Initial Experience with Total Intravenous Anesthesia with Propofol for Elective Craniotomy

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The objective of the study was to determine the effectiveness of total intravenous anaesthesia with propofol as a technique of choice in patients undergoing elective craniotomy for brain pathology. Five patients ASA I-II, aged 35-65 years scheduled for neurosurgery were studied. Intraoperatively haemodynamics were monitored. Duration of anaesthesia, total dose of propofol, time of recovery and postoperative nausea and vomiting were evaluated. Good haemodynamic stability was observed. Recovery time was quick. Incidence of postoperative nausea and vomiting was very low. Neurosurgical operations were carried out under total intravenous anaesthesia with propofol without side effects.

Key words: Craniotomy, propofol, total intravenous anaesthesia

One of the aims of neuroanaesthesia is rapid and smooth awakening of the patient undergoing neurosurgical procedure in order to assess the neurological status of the patient following surgery. The standard use of halothane or isoflurane does not allow quick assessment of these patients following their use. Moreover, because of slow recovery from anaesthesia, these patients need to be stay in recovery area for a longer period of time and might need intensive care for close monitoring which increase the cost for the patients.

Total intravenous anaesthesia (TIVA) can be defined as a technique of general anaesthesia using a combination of agents given solely by the intravenous route and in the absence of all inhalational agents including nitrous oxide[1]. TIVA is becoming more popular. Its advantages included its titratability, rapid return of consciousness and less respiratory complications. Propofol (2.6 diisopropyl phenol), a new intravenous hypnotic agent, undergoes rapid redistribution, metabolism to inactive metabolites, and has a short elimination half life [2].It is an intravenous anaesthetic agent which is widely used for induction and maintenance of anaesthesia. Propofol as an anaesthetic agent for neurosurgical procedure has major advantages which included reduction in cerebral blood volume and intracranial pressure and preserve autoregulation and vascular reactivity. It also has quick onset of action and rapid recovery [3,4].The present report summaries our experience with TIVA in patients undergoing elective craniotomy.

Materials &Methods

We consecutively enrolled five patients undergoing elective craniotomy for brain pathology at B.P Koirala Institute of Health Sciences, Dharan, Nepal. All the patients were fasted for 8 hours preoperatively and premedicated orally with 0.5mg alprazolam, the night before and the morning of surgery. Upon arrival to the theater, routine monitors as EGC, non invasive blood pressure and pulse oximeter was attached. Peripheral venous access was established with a 16G cannula in the forearm of the patients. Lactated Ringer's solution was started as maintenance. The patients were allowed to breathe 100% oxygen while 1% propofol 2-3mg/ kg was injected intravenously over 20-30 sec until patients lost verbal contact. The lungs were ventilated with 100% oxygen. Once mask ventilation was established, 0.1mg/kg vecuronium IV was given. Analgesia was obtained with IV morphine 0.1mg/kg bolus and repeated when required. Anaesthesia was immediately maintained with continuous propofol infusion at the rate of 100µg-200 µg/kg/min and 100% oxygen. Patients trachea was intubated with orotracheal tube and lungs ventilated. Arterial line was secured for blood pressure monitoring. End-tidal CO_2 and invasive blood pressure were also continuously monitored while patients were ventilated. During intraoperative period, signs of light anaesthesia as lacrimation, sweating, mydriasis, hypertension and tachycardia were treated with 1-2 ml bolus of propofol and the rate of infusion of propofol was adjusted according. The infusion was stopped after the scalp was sutured.

Patient No.	Age (yrs)	Gender	Weight (KG)	Diagnosis
1.	35	M	60	Cerebellar abscess
2.	55	M	62	Glioma
3.	65	F	54	Meningioma
4.	45	M	63	Meningioma
5.	52	F	49	Meningioma

Table 1: Demographic data of patients undergoing total intravenous propofol anesthesia.

