



# Circumbilical Access for Ventriculoperitoneal Bypass Insertion in Adults

## *Acesso Circumbilical para Inserção de Derivação Ventriculoperitoneal em Adultos*

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### Abstract

**Introduction** The use of a minilaparotomy for catheter implantation can bring important complications such as adhesions, intestinal lesions, incisional hernias and postoperative pain. In neurosurgery, the umbilical access, currently widely used by surgeons of different specialties mainly for its aesthetic results, is still restricted by the unfamiliarity of the access.

**Material and Method** During the period between 2019 and 2020, a total of 12 patients who required ventricular bypass were selected, using circumbilical access for insertion of the peritoneal catheter and followed up for 12 months to analyze possible complications.

**Description of the Technique** The surgeon responsible for the abdomen performs an umbilical incision bordering the upper edge of the upper ring, avoiding the mamelon, quickly finding the linea alba under the umbilical plane, which after dissection allows reaching the peritoneum, without breaking the rectus muscles. The peritoneum can then be opened under visual control.

**Results** All patients presented resolution of hydrocephalus with good aesthetic results and without complications.

**Discussion** The aesthetic result of the transumbilical procedure was the stimulus for the development of the technique that proved to be easy, safe, cheap, and aesthetic. Initially, the ease of access to the peritoneal cavity is clear, in addition to avoiding manipulation of the rectus abdominis muscle, which improves postoperative pain.

**Conclusion** The circumbilical access for the implantation of a ventriculoperitoneal shunt is safe, effective and has a better aesthetic result for adult patients and should be part of the operative arsenal of neurosurgeons.

### Keywords

- ▶ ventriculoperitoneal shunt
- ▶ hydrocephalus
- ▶ umbilicus

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**Resumo**

**Introdução** O uso de uma minilaparotomia para o implante do cateter pode trazer importantes complicações como adesões, lesões intestinais, hérnias incisionais e dor pós operatória. O acesso umbilical, atualmente muito utilizado por cirurgiões de diversas especialidades principalmente por seus resultados estéticos, na neurocirurgia ainda é restrito pela não familiaridade do acesso.

**Material e Método** Foram selecionados 12 pacientes, durante o período de 2019 e 2020, que necessitavam de derivação ventricular, sendo utilizada o acesso circumbilical para inserção do cateter peritoneal e acompanhada por doze meses para análise de possíveis complicações.

**Descrição da Técnica** O cirurgião responsável pelo abdome realiza uma incisão umbilical margeando a borda superior no rodete superior, fugindo do mamelão, encontrando rapidamente a linha alba sob o plano umbilical que após dissecção permite-se chegar ao peritônio, sem romper os músculos retos. O peritônio pode então ser aberto sob controle visual.

**Resultados** Todos os pacientes apresentaram resolução da hidrocefalia com bom resultado estético e sem complicações.

**Discussão** O resultado estético do procedimento transumbilical foi o estímulo para o desenvolvimento da técnica que se mostrou fácil, segura, barata e estética. Inicialmente é nítido a facilidade do acesso à cavidade peritoneal, além de evitar a manipulação do musculo reto abdominal, o que melhora a dor pós-operatória.

**Conclusão** O acesso circumbilical para a implantação de derivação ventriculoperitoneal é seguro, efetivo e possui melhor resultado estético para pacientes adultos, devendo fazer parte do arsenal operatório de neurocirurgiões.

**Palavras-chave**

- ▶ derivação ventriculoperitoneal
- ▶ hidrocefalia
- ▶ umbigo

**Introduction**

The treatment of hydrocephalus is part of a neurosurgeon's routine, and ventriculoperitoneal shunt is a popular option due to the familiarity of the procedure. This procedure is classically described with the performance of a paraumbilical incision and opening of the rectus abdominis muscle. However, the use of a minilaparotomy for catheter implantation can bring important complications such as adhesions, intestinal lesions, incisional hernias and postoperative pain<sup>1</sup>

With these complications in mind, the umbilical approach was initially described in 1986<sup>1,2</sup> and is currently widely used by surgeons from different specialties, mainly for its aesthetic results. In neurosurgery, its use is still restricted by the unfamiliarity of access.

Thus, the present article aimed to analyze the outcome of the technique of insertion of ventriculoperitoneal shunts in adults using circumbilical access.

