Peri-Operative Anesthetic Events in Posterior Fossa Tumor Surgery

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ABSTRACT

INTRODUCTION: Posterior fossa surgery is one of the most commonly performed neurosurgery in children. The aim of the study is to identify the incidence of intraoperative anesthetic events along with postoperative outcome following posterior fossa surgery.

METHODS: This is a retrospective study of the posterior fossa surgery performed at Bir Hospital, Kathmandu from 2007 to 2012. The data were collected from pre-anesthetic evaluation sheet, intra-operative charts, surgical records and nursing charts from neurosurgical ICU.

RESULT: There were a total of sixty nine patients in our study which showed that thirty-eight (55.07%) patients already have had CSF diversion surgery for hydrocephalus before definite surgery for posterior fossa tumor. Seven (10.14%) patients had neurological deficit and 5 patients (7.25%) were being operated for recurrence of tumor. Significant intraoperative complications like 10 (14.5%) cases of badycardia, 3 (4.34%) cases of tachycardia, 8 (11.6%) cases of hypotension and 7 (10.14%) cases of hypertension were recorded. No case of clinically significant venous air embolism was seen. Forty (57.97%) patients were extubated at the end of the surgery and 29 (42.02%) patients were kept on mechanical ventilation postoperatively. The mortality was 13.04%.

CONCLUSION: The most common type of posterior fossa childhood tumor was medulloblastoma. The present study showed more intraoperative cardiac dysarrhythmias than clinically significant venous air embolism. Therefore the anaesthesiologist should expect dysarrhythmia more commonly during the surgery near the pons and the root of lower cranial nerves.

KEY WORDS: Anesthetic management, Posterior fossa surgery,Intraoperative complication, Postoperative outcome

INTRODUCTION

P osterior fossa tumors are one of the most devastating forms of human illness. It is more common in children and medulloblastoma is the commonest tumor followed by low grade astrocytoma. Posterior fossa surgeries are demanding, delicate and may take long hours, making it challenging for both the surgeons and the anesthesiologists. The main challenges for the anesthesiologist in these operations are due to the raised intracranial pressure, positioning of the patient, chances of cranial nerve dysfunction during surgery, the high possibilities of venous air embolism (VAE) and the need for mechanical ventilation postoperatively.[1]

Anesthetic goals for posterior fossa surgery are to facilitate the surgical access, minimize nervous tissue trauma, and maintain respiratory and cardiovascular stability. For less eventful surgery, we need to have meticulous planning with special anesthetic considerations preoperatively. Positioning and preparations for surgery as well as; prevention, detection and management of venous air embolism is of paramount importance.[2] The aim of this study is to analyse the incidence of intraoperative anesthetic events and postoperative outcome of posterior fossa surgery at Bir Hospital.

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METHOD

This is a retrospective study of the posterior fossa surgeries done at Bir Hospital, Kathmandu from April 14, 2007 to April 12, 2012. The data were collected from preanesthetic, intraoperative anesthesia charts, surgical records and nursing charts of the neurosurgical ICU.

The data of each patient were collected by a detail chart review of all preoperative evaluations and the intra operative and postoperative records. Preoperative data were collected, contained demographic data, ASA physical status, neurological status, history of prior Posterior Fossa surgery and preoperative treatment of hydrocephalus. Evidence of specific cranial nerve involvement, somatic or sensory deficit, ataxia, dysphagia and altered mental status were recorded. Intraoperative data were collected including position of the patients during surgery, technique of operation, the occurrence of clinically significant VAE, haemodynamic changes, volume of intraoperative blood loss and transfusion and duration of surgery. To evaluate the occurrence of haemodynamic changes, episodes of arterial hypotension or hypertension (defined as a decrease or increase of 20% or more in the systolic blood pressure as compared with preoperative pressure respectively), and the occerance of cardiac dysrhythmias were recorded. Postoperative outcome were assessed in terms of the requirement of postoperative mechanical ventilation, days in ICU, postoperative mortality in ICU or development of complications such as neurological deficits, cerebrospinal fluid (CSF) leak, meningitis and need for reoperation.

