

## ORIGINAL ARTICLE

## CULTURE AND SENSITIVITY PATTERN IN PATIENTS WITH EXTERNAL VENTRICULAR DRAIN INFECTION

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**Background:** External ventricular (EVD) is a life saving procedure and involves insertion of a catheter in ventricular space to drain cerebrospinal fluid (CSF). Our objective of this study was to determine the culture and sensitivity (C/S) pattern in patients with EVD infection. **Methods:** This cross sectional study was conducted in Department of Neurosurgery, Pakistan Institute of Medical Sciences (PIMS), Islamabad from December 1, 2008 to January 31, 2010. All admitted patients who had acute hydrocephalus, underwent EVD insertion after excluding meningitis and ventriculitis by physical examination and per operative CSF sampling. The EVD was done at right Kocher's point. Prophylactic third generation antibiotic (Ceftriaxone) was started and continued till EVD was in place. C/S was sent to PIMS laboratory on first documented fever and or change of CSF color or when plan was to replace EVD with Ventriculo-peritoneal shunt (VP). Once infection was there CSF was sent for C/S initially and routine examination (R/E) daily. Antibiotics were changed according to C/S report and continued till they were needed. Infection rate was also estimated. **Results:** Among 76 patients 41 (53.9%) were male and 35 (46.1%) were females. Most were adults and were between 31 to 40 years of age. Mean duration of EVD was 11.41 days. Overall infection rate was 11.8%. Among causative organisms *Staphylococcus Aureus* (44.4%) was most common followed by *Acenitobacter* and *Enterobacter* and commonly used prophylactic antibiotic (Ceftriaxone) had considerable resistance. **Conclusion:** EVD is a simple and life saving procedure. Most common organisms causing infection are *Staphylococcus Aureus* followed by *Acenitobacter*. Conventional used antibiotic Ceftriaxone has considerable resistance.

**Keywords:** External Ventricular Drain, organisms, antibiotics

## INTRODUCTION

External ventricular drain (EVD) involves a catheter insertion in ventricular space. It is widely used to control hydrocephalus associated with tumor or subarachnoid hemorrhage. Various sites can be used including Kocher's, Dandy's, Keen's and Supra orbital. The two most common locations of ventricular catheter insertion are Kocher's and Keen's points have equal long term patency rates.<sup>1</sup>

The EVD like any surgically implanted foreign body is at risk of infection. This infection is a common clinical problem and is associated with morbidity and mortality. A major source of infection is bacterial contamination along the catheter tunnel track.<sup>2</sup> The high incidence of infectious complications, reported to range from 4% up to more than 20% with mean value of approximately 10%.<sup>1</sup> The most common organism is *Staphylococcus Epidermidis*<sup>3</sup> *Acenitobacter* and *Enterobacter*<sup>4</sup>. Judicious use of prophylactic antibiotics is practiced in all of cases of EVD insertion. Third generation antibiotics were used in most of the time for this purpose. However their use without C/S is controversial.<sup>5</sup> Moreover duration of antibiotic use is till the provision of sterile culture.<sup>2</sup> Intraventricular instillation of antibiotic was also recommended by many authors, Vancomycin, Amikacin, Daptomycin are some of the antibiotics used for this purpose.<sup>5,6</sup>

## MATERIAL AND METHODS

All admitted patients of both sex and age, which had acute hydrocephalous and need EVD insertion irrespective of the cause, underwent EVD insertion in operation theatre after meticulous aseptic techniques at right Kocher's point. Patients who had hydrocephalous secondary to meningitis or ventriculitis and all those who were shifted with EVD from others hospitals, were excluded. Size 8 infant feeding tube was put in as EVD and was connected to drainage bag through drip set in all patients. Prophylactic third generation antibiotic (Ceftriaxone) was started and continued till the EVD was in placed. Dressing was changed on third postoperative day and earlier if soaked. Rinsing, manipulation, and repeated sampling were all strongly discouraged as part of laid protocol. If drainage stop, computerized tomogram (CT) scan brain of the patient was performed to determine catheter place and ventricular state. In cases of collapsed ventricles catheter was left in place while in cases of displacement and blockage it was adjusted. C/S of CSF was sent to PIMS laboratory on first documented fever and or change of CSF color or when plan was to replace EVD with VP shunt. Once infection was there CSF was sent for R/E daily and for C/S initially or when there was need to change antibiotic. Organisms were cultured and their

sensitivity against various antibiotics was determined. Antibiotics were changed according to C/S report.

