Clinical Topics

Timing of lumbar puncture in severe childhood meningitis

Dr J R Harper, consultant paediatrician at Northampton General Hospital, wrote describing the following case:

Recently a 20 month old boy was admitted under my care having been unwell and drowsy for three days, with some stiffness of the neck and a non-specific rash. The admitting diagnosis from the family doctor was probable meningitis.

On admission the child was febrile, drowsy but rousable, with moderate stiffness of the neck, normal fundi, and a scanty purpuric rash. Lumbar puncture was carried out soon after admission and 3 ml fluid removed under apparently normal pressure. This was turbid, showing leucocytes $1.0 \times 10^9/l$, proteins 0.85 g/l, and glucose concentration 1.3 mmol/l (23.4 mg/100 ml). Numerous Gram negative diplococci were seen in the stained film. Blood urea, haemoglobin, and electrolyte concentrations were normal, as were white blood cell count and platelets. A diagnosis of meningococcal meningitis was made and he was immediately started on high dose intravenous penicillin and chloramphenicol. Two hours after admission the child's respiration became shallow and then ceased. He developed fixed, dilated pupils and never regained spontaneous respiration. He died after 48 hours' support on a respirator. The parents refused necropsy.

Although I have no reason to suspect that this child's deterioration was related to the lumbar puncture, this case leads me to wonder if lumbar puncture should be delayed in an ill child of this age until antibiotic treatment has been in progress for some hours and the child's general condition and level of consciousness are obviously improving. The diagnosis of meningitis can usually be made clinically at this age with some confidence, and it is unlikely that the choice of initial antibiotics would be influenced by the cerebrospinal fluid examination.—J R HARPER

Professor John Lorber's response

Had Dr Harper put the question in the above letter some 15 years ago I and most others would have thrown up our hands in horror at such heresy.

The situation has radically changed since. We realise even more the risks of difficult lumbar puncture and a possible pressure cone that can cause death.¹ It really is questionable whether lumbar puncture on admission is essential or even desirable when the clinical signs of meningitis are associated with a typical petechial rash, as in meningococcal meningitis. In these cases lumbar puncture is not necessary at any time unless it is thought desirable to give intrathecal treatment. The bacteriological diagnosis in meningococcal and many other meningitides can often be made from a harmless blood culture which is the essential investigation on admission. In meningococcal meningitis even a delayed lumbar puncture is undesirable if the child's progress is good. Going further, if a family doctor requests an admission because he considers that a child has meningitis with a meningococcal rash I would ask him to give an immediate, large dose of penicillin intramuscularly before he sends him to hospital. Every minute counts in these sometimes fulminating cases. It is better to have a live child than a nice cerebrospinal fluid chart and bacteriological diagnosis.

Lumbar puncture on admission is still essential in doubtful or other forms of meningitis to establish the diagnosis and for the correct choice of antibiotic and, possibly, to start intrathecal treatment, which I consider is still necessary in many cases. An

intrathecal injection of the antibiotic presumed appropriate based on clinical features can be given concurrently, without waiting for the results.² This technique ensures good antibiotic concentrations in the cerebrospinal fluid before systemic administration can achieve this. I am in a minority advocating such treatment, but I do not lose children with meningitis.

Routine lumbar punctures are not indicated in children with febrile convulsions who are otherwise well as this causes more harm than good, including an occasional death from a pressure cone.¹—J LORBER

Dr Hillas Smith's response

A 20 month old child with signs of acute meningitis accompanied by a purpuric rash has meningococcal infection. One can find exceptions to this generalisation but, for practical purposes, treatment, in my view parenteral penicillin, should be started immediately.

Of course one likes to have the diagnosis confirmed and a cerebrospinal fluid examination is probably the best readily available laboratory test. If there is confidence about the clinical severity of the meningitis and the rash is typical, lumbar puncture may be not only delayed, as suggested by Dr Harper, but avoided altogether. Blood culture should be obtained in the acute stage of the illness, if possible before chemotherapy.

