Weighing alone will not prevent hypernatraemic dehydration

Having recently reviewed the case notes of babies readmitted to hospital in the first 10 days of life (over a one year period), we firmly agree with the views expressed by Laing and Wong.1 The incidence of documented hypernatraemic dehydration secondary to the failure of lactation in Bristol is 1.7 per 1000 live births much higher than that described by Oddie et al in the Northern Region (2.5 per 10 000 live births). In addition only 50% of infants readmitted with weight loss of <10% had a plasma sodium concentration measured. The true incidence of hypernatraemic dehydration secondary to lactation problems in Bristol could thus be as high as 3.4 per 1000 live births. Our estimate could be an underestimate. Firstly, our study looked only at infants readmitted within 10 days (Oddie et al looked at infants readmitted up to 1 month of age) and secondly, due to failure to recognise this condition.

Laing and Wong proposed weighing all infants when the Guthrie blood samples are taken, to identify those infants at risk of dehydration. We believe that this is too late as in many areas this occurs on days seven or on day 10 with handover of care to the health visitor. We have already described a series of babies with hypernatraemic dehydration where all presented to hospital before day seven.1 The case has been made correctly that newborn hypernatraemia is due to unsuccessful feeding.2 While we agree that careful examination and observation of the infant while feeding and so forth may identify these babies, we would dispute that this is currently universally possible. Due to midwifery shortages, postnatal wards are staffed and community midwives are fully stretched, so many women are discharged within a few hours of delivering. If a midwifery home visit does not coincide with a feed, the mother’s assessment of feeding is assumed to be correct (as indeed it usually is). Weighing the baby will reassure most mothers that their baby is following the normal pattern of loss followed by gain. Identification of excessive weight loss should prompt the health professional to examine the baby for evidence of illness and carefully observe breast feeding technique. These mother-baby dyads could then be given additional support and advice in the community and thus successfully establish feeding. In our experience once the baby has become ill and required readmission to hospital the mother is reluctant to continue to attempt breastfeeding.

There continues to be confusion regarding the best way to manage this problem.1 It should be remembered that these babies have normal guts and are suffering from starvation. If the infant is not shocked, rehydration can occur safely using enteral fluids: expressed breast milk or a breast milk substitute. Serum sodium should be measured six hourly initially and the volume of milk altered to ensure a slow return to normality.

We believe that we need to foster a greater awareness of this problem and weigh the babies at risk around day five if we are to prevent tragedies resulting from a common condition affecting otherwise well babies.

D Harding, J Maxham, P Cairns
Neonatal Medicine, Department of Child Health,
University of Bristol, Bristol, UK;
david.harding@bristol.ac.uk

References
1 Laing IA, Wong M. Hypernatraemia in the first few days: is the incidence rising? Arch Dis Child 2002; 87:F158–61.

Hypernatraemic dehydration: excess sodium is not the cause

I am grateful to Laing and Wong for raising the issue of hypernatraemic dehydration once again the issue of hypernatraemic dehydration in infants. However, I think it is important to remember that hypernatraemic dehydration, like anaemia, is a sign of disease and not a diagnosis in itself. A low haemoglobin concentration in blood can be caused by a large number of different pathological and physiological processes. Hypernatraemic dehydration should be seen in the same light.

Laing and Wong’s article describes two situations in which a child can be found to exhibit the typical biochemical and clinical features of hypernatraemic dehydration, that is—weight loss and hypernatraemia. The first mentioned is associated with gastroenteritis in a bottle fed infant, commonly a few weeks old and the second is seen in “breast fed” infants in the first few days of life. The hypernatraemia associated with these situations is caused by different problems with water balance—in neither is the problem an increased intake of sodium. In the infant with diarrhoea there is an excess loss of water and in the “breast fed” baby an insufficient intake of water.

In discussing hypernatraemic dehydration in association with diarrhoea in young infants, Laing and Wong refer to a paper by Chambers and Steel, where attention is drawn to the slightly increased concentration of sodium in artificial milk mixed incorrectly by parents. This is a red herring. The excess sodium concentration of the artificial milk mixed incorrectly by the mothers reached a maximum of 59 mmol/l with a mean of 37.2 mmol/l. Those who believe that this concentration of sodium could be responsible for hypernatraemic dehydration are advised to remember that the concentration of sodium in the standard oral rehydration solutions in use in the UK is either 60 mmol/l (Dioralyte, Dioralyte rebel, Diocalm junior) or 50 mmol/l (Rehidrat, Electrolyde) and that the WHO formulation for oral rehydration solution contains 90 mmol/l of sodium.

