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Laparoscopic-Assisted Lumboperitoneal Shunt: A Simplified Technique

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ABSTRACT

Objectives: Lumboperitoneal shunt has been advocated as a better alternative to ventriculoperitoneal shunt in communicating hydrocephalus. To minimize the morbidity of subcutaneous tunneling or an open abdominal wound, we developed a simplified technique for laparoscopy-assisted placement of lumboperitoneal shunts.

Methods: Patients deemed candidates for lumboperitoneal shunts underwent laparoscopy-assisted lumboperitoneal shunt placement. Using a Tuohy needle, the neurosurgeon obtains access to the lumbar subthecal space. Simultaneously, the laparoscopist obtains access to the peritoneal cavity with two 5-mm ports for the take down of the descending colon, clearing the way for the passage of the shunt passer from the back into the peritoneal cavity.

Results: Over the last 5 years, 45 patients have undergone laparoscopy-assisted lumboperitoneal shunt placement. Patients have been followed with neuropsychiatric examinations, imaging studies, and repeated neurological examinations. No complications related to the laparoscopy have occurred. Neurosurgical complications included postural headaches caused by overdrainage in 4 patients requiring laparoscopic modification of the shunt slit and in 1 patient with acquired Arnold-Chiari I malformation.

Conclusion: Laparoscopy-assisted lumboperitoneal shunt offers many advantages over percutaneous ventriculoperitoneal or laparoscopic transabdominal lumboperitoneal shunts. The procedure can be performed in less than 30 minutes by any practicing laparoscopist.

Key Words: Lumboperitoneal shunt, Communicating hydrocephalus, Laparoscopy.

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INTRODUCTION

Cerebrospinal fluid diversion is the treatment of choice for hydrocephalus. Currently, ventriculoperitoneal (VP) shunt is widely accepted and practiced as the standard diversion procedure. This procedure, however, remains morbid because of the inherent risk imposed by brain cannulation and the open abdominal incision for the placement of the distal tip of the shunt.[1,2]

With the introduction of clinical laparoscopy, minimally invasive surgery replaced the open abdominal procedure and eliminated most of the associated risks.[3-10] However, cannulation of the brain remains a significant problem. Therefore, investigators developed the percutaneous lumboperitoneal (LP) shunt for communicating hydrocephalus, with gratifying results.[1,2,11]

With minimally invasive surgery, laparoscopic transabdominal LP shunt has become possible.[12] It involves laparoscopic dissection and exposure of the anterior lumbar disc spaces. This technique requires advanced laparoscopic skills that may not be available at many community hospitals. In this report, we describe a simplified technique for placement of a laparoscopy-assisted LP shunt that can be performed by any practicing laparoscopist in less than 30 minutes.

METHODS

After adequate neurological evaluation, patients deemed candidates for the procedure are placed in a right lateral decubitus position on a beanbag with the lower extremities flexed at both hips and knees. The upper extremities are extended anteriorly. Adequate padding is used to protect all prominent body parts. The surgical field is draped to ensure access to the back and the abdomen.

A short, transverse skin incision is made at the left paraspinal area opposite the L3 spinous process. The proximal tip of the Spetzler shunt is introduced into the subthecal space with a Tuohy needle. The position is confirmed by cerebrospinal fluid egress.

Access into the peritoneal cavity is obtained by placement of a Veress needle at the lowest point below the left costal margin. Pneumoperitoneum is established fol-

Table 1.
Indications for laparoscopy-assisted lumboperitoneal shunts.

Indication	Number of Patients
Communicating hydrocephalus	20
Normal pressure hydrocephalus	14
Pseudotumor cerebri	6
Lumbar Root cysts	4
Hydromyelia	1

Table 2.
Complications.

Complications	Number of Patients
Postural headaches	4
Arnold-Chiari malformation	1

lowed by insertion of a 5-mm port for the camera.

Under direct vision, another 5-mm Hunt trocar (Apple Medical Corporation, Marlboro, Massachusetts) is inserted into the left lower quadrant. This trocar has no inflation port, thus providing a wider inner diameter for the passage of the shunt passer from the back to the front.

