A methodological study of the enzymatic determination of galactose in human whole blood, plasma and erythrocytes with galactose oxidase. *Clin. chim. Acta* **15**, 87, 1967.
4. HJELM, M. & SJÖLIN, S. Changes in the elimination rate from blood of intravenously injected galactose during the neonatal period. *Scand. J. clin. Lab. Invest.* **18**, Suppl. 92, 126, 1966.
5. JANKELSON, I. R. & LERNER, H. H. Intravenous galactose liver function test. *Amer. J. dig. Dis.* **1**, 310, 1934.
6. MALLOY, H. T. & EVELYN, K. A. The determination of bilirubin with the photoelectric colorimeter. *J. biol. Chem.* **119**, 481, 1937.
7. MACLAGAN, N. F. The thymol turbidity test as an indicator of liver dysfunction. *Brit. J. exp. Path.* **25**, 234, 1944.
8. ORDELL, R. Glutaminsyra-oxalättigsyra-transaminas in serum. *Opusc. med. (Stockh.)* **1**, 14, 1956.
9. TENGSTRÖM, B. An intravenous galactose tolerance test with an enzymatic determination of galactose. A comparison with other diagnostic aids in hepatobiliary diseases. *Scand. J. clin. Lab. Invest.* **18**, Suppl. 92, 132, 1966.
10. TENGSTRÖM, B., HJELM, M., DE VERDIER, C.-H. & WERNER, I. Intravenous galactose tolerance test with the use of an enzymatic method for the determination of galactose. *Amer. J. dig. Dis.* **12**, 853, 1967.
11. VINK, C. L. J. Liver function and age. *Clin. chim. Acta* **4**, 674, 1959.

Received 13 June 1968

Accepted 16 September 1968

A. RELANDER, Ph. L
Aurora Municipal Hospital
Helsinki, Finland