

THIRD VENTRICULOSTOMY THROUGH THE LAMINA TERMINALIS FOR INTRACRANIAL PRESSURE MONITORING AFTER ANEURYSM SURGERY

Technical note

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ABSTRACT - Objective: A new ventriculostomy technique through the lamina terminalis is described. This technique is applied mainly during aneurysm surgery at the acute stage. **Method:** Thirteen patients were operated on intracranial aneurysms and, during the procedure, had the lamina terminalis fenestrated. A ventricular catheter was inserted into the third ventricle, left in place and connected to an external drainage system for further intracranial pressure (ICP) monitoring and/or cerebrospinal fluid (CSF) drainage. **Results:** ICP readings and CSF drainage were obtained in all cases. No complication was recorded. **Conclusion:** Third ventriculostomy through the lamina terminalis is a simple and easy technique that can be used as an alternative to conventional ventriculostomy. This procedure can be indicated in cases where the ventricle is not reached by means of another technique, and when the decision to perform ventriculostomy is made at the end of aneurysm surgery.

KEY WORDS: cerebral aneurysm, ventricular drainage, third ventricle, intracranial pressure, operative technique.

Terceiroventriculostomia via *lamina terminalis* para monitorização de pressão intracraniana após cirurgia de aneurisma: nota técnica

RESUMO - Objetivo: Uma nova técnica de ventriculostomia através da *lamina terminalis* é descrita para utilização durante cirurgia de aneurisma na fase aguda. **Método:** Treze pacientes foram operados de aneurisma cerebral e, durante o procedimento, tiveram a *lamina terminalis* fenestrada. Um catéter ventricular foi inserido no terceiro ventrículo e conectado a um sistema de drenagem externa para monitorização da pressão intracraniana (PIC) e/ou drenagem de líquido (LCR). **Resultados:** A leitura da PIC e a drenagem do LCR foram obtidas em todos os casos. Não se evidenciaram complicações. **Conclusão:** A terceiroventriculostomia através da *lamina terminalis* é uma técnica simples e fácil, que pode ser usada como uma alternativa à ventriculostomia convencional. Esse procedimento pode ser indicado em casos em que as técnicas convencionais falham, ou quando a decisão de realizar a ventriculostomia é tomada ao final da cirurgia de aneurisma.

PALAVRAS-CHAVE: aneurisma cerebral, drenagem ventricular, terceiro ventrículo, pressão intracraniana, técnica operatória.

Early surgery for treatment of ruptured intracranial aneurysms is well established^{1,2}. Intracranial pressure (ICP) monitoring, by means of a ventriculostomy, may improve the outcome as it decreases the incidence of ischaemic complications and hydrocephalus³⁻⁵. However, ventricular puncture in patients with acute Subarachnoid Hemorrhage (SAH) is neither atraumatic⁶ nor easy to be performed. Fur-

thermore, opening the lamina terminalis influences a better outcome in patients with ruptured intracranial aneurysms^{7,8}.

We present our preliminary experience with ICP monitoring by using a catheter placed directly in the third ventricle through the lamina terminalis. All patients were operated in the acute stage of a ruptured intracranial aneurysm.

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Table 1. Results.

| Case | Gender | Age (years) | HH | Site | ICP(mean) mmHg | Time (days) | GOS |
|------|--------|-------------|----|-----------------|----------------|-------------|-----|
| 1 | f | 23 | 2 | A1 | 6.8 | 5 | 5 |
| 2 | f | 48 | 1 | ACoA | 6.7 | 3 | 5 |
| 3 | f | 51 | 1 | PCoA | 6.5 | 6 | 4 |
| 4 | f | 42 | 1 | PCoA | 2.7 | 3 | 5 |
| 5 | f | 47 | 2 | M2 | 5.6 | 4 | 4 |
| 6 | f | 51 | 1 | ACoA/M2 | 1.9 | 4 | 4 |
| 7 | f | 31 | 1 | ACoA | 1.6 | 2 | 5 |
| 8 | f | 65 | 3 | ACoA | 4.0 | 6 | 3 |
| 9 | m | 37 | 1 | ACoA | 5.5 | 5 | 5 |
| 10 | f | 71 | 1 | M1 | 8.4 | 4 | 4 |
| 11 | f | 57 | 2 | ACoA | 12.6 | 4 | 5 |
| 12 | f | 44 | 2 | basilar tip | 6.5 | 5 | 2 |
| 13 | f | 41 | 1 | ACoA/PCoA/M2/M3 | 9.1 | 5 | 4 |

HH, Hunt&Hess; ICP, intracranial pressure; GOS, Glasgow Outcome Scale; A1, anterior cerebral artery; ACoA, anterior communicating artery; PCoA, posterior communicating artery; M1,M2,M3, middle cerebral artery; m, male; f, female.

