Fourth ventricular shunt

Prone position is better compared to the sitting position. Apart from the risk of air embolism and post operative pneumocephalus in the sitting position, the air may get trapped in the ventricle and interfere in intraoperative visualization [1].

Unfortunately, these techniques showed a high rate of dysfunction and complications.

Standard management of loculated fourth ventricle hydrocephalus consists of fourth ventricle shunt placement via a suboccipital approach. An alternative approach is stereotactic-guided transtentorial fourth ventricle shunt placement via the nondominant superior parietal lobule.

Stereotactic parietal transtentorial approach

Stereotactic parietal transtentorial shunt placement may be considered for patients with loculated fourth ventricle hydrocephalus, especially when shunt placement via the standard suboccipital approach fails. It is therefore reasonable to offer this procedure either as a first option for the treatment of fourth ventricle hydrocephalus or when the need for fourth ventricle shunt revision arises [2].

In 10 patients, Turner et al., used an alternative technique involving stereotactic and endoscopic methods to place a catheter in symptomatic posterior fossa cysts across the tentorium. Discussion of these cases is included, along with a review of various approaches to shunt placement in this region and recommendations regarding the proposed technique.

No patient suffered intracranial hemorrhage related to the procedure and catheter implantation. All 3 patients who underwent placement of a new transtentorial cystoperitoneal shunt and a new ventriculoperitoneal shunt did not suffer any postoperative complication; a decrease in the size of their posterior fossa cysts was evident on CT scans obtained during the 1st postoperative day. Follow-up CT scans demonstrated either stable findings or further interval decrease in the size of their cysts. In 1 patient, the postoperative head CT demonstrated that the transtentorial catheter terminated posterior to the right parietal occipital region without entering the retrocerebellar cyst. This patient underwent a repeat operation for proximal shunt revision, resulting in an acceptable catheter implantation. The patient in Case 8 suffered from a shunt infection and subsequently underwent hardware removal and aqueductoplasty with stent placement. The patient in Case 9 demonstrated a slight increase in fourth ventricle size and was returned to the operating room. Exploration revealed a kink in the tubing connecting the distal limb of the Y connector to the valve. The Y connector was replaced with a T connector, and 1 week later, CT scans exhibited interval decompression of the ventricles. This patient later presented with cranial wound breakdown and an exposed shunt. His shunt hardware was removed and he was treated with antibiotics. He later underwent reimplantation of a lateral ventricular and transtentorial shunt and suffered no other complications during a 3-year follow-up period [3].

Complications

During a 4-year period from July 1989 to June 1993, Lee et al., placed fourth-ventricular shunts in 12

patients. Remarkably, 5 patients suffered complications related to posterior fossa catheter placement (42% rate). Three of these patients developed new cranial nerve dysfunction caused by direct injury to the floor of the fourth ventricle, 1 patient suffered an intracystic hemorrhage and acute shunt malfunction, and 1 patient had the catheter tip in the brainstem on postoperative studies without new neurological deficit. They conclude that placement of fourth-ventricular shunts can be fraught with complications which we believe is related to technique. They propose that altering the trajectory of the ventricular catheter from our usual midline technique to a more lateral position will lessen the chances for injury to the floor of the fourth ventricle. In this manner we hope to decrease our incidence of complications for this procedure [4].

Pang et al., treated a child who suffered from delayed, progressive palsies of the sixth, seventh, 10th, and 12th cranial nerves several weeks after undergoing ventriculoperitoneal shunt placement in the fourth ventricle. Magnetic resonance imaging revealed the catheter tip to be placed well away from the ventricular floor but the brainstem had severely shifted backward, suggesting that the pathogenesis of the neuropathies was traction on the affected cranial nerves. The authors postulated that the siphoning effect of the shunt caused rapid collapse of the fourth ventricle and while the cerebellar hemispheres were tented back by adhesions to the dura, the brainstem became the only mobile component in response to the suction forces. Neurological recovery occurred after surgical opening of the closed fourth ventricle and lysis of the basal cistern adhesions, which restored moderate ventricular volume and released the brainstem to its normal position [5].

Case reports

A 20-year-old man with complex hydrocephalus and trapped fourth ventricle underwent a suboccipital placement of a VP shunt. Postprocedure patient developed double vision. Magnetic resonance imaging showed that the catheter was penetrating the dorsal brainstem at the level of the pontomedullary junction. Patient was referred to the Neuroendoscopic Clinic. Physical exam demonstrated pure right VI cranial nerve palsy. Patient underwent flexible endoscopic exploration of the ventricular system. Some of the endoscopic findings were severe aqueductal stenosis and brainstem injury from the catheter. Aqueductoplasty, transaqueductal approach into the fourth ventricle, and endoscopic repositioning of the catheter were some of the procedures performed. Patient recovered full neurological function. The combination of endoscopic exploration and shunt is a good alternative for patients with complex hydrocephalus. A transaqueductal approach to the fourth ventricle with flexible scope is an alternative for fourth ventricle pathology [6].

1)
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