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Neurosurgery 2020: Related factors and management principles of postoperative complications of ventricular-peritoneal shunt - Xu Ying-hui - First Affiliated Hospital of Dalian Medical University

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To explore the related factors & management principles of postoperative complications of ventricular-peritoneal shunt. 250 patients who underwent ventricular-peritoneal shunt in our hospital were selected & followed up for at least 5 years. The age, gender, history of disease, classification of hydrocephalus, surgical method, type of shunt tube, postoperative complications & other factors were analyzed. Patients with complications were treated & the clinical treatment effect was analyzed. Complications occurred in patients, including puncture bleeding, obstruction of shunt tube (decomposition, rupture), intracranial infection, subdural effusion or subdural hematoma caused by excessive drainage, & delayed intracranial hematoma. Patients can still get a good prognosis after individualized treatment. The incidence of postoperative complications of ventricular-peritoneal shunt is not low. Surgery indications should be strictly grasped before surgery. Strict aseptic operation should be performed during the operation. Patients with a previous history of central nervous system infection or craniocerebral surgery should be more cautious. Early skull repair combined with ventricular-peritoneal shunt is positive significance for improving the quality of life of patients undergoing brain surgery. Patients with complications should be treated individually.

The VP shunt is the most widely used procedure in the treatment of hydrocephalus. As with any surgery, complications can occur. Although infrequent, abdominal complications have been reported. These include pseudocyst formation, intestinal obstruction, & bowel perforation & penetration. Most of these abdominal complications are delayed in occurrence. The incidence of bowel perforation by a shunt catheter is known to be low, occurring in 0.1%–0.7% of cases of complications. These complications can result in potentially fatal ventriculitis, meningitis, intraperitoneal abscess, faecal fistulae, peritonitis, or sepsis. Shunt functional failure can arise from a variety of clinical scenarios including overdrainage, underdrainage, & slit ventricle syndrome. Over-drainage results in a reduction in CSF volume & a corresponding drop in ICP, typically due to a confluence of factors related to shunt placement & valve malfunction. With overdrainage, patients are at risk for tearing of the bridging veins, resulting in subdural hematomas. This is typically seen within the first six months after shunt placement. In slit ventricle syndrome, the pathology is similar to that of CSF over-drainage, with the appearance of small ventricles on radiography. These patients may present with a history of headache that is aggravated when the patient is in an upright position but mitigated when the patient sleeps or is positioned laterally, in contrast with the classic pattern seen in patients with increased ICP. The most common radiologic studies in patients with concern for VP shunt-related pathology are CT of the brain, a shunt series X-ray, or a combination of the two. A shunt series X-ray consists of anteroposterior (AP) & lateral views of the skull, chest, & abdomen. This is done in conjunction with a CT brain without contrast. Many institutions have protocols & order sets in place that ensure optimal imaging of the ventricles & shunt from origin to insertion. While radiography can be useful if acute shunt pathology is identified, some studies have suggested that the efficacy of the shunt series is variable. One study in adults showed a sensitivity of 88.6% & specificity of 62.5%. The literature on pediatric evaluation of shunt series shows different values for sensitivity & specificity, at 11% & 98% respectively. However, when combined with a head CT, sensitivity rises to 57%, & specificity to 76%. In the context of significant clinical suspicion of infection, negative imaging should not preclude consultation to neurosurgery for further guidance.

VP shunt tapping is a controversial subject even within the neurosurgical literature due to concerns regarding infection & morbidity & mortality associated with it. In the instance of communicating hydrocephalus, a lumbar puncture is preferred due to the lower risk of infection & the ability to obtain the same information as from VP shunt tapping. In the case of a rapidly deteriorating patient, initial efforts to lower ICP should be made using hyperventilation, mannitol, &/or 3% hypertonic saline. However, if these efforts are unsuccessful & the patient remains hemodynamically unstable, a tap of the shunt can be performed to remove CSF. Although actual infection caused by VP shunt tapping is low (<1%), employing a sterile technique is paramount. It is recommended to avoid shaving the area, as it may irritate the skin & increase the risk of infection or contamination. Viable alternatives are to use a sterile lubricant to control the hair, or to use scissors to gently reduce the hair length. Using a butterfly needle, IV tubing, & a syringe at a 30-degree angle, it is recommended to gently puncture the

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reservoir under the skin & withdraw fluid as needed. The manometer from a lumbar puncture kit may be used to measure shunt pressure. The manometer is held next to the ear when the pressures are read, with the patient positioned in a lateral decubitus position. In this arrangement, normal pressure is to be 8-12 mmHg.

Hence, an emergency provider needs to be adept at diagnosing & treating acute VP shunt complications. It is imperative for emergency service providers to start with a good history & physical. This should be followed by necessary imaging procedures, & transfer to neurosurgery if required.

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