Case 2. A 3-week-old Indian girl was admitted with a history of vomiting and irritability. On examination she had lost 500 g since birth and was grossly dehydrated with acidotic respiration and bradydardia. Investigations revealed a serum sodium of 134 mEq/l, potassium 5·3 mEq/l, bicarbonate 1·0 mEq/l, and urea 150 mg/100 ml. Nose, throat, umbilical, and rectal swabs, blood culture, and CSF examination revealed no abnormality. Haemoglobin was 15·8 g/dl, total white blood count 20 250/mm³. Suprapubic puncture was unsuccessful, intestinal contents being aspirated. The baby was treated with intravenous fluids, including sodium bicarbonate, and intravenous kanamycin and cloxacillin. In the course of rehydration she had a convulsion which was controlled with paraldehyde and phenobarbitone. In view of her extremely serious condition hydrocortisone was also given for 24 hours. 3 days later the right ear started discharging pus which grew Pseudomonas aeruginosa sensitive to gentamicin, and she was therefore given a course of this. The reintroduction of full-strength milk feeds precipitated an episode of bile-stained vomiting, absent bowel sounds, and abdominal distension, which settled with gastric aspiration and intravenous fluids. 8 days after admission to hospital the antibiotic was changed to co-trimoxazole. The baby's condition at this time was moderate; she was tolerating clear fluids orally, was reasonably active, and still had a discharging right ear. Repeated attempts to reintroduce milk feeds failed, though no abnormal sugars were found in urine or stool. In view of this she was given Velactin, which she tolerated well.

Twenty days after admission a swelling was noted in the suprapubic region, slightly to the right of the midline. This became fluctuant and red, and over the next 3 weeks the surface skin peeled off. The conclusion was reached that this was an abscess. No attempt was made to incise or aspirate it and after about 3 weeks it disappeared spontaneously. Sweat test and nitroblue tetrazolium test were normal and immunoglobulins were normal for age.

Discussion

There can be little doubt that in Case 1 the development of a suprapubic abscess was directly related to the attempted aspiration of urine via the suprapubic route. In Case 2 the time interval between aspiration and swelling, and the failure to establish a definite diagnosis of abscess formation, make interpretation more difficult. This baby had a chronic otitis media, which eventually developed into mastoiditis, and it was felt that there may have been a qualitative defect in her immunological response, though none was identified. Whatever the mechanism, it was felt that the most likely explanation for the suprapubic swelling was infection in the needle track after the attempted suprapubic bladder puncture.

It is worthy of comment that both these babies were grossly dehydrated when the attempts were made at bladder puncture, and their bladders were not palpable. In both cases intestinal contents were aspirated, and both children were treated with antibiotics.

In over 2000 cases of suprapubic bladder puncture reported by Eykyn and Newman (1969) bowel was entered on only one occasion and this without adverse effect. Nelson and Peters (1965) reported 2 cases of suprapubic haematoma without infection. Though the complication rate for this procedure is obviously very low, it is important to remember that problems can occur which may be potentially serious. The grossly dehydrated baby may be particularly at risk, but this baby also presents the more urgent diagnostic and therapeutic problem.

Summary

Suprapubic abscess formation was seen in 2 babies after attempted suprapubic bladder puncture. In both cases the baby was grossly dehydrated and gut contents were aspirated. Though this complication is rare, it should be remembered, as with all investigations, that a definite indication should be present before suprapubic aspiration is undertaken.

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Anterior fontanelle size in the neonate

Assessment of the tension and size of the anterior fontanelle is important in the routine examination of newborn infants when considering, respectively, possible disturbances of intracranial pressure and disorders of skeletal development. The diagnosis of an abnormally large or small anterior fontanelle at birth must assume a knowledge of normal variations in its size, but surprisingly there are no satisfactory references in published reports either to methods of measurement or to possible variations in size of the anterior fontanelle in relation to gestational age and intrauterine growth.
This study (a) describes a simple clinical method of measuring the size of the anterior fontanelle in the newborn infant, and (b) provides data for anterior fontanelle size in three groups of newborn infants: preterm, small-for-dates, and term infants.

**Clinical material**

Three groups of healthy neonates were studied. (a) Preterm infants (less than 37 weeks' gestation), who were further divided into two groups: (i) 28–32 weeks and (ii) 33–36 weeks' gestation. (b) Term infants (37–42 weeks' gestation). (c) Small-for-dates infants (less than the 5th centile after correction for sex, maternal height, and birth order) (Tanner and Thomson, 1970).

