Original Article

Pediatric External Ventricular Drain Infection: Experience from a Tertiary Care Hospital of Pakistan

Pediatric External Ventricular Drain Infection

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ABSTRACT

Objective: To determine the frequency of external ventricular drain Infection in a pediatric population presenting with hydrocephalus.

Study Design: Cross-sectional study

Place and Duration of Study: This study was conducted at the Liaquat University of Medical & Health Sciences Hyerabad, Sindh, Pakistan for the period of one year from 30th June 2019 to 30thJune 2020 after approval from the Ethical review committee Liaquat University of Medical & Health Sciences Hyerabad, Sindh, Pakistan.

Materials and Methods: A total of 91 patients were included in this study. Demographic information like age, gender, the weight of the child and duration of symptoms and positive culture were taken as EVD infection. All the data were analyzed in SPSS version 22.0.

Results: EVD infection was in 13(14.3%) patients 78(85.7%) patients have no infection. Mean age7.14 was with standard deviation 3.965 and the weight of the children was 17.5±4.98 (in kg).41 (45.1%) patients were male and 50(54.9%) were female. the proportion of females was more than male.

Conclusion: EVD is a popular neurochirurgical technique used to treat a range of neurochirurgical conditions like hydrocephalus.A clearly defined guideline on different aspects of integration and maintenance can be a useful approach for reducing the frequency of EVD-related infections.

Key Words: Cerebrospinal, Children, External Ventricular Drain, Fluid, Hydrocephalus, Infection

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INTRODUCTION

External ventricular drain (EVD) is a catheter inserted into the ventricles of the brain. The other end of the catheter is connected to a closed drainage system. The column of cerebrospinal fluid (CSF) in the drain tubing indicates intracranial pressure (ICP).

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EVD is therefore used to measure intracranial pressure and drain cerebrospinal fluid (CSF). Acid hydrocephalus is used because of intracranial hemorrhage, traumatic brain damage, cancers or tumors.[1]

However, the benefits of an EVD can be compromised by complications linked to catheter diseases, such as infection, malfunction, bloodshed, malposition, or obstacle.

They are associated with significant morbidity and mortality.Studycondected by Ratilal et al. who found that contaminated deaths, seizure disorders, and academic output decreased after recovery.[2]Infection rates in adults range from 0% to 45% with a mean of 10% to 17%.[3]Quang at al 2009 described EVD related complication in the pediatric population in that infection rate in 96 patients is 9.4 %.[4]

A team approach including pediatic neurology leads to a standardized checklist bundle and continued attention to practices leads to improved patient outcomes and reduced infections in the pediatric population.[5]

In high-risk cases, up to 22 % are instances of EVD-related infection.[8]

ERI causes disease and death and lengthens hospital stays, increases the cost of hospitalization and even results in several operations.[10]

Thus, the ERI was highly attracted by experts and a recent meta-analysis has shown that a variety of risk factors, including period EVD surveillance, systemic infection, intravenous hemorrhage, basil skull fractures with CSF leakage, catheter manipulation and EVD catheter leakages, have been establishedleak, catheter manipulations, and leakage around the EVD catheter.For children suffering from EVD, however, few reports are published, especially after surgery of the brain tumor.

There is no data on EVD infection from Pakistan. We, therefore, decided to determine the rate of EVD infection in the pediatric population at a tertiary care center of Pakistan. This may also help us identify factors for increased or decreased rates of infection. This Study will generate local data and give us the magnitude of infection post-EVD pediatric patients with hydrocephalus.

MATERIALS AND METHODS

This cross-sectional study was conducted in Liaquat University of Medical & Health Sciences Hyerabad, Sindh, Pakistan for the period of one year from 30th June 2019 to 30th June 2020 after approval from the Ethical review committee Liaquat University of Medical & Health Sciences Hyerabad, Sindh ,Pakistan. A total of 91 patients were included in this study. All patients with age from 1-16 years undergoing EVD insertion was included duration more than 24 hours of symptoms both genders were included. Patients with the infection on in CSF before insertion of EVD were excluded. Patients with previous surgery were also being excluded. Patients who came in the ER with hydrocephalus meeting inclusion criteria were included in this study. Prior to inclusion, the purpose of procedure Risks and Benefits was explained to parents.