## RESULTS

Among 76 patients 41 (53.9%) were male and 35 (46.1%) were females. Among these most were adults; between 31– 40 years of age. Mean±SD of patients' age was 37.89±13.6 years. Mean duration of EVD was 11.41±5.54 days. As our criteria of CSF sampling was change in CSF color, fever or conversion of EVD with VP shunt. So according to data only seven patients develop fever and two patients had change in CSF color. One patient had conversion of EVD into VP shunt. So CSF sampling was done only in these cases to have minimum handling to avoid infection (according to our protocol) and results of C/S were obtained. Overall infection rate in our study was 11.8%. Four patients 44.4% had C/S positive for *Staphylococcus Aureus*, three patients 33.3% for *Acenitobacter*, two for (22.2%) *Enterobacter* (Figure-1).

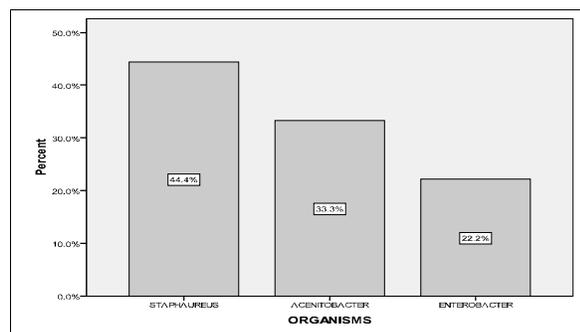


Figure-1: Organisms cultured

Culture sensitivity C/S was checked against variety of drugs including Amikacin, Aztreonam, Ceftriaxone, Cefuroxime, Cefoperazone plus Sulbactam, Levofloxacin, Oxacillin and Vancomycin. All antibiotics were tested against patients who had infection. The pattern of C/S was as follows. Amikacin was sensitive (S) in two patients (18.2%), resistant (R) in two patients (18.2%) (n=9); Aztreonam S in one (9.1%); R in two (18.2%); Ceftriaxone S in one (9.1%) R in two (18.2%); Cefuroxime S in one R in one; Cefoperazone plus Sulbactam S in two R in one; Levofloxacin S in one R in one; Oxacillin S in two R in one; Vancomycin S in one and R in one. (Table-1, 2)

Table-1 Antibiotic resistance pattern

Antibiotic	Number	Percentage
Amikacin	2	18.2
Aztreonam	2	18.2
Ceftriaxone	2	18.2
Cifuroxime	1	9.1
Cefoperazone+sulbactam	1	9.1
Levofloxacin	1	9.1
Oxacillin	1	9.1
Vancomycin	1	9.1

Table-2: Antibiotic sensitivity pattern

Antibiotic	Number	Percentage
Amikacin	2	18.2
Aztreonam	1	18.2
Ceftriaxone	1	18.2
Cifuroxime	1	9.1
Cefoperazone+Sulbactam	2	9.1
Levofloxacin	1	9.1
Oxacillin	2	9.1
Vancomycin	1	9.1

## DISCUSSION

As EVD is a surgically implanted foreign body so there is always an increase chance of infection with significant morbidity and mortality.<sup>2</sup> In study by Korinek *et al*<sup>1</sup> theatre of infection range from 4% up to more than 20%, while in our study it was 11.8%. Different types of bacterial isolates were cultured including *Staphylococcus Epidermidis* by Lo *et al*<sup>3</sup> and *Klebsiella Pneumoniae* and *Acenitobacter* by Beer *et al*<sup>7</sup> and Aucoin *et al*<sup>4</sup>. In our study the most common organism was *Staphylococcus Aureus* followed by *Acenitobacter*.

Prophylactic use of antibiotic is a matter of debate. Some authors recommended the use of antibiotic only at the time of insertion while others throughout the entire EVD duration. Prabhu *et al*<sup>8</sup> performed the meta analysis on role of prophylactic antibiotics. Unfortunately only two studies met their inclusion criteria. Various others have attempted to clear the issue but in vain. Two other retrospective studies addressed this issue. One found long antibiotic administration did not decrease the incidence of CSF infection.<sup>9</sup> The other demonstrated that prophylactic antibiotic use give for duration of EVD did not reduce the ventriculitis rate compared with procedural administration.<sup>10</sup> Moreover prolong antibiotic may select resistant microorganisms. According to Korinek *et al*<sup>1</sup> lack of administration of prophylactic antibiotic was not a risk factor for ventriculitis and long term prophylaxis was never used. However in our study, we routinely used antibiotics (third generation; Ceftriaxone) at time of insertion and continued till EVD was in place or when there was need to change of antibiotic according to C/S report.

## CONCLUSION

EVD is simple and life saving procedure. Meticulous care is needed to prevent infection in such procedures. Careful handling, limited sampling and manipulations are important steps to follow. Most common organism causing infection in our location is *Staphylococcus aureus* followed by *Acinetobacter*. Cefoperazone plus Sulbactam, and Oxacillin are most common antibiotics effective against these bacteria. Resistance against Ceftriaxone has been observed in causative organisms.

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