For those who say that other pathogens such as *Haemophilus influenzae* can produce a similar picture either laboratory confirmation—for example, cerebrospinal fluid examination—or wide spectrum chemotherapy is necessary. My choice is chloramphenicol alone. Lumbar puncture may be postponed for three reasons: because the clinical picture is sufficiently typical, as suggested above; to avoid the possibility of coning; and in desperately ill patients, perhaps seen in the home, when any delay jeopardises life.

I agree with Dr Harper that there is no evidence to suggest that in this particular case lumbar puncture was harmful.

There are no absolutes in making these sorts of decisions in medicine. The clinical state of the patient, the doctor's assessment of the risks of investigation, the reliability of interpreting results, and the time taken before instituting definitive chemotherapy, set in the framework of the doctor's training, experience, and personal philosophy, will determine how different people act. In passing I should add that the decision to perform lumbar puncture is often the responsibility of fairly junior doctors, and action may be influenced by such variables as the time of day or night when the patient is admitted, who is on duty in the laboratory, and "what the boss likes."—G HILLAS SMITH

Dr B D Bower's response

This sad outcome is rare in a child who is not obviously septicaemic or bleeding dramatically into the skin. I doubt the wisdom of altering the generally accepted procedures for diagnosis and treatment as a result of this tragedy.

Why did he die? It is probable that such a young child had meningoencephalitis, and the brain was therefore swollen from inflammatory oedema and hyperaemia with the consequent risk of coning of the brain stem at the tentorium. At lumbar puncture the cerebrospinal fluid pressure was apparently normal, but this might only mean that coning was already present. It is likely that the

removal of cerebrospinal fluid increased the brain stem compression but it is impossible to say whether this was the fatal manoeuvre. In retrospect one may wish that a smaller volume had been removed as 0.5 ml is adequate for smear, culture, and cytology. Other causes of death to be considered are cardiac arrhythmias, adrenal failure (Waterhouse-Friderichsen syndrome), brain stem haemorrhage, and massive septicaemia. We have no information to support any of these possibilities. The description suggests a brain stem death. A postmortem examination, which presumably was not performed, would have distinguished between compression—much more likely—and haemorrhage.

How necessary is a cerebrospinal fluid examination in such a child as this? I disagree with Dr Harper that the diagnosis can usually be made with some confidence. Even when this is possible, however, the disadvantages of treating meningitis before the organism is identified are obvious. It is true, however, that high doses of penicillin and chloramphenicol intravenously are adequate treatments for meningococcus, *Haemophilus influenzae*, and *Streptococcus pneumoniae*, the usual pathogens over 3 weeks of age. In a state of peripheral vascular collapse or when new skin haemorrhages are appearing every few minutes such immediate antibiotic treatment is justifiable and may be life saving. Otherwise diagnostic lumbar puncture (and blood culture) should be done before antibiotics are started. Purpura can occur with organisms other than meningococcus, so this sign cannot indicate specific treatment.—B D BOWER

Dr S J Eykyn's response

It is a curious letter. The question asked seems unrelated to the case presented. In the absence of full details, particularly findings at necropsy, it is difficult to comment, but I think it extremely unlikely that the lumbar puncture had anything to do with the child's deterioration. Patients with meningococcal meningitis do occasionally die suddenly within a few hours of admission, despite appropriate treatment. Death is rare in those who survive 24 hours in hospital.

Dr Harper questions whether in an ill child with suspected meningitis lumbar puncture should be delayed until antibiotics have been given for some hours and there is obvious clinical improvement. This seems almost illogical: if the child is improving why do it at all? No organism is likely to be recovered once penicillin and chloramphenicol have been given. He does not mention what he would do if the child was not improving. I have doubts whether "the diagnosis of meningitis can usually be made clinically with some confidence"—by whom? Quite often it is junior doctors who see these patients. Experience of hundreds of cerebrospinal fluid

examinations received in the laboratory convinces me that the clinical diagnosis of meningitis is not always easy.

