Hydrocephalus and primary ciliary dyskinesia

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SUMMARY Primary ciliary dyskinesia was shown in a 12 year old boy with bronchiectasis who had developed hydrocephalus in the neonatal period. The possible relevance of his ciliary abnormality is discussed.

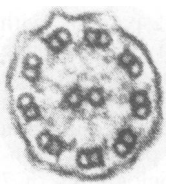

Figure *Cross section of nasal cilium showing normal inner but absent outer dynein arms (× 100 000).*

Primary ciliary dyskinesia (also known as the immotile cilia syndrome) is a genetically determined condition in which cilia beat ineffectively or are immotile.[1] Ciliated cells line upper and lower respiratory tracts and the eustachian tube. Predictably impairment of mucus clearance at these sites produces chronic sinusitis, recurrent chest infections or bronchiectasis, and chronic otitis media. Kartagener's syndrome (dextrocardia, sinusitis, and bronchiectasis) is now known to be a subgroup of primary ciliary dyskinesia as approximately half of the patients with the latter condition have normal cardiac situs.[1] Ciliated epithelium lines the ventricular ependyma of the brain and spinal cord, although its function is unknown. The concurrence of hydrocephalus and primary ciliary dyskinesia is of interest, therefore, not only as an important clinical association but because it may suggest a function of cilia in the embryonic development of cerebrospinal fluid pathways.

Case report

The patient, a 12 year old boy, was born at term by caesarean section in view of fetal distress, and required intubation for birth asphyxia. At 48 hours of age he developed respiratory distress; chest radiograph showed bilateral patchy consolidation and laryngeal aspirates grew *Pseudomonas aeruginosa*.

His condition improved on antibiotics but at 2 weeks of age excessive head growth was noted. Air encephalography showed dilatation of the lateral, third and fourth ventricles. The appearances suggested hydrocephalus due to exit foramina obstruction. It was thought at the time that the likely cause of his hydrocephalus was ventricular haemorrhage or meningitis but there was never any direct evidence of either. He was treated with a ventriculo atrial followed by a ventriculo peritoneal shunt, which has required revision on a number of occasions. Control of his hydrocephalus has, however, been satisfactory and he is of normal intelligence. Computed tomography of the brain confirmed the previously noted encephalographic appearances. Since infancy he has had repeated chest infections and 7 admissions to hospital for pneumonia. He has a chronic productive cough and chronic serous otitis media. He receives regular physiotherapy and prophylactic antibiotics. Physical examination shows an unusual face with large ears and an antimongolian slant to the eyes. He has horizontal nystagmus, ataxia of the upper limbs, and mild bilateral pes cavus with increased tendon reflexes in the lower limbs. Chest radiograph showed normal cardiac and visceral situs and bilateral basal lung shadowing with bronchial wall thickening suggestive of bronchiectasis. Sinus radiograph showed underdeveloped frontal and opaque maxillary sinuses. Sweat test, serum immunoglobulins, and white cell function studies were normal. Nasal mucociliary clearance[2] using a saccharin test was grossly delayed (more than one hour) and brushing of the inferior nasal turbinate[3] showed many completely immotile cilia. No ciliary beating was observed throughout the specimen. Transmission electron microscopy of nasal cilia showed absence of outer dynein arms[1] (Figure).

Discussion

A generalised disorder of ciliary beating led to upper and lower respiratory tract disease in a child developing hydrocephalus shortly after birth. A chance combination of the two conditions cannot be excluded, but it seems likely that his hydrocephalus is in some way connected to his ciliary defect as no

other cause for hydrocephalus was identified and his ependymal cilia can be presumed immotile. Human ependymal cilia are widely distributed throughout the ventricles, particularly the fourth,[4] and continue to beat in a coordinated fashion even after death.[5] In man their function is unknown but in rats ependymal cilia caused circulating currents in cerebrospinal fluid[5] and a mutant mouse (hpy/hpy) had generalised ciliary abnormalities, male sterility, and hydrocephalus.[1] The presence of hydrocephalus was noted in a previous series of patients with Kartagener's syndrome,[6] although the possible significance was not recognised. In another series, a patient with dextrocardia and chronic sputum production developed hydrocephalus requiring a Torkildsen shunt (Dr A Childs, personal communication). Cerebral computed tomography of 7 patients with Kartagener's syndrome yielded equivocal results, although minor abnormalities of ventricular size were noted in two patients.[1] The association has not, however, been reported in any other major series. Clearly hydrocephalus is not a constant feature of primary ciliary dyskinesia nor do we suggest ciliary dyskinesia is important in the pathogenesis of most cases of hydrocephalus. It may, however, be a contributory embryological factor. Since secondary damage to the ependymal ciliary system is well described in hydrocephalus,[4] it is only when a generalised ciliary abnormality is present that a causal relation can be considered.

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Late presentation of haemorrhagic disease of the newborn

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SUMMARY A 9 week old infant presented with bleeding due to vitamin K deficiency. He had not been given vitamin K after birth but there was no associated risk factor for deficiency and he had not bled from circumcision performed at 8 days of age.

Haemorrhagic disease of the newborn caused by vitamin K deficiency occurs in the first few days of life. Where prophylactic vitamin K is not given presentation after the neonatal period is associated with breast feeding, diarrhoea, malabsorptive states, or enteral antibiotics.[1–3] Our patient presented with bleeding caused by vitamin K deficiency at 9 weeks of age with no evidence of underlying disease.

Case report

A 61 day old infant was brought to the emergency department because of orange discoloration of his napkin. Urine examination showed numerous urate crystals but no red blood cells or haemoglobin. A blood sample was drawn and the anus examined with a cotton tipped applicator. He was discharged only to return 12 hours later with continuous bleeding from the venipuncture site and rectum.

He had been born after a normal pregnancy and weighed 3050 g at birth. The mother had taken no drugs during pregnancy and the family history was negative for coagulation disorders. During the first week of life soft stools were noted but there was no diarrhoea; he was discharged from the maternity unit when 6 days old and was fed on ProSobee