

Use of ratios to rule out meningitis in traumatic lumbar punctures

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Question

P: In patients undergoing lumbar puncture who have a “traumatic tap”

I: Do WBC/RBC ratios predicting which patients do not have meningitis

C: Compared to empiric treatment

O: Reliably identify patients who can be safely discharged

Clinical scenario

A 12 year old male presents to the ED with headache, mylagias, including neck pain, and temperature to 101.3. You perform a lumbar puncture which reveals 3200 RBCs and 7 WBCs. You wonder if you have ruled out meningitis and can safely discharge this patient home.

Search strategy

Medline all dates using Pubmed

Lumbar puncture AND traumatic OR traumatic tap AND meningitis LIMIT to human AND

English language

$$\text{Predicted WBC}_{\text{CSF}} = \text{RBC}_{\text{CSF}} \times \frac{\text{WBC}_{\text{blood}}}{\text{RBC}_{\text{blood}}}$$

Relevant papers

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Rubenstein et al, 1984, USA	117 CSF samples from 100 patients with traumatic taps	Retrospective review	Correlation between predicted and observed WBCs	Actual WBCs approx 20% of expected WBCs	Patients with meningitis excluded from analysis
Mehl AL, 1986, USA	24 patients with normal CSF. Blood added to CSF and cell counts compared to expected values	Prospective experimental model	O:P ratio (WBCs) (Observed to predicted ratio)	Wide variance; 2.1 considered pathologic	Studied only patients without culture positive meningitis; small number; excluded neonates
Mehl AL, 1986, USA	61 patients with meningitis and hypothetical contamination Pts with bacterial and aseptic meningitis	Retrospective review	O:P ratio of WBCs Pts with meningitis identified	72%(CSF with $\leq 100,000$ RBCs); 55% (CSF with $\leq 200,000$ RBCs)	Hypothetical addition of RBCs in bacterial meningitis group. Calculations used unclear; No statistical analysis
Mayefsky JH et al, 1987, USA	720 CSF specimens with RBC >200	Retrospective review	Observed multiple (observed WBC/predicted WBC)	Observed multiple of 10 or more sensitivity of 88% and specificity of 90%	10% patients with culture-positive meningitis missed; most cases of bacterial meningitis diagnosed with Hib
Bonadio et al, 1990, USA	92 patients with traumatic taps Pts with and without meningitis	Retrospective review	O:P ratio (WBCs)	O:P ratio ≥ 1 sensitivity of 100% and specificity of 62%	Cohorts in different time periods. Identifies pts with meningitis instead of those without
Mazor SS et al, 2003, USA	57 patients with RBC count in CSF >500 Pts with and without meningitis	Retrospective review	O:P ratio WBC:RBC ratio	O:P ratio ≤ 0.01 specificity and PPV of 100%	Cohorts in different time period; small number of patients with meningitis

Comments

There is limited data in addressing the question of traumatic lumbar punctures and diagnosis of meningitis. The observed to predicted ratio does appear to be sensitive in ruling out meningitis, although further studies are needed.

Clinical Bottom Line

Ratios can be helpful in determining which patients have meningitis, although all clinical and laboratory information needs to be taken into account when developing a treatment plan.

References

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