Peritoneal catheter placement

- Surgical Nuances in Ultrasound-Guided Percutaneous Distal Catheter Placement in Pediatric Ventriculoatrial Shunts
- Scrotal migration of the peritoneal catheter of a ventriculoperitoneal shunt: A case series in a single center
- Cerebrospinal Fluid Shunts to Treat Hydrocephalus and Idiopathic Intracranial Hypertension: Surgical Techniques and Complication Avoidance
- Rare Complications of Lumboperitoneal Shunts: Abdominal Cerebrospinal Fluid Pseudocysts in Adults
- Efficacy and Safety of the Lateral Abdominal Approach for Lumboperitoneal Shunts in the Post-surgical Abdomen
- Evaluation of ultrasound-guided distal catheter placement in pediatric ventriculoatrial shunts for patients with hydrocephalus: Effectiveness and consequences
- Ventriculoperitoneal Shunt
- Intrapleural Migration of Ventriculoperitoneal Shunt due to Negative Intrathoracic Pressure

General information

Used for ventriculoperitoneal shunts, lumboperitoneal shunts…

For small children, use at least 30cm length of intraperitoneal tubing to allow for continued growth (120cm total length of peritoneal tubing was associated with a lower revision rate for growth without a significant increase in other complications55). A silver clip is placed at the point where the catheter enters the peritoneum so that the amount of residual intraperitoneal catheter can be determined on later films (more important in growing children).

Distal slits on the peritoneal catheter may increase the risk of distal obstruction,56 and some authors recommend that they are trimmed off. Wire reinforced catheters should not be used because of excessively high rate of viscus perforation, and this tubing was designed to prevent kinking which is not a problem with modern shunts.

An incision in the abdomen is done to access the peritoneal cavity; the site depends on the surgeon's preference and can be done in the upper quadrant or the midline Shunt passer is used to pass the peritoneal distal catheter between both incisions.

Peritoneal catheter is connected to the valve and secured with a silk tie.

After good distal CSF flow at the peritoneal catheter, it is introduced into the peritoneal cavity.

Wounds are closed in anatomical layers

The CSF sample is sent to the laboratory for cell count, glucose, protein, gram stain, and culture

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A shunt is placed in a ventricle of the brain and threaded under the skin to the abdomen.

The traditional operative approach for peritoneal catheter insertion is minilaparotomy. In recent years, laparoscopy-assisted insertion has become increasingly popular. It seems likely that use of an endoscope could lower the incidence of shunt malfunction. However, there is no consensus about the benefits of laparoscopy-assisted peritoneal catheter insertion.

A systematic search was performed using the PubMed, Embase, ScienceDirect, and Cochrane Library databases. A manual search for reference lists was conducted. The protocol was prepared according to the interventional systematic reviews of the Cochrane Handbook, and the article was written on the basis of the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) guidelines.

Eleven observational trials and 2 randomized controlled trials were included. Seven operation-related outcome measures were analyzed, and 3 of these showed no difference between operative techniques. The results of the meta-analysis are as follows: in the laparoscopy group, the rate of distal shunt failure was lower (OR 0.41, 95% CI 0.25-0.67; p = 0.0003), the absolute effect is 7.11% for distal shunt failure, the number needed to treat is 14 (95% CI 8-23), operative time was shorter (mean difference [MD], -12.84; 95% CI -20.68 to -5.00; p = 0.001), and blood loss was less (MD -9.93, 95% CI -17.56 to -2.31; p = 0.01). In addition, a borderline statistically significant difference tending to laparoscopic technique was observed in terms of hospital stay (MD -1.77, 95% CI -3.67 to 0.13; p = 0.07).

To some extent, a laparoscopic insertion technique could yield a better prognosis, mainly because it is associated with a lower distal failure rate and shorter operative time, which would be clinically relevant [1].

Typically, for insertion of the peritoneal catheter, a mini-laparotomy technique is used. Although generally safe, it can be cosmetically undesirable and time consuming. Complications include malpositioning, bowel injury, and delayed hernias. Laparoscopic techniques have been advocated to address these issues, but have been slow to gain traction with neurosurgeons.