Anesthetic Technique

Preanesthetic evaluation of the patients was done one day before surgery.. All operative procedures were performed under general anesthesia. Patients were anesthetized according to a standard protocol of the hospital. Intravenous line was opened and the patients were premedicated with midazolam intravenously. Anesthesia was induced intravenously using thiopental or propofol, followed by vecuronium to facilitate endotracheal intubation. Analgesia was maintained with pethidine or fentanyl. After orotracheal intubation general anesthesia was maintained with isoflurane and oxygen and muscle relaxation was maintained with intermittent dose of vecuronium. Mechanical ventilation was adjusted to achieve $ETCO_2$ between 28 and 35 mmHg. Central venous catheter was kept in right subclavian vein through infraclavicular approach after induction of anesthesia. Then the patient was kept either on prone or lateral position depending on the surgical approach.

Routine monitors such as heart rate, ECG, pulse oximetry, urine output and invasive arterial blood pressure were monitored. Continuous monitoring of end tidal carbon dioxide (ETCO2) was used throughout the surgical procedure to maintain normocarbia and to detect clinically significant venous air embolism.

The patients who were extubated at the end of the surgery were reversed with neostigmine and glycopyrrolate. Those who needed ventilator support were not reversed and continued on controlled mechanical ventilation. Based on clinical improvement they were weaned off gradually.

RESULTS:

A total of sixty-nine patients had undergone surgery for posterior fossa tumor during the four years study period and all the cases were enrolled in this study. The age ranged between 18 months to 76 years with slight male preponderance (52% vs 48%) (Table1).

Table 1. Demographic Data

Age in years	Male	Female	Total
0-4	5	3	8 (11.6%)
5-15	13	17	30 (43.47%)
>15	18	13	31 (44.93%)
	36 (52.17%)	33 (47.8%)	69

Fifty five percent (38) patients have had CSF diversion before surgery for posterior fossa tumor, 7 (10.14%) patients had pre existing neurological deficit and 5 patients (7.25%) were being operated for recurrence of tumor.

Total excision of tumor was possible in 31 (44.93%) patients. Near total excision was done in 20 (28.98%) patients while only subtotal excision was possible in 16 patients (21.28%). Only biopsy of the tumor was possible in 2 patients due to massive brain swelling. The histopathological finding showed meduloblastoma and ependymoma to be more common in young patients below 16 years of age while hemangioblastoma and astrocytoma were more common in patients above 16 years (Table 2).

Table 2:			
Histopathology	Patients 16 years and above	Patients < 16 years	No of Patients
Medulloblastoma	4	15	19(27.54%)
Ependymoma	3	12	15(21.74%)
Astrocytoma	8	10	18(26.1%)
Hemangioblastoma	8	0	8(11.6%)
Meningioma	4	0	4 (5.8%)
Oligodendroglioma	2	0	2 (2.9%)
Sample inadequate	2	0	2(2.9%)

The surgeries lasted for 5 to 15 hours. Significant bradycardia was recorded in 10 (14.5%) patients and 3 (4.34%) cases had tachycardia,hypotension was recorded in 8 (11.6%) cases and 7 (10.14%) cases of hypertension requiring active management in the intraoperative period. No patients have had clinically detectable venous air embolism (Table 3).

Table 3:	
Intraoperative events	Number of patients
Bradycardia	10 (14.5%)
Tachycardia	3 (4.34%)
Hypotension	8 (11.6%)
Hypertension	7 (10.14%)
Venous Air Embolism (VAE)	0

Transfusion of whole blood was required in 53 (76.8%) patients ranging from 50ml to 1200ml.

40 patients (57.97%) were extubated at the end of the surgery. 29 (42.02%) patients were kept on mechanical ventilator postoperatively.

Out of the 69 patients, 55 (79.71%) patients were discharged from neurosurgical ICU while 9 (13.04%) patients died. Out of twenty-nine patients who needed postoperative mechanical ventilation. tracheostomy was done in 11 (15.94%) patients due to chest infection and prolonged ventilation.

