
Clinical Assessment of Meningitis in Adults

EBEM Commentator

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SYSTEMATIC REVIEW SOURCE

This is a rational clinical examination abstract, a regular feature of the *Annals'* Evidence-Based Emergency Medicine (EBEM) series. Each features an abstract of a rational clinical examination review from the *Journal of the American Medical Association* and a commentary by an emergency physician knowledgeable in the subject area.

The source for this rational clinical examination review abstract is: J Attia, R Hatala, DJ Cook, JG Wong. The rational clinical examination: Does this adult patient have meningitis? *JAMA.* 1999;282:175-181. The *Annals'* EBEM editors assisted in the preparation of the abstract of this rational clinical examination review as well as selection of the Evidence-Based Medicine Teaching Points.

OBJECTIVE

To review and summarize the value of specific history and physical examination components in predicting the presence of meningitis in adult patients.

DATA SOURCES

The authors report a MEDLINE search from 1966 forward as their single data source. The search strategy they used is not currently available.

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STUDY SELECTION

Studies were included that described the precision and accuracy of clinical examination in the diagnosis of meningitis in adults. Studies were excluded that mixed adult and pediatric populations, that reported tuberculous or metastatic meningitis, and that reported or included immunocompromised populations.

DATA EXTRACTION AND ANALYSIS

Methods of data extraction are not discussed. Pooled sensitivities are calculated using a random effects model and including all studies reviewed. Likelihood ratios and specificities are calculated and reported from the single prospective study included in the review. Lumbar puncture results exhibiting pleocytosis were considered positive; pleocytosis is not defined. Final diagnoses of either bacterial or viral meningitis were both considered positive.

MAIN RESULTS

The individual pooled sensitivities for fever, neck stiffness, and altered mental status are 85%, 79%, and 67%, respectively. When calculated in 3 separate studies representing 409 cases of meningitis, 95% of patients had 2 of these, and 99% had at least one.¹⁻³ Sensitivities are listed in the [Table](#).

Alterations in mental status were present in 67% of patients when pooled. Bacterial meningitis appeared to carry a higher likelihood of mental status changes, up to 100% in one inpatient study.³ However, only 44% of meningitis patients initially displayed altered mental status in a 10-year chart review.⁴

Of 54 inpatients and outpatients prospectively evaluated for headache and fever, 34 had cerebrospinal fluid pleocytosis (1/34 was bacterial meningitis).⁵ Patients with altered mental status or neurologic abnormalities were excluded from this study. "Jolt accentuation," described as an increase in headache with quick turning of the head from side to side, was 97% sensitive (33/34) and 60% specific for pleocytosis in the cerebrospinal fluid, and 100% sensitive (30/30) and 54% specific for confirmed meningitis ([Table](#)).

ORIGINAL AUTHOR CONCLUSIONS

Assessment of the accuracy of the clinical examination in the diagnosis of meningitis is severely limited by the paucity of prospective data on this topic, and more prospective research is required. Without fever, neck stiffness, or altered mental status, meningitis can be effectively ruled out. Because of the high sensitivity of jolt accentuation, in low-risk patients this may aid in the decision of whether or not to proceed with lumbar puncture.

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COMMENTARY: CLINICAL IMPLICATION

Leptomeningeal infection continues to be a vexing diagnosis and a source of morbidity and medicolegal risk. When detected and treated early, however, morbidity and mortality may be substantially reduced.⁶ This rational clinical examination installment is a valuable and comprehensive review of the existing data, with important caveats. The authors note that all but one of the studies are retrospective chart reviews (case collections), a fact that affects our confidence in these data and conclusions. Although some of the drawbacks and pitfalls of retrospective design may be mitigated by methods such as hypothesis-blinding, interrater agreement, and standardized data collection, none of these methods are reported in the studies cited.

Knowing the symptoms that are associated with meningitis is critical, a fact that highlights the importance of

Table.

Pooled sensitivities for various clinical features of meningitis.¹⁰

Clinical Feature	Sensitivity, % (95% CI)
Jolt accentuation	100 (88–100)
Fever	85 (78–91)
Neck stiffness (objective)	70 (58–82)
Altered mental status	67 (52–82)
Headache	50 (32–68)
Fever, neck stiffness, and altered mental status	46 (22–69)
Nausea and vomiting	30 (22–38)
Focal neurologic findings	23 (15–31)
Rash	22 (1–43)

CI, Confidence interval.

this review. However, case collections have no control populations and do not compare patients who have meningitis to those who do not. For example, the absence of neck stiffness in those without meningitis may ultimately be more useful than the presence of neck stiffness in those with meningitis. Therefore, these studies may be of only limited use in identifying those who do not have meningitis.

With regard to clinical implications, as the authors point out, 2 studies in the review independently reported 99% and 100% sensitivity for the presence of at least one element of the triad of fever, neck stiffness, and altered mental status. These data are impressive and may be considered, although they should not be viewed as a prospectively validated decision rule.

Jolt accentuation exhibited 97% sensitivity for cerebrospinal fluid pleocytosis and 100% sensitivity for meningitis, making this a potentially important physical examination skill to become familiar with and consider adding to one's armamentarium. However, these results have not yet been substantiated by other investigators or in alternate settings and populations, and only 30 cases of meningitis (with a single case of bacterial meningitis) were included in the study. Therefore, jolt accentuation requires further study before it can be considered a sensitive instrument for decisionmaking in the emergency department.

Of note, the distinction in this rational clinical examination between bacterial and viral, or "aseptic" meningitis is abandoned. Although this may seem at odds with the stark difference in the clinical course of these 2 entities, it makes practical and physiologic sense given that previous studies have demonstrated substantial overlap in both clinical presentation and cerebrospinal fluid findings.^{7,8} Therefore, in most cases both entities should be approached identically until final culture results are available.

TAKE HOME MESSAGE

There is daunting variability in the presentation of meningitis and poor sensitivity of the features we have historically considered helpful in its detection (Table). Given the relative safety of lumbar puncture,⁹ until we have more valid prospective data, performing lumbar puncture remains the best diagnostic tool to rule out meningitis.

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EBEM TEACHING POINT

Retrospective design. Studies that examine previously collected or existing data are referred to as “retrospective.” Studies completed by reviewing clinical charts (such as collections of meningitis cases) are therefore retrospective. Drawbacks to this design include the lack of complete data collection, illegibility, lack of standardization of the data collected, and missing information. From the meningitis example, “+ neck stiffness” may be documented in the chart; however, it is impossible to know if this was completed before or after the results of the cerebrospinal fluid analysis were known. The researcher, and hence the reader, does not know when and how data were generated. In addition, without planning and controlling data collection (eg, who collects it, how and why data are documented), the ability of any existing data to answer a question that they were not originally collected to answer is only moderate. The methodological features noted above (eg, hypothesis-blinding, agreement assessments) can improve a retrospective study’s ability to answer specific questions; however, this is a weaker form of evidence and cannot take the place of a well-planned prospective study.

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