Single port optical access laparoscopy is a fast and minimally invasive technique that allows direct visualization of the layers of the abdominal wall as they are traversed and visualization of the peritoneal catheter during placement. It uses a small cosmetic incision and obviates the need for postoperative abdominal radiographic studies. The procedure has a modest learning curve, but can be safely used without the assistance of an assist surgeon after the skills are acquired [2].

Intermediate incisions are considered necessary to pass a catheter tube from the head to the abdomen in ventriculo-peritoneal (VP) shunting via a frontal bur hole. However, an intermediate incision can sometimes become dehiscent, resulting in Cerebrospinal fluid fistula or infection of the shunt system in the early period after shunt implantation, particularly in infant patients. In a article, the authors describe a novel method of VP shunt insertion that does not require an intermediate incision. This nonintermediate-incision VP shunt procedure was performed in 3 infant patients with hydrocephalus and was not associated with any complications. This method can eliminate the intermediate incision, which is a disadvantage of VP shunt insertion via a frontal bur hole [3].

Open technique

A vertical incision lateral and superior to the umbilicus is one of several choices. The following layers should be identified as they are traversed to avoid confusing preperitoneal fat with omentum and erroneously placing the tip in the preperitoneal space:

1. subcutaneous fat

2. anterior sheath of the Rectus abdominis muscle (anterior rectus sheath)

3. abdominis rectus muscle fibers: should be split longitudinally

4. posterior rectus sheath

5. preperitoneal fat (may be very well developed in a few individuals, but is essentially nonexistent in most)

6. peritoneum (usually closely adherent to the posterior rectus sheath)

Trocar technique

A trocar (e.g. Codman #82-4095 disposable split trocar, which is designed to place catheters with outer diameters up to 3.0 mm) may be used. Also very helpful in conjunction with laparoscopic surgery.

✖ Contraindications: prior abdominal surgery, extremely overweight patients.

Technique:

1. place a Foley catheter to decompress the bladder prior to draping

2. 1 cm skin incision above and lateral to the umbilicus

3. tent-up the abdominal skin anteriorly (away from patient)

4. insert trocar with plastic stylet in place aiming toward the ipsilateral iliac crest

5. feel 2 “pops” of penetration: 1st = anterior rectus sheath, 2nd = posterior rectus sheath/ peritoneum

6. remove the plastic stylet

7. feed the catheter through the central channel of the trocar. The peritoneal catheter should feed easily through trocar (if it doesn’t, the tip of the trocar may be in the preperitoneal space, or pushing up against an organ, adhesion, etc. You can check if a small amount of irrigation fluid runs into the peritoneum through the trocar (if not, placement may not be serviceable)

8. once the peritoneal catheter is in position, it is stabilized with bayonet pickups as the split trocar is withdrawn allowing the catheter to slide through the split opening in its side so that the cathe- ter remains in place

Laparoscopic implantation of a distal catheter is a simple, minimally invasive, and easy procedure to perform and allows exact localization of the peritoneal catheter and confirmation of its patency [4) 5)].

A laparoscopic approach has multiple advantages over open techniques, including decreased morbidity, more rapid recovery, and ability to visually assess catheter function.

Laparoscopy has great utility in the assessment of shunt function. Laparoscopic techniques should be considered not only for placement of peritoneal catheters, but also for the management of distal shunt malfunction and diagnosis of abdominal pain in these patients [6)].

Ventriculoperitoneal shunts are supplied with long peritoneal catheters, most commonly between 80 and 120 cm long. ISO/DIS 7197/2006([15]) shunt manufacturing procedures include peritoneal catheter as an integrate of the total resistance. Cutting pieces of peritoneal catheters upon shunt implantation or revision is a common procedure.

The limit to maintain a shunt in its original pressure settings was 20 cm peritoneal catheter cutting length. By cutting longer pieces of peritoneal catheter, one would submit patients to a less-resistive regimen than intended and his reasoning will be compromised. The pediatric population is more prone to suffer from the consequences of cutting catheters. Shunt manufacturers should consider adopting peritoneal catheters according to the age (height) of the patient [7)].

Complications

Peritoneal catheter placement complications.

1)
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