The hanging transverse colon will be readily identified. The white line of Toldt is taken down with laparoscopic shears, with or without cautery. The colon, with the help of some blunt dissection, will fall centrally exposing the left retroperitoneum. Gerota's fascia is identified, and the dissection is carried laterally to Gerota's fascia until the quadratus lumborum muscle is identified **(Figure 1)**.

The shunt passer is then passed from the back incision under direct vision and is advanced through the Hunt port for the passage of a long silk suture. The distal end of the Spetzler shunt is pulled through the Hunt port for removal of the silk suture. The distal end of the shunt is pushed back into the peritoneal cavity and is advanced to the appropriate location in the pelvis. Proper function is confirmed by observing fluid egress within the peritoneal cavity.

RESULTS

Over the last 5 years, 45 patients have undergone laparoscopy-assisted placement of LP shunts. Indications for the procedure are depicted in **Table 1**. Patients have been followed-up with neuropsychiatric examinations, imaging studies, and repeat neurological examinations. A gratifying response rate occurred in the normal pressure hydrocephalus and pseudotumor cerebri group.

Complications are depicted in **Table 2**. No complications related to the laparoscopy occurred. Neurosurgical com-

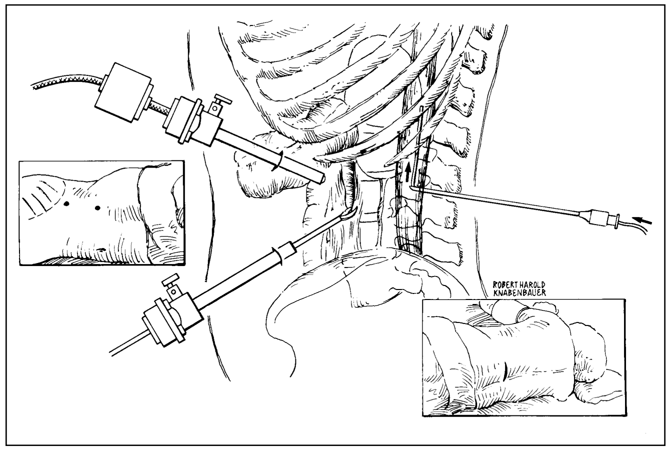

Figure 1. Patient positioning for laparoscopy-assisted lumboperitoneal shunt placement.

plications included postural headaches caused by overdrainage in 4 patients, requiring laparoscopic modification of the shunt slit, and 1 patient with acquired Arnold-Chiari I malformation, as demonstrated by magnetic resonance imaging (MRI). This patient required supratentorial shunting. No infections were encountered.

DISCUSSION

Cerebrospinal fluid diversion is the treatment of choice for hydrocephalus. Diversion, when indicated, has been achieved with the VP shunt. This procedure however has some inherent risks related to brain cannulation, to the open abdominal wound, or to both of these, with the insertion of the distal tip of the shunt.[1,2]

To minimize morbidity, investigators explored other possible options. After the introduction of laparoscopy, the abdominal part of the procedure has been replaced by minimally invasive surgery thus minimizing the morbidity of an open abdominal wound while leaving the morbidity of brain cannulation unchanged.[3-10]

Minimally invasive surgery offers a chance for diagnostic laparoscopy in patients with multiple abdominal operations and enables adhesiolysis prior to the insertion of the distal tip of the shunt. Laparoscopy can also be used for revision of the distal end of the shunt avoiding open wounds.[3,6-8] With communicating hydrocephalus, cannulation of the brain can be avoided. Instead, the proximal tip of the shunt can be inserted into the lumbar subthecal space.[1,2,11] This will eliminate potential complications like brain damage or intracranial bleeding.