EVD was done under GA by R3 TO R5 under supervision. Post procedure CSF sample was sent to Labs for culture, and the report was obtained on day 4,as positive culture was taken as EVD infection. This information along with age, Gender, the weight of child and duration of symptoms was noticed in proforma.

Data Analysis: Data was analyzed using SPSS IBM version 22.0 (Chicago Illinois).We calculated frequencies and percentages for categorical variables like gender, EVD infection. Mean and the standard deviation was calculated for continuous data like age, the weight of the child (in Kg),duration of symptoms. The frequency of infection was stratified according to age and duration of symptoms, weight, and gender. A chi-square test was applied to compare the proportions between groups (EVD infection yes /no). A p-value of less than or equal to 0.05 was considered significant.

RESULTS

A total of 91 patients who fulfilled the inclusion criteria were enrolled in the study; In Table 1 descriptive statistics of age in terms mean 7.14 and standard deviation 3.965 are presented.

In Table 2 descriptive statistics of weight in term of mean and standard deviation was presented, that was 17.5±4.98 (in kg).

In Table 3 descriptive statistics of the duration of symptoms in term of mean and standard deviation was presented, that was 45.6±10.5 (in hours).

In Table 4 distribution of gender was presented, in the study, there were 41 (45.1%) patients were male and 50(54.9%) were female. the proportion of females was more than male.

In this study, distribution of EVD infection was presented 78(85.7%) were infection-free and only 13(14.3%) were having the infection.

In this study stratification of EVD infection was stratified with respect to effect modifiers. it was seen that EVD infection found in 8 patients who were less than 8 years old and in the same group, 33 patients free from infection wherein more than 8 years old children in 5 patients who have found infection remaining were having no infection there is no significant difference in EVD infection in different ages (p-value=0.19)

EVD infection found in 11 patients have symptoms for <48 hours. and in the same group, 22 patients were without infection where the duration of symptoms more than 48 hours only 2 patients were having an infection and 56 patients with more than 48 hours were having no infection there is a significant difference in EVD infection in different categories of duration of symptoms (p-value=0.002)

Table No.1: Descriptive statistics of age, weight, duration of symptoms(n=91)

	No.	Min.	Max.	Mean	Std. Deviation
Age	91	1	16	7.14	3.965
Weight(in kg)	91	5.9	39	17.5	4.98
duration of symptoms	91	24	72	45.6	10.5

Table N0.2: Distribution of patients according to gender and EVD infection (n=91)

Gender	Frequency	Percent
Male	41	45.1
Female	50	54.9
EVD Infection		
No	78	85.7
Yes	13	14.3

EVD infection found in 7 patients who have <15 kg weight. and in the same group, 40 patients were without infection were more than 15 kg weight 6 patients were having an infection and 38 patients were having no infection there is a non-significance difference in EVD

infection in different categories of weight(p-value=0.10)

EVD infection found in 8 male and in the same group 33 patients were without infection where 5 were female patients were having an infection and 45 patients were having no infection there is a non-significance difference in EVD infection and gender(p-value=0.90)**.**

Table No.3: Stratification of EVD infection with respect to effect modifiers(n=91)

Variables		EVD infection		Total	P-value
		Yes (n=13)	No (n=78)		
Age in groups:	< 8 years	8(61.5 %)	33(42.3 %)	41(45.0 %)	0.19
	≥8 years	5(38.4 %)	45(57.6 %)	50(54.9 %)	
Duration ofsymptoms:	< 48hr.	11(84.6 %)	22(28.20 %)	33(36.2 %)	0.002*
	≥48hr.	2(15.3 %)	56(71.7 %)	58(63.7 %)	
Weight	<15 kg	7(53.8 %)	40(51.2 %)	47(51.6 %)	0.10
	≥15 kg	6(46.1 %)	38(48.7 %)	44(48.3 %)	
Gender	Male	8(61.5 %)	33(42.3 %)	41(45.0 %)	0.90
	Female	5(38.4 %)	45(57.6 %)	50(54.9 %)	

