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## Introduction

Insertion of a ventriculoperitoneal (VP) shunt improves morbidity and mortality in patients with hydrocephalus.<sup>(1)</sup> Evolution of technology and surgical technique has resulted in patients surviving longer with good quality of life. Therefore, the lifetime probability of a patient with a VPS in situ developing another health condition requiring laparoscopic intervention has correspondingly increased. We present a first case report of a New Zealand woman with VPS undergoing laparoscopic pelvic surgery.

## Case Presentation

A 52-year-old lady was referred to Gynaecology Outpatient Clinic at Dunedin Hospital with ongoing severe menorrhagia after unsuccessful hormonal (Mirena®) management. Past medical history included hypertension, obesity and subarachnoid haemorrhage requiring VPS placement twenty years prior. She was histologically diagnosed with endometrial carcinoma, FIGO grade 1 with no evidence of metastases on CT scan staging. Hysterectomy and bilateral salpingectomy was recommended for a definitive treatment.

A laparoscopic approach was preferred due to her background multiple comorbidities. Following a review of the literature and discussion with the neurosurgeons, the decision was made for a laparoscopic approach.

## Case Progress

The procedure was conducted with routine anaesthetic monitoring. Veres needle insufflation to 20mmHg was used. The VP shunt was visualized patent and appeared to be free floating in the peritoneum. Although her uterus and ovaries appear normal, there were multiple pelvic adhesions with the uterus completely adherent to the bladder. Therefore, it was converted to a laparotomy. A general surgeon and urologist assisted with adhesiolysis, dissection and mobilization of the bladder. Hysterectomy and bilateral salpingo-oophrectomy was performed with total estimated blood loss of 400mL.

The patient recovered with no evidence of raised intracranial pressure during inpatient care and at 3-week-follow-up.

## Literature Review

Evidence for the safety of laparoscopic surgery in patients with VP shunts is mostly qualitative. Current literature follows four main publications prior to the year 2000 that established the theory behind raised intracranial pressure when using pneumoperitoneum. In the year 2000, Jackman et al. published a series of 18 paediatric patients undergoing laparoscopic procedures with routine anaesthetic monitoring.<sup>(2)</sup> This concluded that laparoscopy with routine anaesthetic monitoring was safe in patients with VP shunts.

We have compiled the evidence published since 2000 on the outcomes for patients with VP shunts who undergo laparoscopy (Table 1). Case reports of patients undergoing elective laparoscopic procedures were collected where the indication for laparoscopy was independent of the VP shunt. This included paediatric, urological, general surgical and gynaecological procedures. Studies not in English were excluded. Seven eligible papers were found.

**Table 1** Summary of case reports published since 2000

Author	No. of Procedure Cases	Monitoring	Outcome
Al-Muffarej et al. <sup>(3)</sup>	1	Cholecystectomy	Routine Uncomplicated
Hammill et al. <sup>(4)</sup>	1	Cholecystectomy	Routine Uncomplicated
Allam et al. <sup>(5)</sup>	23	Cholecystectomy	Routine 8 converted to open 2 VP shunt infections Uncomplicated
Sankpal et al. <sup>(6)</sup>	1	L Salpingectomy	Routine Uncomplicated
Sraikou et al. <sup>(7)</sup>	1	Excision of adrenal gland adenoma	Transcranial Dopplers (TCD) of basal cerebral artery flow Uncomplicated
Cobianchi et al. <sup>(8)</sup>	1	Cholecystectomy	Routine Uncomplicated
Houten et al. <sup>(9)</sup>	1	Hysterectomy	Routine Vaginal migration of distal end of VPS and vaginal CSF leak

## Conclusion

Laparoscopy in the presence of a ventriculoperitoneal shunt in situ is safe. Of 29 procedures compiled 18 were routine laparoscopic procedures with no complication (62%). The other main outcome during procedure was conversion to an open approach; in all cases attributed to dense intra-abdominal adhesions. No significant association found between conversion rate and time since insertion of the VP shunt, number of revisions or history of previous surgeries.

Techniques reported to minimize risk of raised ICP are:

- Pre-op assessment of shunt function
- Minimal intraoperative manipulation of shunt
- Limit maximum insufflation pressure to 12mmHg

As this patient cohort increases, more quantitative research must be conducted to ascertain the safety of laparoscopy in patients with VP shunts.

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