Four cases required re-exploration due to development of cavity hematoma, 7 (10.14%) patients developed cerebrospinal fluid leak, 7 (10.14%) patients developed postoperative meningitis. 11 (15.94%) patients required resuturing of the wound gap, 6 (8.69%) patients developed postoperative hydrocephalus and 8 (11.59%) patients developed pseudomeningocele.

DISCUSSION

Posterior fossa tumor is a common brain tumor affecting all ages. . Posterior fossa operations are demanding, delicate and long surgeries, making them challenging for both the surgeons and the anesthesiologists[1]. Moreover, it is more common in children. Studies have shown that the incidence of posterior fossa tumor in children ranges from 45 to 60 %.[3] Muzumdar D et al[4] have also reported that the most common age group affected by medulloblastoma was between 3 and 12 years amounting for 49.6% and there were 15 patients below the age of 1 year in their study. Similarly our study shows 54.07% of the patients who underwent posterior fossa surgery were 15 years or below.

The patients with posterior fossa tumor may also have preoperative neurological deficits. Orliaguet GA et al[5] in their study have found preoperative neurological deficit in 17 % of their patients. In our study 10.14% patients had some form of neurological deficit. Preopereative neurological deficit also makes anesthesia challenging. The knowledge of neurological evaluation by anesthesiologists and the care of such patients perioperatively is vital for the management of these patients.

Posterior fossa surgeries are usually long surgeries. In our study the operations lasted from 5 to 15 hours. The duration of surgery is important because the more prolonged the surgery, the more there is the risk of perioperative complication.

During intraoperative period various studies have shown cardiac dysarrhythmias. These cardiovascular responses are due to stimulation of the floor of the fourth ventricle, medullary reticular formation, or trigeminal nerve. Bradycardia also results from stimulation of the vagus nerve.[1] Most arrhythmias occur during surgery near the pons, and the roots of nerves V, IX and X. In our study we found significant bradycardia in 14.5% of the patients and sinus tachycardia in 4.34%. 10.14% of the patients had hypertension and 11.6% had hypotension.

Orliaguet GA et al[5] have also observed cardiac dysarrhythmias in 2 patients (10%) of their patients hypotension in 1 patient (5%) and hypertension in 2 patients (10%) in prone position. They have observed that intraoperative complications were significantly more frequent in prone position

compared with sitting position. Though we have not studied these complications separately in prone, sitting and lateral position, yet cardiovascular events seenmore frequently in our patients. Some cases of asystole during posterior fossa surgery have also been reported[6] however, we have not observed a single case of intropeative asystole.

The incidence of venous air embolism during posterior fossa surgery in lateral or prone position is approximately 10 – 15%.[1] but in our study none of our patients had clinically significant venous air embolism. This may be either due to actual absence of such incidence or due to lack of sensitive detection device such as transoesophagial echocardiography of VAE in our setup. Incidence of VAE is as high as 66%, as detected by intraoperative precordial Doppler and two-dimensional echocardiography imaging.[7] The basis of diagnosis of VAE in our setup is clinical parameters and monitoring of end tidal carbondioxide.

During intraoperative period whole blood was transfused in 53 patients (76.8%) volume ranging 50-1200 ml and non of the patient has developed transfusion related complications.

At the end of surgery 40 (58%) patients were extubated on the operating table whereas 29 (42%) patients were not extubated and continued on mechanical ventilation because of intraoperative hemodynamic unstability, brain swelling and long duration of surgery.

During ICU stay the mortality was 13.04 % in our stud BUT. Jain VK et al [8] in their study have mortality of only 6%. The high mortality in our study may be due to late presentation of the patient with pre-existing neurological deficit and hydrocephalus.

CONCLUSION

The most common type of posterior fossa childhood tumor was medulloblastoma and the post operative mortality appears to be high. The present study showed more intraoperative cardiac dysarrhythmias than clinically significant venous air embolism. Therefore the anaesthesiologist should expect dysarrhythmia more commonly during the surgery near the pons and the root of lower cranial nerves. Moreover the operating time should be minimized and post operative care should be optimized in order to reduce the perioperative mortality rate.

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