In a large study, Aoki[1] reported extensive experience comparing 207 patients who underwent LP shunts to 120 patients who underwent VP shunt during the same period. LP shunt offered many advantages over VP shunt. In addition to avoiding the brain, the operative time was shorter, the incidence of infection was lower, the incidence of obstruction of the shunt was lower, the incidence of short catheter secondary to child growth was lower, and no slit ventricle syndrome occurred. LP shunt, on the other hand, has some limitations, such as restriction to communicating hydrocephalus, technical difficulties in patients with vertebral deformity, in addition to some specific complications like radiculopathy, myopathy, and Arnold-Chiari malformation.[1]

Initially, several reports described percutaneous LP shunts,[11] followed by laparoscopic transabdominal LP shunts.[12] The latter procedure involves laparoscopic dissection and exposure of the anterior lumbar disc spaces. This is a fairly complicated and time-consuming procedure that requires advanced laparoscopic skill that may not be available in many community hospitals.

To bring the procedure into the armamentarium of any practicing laparoscopist, we describe here our technique that is fairly simple and requires no advanced laparoscopic skills.

Laparoscopy-assisted LP shunt placement offers many advantages over percutaneous VP or LP shunts, percutaneous or laparoscopic transabdominal. It avoids brain cannulation, open wounds on anterior abdominal wall, enables proper positioning of the distal tip away from the omentum, provides an opportunity for diagnostic laparoscopy and possible adhesiolysis in patients with multiple abdominal surgeries prior to the placement of the new shunt, and is generally a better tolerated procedure. Should revision become necessary, the distal tip of the shunt can easily be retrieved laparoscopically, eliminating the need for an open procedure.

In our experience, no laparoscopic or wound complications, myelopathy, or radiculopathy were encountered. Four patients developed postural headaches secondary to overdrainage, and 1 patient developed Arnold-Chiari malformation. All were managed with laparoscopic revision of the shunt.

CONCLUSION

Laparoscopy-assisted LP shunt offers many advantages over percutaneous VP or laparoscopic transabdominal LP shunts. The procedure can be done in less than 30 minutes by any practicing laparoscopist.

References:

1. Aoki N. Lumboperitoneal shunt: clinical applications, complications, and comparison with ventriculoperitoneal shunt. *Neurosurgery.* 1990;26:998-1004.

2. Babur H, Torres Q, Savitz M. Lumboperitoneal shunts. *Mt Sinai J Med.* 2000;67:272-273.

3. Schievink W, Wharen R, Reimer R, Pettit P, Seiler J, Shine T. Laparoscopic placement of ventriculoperitoneal shunt: preliminary report. *Mayo Clin Proc.* 1993;68:1064-1066.

4. Cuatico W, Vannix D. Laparoscopically guided peritoneal insertion in ventriculoperitoneal shunts. *J Laparoendosc Surg.* 1995;5:309-311.

5. Armbruster C, Blauensteiner J, Ammerer H, Kriwanek S. Laparoscopically assisted implantation of ventriculoperitoneal shunts. *J Laparoendosc Surg.* 1993;3:191-192.

6. Box J, Young D, Mason E, et al. A retrospective analysis of laparoscopically assisted ventriculoperitoneal shunts. *Surg Endosc.* 1996;10:311-313.

7. Khosrovi H, Kaifman H, Hrabovsky E. Bloomfield S, Prabhu V, El-Kadi H. Laparoscopic-assisted distal ventriculoperitoneal shunt placement. *Surg Neurol.* 1998;49:127-135.

8. Khaitan L. Brennan E. A laparoscopic approach to ventriculoperitoneal shunt placement in adults. *Surg Endosc.* 1993;13: 1007-1009.

9. Reardon P, Scarborough T, Mathews B, Marti J, Preciado A. Laparoscopically assisted ventriculoperitoneal shunt placement using 2-mm instrumentation. *Surg Endosc.* 2000;14:585-586.

10. Roth J, Park A, Gewirtz R. Minilaparoscopy assisted placement of ventriculoperitoneal shunts. *Surg Endosc.* 2000;14:461-463.

11. Spetzler R, Wilson C, Schulte R. Simplified percutaneous lumboperitoneal shunting. *Surg Neurol.* 1977;7:25-29.

12. Huie F, Sayad P, Usal H, Hayek N, Arbit E, Ferzil G. Laparoscopic transabdominal lumboperitoneal shunt. *Surg Endosc.* 1999;13:161-163.