METHOD

Thirteen consecutive patients harboring intracranial aneurysms were operated on in the acute stage of SAH.

A pterional approach was performed in all cases and the cisterns opened widely. After having clipped the aneurysm, a fenestration of the lamina terminalis was performed by using bipolar forceps. A ventricular catheter (Radioopaque silicone ventricular catheter. Codman External Drainage System II, Johnson & Johnson Professional, Raynham, MA, USA) was inserted into the third ventricle for approximately 20 mm (the fenestrated tip of the catheter was inserted) (Fig 1). The ventricular catheter was then connected to the external drainage system.

The drainage was accomplished continuously keeping the drip chamber at 20 cm height. ICP was measured every hour and recorded. Ventriculostomy was removed the day after ICP had stabilized.

RESULTS

The results are summarized on Table 1. There was no complication that could be attributed to the ventriculostomy.

DISCUSSION

In patients with SAH, ventriculostomy is useful for 1) ICP monitoring; 2) cerebrospinal fluid (CSF) drainage and 3) managing hydrocephalus^{2,3,5,9-11}. Although the risk of aneurysmal rebleeding increases⁴, it is outweighed by the benefits⁵.

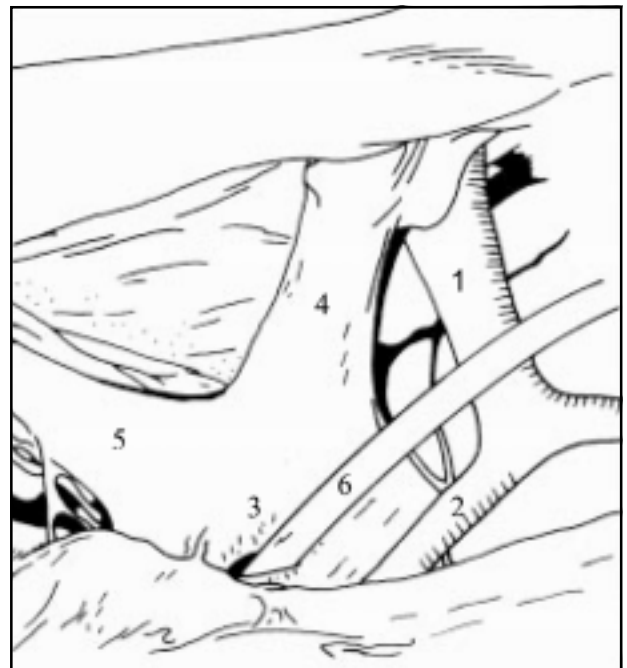


Fig 1. Artist's drawing of ventricular catheter in place. 1, internal carotid artery; 2, anterior cerebral artery; 3, lamina terminalis; 4, right optic nerve; 5, left optic nerve; 6, catheter.

The most popular technique of ventriculostomy is to perform catheterization of the frontal horn of the lateral ventricle through an ipsilateral frontal drill hole¹², at the operating theatre or bedside¹³. Although



Fig 2. Postoperative CT scan showing catheter placed in the third ventricle.

this is generally considered a straightforward procedure, it may add time and trauma to aneurysm surgery⁶.

Alternatively, Paine et al.¹⁴ described an intraoperative ventricular puncture. This approach is very useful in most cases but the ventricle is not always reached through the first pass.

Lamina terminalis fenestration is indicated as an adjunct to aneurysm repair^{7,8} and has been a routine procedure in our clinic in the last years without noticeable complication. Previous experience with a shunt system using the third ventricle¹⁵ proved that catheterization is well tolerated. In the present study, we describe a simple way to get a reliable ventriculostomy for CSF drainage and ICP monitoring. The catheter placement is done under direct vision to ascertain that the whole fenestrated catheter tip is actually in the ventricle. Both ICP readings and pressure curve are extremely sensitive, and CSF drainage is very easy. Due to simultaneous CSF drainage, the pressure values recorded in our cases may be lower than the actual ones¹⁶, but this fact does not undermine the efficacy of the procedure. The midline ventricular position of the catheter warrants the best ICP reference (Fig 2). The disadvantage of the method is that the surgeon has to dissect the cisterns before

he or she obtains CSF ventricular drainage. Although this procedure is simple and safe, it needs more clinical experience; yet, it may become an alternative to ventricular diversion during an aneurysm surgery.

CONCLUSIONS

Third ventriculostomy through the lamina terminalis is a simple and easy technique for the skilled neurosurgeon. Preliminary experience suggests that it can be used as an alternative to conventional ventriculostomy. This procedure can be indicated in cases which the ventricle is not reached by means of another technique, and the decision to perform ventriculostomy is made at the end of aneurysm surgery. No complications directly attributable to this approach were observed in our cases. However, it deserves further study.

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