Lumboperitoneal shunt technique

see https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9763887/#SM1

The patient is typically placed in a lateral decubitus position. The iliac crests serve as a reasonable landmark for the L4-5 spinal level. Fluoroscopy can be used for greater accuracy, and there is reason to believe that the L5-S1 level may be a better site, in case of an epidural hemorrhage due to needle puncture.

After preparation of the skin and draping of the lumbar area, flank, and abdomen, a longitudinal incision is made in the midline, and dissection is carried down to the muscle fascia layer. A Tuohy needle is inserted into the thecal sac and should be well within the space to allow for passage of the catheter (see image below). Passing the catheter-tunneling instrument through Passing the catheter-tunneling instrument through the abdominal incision to the dorsal incision.

The Tuohy needle should be placed with the needle bevel aligned in a rostral-caudal direction; whether rostral or caudal is a matter of preference. The authors suggest measurement of pressure at this point, although the positioning and the presence of general anesthesia and ventilation makes this reading rather artificial. The lumboperitoneal catheter can then be eased through the Tuohy needle and into the thecal sac for approximately 6-8 cm to allow for some displacement upon removal of the needle.

The catheter should never be withdrawn through the needle once it has passed the tip to avoid shearing off the end of the catheter. If additional attempts are necessary, remove the needle with the catheter. Pulling the lumboperitoneal shunt from the cathete Pulling the lumboperitoneal shunt from the catheter-tunneling instrument.

The peritoneal cavity can be accessed simultaneously, as resources allow, through a laparoscopic approach or under direct vision. One advantage of the laparoscopic approach is that the catheter can be inserted through the flank incision, which is used to position a valve. A direct approach to the peritoneum usually requires a more medial ventral incision. Dissection through Scarpa fascia, innominate fascia, the muscle layers, and transversalis fascia is performed successively until the peritoneal membrane has been reached.

At this point, if a valve is to be placed, a flank incision is made, and the catheter-tunneling instrument is used to connect the lumbar to the flank incision. If no valve is to be placed, tunneling can be accomplished from the lumbar region to the abdomen, depending on the patient’s habitus. An intervening incision may be required. Assuming a valve is being placed, the spinal catheter can be brought to the flank exposure, taking care not to dislodge it from the thecal sac. An anchoring device can be sutured to the lumbar fascia to reduce the chance of displacement, leaving additional tubing as a strain relief. The valve is then connected to the cut end of the spinal catheter, and additional tubing is placed in a similar fashion from the flank incision to the abdominal incision.

Flow from the distal end of the system should be ascertained before placement into the peritoneal cavity. The authors typically put a purse-string suture in the peritoneum around the catheter to lessen the risk of displacement. Little concern exists about leaving too much catheter in the peritoneal space.

Closure is carried out in standard fashion. As described above, the laparoscopic approach allows for smaller abdominal incisions and placement from the flank incision site.

In obese patients, we often find difficulty in laparotomy for placing a lumboperitoneal shunt catheter. Kawahara et al., introduced an easy technique to get a sufficiently wide and shallow operative field through small abdominal incision in obese people. Four blunt scalp hooks and rubber bands.

The fat layer and the rectus abdominis muscle layer were retracted and pulled up using these hooks. Blunt scalp hooks were useful for safe and effective retraction of abdominal wall, which made a sufficient and shallow operative field [1].

Ventricular access device (VAD)

Lumboperitoneal shunts with programmable valves effectively controlled the outflow of lumbar cerebrospinal fluid to ameliorate the symptoms of pseudotumor cerebri (PTC). The VAD permitted assessment of ICP and thus, indirectly, LP shunt function, and benefits outweighed risks. The programmable valve permitted cerebrospinal fluid flow to be adjusted based on patients' clinical status and ICP to be measured by the VAD [2].

Videos

<html><iframe width="560" height="315" src="https://www.youtube.com/embed/iS9xS1XE9MA" title="YouTube video player" frameborder="0" allow="accelerometer; autoplay; clipboard-write; encrypted-media; gyroscope; picture-in-picture" allowfullscreen></iframe></html>

1)
Kawahara T, Higashi T, Tokimura H, Arita K, Atsuchi M, Takasaki K. Use of blunt scalp hooks for abdominal procedure in lumboperitoneal shunt placement: technical note. Neurol Med Chir (Tokyo). 2014;54(7):552-3. Epub 2014 Apr 23. PubMed PMID: 24759096.
2)
Nadkarni TD, Rekate HL, Wallace D. Concurrent use of a lumboperitoneal shunt with programmable valve and ventricular access device in the treatment of pseudotumor cerebri: review of 40 cases. J Neurosurg Pediatr. 2008 Jul;2(1):19-24. doi: 10.3171/PED/2008/2/7/019. PubMed PMID: 18590390.