In fact the cause of this association of hypernatraemic dehydration with diarrhoea is the continued feeding with artificial milk after the onset of diarrhoea. The intestinal hurry associated with gastroenteritis results in the delivery of a solution rich in protein and complex carbohydrates to the colon which, after digestion by colonic bacteria, produces a considerable osmotic load in the colon, which in turn results in the production of voluminous stool low in sodium. This results in hypernatraemic dehydration due to excessive water loss. Those who require further discussion of this hypothesis are advised to read the excellent paper by Hirschhorn.4

The second situation relates to the title of the piece, namely hypernatraemic dehydration in the first few days of life in association with “breast feeding”. Though the breast milk produced, in very small quantities, by the mothers of these children is often found to contain a high concentration of sodium, this has nothing to do with their babies’ hypernatraemic state. As Jack Newman puts it so eloquently in his electronic response to Laing and Wong, these babies are not dehydrated because they are breast fed but because they are only pretending to breast feed. They are, in fact, starving. This is amply illustrated by the case described in Oddie et al of a “bottle fed” baby admitted at 6 days of age with hypernatraemic dehydration whose dehydration had nothing to do with the bottle milk being “fed” to her but was caused by that she had oesophageal atresia.5 Hypernatraemic dehydration is frequently seen in the elderly and the mentally handicapped when their need for basic care, and presumably a regular intake of water, is neglected.

Hypernatraemic dehydration is a sign of illness not a diagnosis. It is commonly caused by excess water loss or by insufficient water intake. It can be either alone or in addition to other losses, and almost never the result of excess sodium intake, which would result in retention of water and an increase in body weight, though this would obviously require intact thirst mechanisms and access to sufficient water.

S Richmond
Sunderland Royal Hospital, Sunderland, UK;
Sam.richmond@ncl.ac.uk

References

www.archdischild.com
Hypernatraemia in the first few days: a tragic case

In the MCA, including systolic, diastolic, and pulse pressure, the mean arterial blood pressure is often achieved by TcBM, TcMB, and TSB in 122 healthy newborns (gestational age 34–42 weeks; mean birth weight 929 (250) g. We found that a significant increase in cerebral blood flow between days 1 and 2 was accompanied by a significant decrease in cerebral fractional oxygen extraction (FOE). High cerebral FOE may protect the brain from hypoxic-ischaemic injury, a potential consequence of reduced cerebral blood flow.

The results presented by Evans et al give an insight into the complex relationships that exist within a dynamic fluid system. Systemic blood pressure was closely related to MCA mean velocity, but not estimated MCA diameter, thus implying that the cerebral blood flow would vary independently of systemic blood pressure because of changes in cerebrovascular resistance. Our own observations have produced similar results. Cerebral FOE, which is expected to increase as cerebral blood flow decreases, is not related to mean arterial blood pressure. There is, however, a significant relationship between cerebral FOE and left ventricular output, which is a major determinant of cerebral blood flow. This latter finding is in agreement with the observation of Evans et al that superior vena cava flow, also related to central blood flow, was significantly associated with cerebral FOE. Evans et al remind us that velocity is not the same as flow. Their observations, and our own, stress the importance of vascular resistance in mediating the relationship between blood pressure and blood flow. In the sick preterm infant, the presence of an adequate mean arterial blood pressure is often achieved using pharmacological methods. Although this reassures us, it does not guarantee the presence of good central blood flow, nor the adequate perfusion of the end organs, including the brain.

C M Kicass, S P Wardle, A M Weindling
Neonatal Unit, Liverpool Women’s Hospital, Liverpool, UK; ukmeanrhirad@yahoo.co.uk

In a cohort of preterm infants, Blood flow (F), blood pressure (P), and vascular resistance (R) are closely related (F = P/R), and resistance changes are a function of changing vessel calibre. The authors attempted to measure MCA diameter, but because measurements were inaccurate the authors did not attempt to calculate values for MCA blood flow.