Residual neuromuscular block was reversed with neostigmine 0.5mg/kg and glycopyrrolate 0.4mg. Trachea was extubated on the operation table after patients had spontaneous respiration and maintained airway reflexes. Once the patients were fully awake and oriented, they were transferred to the recovery bay. Duration of anaesthesia, total dose of propofol, time of recovery, awareness and postoperative nausea and vomiting were noted.

Results

The demographic data is summarized in **Table 1**. Among them, three were male and age varied from 35 to 65 years. Three were patients of meningioma, 1 glioma and a cerebellar abscess. Following induction of anaesthesia with propofol, all the patients slept within 30 seconds. Mean duration of anaesthesia was 253 minutes (180-360 min).The total infusion dose of propofol varied from 750mg to 2.16gm. Intraoperatively, highest and lowest mean arterial blood pressure recorded was 140mmHg and 65mmHg respectively. Likewise highest and lowest heart rates recorded were 118 beats/min and 65 beats/min. End tidal CO2 was maintained at 32-36 mmHg. After discontinuation of TIVA and reversal of neuromuscular block, spontaneous breathing returned after 5.3±3.2 minutes, extubation was possible after 7.5±5.1 minutes. Patients were oriented to time, place, person in 10.1±4.7 minutes. Patients were ready to be shifted to recovery bay after 11.1±4.2 minutes. One patient had an episode of vomiting which was treated with ondansetrone 4mg IV.

Discussions

Anesthesia with inhalation agents, particularly with halothane and Isoflurane, is still very popular in developing countries but as argued they might not be suitable in situation where patient's assessment following surgery becomes the priority thus fast recovery from anaesthesia is desired. The study was set to investigate the efficacy of total intravenous anaesthesia with propofol in patients undergoing craniotomy. We found that TIVA caused rapid and predictable recovery of the patients from anaesthesia which is opted for neurosurgical patients. These characteristics clearly relate to the drug' pharmacokinetics.[5] Rapid recovery was interpreted as return of consciousness which was assessed clinically by eye opening and patient's orientation.

Induction and maintenance of anaesthesia were easily achieved with propofol infusion. The infusion rate of propofol (100-200 μg/kg/min) has been shown to be effective for anaesthesia maintenance in surgical procedures of various durations.[6,7] As a hypnotic, propofol does not have intrinsic analgesia property. In these case series, we used morphine for intraoperative pain relief as newer, short acting opioids as fentanyl, remifentanil and sufentanil are not available in the country. Incidence of hypotension is high with propofol infusion.[8] In this study, we did not encounter hypotensive episodes in any of our patients, may be because the number of patients in the study was small. The incidence of nausea and vomiting was low as only one patient has an episode of vomiting postoperatively which was treated with ondansetrone.

Every technique has its own disadvantages. Awareness when propofol is used as sole anaesthetic agent has been a matter of controversy.[9] Various studies are been done using propofol in combination with opioids infusions[10,11].We used propofol as sole agent for TIVA as shorter acting opioids are not available. The recovery would vary if morphine is used in combination with propofol infusion. We did not have routine monitors to assess awareness but we relied on our clinical acumen and knowledge of the doses which usually prevents awareness. When questioned postoperatively, none of the patients recalled the intraoperative period.

To our knowledge, there have not been reports of using TIVA in neurosurgery in Nepal though there are lots of studies reported from different part of the world.[12,13] There are very few referral hospitals in Nepal where neurosurgery is performed. TIVA is a common term used by most anaesthesiologist but it has not come into practice in Nepal because some argue that the ease to titre the volatile agents to effect have similar benefits as of TIVA. Moreover, choice of anaesthesia depends on the anaesthesiologist's

standard practice. Our study is limited by not evaluating the effect of propofol on intracranial pressure (ICP) because of the lack of equipments required to measure ICP. Our study is also limited by the number of patients.

Conclusions

In our small series, total intravenous anaesthesia with propofol was easily induced and maintained by infusion without intraoperative problems. The return of psychomotor performance and cognitive function and recovery time from anaesthesia was rapid after the administration of propofol with few side effects. We recommend that TIVA should be practiced in every hospital particularly where neurosurgery is carried out.

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