The First Year of Life

H B VALMAN

DIARRHOEA

Diarrhoea is the passage of loose stools more often than would be expected from the diet and age of the infant. It indicates a change in bowel habit. A stool should be examined personally. A rectal examination or the passage of a rectal thermometer is often followed by a fresh stool, which can be examined. When diarrhoea is severe the stools may be mistaken for urine. When this is a possibility a urine bag should be placed in position and the infant nursed on a sheet of polyethylene.

The stools of the newborn infant vary with his diet. The normal stools of a breast-fed infant are never formed, may be passed at hourly intervals, may contain mucus, and may be green. When lactation becomes established between the 3rd and 5th days intestinal hurry is common, resulting in frequent stools. Later the stools tend to become less frequent and more pasty, and by the age of 3 weeks they may be passed once every two or three days. No treatment is needed. In contrast, the normal stools of a bottle-fed infant are formed and do not contain fluid or mucus. With certain cows' milk preparations the stools may be dark green, but this has no sinister meaning.

Acute gastroenteritis

Acute gastroenteritis is an acute infection mainly affecting the small intestine which causes diarrhoea with or without vomiting. The main danger is dehydration and electrolyte imbalance, but the infant may also be very infectious for other infants in a ward or nursery. Gastroenteritis is particularly dangerous to infants aged under 2 years.

The early signs of dehydration are often difficult to detect, but recent weight loss is often a valuable indicator. Sunken eyes, inelastic skin, and a dry tongue are late signs, but if the infant has not passed urine for several hours severe dehydration is probable. Clinical signs of dehydration are particularly difficult to detect in fat toddlers.

The infant must be examined in detail to exclude any other acute infection.

The rotavirus is the most common cause of gastroenteritis in children, and recent studies have shown that the initial features of rotavirus often include fever and acute otitis media or other signs of an acute upper respiratory tract infection. If the patient is given an antibiotic at this stage the subsequent diarrhoea may be attributed to the antibiotic rather than to the rotavirus infection. Other drugs—for example, iron—may also be associated with diarrhoea. Diarrhoea may also be the first symptom of a urinary tract infection.

Management

Regrading guide for DOCTORS

Total for 24 hours

Day	Volume of glucose mixture (ml)	Volume of milk (ml)	Total volume in 24 hours
1	150 x wt	0	150 x wt
2	120 x wt	30 x wt	150 x wt
3	90 x wt	60 x wt	150 x wt
4	60 x wt	90 x wt	150 x wt
5	30 x wt	120 x wt	150 x wt
6	0 x wt	150 x wt	150 x wt

No patient should receive more than 12 litres in 24 hours
Feeds can be given hourly or 3-hourly initially and then less frequently

Regrading guide for MOTHERS

For each feed

Day	Volume of glucose mixture (ml)	Volume of milk (ml)	Total volume in each feed (ml)	No of feeds in 24 hours	Weight of infant (kg)
1					
2					
3					
4					
5					
6					

The milk and glucose mixture should be mixed and then given to the baby

Clinical signs of severe dehydration or the loss of 5% or more of body weight are definite indications for admission. If the infant relapses after treatment or there are social problems preventing treatment being carried out at home the infant should also be admitted. Infants who vomit persistently usually need to be admitted, though mild symptoms may be managed by giving frequent small volumes of liquid by mouth.

The main principle of management is to stop milk and solids and give a glucose or sucrose mixture. Milk is gradually introduced over about five days, and this method is called regrading of feeds. Written instructions should be explained and then given to the mother. Standard forms may be helpful. Regrading may be carried out more quickly for toddlers and older children with mild symptoms. Vomiting may be reduced by giving small volumes of fluid every half hour or hour. Solids—for example, fruit or vegetable purées—should be started when the child is receiving full-strength milk.

Kaolin or Lomotil should not be prescribed as it deflects the mother's attention from the main treatment. Lomotil has no place in the management of children. No antibiotics should be given to children with gastroenteritis treated at home.

Infants admitted to hospital with severe dehydration or persistent vomiting may need intravenous fluids and the withdrawal of all oral fluids for 24 hours. During the next day a third of the fluid requirement is given as oral glucose-electrolyte mixture, and later a dilute milk mixture is gradually introduced. Most infants are discharged from hospital on their normal diets within a week of admission. In hospital, infants with diarrhoea must be barrier nursed in a cubicle, which should ideally be in an annexe to the children's ward.