Our own studies of cerebral haemodynamics, using near infrared spectroscopy, support the view of Evans et al that there are significant changes in cerebral blood flow over the first 36 hours after birth. The demographic details of our cohort were similar to the one studied by Evans et al. We found that the mean birth weight 929 (250) g. We found that a significant increase in cerebral blood flow between days 1 and 2 was accompanied by a significant decrease in cerebral fractional oxygen extraction (FOE). High cerebral FOE may protect the brain from hypoxic-ischaemic injury, a potential consequence of reduced cerebral blood flow.

The results presented by Evans et al give an insight into the complex relationships that exist within a dynamic fluid system. Systemic blood pressure was closely related to MCA mean velocity, but not estimated MCA diameter, thus implying that the cerebral blood flow would vary independently of systemic blood pressure because of changes in cerebrovascular resistance. Our own observations have produced similar results. Cerebral FOE, which is expected to increase as cerebral blood flow decreases, is not related to mean arterial blood pressure. There is, however, a significant relationship between cerebral FOE and left ventricular output, which is a major determinant of cerebral blood flow. This latter finding is in agreement with the observation of Evans et al that superior vena cava flow, also related to central blood flow, was significantly associated with cerebral FOE. Evans et al remind us that velocity is not the same as flow. Their observations, and our own, stress the importance of vascular resistance in mediating the relationship between blood pressure and blood flow. In the sick preterm infant, the presence of an adequate mean arterial blood pressure is often achieved using pharmacological methods. Although this reassures us, it does not guarantee the presence of good central blood flow, nor the adequate perfusion of the end organs, including the brain.

M Beck, N Kau
Department of Neonatology, Children’s Hospital Medical Center of the University of Bonn, Bonn, Germany

H Schlebusch
Center for Obstetrics and Gynecology of the University of Bonn, Germany

Correspondence to: Dr Beck, Zentrum für Kinderheilkunde der Universität Bonn, Adenauerallee 119, D-53113 Bonn, Germany; martin.beck@uni-bonn.de

References


Transcutaneous bilirubin measurement in newborn infants: evaluation of a new spectrophotometric method

Transcutaneous bilirubinometry in jaundiced newborns has been extensively evaluated in the literature. Information about the new BiliCheck (TcBC) device has appeared in recent years. Because of the high correlation coefficient, most studies conclude that transcutaneous bilirubinometry could possibly replace the laboratory measurement of serum bilirubin (TSB). However, the number of infants with serum bilirubin levels > 237 µmol/l (15 mg/dl) is too small to assess the accuracy of TcBC for such infants.

We tested the clinical usefulness of this new device and compared it with the established Jaundice Meter (TcBM) by evaluating the levels of agreement, with TSB as the clinically used standard. Bilirubin levels were measured by TcBM, TcMB, and TSB in 122 healthy newborns. We found that the wide limits of agreement, we noted that there are large. In particular, if TSB levels were higher than 188 µmol/l (11 mg/dl), the measurements of both instruments progressively deviated to lower bilirubin levels than TSB. This leads to a dangerous underestimation of TSB, especially if a decision on treatment has to be made.

We conclude that transcutaneous bilirubinometry with the BiliCheck can be used as a screening tool in the evaluation of hyperbilirubinemia, but it cannot replace labora-
tory measurements of serum bilirubin. Given the wide limits of agreement, we recommend that a venous blood sample is taken, if the difference between a potential phototherapy limit and the TcBC level falls below 60 µmol/l (3.5 mg/dl).
We observed hyponatraemia in several pre-
hydrocephalus consequences of serial liquor
Hyponatraemia as a sodium loss in liquor (natraemia (minimal serum sodium corre-
mmol/kg/day). The extent of the hypo-
0.4–3.7 mmol/kg/day (mean (SD) 1.98 (0.94)
loss of sodium in the tapped liquor was
3–34 ml (mean 15.6 ml). The resulting daily
maximum amount of liquor tapped a day was
mmol/l (mean (SD) 125.8 (6.3) mmol/l). The
serum sodium of all patients was 110–136
(range 23–32).

gestational age of these children was 27 weeks
less than 1500 g birth weight (430–1500 g)
16).

