Cisternoatrial, ventriculocisternal, and other cisternal shunts simplified

A percutaneous technique

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Routine operative use of the lateral C1-2 cervical puncture has proved its safety and effectiveness. We use this procedure to introduce a Silastic catheter into the cisterna magna in the treatment of communicating hydrocephalus and aqueductal stenosis, to drain non-communicating tumor cysts, and for the administration of intrathecal antibiotics.

Technique

Description of Assembly

We have designed a spring-reinforced Silastic catheter with a radiopaque marker incorporated into the end of a multi-perforated tip designed to fit through a No. 16 Touhy needle* (Fig. 1). The Touhy needle is inserted through a 1-cm superficial skin incision into the subarachnoid space between the C-1 and C-2 lamina (Fig. 2). With the needle bevel pointed rostrally, the catheter is passed into the cisterna magna (Fig. 3). The needle is then withdrawn over the shunt tubing.

Communicating Hydrocephalus

In communicating hydrocephalus, a No. 14 straight needle is inserted through a 1-cm superficial skin incision into the internal jugular vein. A spring-reinforced Silastic catheter (the peritoneal end of the catheter used in the percutaneous lumboperitoneal shunt) is inserted through the needle so that the slit valves are located in the atrium. The needle is then withdrawn over the tubing, and the catheter is secured with a sleeve sutured into the subcutaneous tissue. Through a small incision over the mastoid process a reservoir is secured and connected to the cisternal and atrial catheters (Fig. 4). If the internal jugular
route is not available or the peritoneum is preferred, the catheter can be passed subcutaneously to the peritoneal cavity in the usual manner. Shunt patency can be verified by injecting albumin-bound Tc$^{99m}$-sodium pertechnetate into the reservoir and monitoring its passage into the atrium (Fig. 5).

**Aqueductal Stenosis**

For aqueductal stenosis, a Silastic spring-reinforced catheter is passed into the ventricle through a No. 14 ventricular needle that has been inserted through a posterior parietal twist drill opening. This catheter and the previously inserted cisternal catheter are secured and connected to a reservoir. This procedure in effect creates a Torkildsen shunt, but eliminates the risks attending a posterior fossa operation.

**Cyst Drainage**

The same procedure is used for shunting cysts, except that the catheter is placed directly into the cyst. Creation of a shunt between the cyst and the cisterna magna allows cyst and cerebrospinal fluid (CSF) pressures to equalize, circumventing the problem of pressure differentials encountered when cyst fluid is shunted into the peritoneum or atrium. A further advantage is the proximity of the cisterna magna to the supratentorial region, which reduces the length of shunt tubing required and thereby decreases the risk of shunt obstruction.

**Administration of Drugs**

Lumbar puncture may be precluded in some cases of coccidioidomycosis secondary
Percutaneous cisternal shunt technique

FIG. 4. Reservoir sutured in place with both shunt tubes fastened.

to arachnoiditis, thus necessitating weekly cisternal taps for Amphotericin B therapy. In this event, a cisterna magna catheter can be connected to a subcutaneous reservoir to facilitate weekly drug injections as well as for CSF sampling.

Discussion

In our hands the described percutaneous route to the cisterna magna is safe and simple, and requires only minimal operative intervention. It can be used to create cisternoatrial, ventriculocisternal, and intracranial cyst-cisternal shunts, and for introducing a cisternal reservoir. When the percutaneous lumboperitoneal shunt is contraindicated for the treatment of communicating hydrocephalus, the cisternoatrial shunt offers a valuable alternative shunting method.

No operative complications have been encountered. The lateral percutaneous route between the C1–2 lamina to the subarachnoid space is a proven, safe procedure. We have employed this technique well over 200 times during the past 4 years without any complications. Vertebral artery puncture or puncture of the spinal cord remains a potential hazard. This complication can be avoided by verifying proper needle position radiographically. The percutaneous route to the internal jugular vein is reliable and safe.

We have used these variations of cisternal shunts in 11 patients, with no complications during a follow-up period ranging from 12 to 16 months. In one patient the shunt tubing became obstructed 14 months after insertion at the point where the wire coil terminated and the drainage holes began. The shunt tubing has been redesigned to eliminate this potential problem. Six cisternal-atrial and three ventriculocisternal shunts were inserted for communicating and obstructive hydrocephalus, respectively. One tumor cyst-to-cisterna magna shunt was inserted to eliminate percutaneous cyst drainage, with prompt improvement of the patient’s clinical condition. Finally, one cisternal shunt was connected to a reservoir over the mastoid in a patient with

FIG. 5. Anteroposterior views of scans with technetium-labeled albumin injected into reservoir. Left: Early phase. Notice filling of ventricles, cisterna magna reservoir, and shunt tubing. Right: Chest view showing tip of atrial shunt and the isotope outlining the heart.
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severe coccidioidomycosis meningitis. This reservoir has been tapped weekly since September, 1975, to obtain a CSF sample and insert Amphotericin B.

References


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