

Vital Changes between Infected and Non-infected Cerebral Spinal Fluid Patients With an External Ventricular Drain

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Introduction

The authors explored the change in vitals for patients with cerebral spinal fluid (CSF) infection post external ventricular drain (EVD) placement and compared these vitals to those of uninfected patients with an EVD.

Methods

A data list of EVD insertions was used to screen for any patients with EVDs who had CSF microorganism and Gram staining cultures performed from January 2011 to October 2015 at Banner-University of Arizona Medical Center Tucson. Patients with positive cultures or gram stains were assigned to the infected study group and negative cultures were assigned to the uninfected study group. Patients with known CSF infections prior to EVD placement were excluded from the study. Patient vitals and blood WBCs were then collected on the date positive CSF cultures were drawn. Uninfected subjects subsequently had vitals and blood WBC collected using the average number of days post EVD placement CSF infection was found in the infected group. These clinical parameters were then compared between the two groups using multiple logistic regression and t-test analysis.

Results

344 patients with received placement of an EVD but only 139 had CSF cultures drawn and were included in the study. Five patients had known CSF infections prior to EVD placement and were excluded from the study. We found an infection rate of 7.9%. In 54% of the infections Staphylococcus Aureus was the identified pathogen. Infections were, on average, discovered 4.7 days post-EVD placement. After comparing the vitals between the two groups using multiple logistic regression no difference was seen in heart rate (HR) (P=.764), temperature (P=.756), or systolic (P=.467) and diastolic (P=.389) blood pressure. A significant difference was found in the white blood cell count (WBC) (OR 1.46, p =.001).

Uninfected versus Infected CSF EVD Patient Independent Variable Averages

	Uninfected Group Mean	Uninfected Group Standard Deviation	Infected Group Mean	Infected Group Standard Deviation	T-test P-value
White Blood Cells (x1000/L)	10.16	3.74	16.31	4.60	<0.0001
Heart Rate (beats/min)	88.30	21.92	106.27	27.91	0.01
Respiratory Rate (breaths/min)	19.41	5.89	23.11	8.25	0.08
Temperature (Celsius)	37.51	0.79	37.59	0.81	0.75
Diastolic BP (mmHg)	67.93	13.59	70.00	12.01	0.63
Systolic BP (mmHg)	125.58	21.90	123.00	20.59	0.71
Age (years)	38.51	20.48	28.16	23.27	0.11
Body Mass Index	26.11	5.77	25.59	7.36	0.81
Sex (Female=1, Male=2)	1.60	0.49	1.64	0.50	0.82

Figure 2: The table above lists the results using independent variable t-test analysis between the uninfected and infected CSF patients with EVDs. Three significant p-values were obtained, which included WBC (p<.0001), HR (p=.01), and RR (p=.003).

WBC ROC Curve

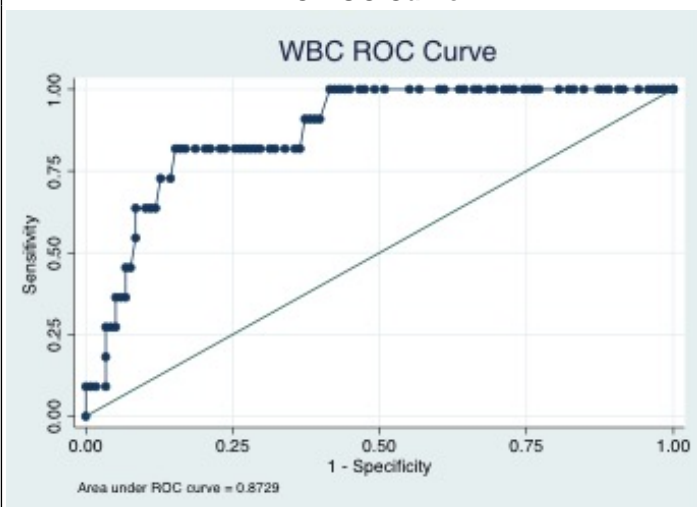


Figure 1: The simple logistic regression model uses WBC as an independent variable for CSF infection in patients with an EVD. Here we are provided with an area under the ROC curve value of .8729.

Conclusions

Clinicians are encouraged to use a rise in the WBC as a predictor for CSF infection in patients with EVDs. Given the relative high degree of perturbed vitals in patients requiring EVD placement, this may not always be reliable. However, elevation in this vital may prompt the clinician to order CSF cultures sooner than the assigned routine culture regimen.

Learning Objectives

By the conclusion of this session, participants should be able to 1.) Describe the importance of early recognition of CSF infection in patients with EVD placement 2.) Discuss in small groups possible indicators of CSF infection in these patients 3.) Identify an effective way to use elevated WBCs as way to improve early recognition of CSF infection

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