Intra-thecal Antibiotic for Post-operative Gram Negative Meningitis and Ventriculitis

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Introduction

Postoperative meningitis and ventriculitis are probably the most feared delayed complications of neurosurgical procedures.Alarming is the rising incidence of multidrug-resistant organisms in these infections that make their treatment a daunting challenge.The authors evaluate the use of intraventricular/intrathecal antibiotics for postoperative Gram-negative meningitis.

Methods

Adult consecutive patients with cerebrospinal fluid (CSF) culture proven Gram-negative postoperative meningitis/ventriculitis, in which intravenous antibiotics were ineffective were included from last three years.

Table 1:

Case No	Age/ Gender	Pathology	Primary Surgery	Organism	IVT/ IT antibiotic	IVT/ IT Route	CSF negativity	Days to sterility	Biochemical Outcome	Clinical Outcome	Admission GCS	Discharge GCS	Length of hospital stay
1.	51/M	SAH, Anterior Circulation Aneurysm	Craniotomy	ATSP	PMB	LD	Yes	4	Cure	F	10	9	48
2.	44/M	SAH, Anterior Circulation Aneurysm	Craniotomy	ATSP	PMB	EVD	Yes	2	Cure	UF	14	14	36
3	35/M	SAH, Anterior Circulation Aneurysm	Craniotomy	ATSP	COL	EVD	Yes	7	Cure	UF	4	6	46
4.	61/F	Supratentorial Primary Brain Tumor	Craniotomy	ATSP	AMK	LD	Yes	10	Cure	F	15	14	76
5	45/F	Supratentorial Primary Brain Tumor	Craniotomy	PSAE	AMK	LD	Yes	2	Cure	F	15	15	33
6	26/M	Supratentorial Primary Brain Tumor	Craniotomy	ATSP	PMB	EVD	Yes	3	Cure	F	5	6	41
7	29/M	Supratentorial Primary Brain Tumor	Craniotomy	ATSP	PMB	EVD	Yes	7	Cure	UF	15	9	42
8	58/M	Supratentorial Primary Brain Tumor	Craniotomy	ATSP/ENCL	PMB	LD	Yes	16	Cure	F	10	9	77
9	35/M	Supratentorial Primary Brain Tumor	Craniotomy	ENCL	AMK	EVD	Yes	14	Cure	UF	15	10	72
10	36/M	Supratentorial Primary Brain Tumor	Craniotomy	ATSP	PMB + AMK	EVD	Yes	5	Cure	UF	12	9	51
11	26/M	Traumatic Brain Injury	Craniotomy	ATSP	PMB	EVD	Yes	8	Cure	F	12	11	69
12	43/M	Traumatic Brain Injury	Craniotomy	ATSP	PMB	EVD	Yes	13	Cure	F	10	12	38
13	29/M	Traumatic Brain Injury	Craniotomy	PM	PMB	LD	Yes	6	Cure	F	10	10	25
14	47/F	Traumatic Brain Injury	Craniotomy	ATSP	COL	EVD	Yes	7	Cure	UF	3	7	56
15	60/F	Traumatic Brain Injury	Craniotomy	ATSP	COL	LD	Yes	4	Cure	In Hospital Mortality	14	-	20
16	55/M	Traumatic Brain Injury	Craniotomy	ATSP	COL	EVD	Yes	6	Cure	UF	4	5	29
17	44/M	Traumatic Brain Injury	Craniotomy	KLPN	AMK	LD	Yes	10	Cure	UF	10	7	32
18	44/F	Traumatic Brain Injury	Craniotomy	PSAE/KLPN	COL	EVD	Yes	8	Cure	F	11	11	56
19	34/M	Third Ventricle Colloid Cyst	Craniotomy	KLPN	AMK	EVD	Yes	7	Cure	F	15	14	34
20	57/M	Hydrocephalus	EVD	KLPN	AMK	EVD	Yes	5	Cure	F	12	10	257
21	36/M	Spinal Cord Lipoma	Laminectomy	ATSP	PMB	LD	Yes	5	Cure	F	15	15	23

*ATSP = Acinetobacter species; ENCL = Enterobacter cloacia; LD = Lumbar drainage; EVD = External Ventricular Drain; PSAE = Pseudomonas Aeruginosa; KLPN = Klebsiella pneumonia; PM= Polymicrobial; AMK = Amikacin; PMB = Polymyxin B; COL = Colistin; F = Favorable; UF= Unfavorable

Clinical Parameters of Individual Patient

Results

Of the 21 patients in our study, 8 had GCS of >12 while the remaining had a GCS < 12. Acinetobacter was the most common organism isolated on CSF culture (n=14) followed by Klebsiella. Three antibiotics were used in the IVT/IT treatment group; Amikacin, Polymixin B and Colistin. Amikacin was used in 7, Polymixin B in 9 and Colistin in 5 patients. An EVD was used for administration in 13 cases (62%) and lumbar drain in 8 (38%) patients. The median duration between starting of IT/IVT after being diagnosed with meningitis/ventriculitis was 3 days. The median duration of IVT/IT therapy was 15 (9-25) days. CSF sterility was achieved in all of the patients with a median time to sterility being 7.1 + 3.8 (Range 2-16) days. Discharge GCS improved in 2, remained the same in 7 and deteriorated in 12 patients. Median hospital stay was 38 days (20-257days) with the EVD group [46 (29-72)] and LD group [32.5 (20-76) days) p-value 0.07. At 6 months follow-up favorable outcomes were seen in 14 (66.7%) patients and 7 (33.3%) patients remained in an unfavorable state. One patient died during treatment the cause of death was found to be a massive pulmonary embolus.

Table 2:

Antimicrobial agent	Acinetobacter species n=14	Enterobacter species n=2	Klebsiella Pneumonia n=4	Pseudomonas Aeroginosa n=2	Total n= 22[a]
Amikacin	10	1	1	1	13 (59.1%)
Carbapenem	11	0	0	0	11 (50%)
Cephalosporin	14	1	4	0	19 (86.4%)
Clotrimoxazole	10	0	4	0	14 (63.6%)
Gentamycin	12	1	3	0	16 (72.7%)
Polymyxin B	0	1	3	0	4 (18.2%)
Quinolone	9	0	1	0	10 (45.5%)

[a] Patient 14 and 21 had two causative organisms as shown in Table 1

Antimicrobial Resistance of Causative Organisms

Table 3:

Author	Year of Study	Number of patients	Route used IVT	IT	Outcome	CSF sterility	Most common organism	Most common antibiotic	Major adverse effect of IVT/IT
Our study	2014	21	13	8	F: 11 (52.3%) UF: 9 (42.9%) D: 1 (4.8%)	100%	ACSP	Polymyxin B	None
Wang J-H et al	2012	15	NA	NA	F+UF: 11(73.3%) D: 4 (26.67%)	73.3%	ACSP	Amikacin	None
Tangden et al	2011	13	10	3	F: NA UF: NA D: 3 (23%)	100%	ENSP	Meropenem	None
Remes et al	2013	9	1	8	F: 1 (11.1%) UF: 6 (66.67%) D: 2 (22.2%)	100%	KLPN	Gentamycin	None

*ATSP = Acinetobacter species; ENSP = Enterobacter species; KLPN= Klebsiella pneumonia; NA= Not available; F = Favorable; UF= Unfavorable; C=Cure; D=Death.

Comparison with Other Studies

Conclusions

The findings of this study suggest that IVT antibiotic therapy is a useful option especially in patients who are non-responsive to standard intravenous therapy with little or no side effects.

References

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