**Material and Method**

Externally, the umbilicus consists of an infundibulum, being surrounded by the rodete, which is an elevated external margin. The fall of the umbilical stump leaves a scar on the underside that may be situated in or near a shallow depression in the skin, called a sulcus. The mamelus is considered to be a remnant of the solid parts of the umbilical cord, being a prominent area that contained the urachus and umbilical

arteries. The normal umbilicus has a wide variety of intermediate forms, and each component mentioned may or may not be present.<sup>3</sup>

The navel, on its internal surface, is free, being separated by the parietal peritoneum from the abdominal cavity, having only one umbilical fascia with variable thickness. The function of this ring is to reinforce the peritoneum, its margins being formed by the union of the oblique fascia in the aponeurosis of the linea alba. Superiorly, its border is free, but inferiorly it receives the insertion of the umbilical and urachus arteries, which in the adult form the medial and median umbilical ligaments, respectively.

Twelve patients with a mean age of 54 years old who required ventricular shunt were selected, during the period between 2019 and 2020, 8 of them women, for the following causes: posterior fossa tumors, subarachnoid hemorrhage, normal pressure hydrocephalus and pseudotumor cerebri.

As an exclusion criterion for the procedure, in addition to the criteria for implantation of a ventriculoperitoneal shunt, patients with previous abdominal surgeries or with umbilical herniations were considered.

After the surgery, the patient remained hospitalized for 24 hours and during this period a cranial and abdominal computed tomography (CT) was performed to verify an adequate positioning of the two ends of the catheter. Within a period of 14 days, the removal of the cranial suture was scheduled, and outpatient follow-up remained quarterly in the first year after surgery.

After the procedure, the patients were followed-up for 12 months, being questioned about the aesthetic result and investigated for possible complications such as abdominal pain, infection, and incisional hernia.

## Technique Description

Surgery performed by two neurosurgeons, one responsible for the skull and the other for the abdomen. Initially, the patients were positioned in dorsal decubitus with their head on a rotational caster contralateral to the puncture site and a pad on the ipsilateral shoulder. Afterwards, marking, shaving and asepsis are performed with degerming and alcoholic chlorhexidine according to protocols,<sup>4</sup> paying special attention to the umbilicus, in addition to antibiotic prophylaxis with first-generation cephalosporin.

The surgeon responsible for the abdomen performs an umbilical incision bordering the upper edge with a scalpel n15 (►Fig. 1A). The incision site must be in the upper ring, avoiding the mamelon, to avoid injury to the remnants of the umbilical cord or a possible Meckel diverticulum, whose prevalence in the population varies from 0.3 to 2.9%.<sup>5</sup> Next, the linea alba is quickly found under the umbilical plane, which, when gradually dissected with the help of Kelly forceps, allows it to reach the peritoneum directly, without breaking the lateral straight muscles. The peritoneum can then be opened under visual control.

The incision, trepanation and cranial puncture remain identical to the traditional technique as well as the tunneling and burial of the peritoneal catheter in the peritoneal cavity (►Fig. 1B).

Closure is performed only with a 4.0 polyglecaprone thread in an intradermal suture technique followed by a sterile gauze dressing.

