Short reports

hydrocephalus. The cause of his symptoms was a pulsion diverticulum of the lateral ventricle, a rarity which does not usually figure in the differential diagnosis of this syndrome, though the history is characteristic of the few recorded cases.

We thank the consultant staff of the Department of Child Health for permission to publish this case.

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Thyroxine levels in normal newborn infants

It is well known that thyroxine (T₄) levels in the blood are higher in infancy than at any other time of life. This was shown in the papers of Danowski et al. (1951), Durham et al. (1954), and Pickering et al. (1958). These papers were based on the measurement of protein-bound iodine and butanol-extracted iodine in infants. O'Halloran and Webster (1972) measured thyroid function in Australian Caucasian babies during the first year of life. They used a technique involving a resin column, ¹²⁵I-labelled thyroxine, and a γ counter. This method of T₄ measurement is marketed in the form of Tetrosorb Kits (Abbott Laboratories), Tetralute Kits (Ames Company), and Thyropac 4 (Amersham Radio Chemical Centre). It is finding increasing favour in biochemistry laboratories as a method for estimating T₄ levels in the blood, for it is quick, easy, accurate, and uses only 0.1 ml serum. The method is attractive to paediatricians because it can be performed on heel prick samples of blood.

In view of the probable increased use of this test, a study was done to define the normal range of T₄ levels in Caucasian neonates in Britain.

Methods

T₄ measurement was carried out on a series of venous and some capillary samples of blood. The estimations were carried out in the Fazakerley Hospital Biochemistry Department by one of us (D.W.) using a Tetrakute Kit and a Thyrimeter Gamma Counter (Ames Company) according to the printed instructions. 30 samples of cord blood, 30 blood samples from 6-hour to 44-hour-old babies, and 30 samples from 4- to 7-day-old babies were taken for T₄ estimations.

The infants in the trial were normal Caucasian term babies. Any complicating factor such as prematurity, small-for-dates status, jaundice, asphyxia, sepsis, etc., excluded the infant from the study. The only maternal complication allowed was an elective caesarean section for disproportion or because of a previous caesarean section. The samples were not taken serially from individual infants.

Results

The values of serum thyroxine in μg/100 ml blood were as follows. In 30 samples of cord blood the range was from 7.2 to 13.5 μg/100 ml. The mean value of the cord samples was 9.9 μg/100 ml and the normal range (mean ± 2 SD) was 6.1 to 13.7 μg/100 ml.

In 30 samples of blood from infants 6 to 44 hours old, T₄ values ranged from 13.2 to 19.6 μg/100 ml. The mean value was 16.6 μg/100 ml and normal range 13.4 to 19.8 μg/100 ml.

In 30 samples of blood from infants 4 to 7 days old, T₄ values ranged from 8.6 to 18.5 μg/100 ml. The mean value was 14.4 μg/100 ml and normal range 10.4 to 18.4 μg/100 ml.

Discussion

The cord blood values are similar to those found by O'Halloran and Webster (1972). The mean cord blood T₄ in our series was 9.9 μg/100 ml, which was lower than their mean value of 11.3 μg/100 ml.

The mean T₄ value of O'Halloran and Webster's 20 babies aged 0 to 13 days was 13.2 μg/100 ml. This is exceeded by the mean value of 14.4 μg of our 30 4- to 7-day-old babies. The mean T₄ levels of our 30 6- to 44-hour-old infants was even higher at 16.6 μg/100 ml.

Our findings are in keeping with the findings of Danowski et al. (1951) and Fisher and Odell (1969) who found that peak thyroxine levels occurred between days 1 to 4 of life. Fisher and Odell showed a marked increase in thyroxine stimulating hormone at this time. It can be seen that our
results show maximum T₄ levels at 6 to 44 hours, dropping by 4 to 7 days.

Perhaps the lower T₄ levels shown in O'Halloran and Webster's 0- to 13-day-old infants can be explained by most of their infants being nearer in age to day 13 than to day 1. They would then be less affected by the highest levels of thyroid-stimulating hormone on days 1 to 4.

Knowing the normal range of T₄ at 4 to 7 days (10·4 to 18·4 µg/100 ml) may be of value in suspected hypothyroidism, in hyperthyroidism, or where there is maternal antithyroid drug taking, or where the family history suggests an increased chance of hypothyroidism. It is well known that many babies who are discovered to be hypothyroid later in the first year of life do not appear cretinous at birth.

More frequent T₄ measurement in neonates who are jaundiced, with further tests on those whose T₄ levels are below the normal limits described, should be carried out. This policy might detect more of these occult cretins before brain damage has occurred through lack of early thyroxine treatment.

Summary

A study of T₄ values in normal term British Caucasian neonates was made. Mean T₄ values and normal ranges were: (1) cord blood, mean 9·9 µg/100 ml, normal range 6·1 to 13·7 µg; (2) infants 6 to 44 hours old, mean 16·6 µg/100 ml, normal range 13·4 to 19·8 µg; (3) infants 4 to 7 days old, mean 14·4 µg/100 ml, normal range 10·4 to 18·4 µg.

This study was performed on normal infants in Fazakerley Maternity Hospital with the informed consent of their mothers, whom we thank. We also acknowledge the help and encouragement of Dr. Hudson, Consultant Paediatrician to Fazakerley Maternity Hospital, on whose patients the study was performed.

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