Surgical technique for cisternostomy: A review

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ABSTRACT

The evolution of modern neurosurgical techniques in traumatic brain injury has been ongoing for the last two centuries. However, it has always been a challenge to obtain an effective clinical outcome, especially in those following severe traumatic brain injuries. Other than the well-established procedures for acute and/or chronic subdural hematomas and depressed skull fractures, newer avenues for the development of surgical techniques, where indicated, have been minimal. The study proposes to apply the principles of microvascular surgery and skull base surgery in selected cases of severe traumatic brain injuries.

Key words: Brain swelling, cisterns, contusions, craniotomy, intracisternal pressure, subdural, traumatic brain injury

INTRODUCTION

The practical scenario in trauma neurosurgery comes with multiple challenges and limitations. In an emergency setup, the primary management of traumatic brain injuries falls upon the resident on duty or medical officer in training. Due to the emergent nature of the condition and with time being an important variable, the experience of the operating surgeon as well as the severity of the injury become important contributing factors in the prognosis of the disease. The indications for decompressive hemicraniectomy have been used for this new procedure for cisternostomy and the results have been compared with decompressive hemicraniectomy. This procedure could be a more elegant and better procedure than decompressive hemicraniectomy. Based on the clinical experience and observation acquired in acute neurosurgical service in a tertiary medical center in a developing country, a novel technique in the management of trauma neurosurgery has been elucidated in the current study.

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SURGICAL TECHNIQUE

The indications for cisternostomy are similar to those for decompressive hemicraniectomy although acute subdural hematomas with a *Glasgow Coma Scale* (GCS) score corresponding to moderate head injury can also undergo cisternostomy. This surgery has been compared to decompressive hemicraniectomy for the same indications and has been found to be better in terms of mortality, morbidity, number of days of stay in the intensive care unit (ICU), and GCS at six weeks. In this article, we will focus on the technique of cisternostomy.

The patient is positioned in a supine position with the head tilted and extended about 20° to the opposite side of the surgery. A frontotemporal flap is made and craniotomy is done in the routine fashion. The sphenoid ridge is removed up to the superior orbital fissure.

A dural opening is first done, parallel to the supraorbital ridge. About 5 cm of the dura is opened in this manner and the subdural hematoma if present is drained. After this, a large handheld brain spatula and suction are used to get into the interoptic cistern. It is to be noted that this step is done without the microscope and has to be done within 2–3 minutes of draining the subdural. After this, the brain may start to swell and this step may become difficult.

Once the interoptic cisterns are opened, the microscope is brought in and the opticocarotid cistern is opened in a sharp fashion. The lateral carotid cistern between the carotid and the third nerve is also opened. Through either one of these cisterns, the membrane of Liliequist is opened and the basilar artery, bilateral *posterior cerebral arteries* (PCAs), superior cerebellar arteries, and the third nerve are visualized. Constant irrigation is performed and the subarachnoid blood is washed out. The brain is lax at the end of the surgery and the bone flap can be replaced.

DISCUSSION

A review of publications during the last 20 years on decompressive craniectomy in patients with severe head

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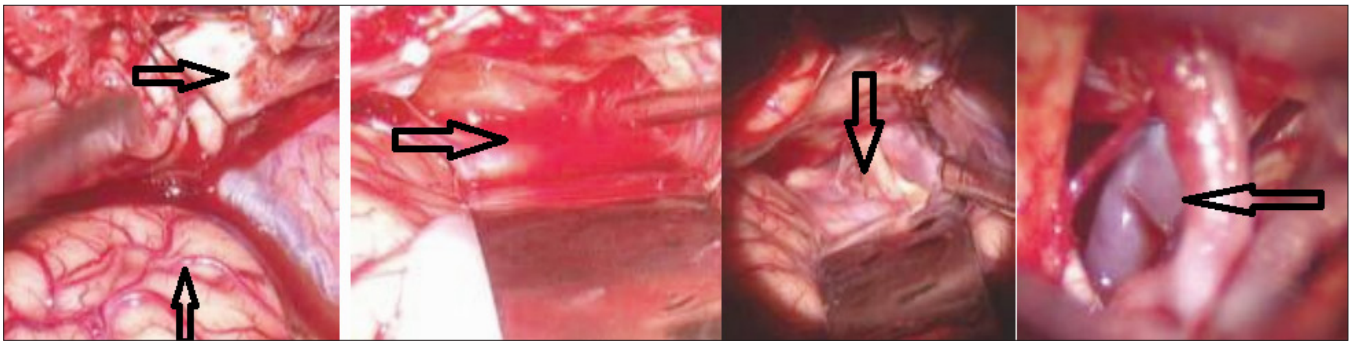