We observed hyponatraemia in several pre-
terms with a ventricular access device
after posthaemorrhagic
hydrocephalus

We observed hyponatraemia in several pre-
children treated with a ventricular access device (Rickham reservoir) after intra-
ventricular haemorrhage (IVH) and serial liquor puncture to drain liquor. To rule out a
connection, we retrospectively investigated the data of all preterm children (23–32 weeks
of gestational age) treated at the University Children’s Hospital of Cologne with a ven-

Sixteen of 480 preterm infants (3.3%) of
less than 1500 g birth weight (430–1500 g) developed an IVH and required treatment
with a ventricular access device. The mean gestational age of these children was 27 weeks
(range 23–32).

Twelve of them (75%) developed hypo-

Figure 1 Relation between serum sodium concentration and maximum sodium loss in the liquor (r = 0.78, p < 0.001).

Further analysis of the use of drugs—for example, thiazides—did not contribute to this
correlation. Two children with hyponatraemia
developed general hypotonia with poor feed-
ing; this prompted further diagnostic meas-
tures to exclude syndrome of inappropriate
antidiuretic hormone (SIADH) or excessive
sodium loss in urine. The investigations were
negative. Both children showed normal neu-
rology after administration of the
sodium lost. No child with hyponatraemia
developed other acute neurological symptoms
such as seizures.

This is the first report of hyponatraemia as a consequence of serial liquor punctures with
a ventricular access device in children. The sodium loss was sometimes as high as the
normal sodium requirement per day (3–5
mmol/kg/day).

Hyponatraemia in children caused by the use of a ventricular access device should be
managed carefully and the sodium replaced promptly. Loss of sodium by serial liquor tap-
ing must be taken into the differential diag-
nosis of hyponatraemia in preterm infants.

K Tenbrock, A Kribs, B Roth
Department of Neonatology and Pediatric Intensive Care, University Children’s Hospital of Cologne, Cologne, Germany

B Speder
Neurosurgical Department, University Hospital of Cologne

Correspondence to: Dr Tenbrock, Walter Reed Army Institute of Research, MCR, Washington DC 20307-5100, USA;
klaus.tenbrock@na.amedd.army.mil

References

Use of animal surfactant: should we seek consent?

Animal derived surfactants such as Curosurf (porcine) and Survanta (bovine) are the com-
monly used surfactants in the United King-

dom. Involvement in a trial of a new artificial surfactant, and the specific information on
the origins of the surfactant in the patient informa-
tion leaflet led us to review our prac-
tice. Two families declined to participate in the
trial. A Hindu family wished to avoid use of
Survanta, as cows are considered sacred in
Hindu religion. A Moslem family preferred to
avoid porcine products. Having reviewed our
own practice, we were unsure as to the prac-
tice of other units.

We telephoned the second on call doctors in
42 teams providing newborn resuscitation and initial surfactant therapy to preterm
infants in England and Wales. Respondents
were asked about which surfactant was avail-
able and whether the constituents were
asked about which surfactant was avail-
able for the origins of the surfactant in the
patient information leaflet. All units had a
practice of other units.

Only nine of 42 respondents said that they
would routinely discuss the constituents of
the surfactant with the families and could
remember having done so in the recent past.

Twenty two respondents in England said
that their units only stocked Curosurf, two
units stocked Survanta, and three units stocked Curosurf and Survanta. One did not
know which surfactant was available. In
Wales, 13 units had only Curosurf and one
unit stocked both Curosurf and Survanta.

We were surprised by the number of people who had thought about this being a possible
problem. With many units choosing to stock
only one surfactant, we think that it is impor-
tant to keep all parents fully informed both of
the importance of early administration and
the nature of the available surfactants.

We suspect that, with fully informed, most
parents would agree to a life saving medicine.
However, we are not sure if this consent
should be presumed where there are grounds
to wonder if this may be a problem. Individual
tamilies still need to make their decisions
to avoid the perception that the medical
profession has a patronising attitude.

We hope to generate a discussion to see if
a consensus can be evolved.

