Collapse Following Subgaleal Negative Pressure Drain Application: Reverse Brain Herniation or Trigeminocardiac Reflex?

Shamik K. Paul, Shalendra Singh, Venigalla Krishna, Gunjan Singh

Department of Anaesthesiology and Critical Care, Armed Forces Medical College, Pune, Maharashtra, India

Address for correspondence: Shamik Kr Paul, MD, DM, Department of Anaesthesiology and Critical Care, Main Block, Armed Forces Medical College, Pune 411040, Maharashtra, India (e-mail: rakshaafmc@gmail.com).

A negative-suction pressure subgaleal drain is most commonly applied during the closure of the cranial defect to reduce the risk of postoperative hematoma formation. The literature revealed few cases of life-threatening subgaleal negative pressure drain (SNPD) associated complications. We report a probable case of reverse brain herniation (RBH) or trigeminocardiac reflex (TCR) from application of SNPD following craniotomy. Both RBH and TCR are the least understood complications of SNPD. TCR is an autonomic brainstem reflex that manifests as sudden bradycardia, hypotension, and gastric hypermotility. This reflex occurs when there is a stimulation of the trigeminal nerve or any of its branches. Though, believed to be an inherent protective reflex, it can lead to adverse outcome if exaggerated. Whereas RBH has been reported following cerebrospinal fluid (CSF) diversion procedure or removal of CSF during posterior fossa surgery, but has also been seen following SNPD in supratentorial surgery. RBH is the least understood of brain herniation syndromes and is a rare complication of ventriculoperitoneal shunt and also after SNPD placement. The early identification of RBH and TCR during scalp closure is imperative to prevent a precipitous drop in heart rate, blood pressure, and further circulatory arrest. Knowledge of both these entities therefore helps prevent cataclysmal complications under anesthesia.

An 18-month-old male weighing 10 kg with enlarged head size was posted for surgery. Magnetic resonance imaging of brain and orbit revealed a supratentorial growth, an optico-chiasmatic glioma with right infraorbital extension resulting in obstructive hydrocephalus associated with large subarachnoid cyst in the right temporal aspect superior to the glioma (Fig. 1A, B). He underwent frontotemporal orbital craniotomy with excision of tumor and drainage of arachnoid cyst. Surgery was uneventful. Hemodynamics as measured by invasive blood pressure (IBP) were stable throughout the surgery. Hemostasis was achieved and duraplasty was done. Before closing the scalp, a subdural drain was inserted to avoid any subgaleal blood collection. Within a few minutes during closure of the scalp, there was bradycardia (heart rate 60–68/min) and hypotension (IBP 60/40 mm Hg). Immediately, the drain was clamped and the negative pressure released. The bradycardia was reversed instantaneously but the hypotension had to be addressed by infusion of noradrenaline at 0.02 mcg/kg/min. The patient was not reversed and was shifted to the pediatric intensive care unit postoperatively for elective mechanical ventilation. The patient was extubated on 2nd day postsurgery with a Glasgow Coma Scale of E4V3M5.

RBH has been known to occur in CSF diversion procedures, like shunt or external ventricular drain placement due to abrupt reduction in the CSF volume resulting in the upward displacement of the medulla and brainstem which leads to intraventricular hemorrhage and tumor bleed. If such an episode is not addressed early, it can even lead to brainstem ischemia. In our case the progression of hemodynamic instability was arrested once the negative pressure was removed. The vitals of the patients were absolutely stable till the suction was applied. Similar hemodynamic disturbances are also observed from TCR arising from painful stimulus to the scalp. The main purpose of this correspondence was to emphasize that the anesthesiologist should always keep in mind the
possibility of RBH or TCR causing sudden hemodynamic collapse during scalp closure following SNPD insertion at the end of craniotomy. As this phenomenon was immediately recognized and addressed by releasing the pressure, a catastrophe was avoided.

Conflict of Interest
None declared.

References

Fig. 1 (A) T1-weighted with contrast axial magnetic resonance imaging of the brain showing lesion in the optico-chiasmatic area with a large subarachnoid cyst in the right temporal region (yellow arrow) with absent right temporal lobe. (B) T1-weighted sagittal view.