



## Evidence helps, but some decisions remain within the art of medicine

Despite advances in therapy, more than 10% of patients with acute bacterial meningitis still die of it, and more suffer significant morbidity, including cognitive dysfunction and deafness. Well-defined protocols that include empiric antibiotics and systemic corticosteroids have improved the outcomes of patients with meningitis. But, as with other closed-space infections such as septic arthritis, any delay in providing appropriate antibiotic treatment is associated with a worse prognosis. In the case of bacterial meningitis, a retrospective analysis concluded that each hour of delay in delivering antibiotics and a corticosteroid can be associated with a relative (not absolute) increase in mortality of 13%.<sup>1</sup>

The precise diagnosis of bacterial meningitis depends entirely on obtaining cerebrospinal fluid for analysis, including culture and antibiotic sensitivity testing. But that simple statement belies several current and historical complexities. From my experience, getting a prompt diagnostic lumbar puncture is not as simple as it once was.

Many hospitals have imposed patient safety initiatives, which overall have been beneficial but have had the effect that medical residents and probably even hospitalists in some medical centers are less frequently the ones doing interventional procedures. Some procedures, such as placement of pulmonary arterial catheters in the medical intensive care unit, have been shown to be less useful and to pose more risk than once believed. The tasks of placing other central lines and performing thoracenteses have been relegated to special procedure teams trained in using ultrasound guidance. Interventional radiologists now often do the visceral biopsies and lumbar punctures, and as a result, it is hoped that procedural complication rates will decline. On the other hand, these changes mean that medical residents and future staff are less experienced in performing these procedures, even though there are times that they are the only ones available to perform them. The result is a potential delay in performing a necessary lumbar puncture.

Another reason that a lumbar puncture may be delayed is concern over iatrogenic herniation if the procedure is done in a patient who has elevated intracranial pressure. We do not know precisely how often this occurs if there is an undiagnosed brain mass lesion such as an abscess, which can mimic bacterial meningitis, or a malignancy, and meningitis itself may be associated with herniation. Yet, for years physicians have hesitated to perform lumbar punctures in some patients without first ruling out a brain mass by computed tomography (CT), a diagnostic flow algorithm that often introduces at least an hour of delay in performing the procedure and in obtaining cultures before starting antibiotics.

When I was in training, we were perhaps more cavalier, appropriately or not. If the history and examination did not suggest a brain mass and the patient had retinal vein pulsations without papilledema, we did the lumbar puncture. It was a different time, and there was a different perspective on risks and benefits. More recently, the trend

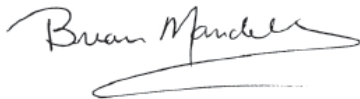
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doi:10.3949/ccjm.84b.02017

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has been to obtain a CT scan before a lumbar puncture in several subsets of patients.

A 2015 analysis from Sweden<sup>1</sup> showed that we can probably do a lumbar puncture for suspected bacterial meningitis without first doing a CT scan in most patients, even in patients with moderately impaired mentation. Perhaps some other concerns can also be assuaged if evaluated, but we don't have data. Mirrakhimov et al, on page 111 in this issue of the *Journal*, review the current evidence on when to do CT before a lumbar puncture, even if it may significantly delay the procedure and the timely delivery of antibiotics. A perfect algorithm that balances the risks of delaying treatment, initiating less-than-ideal empiric antibiotics potentially without definitive culture, and inducing complications from a procedure done promptly may well be impossible to develop. Evidence helps us refine the diagnostic approach, but with limited data, some important decisions unfortunately remain within the "art" rather than the science of medicine.



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1. Glimåker M, Johansson B, Grindborg Ö, Bottai M, Lindquist L, Sjölin J. Adult bacterial meningitis: earlier treatment and improved outcome following guideline revision promoting prompt lumbar puncture. *Clin Infect Dis* 2015; 60:1162–1169.