A COMMON CAUSE OF DIARRHOEA, VOMITING, AND DEHYDRATION IN INFANTS

BY

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Disease in infants is frequently characterized by diarrhoea, vomiting, and increasing dehydration. Sometimes this condition is due to gastro-enteritis, proved by the discovery of a causative organism in the stools and post-mortem appearances in the intestine. More often, however, no causative organism is discovered, and at necropsy no abnormality is found in the intestine. It is obvious, therefore, in this type—and it is exceedingly common—that the diarrhoea, vomiting, and dehydration are not due to gastro-enteritis, and that such a diagnosis, if made, is incorrect. The object of this communication is to point out a condition in this type of case which, though frequently unsuspected, is commonly present, to describe how it is acquired, and to give reasons for the belief that it accounts satisfactorily for the symptoms.

It is well known that at post-mortem examinations on children who during life had suffered from diarrhoea, vomiting, and dehydration an unsuspected purulent mastoiditis is frequently discovered on both sides. As an explanation it has been suggested that the mastoiditis is a terminal event. But since mastoiditis, if present, as will be shown later, can be diagnosed with certainty two or three weeks before death, this explanation is unconvincing. We are forced, therefore, to the conclusion that many infants dying from diarrhoea, vomiting, and dehydration have had in addition an unsuspected bilateral mastoiditis two or three weeks before death.

Method by which Mastoiditis is Acquired

The Eustachian tube in infants is more horizontal than in adults and, as in them, opens with each act of swallowing. When the child is lying on his back the tube is perpendicular, so that when open, as in swallowing, any foreign liquid in the post-nasal space is free to pass by gravity and suction into the tympanum and mastoid antrum—in this way milk, vomit, or infected mucus is offered an easy entrance. It is well known that a majority of infants suffering from severe diarrhoea, vomiting, and dehydration are well under 1 year old—too young to sit up—and are bottle-fed, often while lying down, in an ideal position for milk or any other liquid to reach the mastoid antrum through the Eustachian tube by gravity and so cause a mastoiditis. Diarrhoea, vomiting, and dehydration, and therefore mastoiditis, however, are not confined to children who cannot sit up and are bottle-fed. It frequently happens that a child who is in hospital suffering from some air-borne infection, after having recovered from it develops diarrhoea, vomiting, and dehydration. These children have been too ill to sit up, so that infected mucus or liquid food or vomit in the post-nasal space can easily enter the mastoid cavity, infecting it in the same way.

We may conclude, therefore, that mastoiditis is commonly caused by milk, vomit, or infected mucus entering the Eustachian tube in children who are either too young or too ill to sit up, and are accordingly nursed and perhaps fed while lying on their backs.

Pathology of Diarrhoea, Vomiting, and Dehydration due to Mastoiditis

We have come to the above conclusion that gastro-enteritis is not the cause of diarrhoea, vomiting, and dehydration because this condition is not present. That mastoiditis is the cause is based upon the fact that after operation these symptoms have often rapidly disappeared. The tympanic cavity and mastoid antrum are supplied by parasympathetic fibres from the seventh and ninth cranial nerves. When these cavities are inflamed the nerve endings are stimulated, causing a parasympathetic reflex whose afferent limb travels in the seventh or the ninth nerve, the efferent limb in the tenth, which supplies the intestine with secretory fibres. The normal harmony between parasympathetic and sympathetic innervation

is upset in favour of the parasympathetic, leading to hypersecretion, evidenced by diarrhoea, vomiting, and dehydration.

Diagnosis

We must remember that an infant cannot tell us that he has earache; that it is impossible to find out by pressure over the mastoid whether he has pain or not; that discharge from the ears is seldom present; that examination of the tympanic membrane is often impossible, and even when a view is obtained the appearances may be equivocal; and, finally, that only very rarely is there a swelling behind the ear. In fact, none of the ordinary physical signs associated with acute mastoiditis in elder children is present. Yet in addition to diarrhoea and vomiting a careful examination will elicit additional symptoms and physical signs which allow a diagnosis of mastoiditis to be made with certainty. Perhaps a recent rise in temperature has been noticed; the child has begun to cry out as if in pain; he puts his hand to his head and rolls his head on the pillow, causing a bald patch on the back of his head. On rare occasions a discharge appears from one or both ears. The tympanic membrane, if seen, may be pink or may lack the normal lustre. Almost invariably the lymph nodes in the posterior triangle of the neck are enlarged so that they roll under the finger. This is the most significant physical sign, and is of greater diagnostic value than the appearance of the tympanic membrane.

It may be said with confidence that if a child suffering from diarrhoea and vomiting has enlarged glands in the posterior triangle and has in addition some of the above physical signs, a mastoiditis is present. If this child is losing weight and going downhill in spite of sulphonamides and intravenous salines a mastoid operation is urgently required to save his life. It is not suggested that all cases suffering from mastoiditis require operation; many recover spontaneously, probably helped by sulphonamides and certainly by intravenous salines and blood transfusion. In a certain number, however, the mastoiditis is progressive, and these patients, unless treated surgically, will inevitably die.

Prevention

It has been shown above that mastoiditis occurs chiefly in bottle-fed infants who, being too young to sit up, are fed lying down, and also in elder children suffering from air-borne infection or other illness which has rendered them too ill to sit up. On this account such children have been nursed and perhaps fed in the recumbent position—a position which invites mastoid infection by liquid food, vomit, or infected mucus passing through the Eustachian tube. It is therefore suggested that children should never be fed while lying down, nor should they ever be allowed to lie for a long time on their backs; they should be propped up in bed and constantly changed from side to side if too young or too ill to do so themselves.

The operation in itself is an extremely simple one and can be completed on both sides in about 15 minutes. If the child has no air-borne infection light ether anaesthesia is satisfactory, but should there be bronchitis or pneumonia or a suspicion of any form of pneumonitis a local anaesthetic should be given. It must be stressed that the condition, as its aetiology suggests, is nearly always bilateral, and that the best results are achieved by opening both mastoids at the primary operation.

Conclusion

It would appear relevant to state that the remarks made above are the result of work done chiefly at the Royal Liverpool Children's Hospital in co-operation with the physicians and surgeons during the last 20 years. During this period more than 2,000 cases of progressive mastoiditis have been selected for operation; all of them were obviously going downhill, and in the vast majority mastoiditis was proved at operation. Without surgical aid all would have died; after operation approximately 80% recovered. It is clear, therefore, that were co-operation between physician, general practitioner, and aural surgeon more complete and more universal the death rate among infants would be materially reduced, possibly even halved. It is stressed that when diarrhoea, vomiting, and dehydration is due to progressive mastoiditis the condition cannot be cured by sulphonamides, intravenous salines, or changes of diet.