R Adappa, R Benson
Department of Paediatrics, Ysbyty Gwynedd,
Bangor, N Wales, UK
S Oddie, J Wylie
Neonatal Intensive Care Unit, James Cook
University Hospital, Middlesbrough, UK

Correspondence to: Dr Adappa;
Roshanadappa@aol.com

Intravenous propacetamol overdose in a term newborn

Following a prescribing error, a term female
infant was given two intravenous doses of 900
mg propacetamol (307 mg/kg/dose) at 6 hour
intervals, which is 10 times the routine dose
used in our unit (120 mg/kg/day, 30 mg/kg/
dose). When the error was noted, immediately
after the second dose, the plasma paracetamol
level was 163.8 mg/l. N-Acetylcysteine was
given as follows: 150 mg/kg (450 mg) after 15
minutes, 50 mg/kg (145 mg) after four hours,
and 100 mg/kg (290 mg) after 16 hours.
Plasma paracetamol levels were checked:
119.9 mg/l five hours later, 61.4 mg/l 11 hours
later, 28.8 mg/l 16 hours later, and finally 1
mg/l 24 hours after the second dose (fig 1).
Liver function and clotting factors were
normal. The infant was discharged on day 7.

Paracetamol poisoning in newborn babies is
usually due to either maternal absorption of
high doses of the drug just before birth or oral
absorption of an inappropriate dose.1 Reports
of propacetamol overdose are unusual, and so
far the overdose has only been by intramuscu-
lar injection.1 As far as we know, this is the
first report of intravenous propacetamol poi-
sioning in a newborn. This reason may be the
rare use of this drug during the neonatal
period, the pharmacokinetics having been

Figure 1 Serum paracetamol levels after administration of N-acetylcysteine.
published in only one study for this stage of life. However, as with other routes of administration described in the literature, no adverse effects were seen in this case. The administration of N-acetylcysteine following guidelines given for older patients proved efficient. The elimination of the drug seems to be linear. Although drug overdose should be carefully avoided, intravenous propacetamol is probably safe in term newborn babies.

A de la Pintière, A Beuchée, P E Bétrémieux
Unité de réanimation néonatale et pédiatrique, Pavillon Lechartier CHU Pontchaillou, Rennes 35033, France; pierre.betremieux@chu-rennes.fr

References

Endotracheal tube fixation in neonates
A stitch in time saves nine. But not all neonatal units believe in this saying and use different methods to secure oral endotracheal tubes in neonates who require ventilatory support. Success in stabilising a premature infant is best achieved by least intervention and good ventilatory support. A stable oral endotracheal tube will help. A naso-oral endotracheal tube is extremely easy to stabilise; however, stabilisation is not routinely performed in the United Kingdom.

Three commonly used methods are: (a) stitching the tube to a plastic flange; (b) fixing a premeasured and cut tube in a flange with adhesive tape; (c) fixing a premeasured and cut tube into a tight fitting flange. In all three methods, the tube is secured by tying it to the baby’s hat.

Normally, weight or foot length is used to determine endotracheal tube size, and this is quite reliable. However, head movement, suctioning, and patient care can all cause instability and displacement of the tube. If the tube is too short, there will be ineffective ventilation. If the tube is too long, it may collapse resulting in selective ventilation. A precut tube is difficult to manipulate if the positioning is not satisfactory. This is not a major problem in a stitched tube. There are pros and cons to each method. There are no comparative studies from the United Kingdom to evaluate the benefits and disadvantages of each method. A search through the databases found no randomised trials comparing various techniques, except one study which compared an umbilical clamp with the routine fixing method.

Accidental extubation or unsatisfactory positioning of the tube may influence the reintubation rate. Securing and properly stabilising an endotracheal tube can solve this problem to a large extent. A prospective randomised trial evaluating each method against reintubation criteria will help neonatal units to adopt the correct policy for their own situation.

V A Pai
Southmead Hospital, Bristol, UK
B V Pai
Royal united Hospital, Bath, UK; binapai@hotmail.com

References
Hyponatraemia as a consequence of serial liquor punctures in preterm infants with a ventricular access device after posthaemorrhagic hydrocephalus

K Tenbrock, A Kribs, B Roth and B Speder

Arch Dis Child Fetal Neonatal Ed 2003 88: F351
doi: 10.1136/fn.88.4.F351

Updated information and services can be found at:
http://fn.bmj.com/content/88/4/F351.1

These include:

References
This article cites 3 articles, 1 of which you can access for free at:
http://fn.bmj.com/content/88/4/F351.1#BIBL

Email alerting service
Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

Notes

To request permissions go to:
http://group.bmj.com/group/rights-licensing/permissions

To order reprints go to:
http://journals.bmj.com/cgi/reprintform

To subscribe to BMJ go to:
http://group.bmj.com/subscribe/