chronic obstructive airways disease had received theophylline (daily dose 9.8 (4.7) mg/kg and 8.1 (3.6) mg/kg) and one with asthma had received aminophylline 250 mg intravenously before arrival; their mean initial serum theophylline concentrations were 11 (9.1) mg/l and 9.3 (7.5) mg/l. The differences between these doses and initial concentrations were not significant, but outpatient doses and initial concentrations correlated significantly ($p < 0.01$) but loosely ($r = 0.59$). Serum theophylline concentrations were within the therapeutic range (10–20 mg/l) in nine, potentially toxic in two,

Serum theophylline concentrations before and one to two hours after intravenous injection of 250 mg (*125 mg) aminophylline (optimum therapeutic range between broken lines).

and undetectable in two. Five patients who gave no history of treatment with theophylline had positive assays; in three the history was unsatisfactory, and two were receiving a compound preparation (Franol) not realised to contain theophylline.

The admitting doctor gave 250 mg aminophylline intravenously to 32 patients and 125 mg to one. The mean increase in serum theophylline concentration was 6.3 (2.4) mg/l. The figure shows individual serum theophylline concentrations before and after the injection. No acute complications were recorded.

Comment

To achieve therapeutic theophylline concentrations rapidly in untreated patients an initial dose of aminophylline 6 mg/kg intravenously has been recommended.^{2,3} Despite this advice, our findings suggest that the dose of aminophylline given intravenously in casualty was determined by the size of the ampoule (250 mg), which represented 4.1 (0.7) mg/kg in our untreated patients, and resulted in a mean serum theophylline concentration of only 7.5 (1.4) mg/l after one hour. Although peak serum concentrations occur immediately after the injection, we chose this interval to reflect the therapeutic appropriateness of the dose by allowing for redistribution of the drug and variations in the speed of injection.

In 17 patients treated with theophylline, only one received a modified dose of aminophylline; the doctor did not realise that theophylline had been taken by a further five. These findings underline the need for careful inquiry before administering intravenous aminophylline and for awareness of the composition of compound bronchodilator preparations.

Initial serum theophylline concentrations in those on treatment were mainly in the low or subtherapeutic range. The dose given (mean 3.8 (1) mg/kg) resulted in serum concentrations of over 20 mg/l in only the two patients with already high concentrations, although concentrations may have been higher immediately after the injection. In a recent study 14 (12%) of 113 outpatients in a stable condition receiving theophylline had serum concentrations over 20 mg/l.⁴ During exacerbations clearance of theophylline can fall, but patients often increase their rectal or oral intake. In one of our patients the result was an initial serum concentration of 40 mg/l.

Our results indicate the need to estimate aminophylline dosage more carefully to achieve optimum therapeutic concentrations and avoid overdosage. They support the current recommendations of a loading dose of 6 mg/kg in those who have not taken theophylline within 24 hours.⁵ A loading dose may be inappropriate in patients already being treated but, in the absence of evidence of toxicity, 3 mg/kg can be administered with relative safety if intravenous aminophylline is considered to be essential.

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Department of Respiratory Physiology, City General Hospital, North Staffordshire Hospital Centre, Stoke on Trent ST4 6QG

C S MUNRO, MB, MRCP, medical registrar
K PROWSE, MD, FRCP, consultant physician

Correspondence to: Dr C Munro.

Can *Trichomonas vaginalis* cause pneumonia in newborn babies?

The differential diagnosis of respiratory distress in the newborn baby is often difficult. The clinical and radiological picture of conditions such as bacterial and aspiration pneumonia may be similar to those of delayed absorption of lung fluid.^{1,2} Many babies are therefore treated empirically with antibiotics. We describe a patient who was considered to have one of the above conditions until microscopical examination of a wet preparation of tracheal aspirate showed many *Trichomonas vaginalis* organisms.

Case report

A boy weighing 3690 g was born at 40 weeks' gestation after an uneventful pregnancy. A mild vaginal discharge had occurred early in pregnancy; microscopical examination for *Trichomonas vaginalis* gave negative results, but *Candida albicans* was cultured. The membranes broke 15 hours before delivery. There was no passage of meconium and no sign of fetal distress. The baby was, however, asphyxiated at birth (Apgar scores were: 1 at 1 minute, 3 at 5 minutes, and 7 at 10 minutes). He was immediately intubated and placed on a ventilator. Thick white sputum was aspirated from the trachea. Microscopical examination of wet preparations of tracheal aspirate and gastric content³ showed scanty leucocytes and numerous organisms with motile flagella which resembled *Trichomonas vaginalis*. The identification was confirmed by the department of microbiology. A chest radiograph showed widespread patchy infiltrates in both lungs. A full blood count showed 7.1×10^9 leucocytes per ml with 21% band forms. The child was given ampicillin and tobramycin intravenously. Bacterial cultures of blood, cerebrospinal fluid, and aspirates of the trachea and gastric contents were sterile. As there was a rapid improvement in the clinical signs and blood gases we decided not to start treatment with metronidazole.

Assisted ventilation was stopped at 36 hours. The tachypnoea and radiological changes, however, persisted until day 7. The patient was well when discharged at 14 days of age and was thriving at follow up two weeks later.

