

Technique-Shunt

Laparoscopic versus non–laparoscopic-assisted ventriculoperitoneal shunt placement in adults. A retrospective analysis

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Abstract

Background: Ventriculoperitoneal shunts and distal shunt revisions bear a high risk of distal malfunction, especially in patients with previous abdominal pathologies as well as in obese patients. We performed laparoscopy-guided distal shunt placement or revision for patients with and without a positive abdominal history. We review the indications, techniques, complications, and long-term outcomes of these cases and compare the results to those of patients operated without laparoscopic guidance.

Methods: A total of 211 distal shunt procedures were performed in our institute between January 2001 and December 2005, 59 of which were laparoscopically guided, and 152 were not. Of the 211 procedures, 177 were placement of new shunt systems, and 34 were distal revisions. A total of 33 procedures were performed in 25 patients with a history of abdominal surgery or inflammatory bowel disease; 15 procedures were operated with laparoscopic guidance.

Results: The short-term complication and outcome rates were similar between the laparoscopy group and the other patients. Among the patients with new shunts, the long-term distal malfunction rate was lower in the laparoscopy group compared with the nonlaparoscopy group (4% vs 10.3%, respectively; $P = .17$). No patients in the laparoscopy group and 6 patients operated by other techniques had distal malfunction. There was 1 laparoscopy-related mortality and no morbidity.

Conclusions: Laparoscopy is not routinely indicated in distal shunt placement or revision. However, a laparoscopy-guided procedure may lower the rate of distal malfunction in patients with previous abdominal surgeries.

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Keywords:

Laparoscopy; Minilaparotomy; Ventriculoperitoneal shunt; Distal revision; Complications

1. Introduction

Ventriculoperitoneal shunts are common procedures in neurosurgery. Shunts are placed for treatment of hydrocephalus, drainage of arachnoid cysts, and postcraniotomy chronic subcutaneous fluid collections. The most common organ recruited for draining is the peritoneum, but shunts may drain to the pleura or cardiac atrium [4,29]. Several techniques are used to place the distal end

of the shunt into the peritoneal cavity, such as exposing various layers of the abdominal wall and sticking a trocar into the peritoneum, or performing a minilaparotomy, followed by placement of the distal end into the peritoneum. Shunt surgery bears an immediate and a delayed risk of perforating an abdominal organ, as well as a delayed risk of mechanical distal malfunction. Laparoscopy-guided placement of distal catheters and distal revisions have previously been described, but this technique is not routinely used. We present our experience with laparoscopic-assisted shunt placement and distal shunt revisions and compare the outcome and complications of this technique with other techniques in selected patient populations.

Abbreviations: BMI, body mass index; CSF, cerebrospinal fluid; ICP, intracranial pressure; VPS, ventriculoperitoneal shunt.

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2. Methods

2.1. Inclusion criteria

All patients undergoing VPS procedures between January 1, 2001 and December 31, 2005 were included. Because the aim of the study was to evaluate the abdominal part of the procedure, we included all patients older than 18 years who underwent placement of a peritoneal catheter regardless of the proximal site of the shunt (ventricular, arachnoid cyst, or other cranial fluid spaces). Patients undergoing distal revisions were also enrolled if the procedure included dealing with the peritoneal end. The patients' data were retrospectively collected from their medical files, surgical reports, and follow-up notes.

2.2. Technical aspects

Shunt procedures were performed by a neurosurgical resident and a senior neurosurgeon. The procedures aided by laparoscopy were performed in collaboration with a specialist general surgeon or a senior resident experienced in laparoscopic procedures.

2.2.1. Procedure description

The cranial part of the operation is performed concurrently with the abdominal part except in revision cases in which only the abdominal part was revised. Pneumoperitoneum is created using a closed technique with a Verres needle. Carbon dioxide is insufflated to a pressure of 12 mm Hg. A 5-mm subumbilical trocar is inserted, and a 5-mm videoscope is used. An additional 5-mm trocar is inserted for cases in which an intra-abdominal intervention of the distal tubing is needed. The peritoneal cavity is inspected, and a suitable place for the insertion of the distal part of the shunt is selected, usually in the right hypochondrium. The distal tubing is inserted and localized under videoscopic inspection, and distal CSF flow is verified (either spontaneously or after shunt valve pumping). The videoscope is then removed. The peritoneum is deflated, and the trocars are removed. Abdominal skin incisions are closed with intracutaneous absorbable stitches.

2.3. Data collection

Data that were collected included basic demographics, reason for the operation (including etiology of the hydrocephalus), type of procedure performed, method of abdominal shunt handling (laparoscopic, trocar based, or minilaparotomy), intraoperative findings, technical problems during operation, length of procedure, postoperative complications,

and long-term complications (including the need for distal shunt revisions and infections). We also noted the patients' preoperative abdominal status. Any patient who had undergone an abdominal operation in the past (eg, appendectomy, cholecystectomy), regardless of the surgical technique and severity of the historical pathology, was considered to have a positive abdominal history. Other cases that were considered as having a positive abdominal history were patients with inflammatory bowel disease, patients with multiple (>5) previous shunt insertions to the abdomen, and patients with a history of peritonitis secondary to any reason.

2.4. Statistics

The data were recorded on Excel spreadsheets. Differences of outcome and complications between treatment options were evaluated using the χ^2 test.

3. Results

A total of 211 procedures were performed during the 5-year study period on 173 patients who fulfilled the inclusion criteria. They included 96 men and 77 women; average age was 60 years (range, 19–88). Of these 211 operations, 177 involved the placement of new shunt systems, and 34 were distal revisions. Seven procedures included a proximal revision in addition to the distal revision at the same operation. Altogether, 59 distal shunts (28%) were placed with laparoscopic aid. The remaining 152 cases (72%) had the distal end placed either by using a trocar (22%) or by a minilaparotomy (52%). The technique was not specified in the reports on 38 (26%) patients. Based on the inherent intersurgeon variability of the trocar technique, all patients not operated by means of a laparoscope comprised one group. The distribution of the patients in the various groups is presented in Table 1. There were no significant differences in patients' ages, percentage of positive abdominal history, and length of operation between the laparoscopy-aided and other subgroups.

3.1. Outcome and complications

Short-term (<1 month) and long-term (>1 month) outcomes and complications are summarized in Table 2. The average follow-up time was 22 months for the laparoscopy group and 25 months for patients treated using other techniques. The main outcome variables that were evaluated and compared between the laparoscopic and the other techniques were infection rate, distal malfunction, and

Table 1
Study groups

	N	All procedures		Patients with positive abdominal history	
		Laparoscopy	Other techniques	Laparoscopy	Other techniques
Entire cohort	211	59	152	15	18
New shunts	177	43	134	10	17
Distal revision	34	16	18	5	1

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