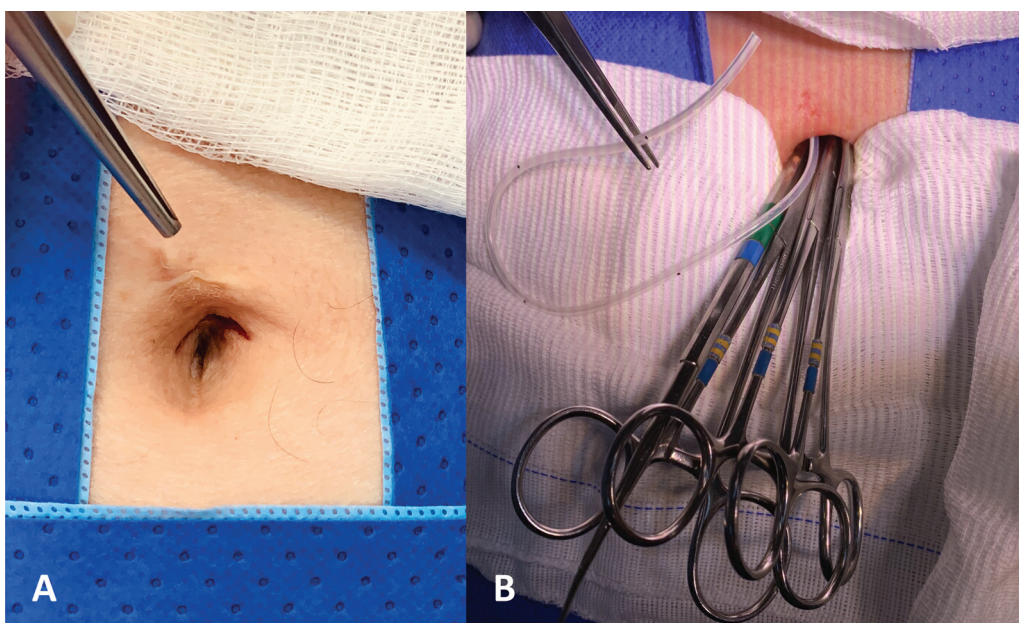
## Results

The aesthetic improvement of the procedure is easily visible in the postoperative period when compared with the transrectal incision technique commonly performed. The duration of the procedure and the postoperative period were not prolonged. All patients had resolution of hydrocephalus and none complained of abdominal pain after the procedure, with an infection rate remaining at zero, as well as the rate of incisional hernia. All patients evolved uneventfully during the 12-month follow-up period and confirmed that they were satisfied with the aesthetic result of the surgery. A summary of the cases with the primary pathologies can be seen in ►Table 1.

## Discussion

For a long time, the use of the navel to access the abdomen was avoided because it was believed to be a source of infection. But the aesthetic result of the transumbilical procedure was the stimulus for the development of the technique that proved to be easy, safe, cheap and aesthetic.<sup>1,2,6-9</sup> Studies show its use for cholecystectomies, appendectomies and even breast implants.<sup>7,9,10</sup>

Several other advantages were observed with this surgical technique, initially the ease of access to the peritoneal cavity is clear, in addition to avoiding manipulation of the rectus abdominis muscle, which improves postoperative pain. The passage of the catheter and its introduction did not present difficulties and, in addition, its passage through the midline avoided the breast tissue, an important factor for females. Closure is also simpler, as only one layer of skin needs to be sutured, without the need to suture fascia and subcutaneous tissue.



**Fig. 1** (A) The circumbilical incision with a scalpel blade is observed; (B) Intraoperative appearance after tunneling the shunt catheter.

**Table 1** Summary of operated cases

Patients	Gender	Age (years old)	Pathology	Postoperative infection	Incisional hernia	Aesthetic outcome
1	F	26	Posterior fossa tumor	–	–	+
2	F	67	Neurocysticercosis	–	–	+
3	F	75	Posterior fossa tumor	–	–	+
4	F	62	Subarachnoid hemorrhage	–	–	+
5	M	64	Posterior fossa tumor	–	–	+
6	F	70	Normal pressure hydrocephalus	–	–	+
7	F	48	Meningitis	–	–	+
8	M	49	Pituitary macroadenoma	–	–	+
9	F	43	Lumbar schwannoma	–	–	+
10	M	37	Pseudotumor cerebri	–	–	+
11	F	58	Posterior fossa tumor	–	–	+
12	M	59	Normal pressure hydrocephalus	–	–	+

This technique should initially be compared to the minimally invasive technique of percutaneous introduction of a Portnoy trocar. However, the circumbilical approach allows an opening of the peritoneal cavity under direct visualization, unlike the trocar that perforates the peritoneum blindly, with the risk of intestinal injury.<sup>7</sup>

Studies show that the risk of infection and wound dehiscence were not higher when performing an umbilical incision.<sup>2,6–9</sup> The risk of umbilical and incisional hernia was not reported in our series or in the literature.<sup>6–9</sup>

## Conclusion

The circumbilical access for the implantation of a ventriculoperitoneal shunt is safe, effective, and has a better aesthetic result for adult patients, and should be part of the operative arsenal of neurosurgeons. In this series of cases presented, there were no complications reported such as infections and incisional herniations, proving to be a feasible technique for neurosurgical routine.

### Conflict of Interests

The authors have no conflict of interests to declare.

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