Oral rehydrating fluids

The ideal rehydrating fluid is a glucose-electrolyte mixture, but a 5% glucose or 5% sucrose solution is easily available and safe. The 5% glucose solution can be supplied in a 1-litre plastic pack of intravenous fluid or can be made up by the mother using 3 level teaspoonfuls of glucose in 200 ml (6 oz) water. It is potentially dangerous for mothers to add salt to this mixture. Single-dose sachets of glucose-electrolyte powder (Dioralyte) have recently become available, which enable mothers to make up the mixture accurately at home.

Investigations

Stool culture

Electron microscopy
of stool

Urine culture

Plasma sodium, potassium
and urea estimations

Ideally a stool should be sent to the laboratory for culture of pathogens, but this is not necessary for mild cases treated at home. Only about 15% of patients have bacterial pathogens such as pathogenic *Escherichia coli* isolated from their stools. Most cases of gastroenteritis in children are caused by viruses, usually of the rotavirus group, and these can be identified by electron microscopy of the stool.

Infants needing intravenous fluids should have their plasma electrolyte and urea concentrations measured urgently.

If two or more infants in a ward or nursery have diarrhoea at the same time, even if their stool cultures show no pathogens, cross-infection should be presumed. Stools from all the infants on the ward should be sent for culture and electron microscopy. It may be necessary to stop admissions to the ward.

Progress and relapse

The infant must be seen again by the doctor within 12 hours of starting treatment to ensure that the illness is improving, the infant is not losing an excessive amount of weight, and the mother understands the management. It must be remembered that severe dehydration can occur within a few hours. It is helpful to have a specific policy to ensure adequate follow-up visits either at the family doctor's surgery or at the hospital.

The main cause of relapse or persistent symptoms is failure to follow a plan of treatment, and these patients must be admitted to hospital. A few infants, however, have temporary mucosal damage, which may cause intolerance to cows' milk protein or to lactose for several weeks or months.

If the stool fluid contains over 0.5% of reducing substances when tested with Clinitest a specimen should be sent to the laboratory for sugar chromatography. Testing the stool with Clinitest should be performed in a disposable tube—for example, a universal container—to avoid contamination of the nurse's hands with potentially infected material. Secondary lactose intolerance may be the cause of the diarrhoea, and the symptoms may be alleviated by giving lactose-free milk. Lactose intolerance is often associated with cows' milk protein intolerance, and many paediatricians prefer to give a milk substitute that is free of both cows' milk protein and lactose.

Vitamin supplements are needed and can be given as Ketovite liquid together with Ketovite tablets, which are lactose- and sucrose-free. The special diet should be supervised by a paediatric dietitian.

Small amounts of lactulose produced during sterilisation of the commercially prepared fluid feeds used in hospitals may produce symptoms similar to those of lactose intolerance. In these patients it may be necessary to use dried powdered milk rather than these prepared feeds.

Dr H B Valman, MD, FRCP, is consultant paediatrician, Northwick Park Hospital, and Clinical Research Centre, Harrow.

Some useful drugs in older infants

Infants treated at home and most of those in hospital need oral drugs three times a day. They should be given before feeds and the infant need not be woken specially for the drug. Some preparations, particularly the penicillins, have an unpleasant taste and the medicine should not be mixed with food as the infant may then hate both. Syrup, which is a sucrose solution that forms the base of most elixirs, may cause dental caries if it is given regularly for a long time. If only one adult is present to give the medicine, wrapping the infant securely in a blanket may prevent spillage.

Amoxycillin 50 mg/kg/24 h
 Ampicillin 100 mg/kg/24 h
 Cephalexin 40 mg/kg/24 h
 Chloral hydrate 30 mg/kg/24 h
 Cloxacillin 100 mg/kg/24 h
 Co-trimoxazole 6 mg/kg/24 h (as trimethoprim)
 Diazepam 0.04–0.2 mg/kg orally, 0.1–0.2 mg/kg slowly intravenously
 Erythromycin 50 mg/kg/24 h
 Flucloxacillin 50 mg/kg/24 h
 Gentamicin 7 mg/kg/24 h intramuscularly or intravenously
 Hyaluronidase 300 units per dose
 Nystatin 100 000 units per dose (four-hourly)
 Paracetamol 75 mg/kg/24 h
 Paraldehyde 0.15 ml/kg per dose *intramuscularly*
 Benzylpenicillin (intramuscular) 150 mg/kg/24 h
 Phenoxymethylpenicillin 60 mg/kg/24 h
 Phenobarbitone 5 mg/kg/24 h
 Phenytoin 5 mg/kg/24 h
 Promethazine hydrochloride 1 mg/kg per dose
 Trimeprazine tartrate 3 mg/kg per dose