**Discussion**

Although several predisposing factors have been identified\(^1\) to \(^3\) the trigger for febrile convulsion remains elusive. Previous studies have shown slowing of background rhythms during and after pyrexial illnesses\(^3\) and during artificially induced fever.\(^4\) The background rhythms in the present study were generally slower than expected for the children’s ages but no fluctuation with temperature was detected, suggesting the slowing is caused by an effect of the infection other than fever.

It has been suggested that fever precipitates reflex anoxic seizures that progress to typical febrile convulsions.\(^6\) None of the present children had asystole, and seizure activity occurred independently of cardiac rhythm. We are unable to exclude asystole as the final precipitating event for clinically observable seizures, but seizure activity in this study could not be attributed to anoxia. Our findings did not help to predict early recurrences of febrile convulsion.

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**References**


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**Weight as the best standard for glomerular filtration in the newborn**

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**SUMMARY** The relation between surface area and body weight changes dramatically in infancy. In 31 healthy infants of 27 to 40 weeks’ gestation, variations in glomerular filtration rate were reduced more than twofold by choosing glomerular filtration rate/kg body weight rather than glomerular filtration rate/m². The former provides the most useful and practical index of renal function in the neonate.

Although the use of surface area for standardising glomerular filtration rate minimises age and weight dependent variations in children and adults, this has never been tested in infancy, when surface area:weight changes most dramatically. We have, therefore, tested glomerular filtration rate data from preterm and term babies to find which standard reduces the variation most effectively.

**Patients and methods**

Thirty one well babies of 27 to 40 weeks’ gestation weighing 0.68 to 3.7 kg were studied between 2 and 7 days of age. Twenty five (81%) of the infants were below the 50th centile for weight and 11 (35%) were below the 10th. Glomerular filtration rate was measured by the 24 hour constant inulin infusion method\(^1\) on average three times for each baby, and the mean value taken. Surface area was estimated by Boyd’s formula\(^2\) and a weight index was calculated as:weight:50th centile weight. The study had the approval of the local ethical committee, and informed parental consent was obtained.

**Results**

Glomerular filtration rate values varied more than 10 fold between babies (0.50 to 5.71 ml/min), but only fivefold when expressed per unit surface area (4.5 to 22.6 ml/min/m²) and less than threefold when expressed per unit body weight (0.59 to 1.56 ml/min/kg). Glomerular filtration rate/m² and glomerular filtration rate/kg were each positively correlated with weight (P<0.001), gestational age (P<0.001), and weight index (P<0.05). Multiple
pressed both excretion of surface glomerular and would be have to be with surface a maintain a term (Fig. 2).

regression analysis, however, showed that when weight was accounted for there was no longer any association with either gestation or weight index (P>0.25 in each case). The slope of the regression line relating glomerular filtration rate/m² to body weight is two and a half times steeper than that for glomerular filtration rate/kg (P<0.05) (Fig. 1). Glomerular filtration rate/m² therefore shows wider variations between infants of different sizes than glomerular filtration rate/kg.

Discussion

The ratio of glomerular filtration rate to surface area hardly changes between age 2 years and adulthood, while surface area:weight falls by about 40%. Surface area:weight alters much more dramatically, however, during infancy (it is about four times higher for a baby of 27 weeks’ gestation than for an adult) and falls by one third between 27 weeks’ and term (Fig. 2). For a physiological function to vary with surface area, its value per kilogram in early life would have to be large and change very rapidly. To maintain a glomerular filtration rate of 80 ml/min/m², a baby of 27 weeks’ gestation would need to filter 8 ml/min/kg, whereas the figure for an adult would be 2 ml/min/kg.

The metabolic rate determines the need for the excretion of waste products. Basal metabolic rate and glomerular filtration rate correlate in older children and adults in that they each vary closely with surface area. Metabolic rate has been expressed both as metabolic rate/m² and metabolic rate/kg in newborn infants; the advantage of using metabolic rate/kg is shown by data previously presented by one of us. The effects of environmental temperature and postnatal age on metabolic rate were easily recognised because size related variations were eliminated. If the same data are expressed per surface area, the regression of metabolic rate/m² on both weight and gestation (P<0.01) almost masks the effects of the other factors. Our finding that glomerular filtration rate is more closely related to weight than surface area in newborns, therefore, fits well with the data on metabolic rate.

The use of surface area to ‘correct’ neonatal glomerular filtration rate may be more than a mere extrapolation of convention; it may relate to the unifying ‘law of surface area’. This century old law has, however, been shown to be invalid, and its use has led to many false conclusions. Over 30 years ago, McCance and Widdowson argued that the incorrect selection of surface area as a basis for comparison had delayed the understanding of juvenile renal function, but predicted pessimisti-
Weight as the best standard for glomerular filtration in the newborn

Cushing's syndrome and bronchial carcinoid tumour

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SUMMARY Adrenal function test results in a girl with Cushing's syndrome and a bronchial carcinoid tumour suggested pituitary dependent hypercortisolism. Resolution after excision of the tumour indicated that her condition had been caused by ectopic adrenocorticotrophic hormone secretion. Conventional tests of adrenal function may be misleading in cases of adrenocorticotrophic hormone secreting bronchial carcinoid tumours.

The aetiology of Cushing's syndrome can usually be determined from the serum adrenocorticotrophic hormone concentration and the response of urinary corticosteroids to high dose dexamethasone and metyrapone. In some circumstances, however, these investigations may be misleading. We report a patient who seemed to have pituitary dependent hypercortisolism but was subsequently shown to have an adrenocorticotrophic hormone secreting bronchial carcinoid tumour.

References
5 McCance RA, Widdowson EM. The correct physiological basis on which to compare infant and adult renal function. Lancet 1952;i:860-2.

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