Editorial

Bull Emerg Trauma 2016;4(3):119-120.

Bulletin of Emergency And Trauma

beat

Cisternostomy for Traumatic Brain Injury: A New Era Begins

Giovanni Grasso[1*], Iype Cherian[2]

[1]Section of Neurosurgery, Department of Experimental Biomedicine and Clinical Neurosciences (BIONEC), University of Palermo, Italy
[2]Department of Neurosurgery, College of Medical Sciences, Bharatpur, Nepal

***Corresponding author:** Giovanni Grasso*
Address: Section of Neurosurgery, Department of Experimental Biomedicine and Clinical Neurosciences (BIONEC), University of Palermo, Italy Via del Vespro 129, 90100 Palermo, Italy. **Tel:** +39-091-6554299; **Fax:** +39-091-6554130
e-mail: giovanni.grasso@unipa.it

Received: June 9, 2016
Accepted: June 14, 2016

Keywords: Traumatic brain injury; Cisternostomy; Microsurgical anatomy.

Please cite this paper as:
Grasso G, Cherian I. Cisternostomy for Traumatic Brain Injury: A New Era Begins. *Bull Emerg Trauma*. 2016;4(3):119-120.

Traumatic brain injury (TBI) is a major cause of death and disability especially in the young generations. In the United States TBI affects about 1.7 million people annually [1] and this number is higher in the developing countries. It is well known that TBI is associated to a primary and secondary brain injury. The first is without solution and depends on the impact. In surviving patients, what plays a critical role is the subsequent secondary injury since, without effective treatments, complex cascades will promote additional brain damage.

Despite improvements in medical interventions, there are still currently no drugs available to counteract secondary or delayed damage following TBI. A number of preclinical and clinical studies have long explored agents with neuroprotective effects. However, to date all phase III trials have so far failed in demonstrating efficacy of neuroprotective agents in TBI [2]. The surgical measures in current common practice include external ventricular drain insertion and decompressive craniectomy. There is evidence that both of these measures reduce intracranial pressure but the effect on outcome is ambiguous. The DECRA (Decompressive Craniectomy in Patients with Severe Traumatic Brain Injury), the largest randomized trial in diffuse TBI, failed to show effectiveness of decompressive craniectomy in adults with traumatic brain injury [3]. Although decompressive hemicraniectomy brings the intracranial pressure to atmospheric pressure it does not counteract the intra cerebral pressure, which causes severe brain swelling and herniation.

In this issue of Bulletin of Emergency and Trauma, *Masoudi and collaborators* report on a case of severe TBI in a 13-year-old boy treated by cisternostomy [4]. The patient was admitted following a motor vehicle accident with a GCS of 6. Brain CT scan showed diffuse brain edema, left frontal contusion and posterior interhemispheric subdural hematoma. First, the patient underwent intracranial pressure (ICP) monitoring. Subsequently, with 26 mmHg mean-value of ICP, he was treated surgically by cisternostomy technique. The authors reported a rapid brain relaxation upon the cisterns opening and a progressive improvement of the neurological conditions in the following hours. After 5 days the boy was discharged and in the 3-months follow-up he was completely recovered.

This case shows the usefulness of the cisternostomy following TBI. To date, many cases have been treated with satisfactory results. In this regard, in a personal series, cisternostomy was tried out in over 1000 patients and was found to decrease the intraoperative brain swelling, mortality and morbidity [5].

Briefly, cisternostomy is a novel technique that incorporates knowledge of skull base and microvascular surgery [6-8]. It has been proposed that in acute stages of head injury the cerebrospinal fluid (CSF) could be shifted from the cerebral cisterns to the brain leading to a severe brain swelling. Cisternostomy, by opening the brain cistern to atmospheric pressure has been shown to decrease the intracranial pressure due to a back-shift of CSF throughout the Virchow-Robin (VR) spaces.

It must be considered, however, that opening of the cisterns in a swollen TBI-affected brain is challenging and requires a thorough anatomic knowledge and enough surgical experience.

Principal steps for cisternostomy can be summarized in the following ten steps: 1- Drilling the sphenoid ridge until the orbitomeningeal arteries are encountered; 2- Identification of the superior orbital fissure and the orbitomeningeal band; 3- Division of the meningo-orbital band, which marks the lateral edge of the superior orbital fissure; 4- exposing the inferior aspect of the anterior clinoid process; 5- Elevation of the temporal lobe from the superior orbital fissure exposing the anterior clinoid process; 6- Elevation of the frontal lobe from the anterior clinoid process, which can easily be removed; 7- Opening the dura; 8- Identification and opening of the interoptic, optico-carotid, and lateral carotid cisterns; 9- Approaching the membrane of Liliequist through the optico-carotid window or the lateral carotid window; 10- Drilling the posterior clinoid process in case of difficulty in opening the membrane of Liliequist. Cisternostomy can be considered a novel surgical approach for severe TBI although the philosophy of the cisternal opening is a well-known knowledge in the neurosurgical practice. To date, the technique can be considered as an adjuvant surgical strategy complementary to decompressive craniectomy. However, once its effectiveness will be definitively proven it has the potential to replace decompressive craniectomy in the treatment of severe TBI.

The case report by *Masoudi and collaborators* [4] not only confirms the clear role of cisternostomy following TBI but stimulates for large multicenter clinical trials to evaluate the effectiveness and safety of the cisternostomy following TBI.

Conflict of Interest: None declared.

References

1. Faul M, Coronado V. Epidemiology of traumatic brain injury. *Handbook of clinical neurology*. 2014;**127**:3-13.
2. Grasso G, Alafaci C, Buemi M. Erythropoietin in Traumatic Brain Injury: An Answer Will Come Soon. *World Neurosurg*. 2015;**84**(5):1491-2.
3. Chi JH. Craniectomy for traumatic brain injury: results from the DECRA trial. *Neurosurgery*. 2011;**68**(6):N19-20.
4. Masoudi MS, Rezaei E, Hakimnejad H, Tavakoli M, Sadeghpoor T. Cisternostomy for Management of Intracranial Hypertension in Severe Traumatic Brain Injury; Case Report and Literature Review. *Bull Emerg Trauma*. 2016;**4**(3):161-4.
5. Cherian I, Yi G, Munakomi S. Cisternostomy: Replacing the age old decompressive hemicraniectomy? *Asian J Neurosurg*. 2013;**8**(3):132-8.
6. Cherian I, Bernardo A, Grasso G. Cisternostomy for Traumatic Brain Injury: Pathophysiologic Mechanisms and Surgical Technical Notes. *World Neurosurg*. 2016;**89**:51-7.
7. Cherian I, Grasso G, Bernardo A, Munakomi S. Anatomy and physiology of cisternostomy. *Chin J Traumatol*. 2016;**19**(1):7-10.
8. Grasso G. Surgical Treatment for Traumatic Brain Injury: Is It Time for Reappraisal? *World Neurosurg*. 2015;**84**(2):594.