Undergoing Invasive Procedures in the Treatment of Spinal Epidural Abscesses Does Not Change Antibiotic Treatment Plans: A Retrospective Cohort Study

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INTRODUCTION: Spinal epidural abscesses (SEA) are uncommon, but carry a devastating prognosis if not recognized and treated appropriately. Patients who present with sensory or motor deficits attributed to compression from the mass effect of an SEA are indicated for surgical irrigation, debridement, and decompression. However, the additional clinical value of invasive procedures for the purposes of cultural acquisition in patients without neurodeficits, remains uncertain. The primary aim of this study is to determine if identifying a causative organism changes the antibiotic treatment plan in patients with SEAs. Secondarily, the hospital course and outcomes of patients who underwent an invasive procedure versus those who did not will be compared.

METHODS: Adult patients (≥18 years) with magnetic resonance imaging-confirmed SEAs treated at an urban, level I trauma center between January 1st, 2016 and January 1st, 2024 were reviewed. Data collected included patient demographics, past medical history, the location of the SEA, and symptoms, concomitant diagnoses, and laboratory markers at hospital presentation. Additionally, data related to their treatment course, including the number of antibiotics prescribed, mortality rate, complications, hospital length of stay, and outcomes at six months and 12 months were collected. Patients were stratified by management strategy - invasive procedures (surgical decompression and/or image-guided aspiration) versus antibiotic therapy alone. Statistical analysis was then conducted. A subgroup analysis of subjects with a causative organism identified versus those without a causative organism identified was also conducted. Lastly, of the subjects presenting with neurodeficits, propensity-matched scoring was used to control for a number of variables before comparing hospital course and outcomes data between those who underwent an invasive procedure versus those who did not.

RESULTS:

A total of 160 patients met inclusion criteria (median age 53 years), of whom 57 (35.6%) underwent an invasive procedure and 103 (64.4%) received only antibiotic therapy. Patients who did not undergo an invasive procedure were less likely to have a causative organism identified ($p < 0.0001$). Patients presenting with a higher mean white blood cell count were statistically more likely to undergo an invasive procedure ($p = 0.040$) (Table 1). Among those who underwent an invasive procedure and had an infecting organism identified, less than half (48.1%) had a subsequent adjustment to their antibiotic regimen. Six months after discharge, individuals who underwent an invasive procedure exhibited higher rates of persistent sensory and motor deficits in comparison to those who underwent antibiotics alone ($p = 0.004$ and $p = 0.011$, respectively). Twelve months after discharge, those who underwent an invasive procedure continued to show a greater prevalence of residual sensory impairment compared to the antibiotics-alone group ($p = 0.018$) (Table 2). There was no difference in diabetes, hypertension, immunosuppression conditions, alcohol use, and past history of discitis or osteomyelitis between subjects with an infecting organism and those without infecting organism identified. However, subjects using intravenous (IV) drugs were more likely to have an infecting organism identified as compared to those who do not use IV drugs ($p = 0.009$) (Table 3). Using propensity-matched scoring to compare outcomes between subjects who underwent invasive procedures versus those who did not, subjects undergoing invasive procedures had a higher in-hospital mortality rate, and were more likely to have persistent neurodeficits at both six- and 12-months post-hospital discharge (Table 4).

DISCUSSION AND CONCLUSION:

While undergoing an invasive procedure, such as a needle aspiration or surgical irrigation, debridement and decompression, may result in identification of the infecting organism, the clinical relevance of this remains uncertain. Organism identification via invasive procedures resulted in a change to the antibiotic treatment regimen in less than 50% of subjects. Moreover, invasive procedures conferred no improvement in sensory or motor outcomes at six- and 12-months post-hospital discharge. The clinical significance of identifying causative organism in patients with SEAs remains uncertain and requires further investigation.

Table 1: Presentation and Hospital Course in Subjects with Spinal Epidural Abscesses, Stratified by Treatment Method

	Invasive Procedures (n = 57)	Antibiotics Alone (n = 103)	p-value
White Blood Cell Count (#)	14.63	12.40	0.040
Erythrocyte Sedimentation Rate (#)	71.22	66.96	0.59
C-Reactive Protein (#)	33.82	42.28	0.47
Concomitant sepsis/bacteremia (%)	42.4%	37.3%	0.58
Concomitant discitis (%)	22.4%	24.0%	0.78
Concomitant vertebral osteomyelitis (%)	32.9%	37.3%	0.56
Hospital Length of Stay (median, days)	15.50	14.00	0.41
Number of antibiotics prescribed during treatment course (Median, IQR)	4 (3 – 6)	4 (2 – 5)	0.022

Abbreviations: IQR = Interquartile Range

Table 2: Six-month and 12-month Mortality and Outcomes, Stratified by Treatment Method

	Invasive Procedures (n = 57)	Antibiotics Alone (n = 103)	p-value
6 months			
Mortality	9.3%	8.1%	0.12
Persistent sensory deficits	57.1%	12.5%	0.004
Persistent motor deficits	69.2%	31.3%	0.011
12 months			
Mortality	9.3%	9.5%	0.81
Persistent sensory deficits	50.0%	8.3%	0.018
Persistent motor deficits	59.3%	30.8%	0.11

Table 3: Pertinent Past Medical History of All Subjects

	Infecting Organism Identified (n = 53)	No Organism Identified (n = 107)	p-value
Diabetes (%)	17.0%	26.2%	0.20
Hypertension (%)	37.7%	43.9%	0.45
Chronic Immunosuppression (%)	13.2%	14.0%	0.90
History of discitis (%)	3.8%	3.7%	0.83
History of osteomyelitis (%)	15.1%	14.0%	0.82
Alcohol use (%)	32.1%	46.7%	0.075
Intravenous drug use (%)	71.7%	49.5%	0.009

Table 4: Case-Control Comparisons After Propensity-Matched Scoring of Patients Presenting with Neurodeficits

		Invasive Procedure (n = 50)	Antibiotics Alone (n =50)	p-value
Number of Antibiotics during treatment course (Median, IQR)		4 (3 – 5)	4 (3 – 6)	0.74
Hospital Length of Stay (Median days, IQR)		12 (11 – 25)	14 (10 – 18)	0.18
In-hospital mortality rate (%)		10.0%	0.0%	0.028
6 months post-hospital discharge	Mortality	18.6%	5.0%	0.67
	Persistent sensory deficits	87.5%	6.3%	< 0.0001
	Persistent motor deficits	82.4%	25.0%	0.0010
12 months post-hospital discharge	Mortality	21.6%	8.3%	0.15
	Persistent sensory deficits	90.0%	7.7%	< 0.0001
	Persistent motor deficits	81.8%	30.8%	0.011

Abbreviations: IQR = Interquartile Range