The Journal of Laryngology and Otology
December 1990, Vol. **104**, pp. 949–951

Lateral sinus thrombosis: a problem still with us

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Abstract
Lateral sinus thrombosis is now a rare complication of ear disease in the developed world, since the advent of the widespread use of antibiotics. The classic picture is often modified by previous antibiotic treatment making diagnosis and management difficult. Lack of familiarity with this condition amongst present day otologists may lead to late diagnosis and treatment.

We review three cases that we have managed recently and compare their clinical courses with the classic description of the disease.

Case Reports

Case 1

A nine-week old girl presented to the paediatric department with a three day history of a right otitis media with discharge, left otitis media with an intact drum, irritable behaviour and pyrexia. On admission she was drowsy, with bulging fontanelles and cold, blue peripheries. There were no other neurological signs. Lumbar puncture yielded pale yellow cerebrospinal fluid with no organisms on mircoscopy and no growth on incubation. There were 53 white cells per mm^3 and normal protein and glucose content. Blood cultures were also negative. *Streptococcus pneumoniae* sensitive to penicillin and chloramphenicol was grown from the ear discharge. She was commenced on systemic penicillin and chloramphenicol. The baby's general condition improved dramatically although she continued to have a low grade pyrexia with occasional spikes up to 39°C. This was attributed to a proven adenovirus grown from the profuse diarrhoea which had now developed. Two weeks after admission a wildly swinging pyrexia with peaks up to 40°C developed and the baby's general condition deteriorated. Hepato-splenomegaly and a haemolytic amaemia now developed. A repeat lumbar puncture again produced pale yellow cerebrospinal fluid but no organisms or growth. A C.T. scan with contrast was normal. Both ears were dry but with dull red drums. After an otological opinion was sought she had bilateral myringotomies and bilateral cortical mastoidectomies.

Right myringotomy revealed pus. Right cortical mastoidectomy also revealed pus. The lateral sinus was exposed and needled; there was a free flow of blood. Left myringotomy revealed thick pus. Left cortical mastoidectomy also revealed thick green pus and a large 2 × 2 cm sequestrum which was removed. The lateral sinus was exposed to the jugular bulb and incised. Large quantities of pus and thrombus were removed but a free flow of blood at either end of the sinus was not achieved. Cultures from both middle ears and both mastoids were sterile.

Over the next 48 hours the baby continued to have a swinging pyrexia and a haemolytic anaemia. Blood cultures and cultures from the drain fluid from both mastoids were again sterile. A repeat CT scan with contrast showed no evidence of intracranial infection.

The left shoulder and right thigh became swollen. Clinical suspicions of osteomyelitis were corroborated by a gallium enhancement scan and confirmed on surgical exploration of the arm and leg.

The baby's temperature returned to normal over the next few days and her general condition improved gradually, permitting discharge home one month after drainage of the arm and leg.

Case 2

In February 1988, a 10-year-old girl developed right sided headaches followed 48 h later by right sided otitis media with discharge. After treatment with oral erythromycin and ear drops, the discharge resolved. Three days later her right sided headaches recurred along with intermittent vomiting and photophobia which was treated with oral amoxycillin with little effect. Two weeks later she was admitted to Birmingham Children's Hospital with diplopia.

On admission, she was afebrile, with normal tympanic membranes, bilateral papilloedema and a right sixth nerve palsy. There were no other neurological signs. A CT scan (Fig. 1) showed a filling defect in the right sigmoid sinus consistent with an abscess.

At myringotomy, a thickened tympanic membrane and oedematous middle ear mucosa are found but no fluid or pus. The mastoid was explored and found to contain oedematous mucosa but no pus or cholesteatoma. The sigmoid sinus was surrounded and incorporated in a sterile abscess cavity which was drained to give free flow of venous blood from above and below. The child improved gradually over the next four weeks but the right sixth nerve palsy took three months to recover and the papilloedema disappeared after five months leaving a marked reduction of visual acuity in the right eye.

Case 3

A 52-year-old man presented with a long history of left

Accepted for publication: 19 September 1990.

https://doi.org/10.1017/S0022215100114458 Published online by Cambridge University Press

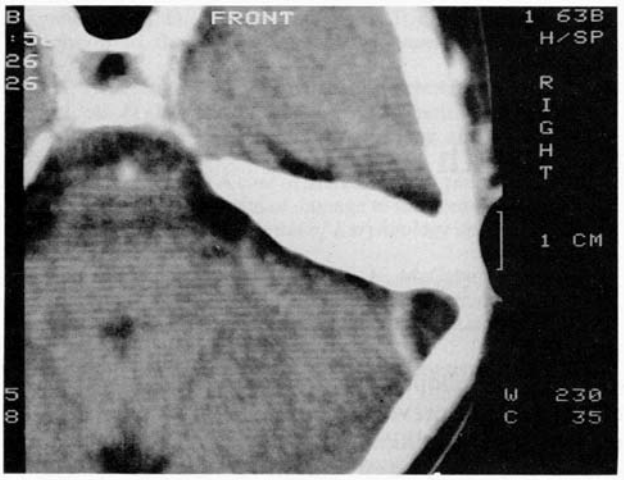


FIG. 1
CT scan showing right lateral sinus thrombosis.

