Letter to Editor

Brain death after Concorde positioning for supracerebellar–infratentorial approach: Unanswered questions and lessons learned

Ashish Kumar, Suchanda Bhattacharjee, Barada P. Sahu, Dilip Kulkarni

Departments of Neurosurgery and Anesthesiology, Nizam’s Institute of Medical Sciences, Hyderabad, India

E-mail: *Ashish Kumar - drashishmch@hotmail.com; Suchanda Bhattacharjee - suchandab2010@gmail.com; Barada P. Sahu - barada81pd@yahoo.com; Dilip Kulkarni - dilipkum@gmail.com

*Corresponding author

Received: 17 December 11 Accepted: 6 February 12 Published: 19 March 12

This article may be cited as:
Kumar A, Bhattacharjee S, Sahu BP, Kulkarni D. Brain death after Concorde positioning for supracerebellar-infratentorial approach: Unanswered questions and lessons learned. Surg Neurol Int 2012;3:37.

Available FREE in open access from: http://www.surgicalneurologyint.com/text.asp?2012/3/1/37/94036

Dear Sir,

A 51-year-old male presented with a 1-month history of severe headache and vomiting. On admission, neurological examination was remarkable only for early papilledema. The initial computed tomography (CT) scan revealed a hyperdense lesion in posterior third ventricular region with moderate hydrocephalus [Figure 1]. Magnetic resonance imaging (MRI) revealed a well-defined pineal region lesion which was isointense on T1-weighted images and hyperintense on T2-weighted images, and enhanced intensely following the administration of gadolinium [Figure 2]. As the headache was severe, an Ommaya reservoir was inserted and he was investigated further. Serum and cerebrospinal fluid (CSF) tumor markers were negative. He was operated by the Stein’s (supracerebellar–infratentorial) approach and was placed in Concorde position after induction of general anesthesia. The head was flexed (two fingerbreadths between chin and sternum) after elevating the head end of the table. The airway pressures were confirmed with the anesthesiologist (14 cm of H2O). A vertical midline incision was made from just above the inion down to C4. Surgery progressed uneventfully. The cerebellum was well pulsatile after 15–20 ml of CSF was tapped. Superior vermian and pre-central cerebellar veins were coagulated en route. Gross total removal was done with no major artery or venous compromise. The cerebellum was slack and well pulsatile at the end of surgery. Patient remained hemodynamically stable throughout the intraoperative period [Table 1]. He was reversed and made supine. His respiratory efforts were adequate, but motor activity was absent. Pupils were 2 mm and sluggishly reacting. He was kept on the ventilator and planned to be weaned off the next morning. To our surprise, he did not show any signs of reversal and no motor activity was recorded in the next few hours. After 6–8 hours of surgery, his blood pressure dropped and pupils became semi-dilated, non-

![Figure 1: CT showing a hyperdense pineal region lesion with moderate hydrocephalus](image_url)
reactive to light. Inotropic support had to be started and immediate imaging was sought. The postoperative MRI revealed white matter changes on T2-weighted images within cerebellum along with blooming on gradient echo. More interestingly, the brainstem was hypointense on T2-weighted images, suggesting ischemia, and there were no flow voids seen in both anterior and posterior circulation [Figure 3]. The possibility of Digital Subtraction Angiography was remote due to the ever increasing requirements of inotropic support. Soon, there were no brainstem reflexes and pupils became fully dilated. Patient was declared brain dead within 12 hours of surgery. His relatives refused autopsy which would have enlightened us to some extent.

This sudden and unexplainable catastrophe has left us with many unanswered questions. We could not find any literature in support of this phenomenon, although various possible complications associated with Concorde position including cervical spine trauma and vertebro-basilar dissection have been cited.\textsuperscript{[1,2,6]} Possible causes in our case for posterior circulation insufficiency (vertebro-basilar dissection/thrombosis) include compression/kinking of the vertebral arteries between occipital condyles and Cl arch due to hyperflexion. The other explanation could be the bilateral carotid compression due to excessive flexion. The absence of any hemodynamic instability makes it less favorable. As quadriplegia has been reported after a posterior fossa surgery,\textsuperscript{[5]}cervical spine X-ray was done to rule out any cord injury. Pneumocephalus, air embolism, and intracranial hemorrhage have also been cited as reasons for non-reversal of patients after posterior fossa craniotomies.\textsuperscript{[3,4,7,8]}