Obviously delay in antibiotic treatment is undesirable but once admitted to hospital the short time it takes to do a lumbar puncture is well justified by the crucial information gained, which allows appropriate and specific management of the patient. The pathogen can often be identified, as in this case, on the Gram stained smear as well as by the later result of culture, and its antibiotic sensitivity can also be determined. Thus a single antibiotic can be used to treat the patient. There is no evidence that combined treatment is better than a single appropriate antibiotic but it seems to be entrenched paediatric dogma that two or even three antibiotics are better than one. I wonder why? Identification of the pathogen in meningitis not only confirms clinical suspicions and determines appropriate treatment for the patient but it also enables logical decisions to be taken about chemoprophylaxis for close contacts. As the prophylactic antibiotic of choice for contacts of meningococcal infection and probably for those of haemophilus infection is rifampicin, to which resistance readily emerges, its use in such circumstances should at least be justifiable, and without a lumbar puncture it cannot be.

In conclusion, I see no reason to recommend departing from the conventional practice of performing a lumbar puncture before antibiotics are given in any patient admitted to hospital with suspected meningitis.—S J EYKYN

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References

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- 2 Lorber J. Acute bacterial meningitis. In: Forfar JO, Arneil GC, eds. *Textbook of paediatrics*. 3rd ed. Edinburgh: Churchill Livingstone, 1983:1381-90.

MATERIA NON MEDICA

Using your ears

Getting the best out of one's 78 rpm records can be a tricky business. Invariably the dust laden shellac discs taken from the attic are written off as unplayable artefacts of a previous age, to be broken up, incinerated, or turned into plant pots by immersion in hot water. One method of hearing them at their best, particularly those pressed between the wars, is to use contemporary reproducing equipment—there is nothing finer than listening to the charismatic tones of Dame Nellie Melba produced by a well sharpened thorn or fibre needle negotiating the groove of a well preserved disc. Equipment at that time, prestigiously called the "Gramophone," "Zonophone," and whatever else the makers could think of, was protected by registration with scores of patents each professing to represent the ultimate in innovation. A well balanced sound box, clockwork motor, tone arm, and horn system—often made of brass, embellished japanned tin, or aluminium—provided acoustics superior to the early electric instruments that used magnetic reproducers and crude valve amplification.

Those recordings that have survived the ravages of time in a less than perfect state of preservation can often be salvaged quite simply. Discs can be immersed in warm water and detergent in the kitchen sink to lift the coarse particles of dirt. Using a perfectly level, earthed turntable and a modern

sapphire 78 rpm stylus and cartridge, the record can then be played slightly moist, causing the stylus to hydroplane along the groove. The small irregularities caused by the coarse shellac matrix occlude and smooth out with the water, effectively reducing the characteristic high frequency hiss. Recordings with a high hiss component can have this dramatically reduced by passing the signal through tone filters—purchased or constructed—and by using a microgroove long playing diamond stylus reserved for the purpose, providing it is not used on the same record too often. Because of its smaller tip radius, the stylus sits deeper in the groove and obtains its information from hitherto unworn shellac. At this point the signal so far obtained can be transferred on to magnetic tape (taking care not to infringe the copyright regulations). Careful excision and splicing of the tape can then be used to take out transient noise due to scratches or missing bits of matrix.

It is interesting that records manufactured before 1925 were produced simply by the artist shouting down a horn to modulate a stylus via a mica diaphragm. Such recordings have a profound treble component with very little bass response. To some extent this can be corrected by using tone boosting circuits. Add a little artificial reverberation from a continuous tape loop device, if necessary, to eliminate the dead acoustics which so constrain the early recordings, then sit back, listen, and let the artistes come to life.—ANDREW PARKER, ENT registrar, Bristol.