

Caring of Neurosurgical Patients with External Ventricular Drain

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ABSTRACT

An external ventricular drain (EVD), also known as a ventriculostomy or extraventricular drain, is a device used in neurosurgery to treat hydrocephalus which can lead to raised intracranial pressure when the normal flow of cerebrospinal fluid (CSF) inside the brain is obstructed. An EVD is a flexible plastic catheter placed by a neurosurgeon or neurointensivist and managed by intensive care unit (ICU) physicians and nurses. The purpose of external ventricular drainage is to divert fluid from the ventricles of the brain and allow for monitoring of intracranial pressure. Nurses are responsible for the care of patients who have external ventricular drains. This article explains how the drains work and discusses key nursing considerations for their management.

Keywords: Cerebrospinal fluid; External ventricular drain; ICP.

INTRODUCTION

Hydrocephalus is a medical emergency and its treatment involves inserting an external ventricular drain (EVD) into one of the lateral ventricles of the brain to remove excess cerebrospinal fluid (CSF). This article discusses the essentials of nursing care for patients with EVD. The ventricular system produces CSF at approximately 20mL/hr by the choroid plexus in the lateral ventricles. The CSF circulates around the brain and spinal cord and is then reabsorbed via the arachnoid villi. CSF is a clear, odourless liquid containing substances that bathes the brain and spinal cord, providing energy to the working brain cells (neurons), such as glucose, oxygen and electrolytes and removing waste.¹ The CSF cushions the brain and spinal cord, acting as a shock absorber and reducing the impact of outside knocks and jolts.²

ASSESSMENT

Increased intracranial pressure (ICP) is usually defined as

sustained rises above 15mmHg. Common clinical signs of early intracranial hypertension include; headache, vomiting, irritability, seizures, photophobia, lethargy, nystagmus, and diplopia. With severe intracranial hypertension, consciousness becomes depressed, tone and reflexes of the limbs are altered, pupils enlarge, papillary reaction to light is sluggish and spontaneous movement of the limbs is decreased.² Signs may be unilateral or bilateral depending on the cause of the intracranial hypertension. At a critically high level of ICP, spontaneous respiration is depressed, hypertension occurs, and heart rate is slowed, this is known as Cushing's triad.

MONITORING EXTERNAL VENTRICULAR DRAIN NURSING CONSIDERATIONS

Patients will usually arrive on the unit from the operating theatre with the EVD insitu.

Mandatory Checks (Treatment Orders)

At the beginning of each shift it is the responsibility of the nurse caring for a patient with an EVD to complete the following mandatory safety checks:

- Patient has a valid EVD order set that includes; height, reference point ³ (e.g. Tragus), drainage (e.g. continuous), notify doctor if drainage is greater than (mL/hr).
- EVD column is oscillating and patent.
- Head dressing is dry and intact.
- Report any signs of changes in patient's neurological condition to the Medical team.

EVD should be documented hourly which includes:

- Drain height (cmH₂O).
- Hourly output (mL).
- CSF appearance (e.g. rosé, clear, cloudy)⁴
- Drain levelled (e.g. tragus/ mid sagittal line)
- Is the drain oscillating? kinked?
- Patient position (e.g. supine, lateral, sitting up in chair).
- Patient state (e.g. alert, crying, settled, c/o headache).
- dressing status (e.g. dry and intact, old ooze).³
- Drain status (e.g. clamped/unclamped).

When a patient with an EVD is being transported off the ward, the patient MUST be accompanied by a nurse. Visitors are not to be taught how to clamp and unclamp the EVD.

Levelling the EVD system

The transducer of the EVD must be maintained at the same horizontal level as the ventricles to ensure reliable interpretation of its value. If the patient is supine with their head neutral, level the EVD system to the tragus of the ear. If the patient is lateral, level the EVD to the mid sagittal line (between the eyebrows). Every time the patient moves the EVD must be re-levelled. Errors in positioning the transducer

- Too far above the (Foramen of Monroe) FOM will lead to a falsely low ICP measurement and insufficient drainage of CSF – in this case intracranial hypertension would go undetected and untreated.
- Too far below the FOM will lead to a falsely high ICP measurement and excessive drainage of CSF – with subsequent collapsing of the ventricles with perhaps blockage of the system and unnecessary other treatment.⁴

CSF Sampling from EVD

It should be conducted using standard aseptic techniques by neurosurgeon⁵, If patient has minimal drainage, consider clamping EVD 10-15 minutes prior to sampling to assist with collection of CSF as the patient's ICP will increase, enabling a sample to be obtained more easily.

*** Under no circumstance is a sample to be obtained via aspiration, as the risk of aspirating brain parenchyma exists.*

Dressings of the EVD site need to be observed oftenly to ensure for any leak. Dressings should be changed using sterile technique.³ The entire EVD system needs to be changed using sterile technique every 7 days.

Complications of EVD

Infection: Prophylactic antibiotics are recommended until the EVD is removed⁶.

CSF leak: If clear fluid is visible around entry site, reporting should be done.

Accidental removal of EVD: Apply sterile gauze to wound site. Inform to neurosurgeon and observe patient closely for signs of ICP.

Blocked drain: Rule out the reason like accidentally clamped EVD or dislodgement.

Fluid and electrolyte imbalance: Patient with EVD are losing CSF, so daily electrolytes to be monitored.

Removal of EVD

Clamping EVD- Prior to removal of the EVD the Neurosurgery team may ask for the drain level to be altered or clamped. Once the patient has the EVD clamped, observe for signs and symptoms of increased ICP, CSF leak at dressing site and ensure the dressing is dry and intact. Removal of EVD- When it is determined that the patient can have the EVD removed; this is completed by a member of the Neurosurgery team. Post removal of the EVD, ensure the patient and wound site are observed and the dressing remains dry and intact.

CONCLUSIONS

A nurse should possess a features of monitoring and documenting as well as carrying a competencies related to self care and management of patient with an EVD Insitu. Although these drains can appear daunting, with an understanding of their key elements and functioning they are a rewarding aspect of patient care.

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