Lack of supporting data and evidence leaves a lot to be answered. The rapidity of events after an uneventful surgery forced us to introspect. This case exemplifies the need of practising basic precautions in positioning of a patient prior to any surgery. The pre-operative assessment of cervical spine by dynamic flexion and extension views and Doppler study of neck vessels to look out for carotid insufficiency should be done in all patients where extreme neck flexion is anticipated, especially in the elderly. Airway pressure monitoring can be misleading, and hence monitoring of somatosensory-evoked potentials during positioning should be opted for whenever feasible. Although only the pre-central cerebellar and the superior vermian veins were intentionally sacrificed, possibilities of an unintentional venous injury always persist with this approach, and hence precautions should be exercised in order to prevent any other inadvertent venous injury. Lack of autopsy leaves much to speculation, but we would like to emphasize the compulsory use for electrophysiology during positioning in elective surgeries. Also, this case undermines the importance of certain basics in neurosurgery, especially in positions like Concorde, while we embark on high-end, technologically

### Table 1: Intraoperative records of blood pressure, heart rate, end-tidal CO2, SpO2, and airway pressures during surgery

| Time  | Systolic BP (mm of Hg) | Diastolic BP (mm of Hg) | SpO2 (%) | End-tidal CO2 | Heat rate | Airway pressure (cm of H2O) |
|-------|------------------------|-------------------------|----------|---------------|-----------|-----------------------------|
| 8.00  a.m. | 140                     | 100                     | 100      | 35            | 120       | 15                          |
| 9.00  a.m. | 130                     | 90                      | 100      | 35            | 124       | 14                          |
| 11.00 a.m. | 140                     | 96                      | 100      | 33            | 128       | 15                          |
| 1.00  p.m. | 136                     | 98                      | 100      | 30            | 100       | 15                          |
| 3.00  p.m. | 138                     | 96                      | 100      | 30            | 96        | 14                          |
| 4.00  p.m. | 140                     | 90                      | 100      | 32            | 98        | 13                          |
Commentary

The authors present the case of a devastating complication following a supracerebellar–infratentorial approach to a pineal region tumor. The Concorde position was used for this case and surgery appeared to have been uncomplicated; however, the patient failed to awaken from anesthesia, and within 12 hours was brain dead. This case reminds us all that surgery is fraught with unexpected risks and that we must be constantly vigilant for them.

In reviewing this case, the authors note that for approaches requiring significant neck flexion, such as with the Concorde position, it is important to evaluate the patient for possible cervical instability and to use neurophysiologic monitoring. The risk of complications with the Concorde position is increased in patients with cervical spondylosis, and in those with cerebrovascular occlusive disease or vascular anomalies, such as unilateral distal vertebral artery hypoplasia, which may increase the risk of ischemia caused by flexion or rotation of the head (Bow Hunter’s Syndrome).

While I agree with the value of neurophysiologic monitoring when performing these cases, I am personally struck by the findings present in the left cerebellum on this patient’s postoperative MRI, which are consistent with a venous infarct. Swelling and hemorrhage of the cerebellum secondary to compromise of its venous drainage may occur secondary to stretching, or intentional sacrifice, of the bridging veins between the cerebellum and tentorium associated with this approach, and may have contributed to the clinical course described by the authors. Efforts to minimize risks to the venous drainage of the cerebellum should be added to the author’s list of safety precautions for this approach.

Joseph M. Zabramski
Chief, Section of Cerebrovascular Surgery,
Director, Clinical Neurosurgical Research,
Barrow Neurological Institute, Phoenix, Arizona.
E-mail: neuropub@dignityhealth.org

REFERENCES

1. Edgcombe H, Carter K, Yarrow S. Anaesthesia in prone position. Br J Anaesth 2008;100:165-83.
2. Gulsen S, Yilmaz C, Ozdemir O, Gerilmez A, Caner H, Altinors N. Placement of three-pin holders in concorde position. Turk Neurosurg 2010;20:136-41.
3. Morgenthaler K, Larsen B, Grundmann U, Silomon M. Intracranial haemorrhage: A reason for delayed awakening after general anaesthesia. Anaesth 2005;54:450-4.
4. Rath GP, Bithal PK, Chaturvedi A, Dash HH. Complications related to positioning in posterior fossa craniectomy. J Clin Neurosci 2007;14:520-5.
5. Rau CS, Liang CL, Li CC, Lee TC, Lu K. Quadriplegia in a patient who underwent posterior fossa surgery in prone position. Case report. J Neurosurg 2002;96:101-3.
6. Rozet I, Vavilala MS. Risks and benefits of patient positioning during neurosurgical care. Anesthesiol Clin 2007;25:631-53.
7. Tondon A, Mahapatra AK. Subtemporal intracerebral hemorrhage following infratentorial surgery. J Clin Neurolsci 2004;11:762-5.
8. Vimala S, Reddy MK, Rao UG. Non-awakening from anesthesia following posterior fossa surgery due to skull pin-induced tension pneumocephalus. Neurol India 2011;59:641-2.