Bucket and straw technique to facilitate passage of a ventriculoperitoneal shunt through the distal tunneling sheath

Technical note

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Placement of a ventriculoperitoneal shunt (VPS) is a procedure comprising many small steps. Difficulties and delays can arise when passing the distal shunt tubing down the distal tunneling sheath during surgery. The authors of this report describe a simple technique for quickly passing the distal catheter of a VPS through the tunneler sheath, whereby the sheath is used as a fluid tube to allow the distal catheter to be drawn through the fluid tube under suction pressure. The plastic sheath that surrounds the shunt tunneler device is used as a fluid tube, or “straw,” with the proximal aperture submerged into a bucket of sterile irrigation liquid containing the distal catheter. Suction pressure is placed against the distal aperture of the tunneler, and the shunt catheter is quickly drawn through the sheath. No special equipment is required. In time trials, the bucket and straw technique took an average of 0.43 seconds, whereas traditional passage methods took 32.3 seconds.

The “bucket and straw” method for passing distal shunt tubing through the tunneler sheath is a technique that increases surgical efficiency and reduces manual contact with shunt hardware. (http://thejns.org/doi/abs/10.3171/2014.9.PEDS14171)

KEY WORDS • ventriculoperitoneal shunt • catheter • hydrocephalus • bucket and straw technique

Placement of a ventriculoperitoneal shunt (VPS) is one of the most common procedures in neurosurgery. Operative time can quickly increase at any point during the many small steps that make up the procedure. Passing the distal portion of a VPS through the subcutaneous sheath can sometimes be a time-consuming and frustrating step, especially when using longer shunt passers. In addition, bends created in a metal sheath to aid in subcutaneous tunneling can lead to increased points of friction between the distal tubing and the sheath.

We describe a way to overcome difficulties encountered when passing the distal shunt tubing through the tunneler sheath, whereby the sheath is used as a fluid tube to allow the distal catheter to be drawn through the fluid tube under suction pressure.

Surgical Technique

The “bucket and straw” technique is used as a way to facilitate passage of the distal shunt through the metal or plastic subcutaneous peritoneal tunneler sheath. To set up for the technique, the distal shunt catheter is placed in a bucket of sterile irrigation liquid. The bucket should be adequately filled with the sterile liquid, which should come near the top of the bucket to allow complete submersion of the shunt. The sheath should be long enough at the cranial side for the proximal opening to be completely submerged in the sterile liquid containing the shunt catheter, which allows the catheter to be held under water near the opening.

The surgeon operating at the head of the patient will use blunt forceps to guide the distal end of the shunt catheter into the submerged proximal end of the tunneler sheath (straw; Fig. 1). The assistant at the abdominal incision holds a standard surgical suction tip snugly onto the distal aperture of the plastic sheath. The creation of a tight seal from the suction tip to the sheath is essential to the success of the technique. We typically use a 12-Fr Rhoton

Abbreviation used in this paper: VPS = ventriculoperitoneal shunt.
suction tip (CareFusion), which is similar in diameter to the distal end of the sheath. Once full suction is applied, the catheter is quickly drawn through the sheath along with the irrigation liquid. The process of advancing the shunt tubing is essentially reduced to a fraction of a second. In fact, it is possible for the catheter to pass directly into the suction canister if the surgeon does not securely hold the catheter at its cranial end. We recommend that the surgeon at the proximal end strongly secure the distal catheter in the irrigation bucket or attach the valve prior to this step, so as not to lose control of it. The sheath can then be removed in the usual manner (Video 1).

**Video 1.** Methods for CSF shunt catheter passage through the plastic sheath. Demonstration of bucket and straw technique and time trial comparison with traditional technique of passing distal catheter through sheath. Copyright Angela Downes. Published with permission. Click here to view with Media Player. Click here to view with Quicktime.

The efficiency of this technique can be highlighted by comparing it to a traditional method of manually advancing the shunt tubing through the distal tunneler sheath. The traditional method used at our institution requires an assistant to occlude the distal end of the sheath after it has been filled with irrigation liquid while the surgeon uses forceps to pass the distal catheter through the proximal opening. Often, the catheter will stick to the sides of the sheath, and if the irrigation fluid leaks out, passage is even more difficult.

To objectively compare these two techniques, we performed 20 time trials of passing antibiotic-impregnated shunt tubing through a 61-cm plastic tunneler sheath, first using the traditional method and then using our technique. The average time for our bucket and straw technique was 0.43 seconds, with the fastest time at 0.20 seconds; this is compared with an average time of 32.3 seconds for traditional catheter passage.

**Discussion**

Neurosurgeons often consider VPS placement as technically straightforward. However, this commonly performed operation is associated with a high complication rate, including infection, obstruction, migration, breakage, and overdrainage.

Many studies have focused on the effective implementation of intraoperative protocols with the ultimate goal of reducing infections.\(^1\text{,}5\text{,}10\) A decreased risk of shunt infection or failure has been correlated with several factors including a patient age greater than 3 months at the time of initial surgery, more extensive surgeon experience, minimizing the number of times that surgical gloves contact the shunt system and skin edges, and keeping the duration of the operation to 30 minutes or less.\(^2\text{,}3\text{,}6\text{,}9\)

Our bucket and straw technique reduced the time required to pass the shunt tubing through the distal tunneler by an average of 32 seconds. Although our times improved with practice in both cases, the fastest time for the traditional method was 21.1 seconds, which is far from the best time of 0.20 seconds for the bucket and straw technique. While we do not suggest that this technique directly reduces shunt infections, we do think it is a useful modification for improving overall operative efficiency and decreasing hands-on manipulations of the catheter. We have found it particularly useful when passing antibiotic-impregnated distal shunt catheters, which seem to be more pliant and prone to sticking in the plastic tunneling sheath.

This technique is applicable to patients of all ages, but limitations of plastic sheath length may make it difficult in some adults. If performing the technique in taller patients, one should use a long tunneling sheath, and the incision for the distal catheter should be placed along the upper abdomen to allow an adequate distance of sheath to be submerged in water at the cranial entry.

**Conclusions**

We describe an alternative technique for passing distal shunt tubing down a tunneler sheath. The operative time for passing the distal catheter via this method is consistently reduced to less than 0.50 seconds.

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Disclosure

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

Author contributions to the study and manuscript preparation include the following. Conception and design: Tuite, Vandergrift. Acquisition of data: Truong. Analysis and interpretation of data: Downes. Drafting the article: Downes. Critically revising the article: Downes, Beckman. Reviewed submitted version of manuscript: Downes. Video creation: Truong.

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