*=significance

DISCUSSION

In our sample, the overall incidence of EVD-related infections was 14.3% and was thus comparable to previous studies released.[10,11]The device-associated infection rate found in this analysis is higher than Scheithauer et al.'s (6.3 per 1000 device days) report rate (10.4 per 1000 EVD days), This has been reported to date as the only equipment-associated infection rate.[12]

There was no coherence between the two, as in previous research health-associated disease body and the individual patient's EVD-related infection body.[6]

Lozier et al.[6] showed that the length of the risk of EVD-related infection through catheterization was investigated in several studies. Although the actual daily rate of infection is unclear. Among previous studies, 62% of patients with EVD-related infects had coagulase-negative Staphylococci as their bacteria mainly isolated. Enterococcus spp. and Enterobacter spp. and Staphylococcus aureus are other common organisms.[14]

The hypothesis is currently that EVD-related infections are caused either by pathogen inoculation during EVD placing and/or by the EVD device contamination and colonization following surgery.[6] The infection rate of 27.6% in our patients falls within the 0-40% range of other research mentioned.[18] The high rate of infection is partly because of our lower standards in comparison to those of other students who only have culturally supportive ventriculitis identified.[15,16]

While Mayhall et al.[17] have chosen positive cultural definitions of EVD associated ventriculitis, the strong similarities between pleocytosis of CSF and ventriculitis have been focused on.It was also established that SAH resulted in CSF pleocytosis with lower sugar levels and higher protein levels. The high level of infection is also because our patients needed a long ventricular catheter compared with other studies that were more likely to become infected by it. EVD length was 7.5 days on average before infection.[2,18]

A few studies have indicated that the flush of catheters (using antibiotic solutions), as opposed to documented protection in other studies, is a risk factor for ventriculitis.[20]

Several trials have shown that ventricular flushing is a risk factor for ventriculitis, compared with the recorded safety in a second trial.[25]

In addition to immune suppression, subsequent trauma and operating procedures, patients who had another neurochirurgical procedure performed could also have a substantial increase in risk for a predisposing impact.[22]

In a study by Sundbärg et al,.[21] this trend was also reported.

The technique is safe on one hand and using a freehand approach in emergencies such as contaminated or hemorrhagic hydrocephalus.[23–25]

Where image control is possible, the accuracy of positioning in the lateral ventricle front horn can be improved.[26]

It is without a doubt useful in neurosurgical procedure in patients with a potential fatal fatality, Hydrocephalus, IVH/SAH, or tumor of the brain, because of elevated intracranial pressure.[27]

These differences in the EVD or age distribution indicate were also identified by studies elsewhere. The principal reason for hydrocephalus ventricles, IVH should not drain the blood, but drain the CSF. Unchanging, the ventricle may have some blood drainage.

EVD time is variable as well. Research has shown that the incidence of EVD infection with EVD antibiotic sets has decreased.[28]

EVD prevents acute Sylvius aqueduct hydrocephalus, as well as from the risk of cerebellum edema triggering a CSF outflow obstruction for post-fossa tumor surgery. Several discussions were held concerning the impact of drainage length and infection rate. It is a good practice in a randomized study by Wong et al. and others, and there is proof that the EVD collection was left as long as necessary.

CONCLUSION

EVD is a common neurochirurgical procedure used to treat many neurochirurgical conditions, such as

hydrocephalus. The ICP Monitoring and controlled release of CSF is a useful and reliable timing method. Infection can lead to significant and serious EVD complications causing serious morbidities and even deaths

Many risk factors have been reported for EVD infections, and preventive measures have been established to reduce these factors.

A clearly defined protocol covering various insertion and servicing aspects would likely be a good way to minimize the incidence of infections associated with EVD.

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Author's Contribution:

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Conflict of Interest: The study has no conflict of interest to declare by any author.

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