sided ear discharge followed by a two week history of pyrexia and rigors. Examination of his left ear revealed an attic cholesteatoma and a dead ear. He was commenced on systemic antibiotics. During mastoidectomy cholesteatoma was found in the antrum, eroding into the lateral semicircular canal, with pus coming from the semicircular canal.

The patient's general condition improved dramatically. A post-operative CT scan with contrast showed no intracerebral abscess and no lateral sinus thrombosis.

Twelve days after operation he was re-admitted with pyrexia and rigors. Repeat blood cultures and repeat CT scan were again negative. Lumbar puncture gave clear CSF macroscopically with 13 white cells per mm^3 and normal biochemistry and no bacterial growth. Twenty-four hours later the patient developed pain and tenderness over the left internal jugular vein. A third CT scan with contrast was again negative but the venous phase of a carotid angiogram (Fig. 2) showed a lateral sinus thrombosis extending into the internal jugular vein. The left ear was re-explored. The lateral sinus was exposed fully in the mastoid segment. The sinus was needled and as there was no flow of blood it was incised.

Sterile pus and thrombus were found in the lateral sinus and evacuated. A free flow of blood was obtained from the upper end of the sinus but not from the jugular end. The internal jugular vein was tied in the neck. The patient improved steadily and was discharged home two weeks post-operatively.

Discussion

One hundred and eleven cases of lateral sinus thrombosis have been reported since 1980; 82 of these cases were from the black population in South Africa, where otitis media is often neglected and patients are reluctant to seek medical treatment. (Samuel and Fernandes, 1987). There have been no cases reported from Britain since 1978 when two cases of otogenic intracranial hypertension secondary to lateral sinus thrombosis were described by O'Connor and Moffat (1978).

Shambaugh (1967) states that lateral sinus thrombosis must be considered in a patient with a high or septic fever and acute otitis, or a slight or intermittent fever with a chronic draining ear. The classic case of lateral sinus thrombosis in the pre-antibiotic ear typically produced a 'picket-fence' fever curve due primarily to periodic release of haemolytic streptococci from the septic sinus thrombus. The patients were alert but became progressively anaemic and emaciated. Headaches and mastoid tenderness were a frequent finding. In former days positive blood cultures and the Queckenstedt test were the most helpful diagnostic findings.

We have described three patients with lateral sinus thrombosis, cases 1 and 2 secondary to acute otitis media and case 3 to long-standing cholesteatoma. Earlier articles stress the preponderance of lateral sinus thrombosis secondary to chronic ear infection (Jensen 1962; Seid and Sellars, 1973) Beta haemolytic streptococcus used to be the commonest infecting organism. (Kopetsky, 1936; Goldman, 1939; Mouse, 1956). In case 1, we grew *Streptococcus pneumoniae* from the opposite ear, prior to the administration of antibiotics. Apart from this one result all bacteriology results were sterile presumably as a result of antibiotic therapy.

Teichgraber *et al.* (1982) states that fever itself is rarely prevented but that the temperature may not show the typical spiking curve. Case 2 was apyrexial throughout her clinical course. Cases 1 and 3 had a low grade pyrexia on presentation but after a period of a few days each exhibited a typical spiking curve. In both cases this was unfortunately initially attributed to a proven intercurrent infection delaying diagnosis and treatment. Several articles stress the importance and accuracy of CT scanning with contrast, in the diagnosis of lateral sinus thrombosis. (Teichgraber *et al.*, 1982; Rizer *et al.*, 1986). In case 2 it confirmed the diagnosis. In cases 1 and 3, however, negative results and too heavy a reliance on them led to a serious delay in diagnosis and surgical treatment.

There is still controversy as regards internal jugular vein ligation. Cody (1939), summarized the arguments for internal jugular vein ligation as:

1. It isolates the source of infection from the general circulation.

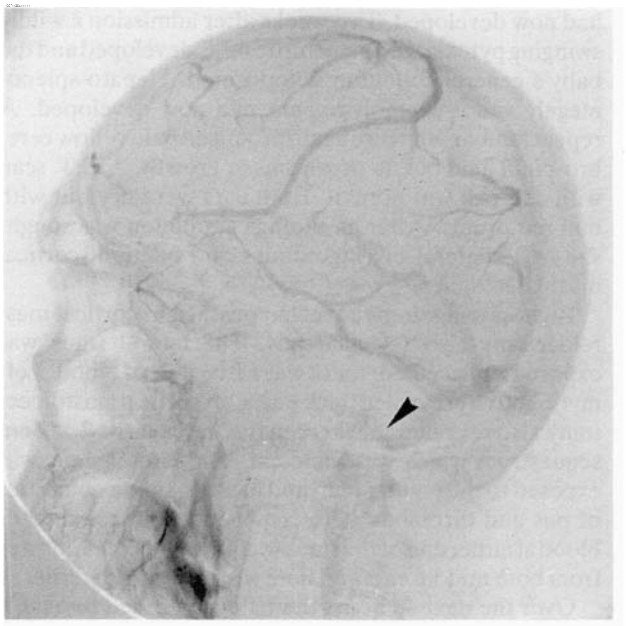


FIG. 2
Venous phase of carotid angiogram showing a filling defect consistent with a left lateral sinus thrombosis.

https://doi.org/10.1017/S0022215100114458 Published online by Cambridge University Press

2. It protects against the possibility of a mural thrombus embolizing.

3. It does not alter the favourable course of the disease or add undue burden to the patient.

Lyman (1935) summarized the arguments against internal jugular vein ligation as:

1. There were numerous cases of symptomless lateral sinus thrombosis found on mastoid surgery.

2. Septic complications often followed internal jugular vein ligation since ligation above the entrance of the facial vein does not block off the collateral circulation.

3. In the presence of a collateral circulation ligation may cause a retrograde thrombosis and the interruption of venous return from the head, resulting in an intracranial infection.

4. Operative intervention on the internal jugular vein exposed the patients to damage to the vagus, accessory and hypoglossal nerves.

Meltzer (1935) in his studies found that the incidence of septic embolus was four times as high in those patients who had internal jugular vein ligation as those that did not. Goldman (1939) found that the incidence of septic embolus as nearly equal before and after internal jugular vein ligation.

Recent authors are of the opinion that with modern antibiotic therapy, internal jugular vein ligation is necessary only in certain circumstances, ie when the clot extends beyond the mastoid area (Procter, 1966), or when sepsis persists (Seid & Sellars, 1973).

Prior to the widespread use of antibiotics heparinization was widely used to prevent septic embolization. However, the literature has no proof of the efficacy of this practice and most modern authors do not use it.

Before the introduction of surgery or antibiotics mortality was 100 per cent. Operative intervention reduced this to 50 per cent. With the introduction of antibiotics, between 1932 and 1940, the combination of antibiotics and surgery reduced the mortality to 25 per cent. Between 1968 and 1981, the mortality rate, has varied between 16.6 and 36 per cent despite combined antibiotic and surgical treatment. Samuel and Fernandes (1987) in their review of 45 cases, reported a 10 per cent mortality although in the latest paper from Iran by Amirmajdi (1988), there were no deaths amongst the 16 cases reported.

Opinions seem to be unanimous in advocating combined surgical and antibiotic treatment. (Seid and Sellars, 1973; Teichgraber *et al.*, 1982; Samuel and Fernandes, 1987). On suspicion of a lateral sinus thrombosis, most modern authors (Seid and Sellars, 1973; Teichgraber *et al.*, 1982; Samuel and Fernandes, 1987; Amirmajdi, 1988) expose and remove the bony plate of the lateral sinus during mastoidectomy and needle the sinus. If a free flow of blood is obtained no further action is taken. If no flow, and/or pus is obtained then the sinus is incised and the clot/pus is drained and removed as extensively as possible. Before the introduction of antibiotics it was felt desirable to obtain free bleeding from each end of the incised sinus, but now it is thought to be unnecessary to follow the clot centrally to obtain free bleeding, nor is it thought to be necessary to remove organized thrombus (Teichgraber *et al.*, 1982; Samuel and Fernandes, 1987).

If a free flow of blood is obtained from the incised ends of the sinus it can be controlled by packing with ribbon gauze impregnated with antibiotics. Ribbon gauze impregnated with bismuth iodoform paraffin paste is commonly used as a packing agent in otological practice. In this situation however, it is best avoided as it is radioopaque. Further CT scans are often required as the incidence of other intracranial infections associated with lateral sinus thrombosis may be high (Teichgraber *et al.*, 1982; Samuel and Fernandes, 1987; Amirmajdi, 1988).

Conclusion

Lateral sinus thrombosis is now a very rare complication of suppurative ear disease, but it still occurs. A high index of suspicion and awareness of the condition is necessary for early diagnosis. Antibiotic therapy may modify the typical symptoms and signs or delay their appearance. A negative CT scan does not preclude a lateral sinus thrombosis.

Acknowledgements

I should like to thank Mr P. E. Robin, Mr A. B. Drake Lee and Mr P. Glossop for allowing me to present their patients. I am also grateful to Dr S. Chapman and Dr I. Mackie for their radiological assistance.

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