Anterior fontanelle size was measured on the third day of life to allow for the effects of moulding to disappear.

**Method of measurement**

The four apices of the anterior fontanelle were identified. The index finger was introduced in turn into each of the four corners (Fig. 1) and a small circular dot in ink was marked with a felt pen on the skin immediately distal to the finger. A piece of white paper was firmly pressed over the fontanelle so that the four dots were transferred onto the paper. This part of the examination was performed by the same individual (D.P.D.) in every case. The points were joined by a straight line to form a quadrilateral (Fig. 2) and the enclosed area was then calculated in the following stages.

(i) Points A and C were joined by a straight line AC which served as a common base line for triangles ABC and ADC. (ii) A line (a-c) parallel to AC was then drawn through D. (iii) A perpendicular was dropped from the apex B of the triangle ABC to intersect the line ac at X. (iv) AC and BX were then measured in mm and the area of the figure ABCD in mm\(^2\) was obtained by the formula \((AC \times BX)/2\).

**Results**

Fig. 3 shows the individual values for anterior fontanelle size together with the mean values (±SEM) for the individual infant groups. The mean value for the preterm (33–36 weeks) infants is higher than that for the more immature preterm (28–32 weeks) group, but the difference is not significant (P > 0.05). The mean value for anterior fontanelle size in the term infants is also higher than in the preterm infants (33–36 weeks), but again the difference is not significant (P > 0.05). The difference between the preterm (28–32 weeks) and the term infants, on the other hand, is significant.
(P < 0.01). These findings suggest that anterior fontanelle size enlarges with advancing gestation. The small-for-dates infants show a very wide scatter of individual values and the mean fontanelle size is higher than the two preterm groups and term infants (P < 0.001 in each instance).

**Discussion**

Popich and Smith (1972) have described normal fontanelle size at birth by recording the average of the longitudinal and transverse diameters of the fontanelle along the area of the sagittal and coronal sutures. The method proposed in this study offers a more suitable alternative since it provides an estimate of fontanelle size in terms of area. The fundamental assumption on which the method is based, namely that the anterior fontanelle has the shape of a quadrilateral, is a simplification since its bone margins are rarely linear; nevertheless, the method is simple, easily learned, and, provided care is taken to fit the fingers tightly into each of the four corners before marking the skin (thereby consistently obviating the difficulty of determining exactly where the fontanelle ends and the sutures begin), an estimate of anterior fontanelle size is obtained which is sufficiently accurate for clinical purposes.

The values obtained for normal fontanelle size show an enlargement with increasing gestational age. The much larger fontanelle in the small-for-dates infants is, however, an interesting observation since large fontanelles are also known to occur in a number of disorders of skeletal morphogenesis such as achondroplasia, hypophosphataemia, osteogenesis imperfecta, and congenital hypothyroidism (Popich and Smith, 1972), resulting from retardation of membranous ossification of the calvarium of the skull. Considerable skeletal growth retardation undoubtedly occurs in many small-for-dates babies (Usher, 1970), so that it is likely that large fontanelle size in these infants is a further manifestation of intrauterine growth retardation. The very large anterior fontanelle of the Russell-Silver syndrome (Gareis, Smith, and Summitt, 1971), where there is marked intrauterine growth retardation, seems to support this suggestion of a delay in osseous maturation of the skull bones in small-for-dates infants.

In the absence of raised intracranial pressure the most important reason for assessing anterior fontanelle size in the neonate is the early diagnosis of congenital hypothyroidism (Smith and Popich, 1972) since its early detection and treatment has an important bearing on ultimate mental progress (Raiti and Newns, 1971). The accurate measurement of anterior fontanelle size might therefore be of value in the early diagnosis of congenital hypothyroidism and other disorders of skeletal development.

**Summary**

A simple method is described for measuring the area of the anterior fontanelle at birth. Normal values in preterm and term infants suggest enlargement of the fontanelle with gestational age. Small-for-dates infants have significantly larger anterior fontanelles than either preterm or term infants. Knowledge of the normal variation in anterior fontanelle size may be of help in the early diagnosis of congenital hypothyroidism or provide a clue to other disorders of skeletal development.

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