Figure 1: First and second image reveals approach to interoptic cisterns. Third and forth image shows optic chiasma and interoptic cisterns. After that, the opticocarotid cistern is opened in a sharp fashion. The lateral carotid cistern between the carotid and the third nerve is also opened. Through either one of these cisterns, the membrane of Liliequist is opened and the basilar, bilateral PCAs, superior cerebellar arteries and the third nerve is visualized

trauma failed to demonstrate a clear benefit.[1-15] Research in the conservative management of traumatic brain injury with therapeutic options for neuroprotection has been rigorously pursued over the last 40 years.[16]

In the current study, a novel technique which incorporates the discipline of skull base and the microvascular approach of opening the subarachnoid cisterns has been described. Furthermore, it has been recommended that the technique can be reproduced in any well-equipped tertiary care center where the neurosurgery consultant on duty is adequately trained and is cognizant of the pathophysiology of trauma neurosurgery and the approach to its management. It is noteworthy that the microvascular approach described in this study is similar to the previously well-described cases of aneurysmal subarachnoid hemorrhage and related surgical procedures [Figure 1].[17-20]

REFERENCES

1. Alexander E 3rd, Ball MR, Laster DW. Subtemporal decompression: Radiological observations and current surgical experience. Br J Neurosurg 1987;1:427-33.
2. Britt RH, Hamilton RD. Large decompressive craniotomy in the treatment of acute subdural hematoma. Neurosurgery 1978;2:195-200.
3. Clark K, Nash TM, Hutchison GC. The failure of circumferential craniotomy in acute traumaticcerebral swelling. J Neurosurg 1968;29:367-71.
4. Cooper PR, Rovit RL, Ransohoff J. Hemicraniectomy in the treatment of acute subdural hematoma: A re-appraisal. Surg Neurol 1976;5:25-8.
5. Dam Hieu P, Sizun J, Person H, Besson G. The place of decompressive surgery in the treatment of uncontrollable post-traumatic intracranial hypertension in children. Childs Nerv Syst 1996;12:270-5.
6. Fell DA, Fitzgerald S, Moiel RH, Caram P. Acute subdural hematomas: Review of 144 cases. J Neurosurg 1975;42:37-42.
7. Gaab MR, Rittierodt M, Lorenz M, Heissler HE. Traumatic brain swelling and operative decompression: A prospective investigation. Acta Neurochir Suppl (Wien) 1990;51:326-8.
8. Gerl A, Tavan S. Bilateral craniectomy in the treatment of severe traumatic brain edema [in German]. Zentralbl Neurochir 1980;41:125-38.
9. Gower DJ, Lee KS, McWhorter JM. Role of subtemporal decompression in severe closed headinjury. Neurosurgery 1988;23:417-22.
10. Jennett B, Bond M. Assessment of outcome after severe brain damage. Lancet 1975;1:480-4.
11. Jourdan C, Convert J, Mottolese C, Bachour E, Gharbi S, Artru F. Evaluation of the clinical benefit of decompression hemicraniectomy in intracranial hypertension not controlled by medical treatment [in French]. Neurochirurgie 1993;39:304-10.
12. Karlen J, Stula D. Decompressive craniotomy in severe craniocerebral trauma following unsuccessful treatment with barbiturates [in German]. Neurochirurgia (Stuttg) 1987;30:35-9.
13. Kerr FW. Radical decompression and dural grafting in severe cerebral edema. Mayo Clin Proc 1968;43:852-64.
14. Kjellberg RN, Prieto A Jr. Bifrontal decompressive craniotomy for massive cerebral edema. J Neurosurg 1971;34:488-93.
15. Guerra WK, Gaab MR, Dietz H, Mueller JU, Piek J, Fritsch MJ. Surgical decompression for traumatic brain swelling: Indications and results. J Neurosurg 1999;90:187-96.
16. Vink R, Bullock MR. Traumatic brain injury: Therapeutic challenges and new directions. Neurotherapeutics 2010;**7**:1-2.
17. Sindou M. Favourable influence of opening the lamina terminalis and lilliequist's membrane on the outcome of ruptured intracranial aneurysms. A study of 197 consecutive cases. Acta Neurochir (Wien) 1994;127:15-6.
18. Komotar RJ, Hahn DK, Kim GH, Starke RM, Garrett MC, Merkow MB, *et al*. Efficacy of lamina terminalis fenestration in reducing shunt-dependent hydrocephalus following aneurysmal subarachnoid hemorrhage: A systematic review. clinical article. J Neurosurg 2009;111:147-54.
19. Komotar RJ, Olivi A, Rigamonti D, Tamargo RJ. Microsurgical fenestration of the lamina terminalis reduces the incidence of shunt-dependent hydrocephalus after aneurismal subarachnoid hemorrhage. Neurosurgery 2002;51:1403-12.
20. Akyuz M, Tuncer R. The effects of fenestration of the interpeduncular cistern membrane arousted to the opening of lamina terminalis in patients with ruptured ACoA aneurysms: A prospective, comparative study. Acta Neurochir (Wien) 2006;148:725-3.

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