Ventricular catheter misplacement is a serious concern during the placement of ventriculostomy catheters, which are commonly used in the management of conditions like hydrocephalus and intracranial hypertension. Misplacement can lead to complications such as bleeding, infection, or improper drainage. Several strategies can be employed to prevent ventricular catheter misplacement:

Use of Imaging Guidance:

Intraoperative Imaging: Real-time imaging, such as fluoroscopy or intraoperative CT scans, can be used to visualize the catheter placement during the procedure. This helps in confirming proper positioning and avoiding misplacement. Frameless Stereotaxy: Frameless stereotactic navigation systems allow for precise guidance during catheter placement, ensuring accurate positioning within the ventricle. Preoperative Imaging:

Preoperative Imaging Studies: Reviewing preoperative imaging, such as CT scans or MRI, can provide crucial information about the anatomy of the patient's brain, assisting in planning the optimal trajectory for catheter insertion. Anatomical Landmarks:

Utilization of Anatomical Landmarks: Surgeons should rely on anatomical landmarks to guide catheter placement accurately. Understanding the relationships between key structures can help avoid misplacement. Depth Markers:

Depth Markers on the Catheter: Catheters with depth markers can assist surgeons in gauging the depth of insertion. This information can be cross-referenced with preoperative imaging to ensure proper placement within the ventricle. Intraoperative Monitoring:

Continuous Monitoring: Continuous monitoring of intracranial pressure (ICP) during catheter insertion can provide real-time feedback. Sudden changes in ICP can signal potential misplacement, prompting corrective action. Use of Stylet and Guidewire:

Stylet and Guidewire Technique: A stylet or guidewire can be used during the initial catheter insertion to provide stability. Once the catheter tip is positioned correctly, the stylet or guidewire is removed. Confirmatory Imaging Post-Insertion:

Postoperative Imaging: Confirmatory imaging, such as a postoperative CT scan or X-ray, should be routinely performed to verify catheter placement accuracy. Multidisciplinary Approach:

Multidisciplinary Collaboration: Involvement of neurosurgeons, neuroradiologists, and other relevant specialists in decision-making and procedures can enhance the accuracy of catheter placement and reduce the risk of misplacement. Training and Experience:

Surgeon Training: Surgeons with adequate training and experience in ventriculostomy procedures are more likely to perform accurate catheter placements. Regular training and updates on best practices are crucial. Clinical Protocols:

Adherence to Clinical Protocols: Following standardized protocols and guidelines for ventricular catheter insertion can contribute to consistency and minimize the risk of misplacement. Preventing ventricular catheter misplacement involves a combination of proper planning, meticulous technique, and the use of available technologies to ensure accurate placement and reduce the likelihood of complications. Surgeons and healthcare teams should remain vigilant throughout the procedure and use multiple safeguards to enhance patient safety.

Sargut et al. describe a novel navigated bedside EVD insertion technique, which is evaluated in a clinical case series with the aim of safety, accuracy, and efficiency in neurosurgical emergency settings.

From 2021 to 2022, a mobile health-assisted navigation instrument (Thomale Guide, Christoph Miethke, Potsdam, Germany) was used alongside a battery-powered single-use drill (Phasor Health, Houston, USA) for bedside EVD placement in representative neurosurgical pathologies in emergencies requiring ventricular cerebrospinal fluid (CSF) relief and intracranial pressure (ICP) monitoring.

In all 12 patients (8 female and 4 male), navigated bedside EVDs were placed around the foramen of Monro at the first ventriculostomy attempt. The most frequent indication was aneurysmal subarachnoid hemorrhage. Mean operating time was 25.8 ± 15.0 min. None of the EVDs had to be revised due to malpositioning or dysfunction. Two EVDs were converted into a ventriculoperitoneal shunt. Drainage volume was 41.3 ± 37.1 ml per day in the mean. The mean length of stay of an EVD was 6.25 ± 2.8 days. Complications included one postoperative subdural hematoma and cerebrospinal fluid infection, respectively.

Combining a mobile health-assisted navigation instrument with a battery-powered drill and an appropriate ventricular catheter may enable and enhance safety, accuracy, and efficiency in bedside EVD implantation in various pathologies of emergency neurosurgery without adding relevant efforts [1].

1)
Sargut TA, Thomale UW, Schulz M, Schaumann A, Schneider UC, Bayerl SH, Spindler P, Vajkoczy P, Ferdowssian K. Navigated bedside implantation of external ventricular drains with mobile health guidance: technical note and case series. Acta Neurochir (Wien). 2024 Feb 10;166(1):76. doi: 10.1007/s00701-024-05955-w. PMID: 38340225.