Comment

We had previously found *Trichomonas vaginalis* in the gastric contents of two other babies with respiratory distress, but had not considered this contamination to be clinically important. McLaren *et al*³ have now suggested, however, that this parasite may cause neonatal pneumonia. They reported on two babies who required ventilation for their respiratory disease for which bacterial and viral causes were excluded. *Trichomonas vaginalis* was not seen on Gram's stain of the tracheal aspirate, and diagnosis was delayed until the organism was found growing on the viral culture medium. The babies responded

well to treatment with metronidazole. We were able, however, to make an immediate diagnosis of infection with *Trichomonas vaginalis* by microscopical examination of wet preparations of the tracheal aspirate and gastric contents.

We cannot be certain that our patient's disease was caused by this organism. Aspiration of amniotic fluid results in a similar picture, and the organism may have been just a contaminant. Bacterial pneumonia was also a possibility, despite the negative cultures, as the patient improved with antibacterial treatment without receiving specific treatment for *Trichomonas vaginalis*. Nevertheless, the findings in our patient, including his slow recovery, and the report of McLaren *et al* suggest that *Trichomonas vaginalis* may be an unrecognised cause of neonatal pneumonia.

Determining the cause of respiratory distress in an ill baby is often difficult, and infection with *Trichomonas vaginalis* should be considered when the aetiology is not clear. In these circumstances direct microscopical examination of wet preparations of gastric content and tracheal aspirate is a useful screening test. Further work is needed on the incidence of contamination of the newborn with this organism, which commonly infects mothers during pregnancy,³ and consequent respiratory infection.

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Neonatal Unit, Department of Paediatrics, University Hospital, Leiden, the Netherlands

I HIEMSTRA, MB, houseman

F VAN BEL, MB, paediatrician

H M BERGER, BSC, MRCP, neonatologist

Correspondence to: Dr H M Berger.

Argyll Robertson pupils due to neurosarcoidosis: evidence for site of lesion

In 1869 Argyll Robertson described the syndrome of miosis accompanied by absent pupillary light reaction and intact near response but the location of the responsible lesion has been in doubt.¹ This report describes a patient with Argyll Robertson pupils in whom magnetic resonance imaging located a lesion in the periaqueductal region of the mid brain.

Case report

A 28 year old white housewife had presented in 1974 with weight loss, bilateral facial palsies, uveitis, retinopathy, and numbness and pain affecting her limbs and trunk. She had bilateral hilar adenopathy and a Kveim-Siltzbach skin test had proved positive. Sarcoidosis had been diagnosed, and she had responded slowly to steroid treatment. Her cerebrospinal fluid had contained 12 lymphocytes/ml and a total protein concentration of 0.95 g/l.

Ten years later she became lethargic with a return of pain and numbness to her limbs and trunk. On examination she had bilateral ptosis and small pupils. They did not react to bright torch light directly or consensually. The pupils constricted to the near response and accommodation was normal. Sensation was reduced bilaterally in the three divisions of the trigeminal nerve. Her pterygoids and masseters were weak. She had bilateral lower motor neurone facial weakness and sensorineural deafness. Her oropharynx was numb and the tongue deviated to the left. Her limbs and trunk had large areas where sensation to pinprick and temperature was impaired. Her reflexes were normal and plantars flexor.

Corrected visual acuity was 6/6 N5 bilaterally. On examination by slit lamp the irides appeared normal and neither uveitis nor retinopathy were present. The pupils dilated poorly in the dark and measured 3.8 mm on the right and 4.4 mm on the left. Two drops of 0.01% arecoline (a parasympathomimetic agent) did not produce a supersensitive response. Light-near dissociation of her pupils was confirmed by television pupillometry.² Serum

Venereal Disease Research Laboratory and treponemal haemagglutination tests proved negative and the cerebrospinal fluid was normal. No abnormality was seen on a 9800 computed tomography brain scan but a magnetic resonance imaging scan showed an increase of T₂ lesions around the cerebral aqueduct at the level of the superior colliculi and at the anteriolateral angles of the lateral ventricles.

Magnetic resonance imaging scan at the level of the superior colliculi showing an increased T₂ lesion around the cerebral aqueduct which is just posterior to a central artefact.

Comment

This patient presented with acute sarcoidosis and neuro-ophthalmic complications. Ten years later she developed a cranial polyneuropathy with Argyll Robertson pupils.

One theory suggests that the Argyll Robertson syndrome is caused by interruption of the light reflex pathway and inhibitory supranuclear pathways to the Edinger-Westphal nucleus at a point dorso-rostral to the oculomotor complex,³ while fibres controlling accommodation, being placed more ventrally, are left unaffected. A lesion in the periaqueductal grey matter at the level of the superior colliculi is consistent with this theory.

Neurological damage is seen in about seven per cent of patients with sarcoidosis,⁴ and internal ophthalmoplegias are rare.⁵ The seventh cranial nerve is affected most commonly and often bilaterally. The second, fifth, and eighth cranial nerves are sometimes affected, but rarely the others. Normally, the cerebrospinal fluid shows pleocytosis and raised concentration of total protein: it may, however, be normal. Granulomas presenting as intracranial space-occupying lesions have been reported in sarcoidosis as has stenosis of the cerebral aqueduct. There has never been a report, however, of a localised granuloma in the periaqueductal grey matter causing Argyll Robertson pupils.

I thank Dr D Geraint James for allowing me to report this case, Dr S A Smith for performing the television pupillometry, and Dr R W Ross Russell for his advice.

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Department of Medical Ophthalmology, St Thomas's Hospital, London SE1 7EH

C J M POOLE, MB, MRCP, neurology registrar

Correspondence to: Department of Neurology, St Thomas's Hospital.