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Study of Efficacy of Propofol in Maxillo Facial Surgery

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Abstract

This study evaluated the efficacy of propofol along with local anaesthesia for maxillofacial surgical procedures. A total of 25 patients, who are ASA class 1 or 2 category undergoing maxillo facial surgery were selected for inclusion in this study. Anaesthesia was induced with 2 mg/kg propofol, 1mg midazolam and 50 micrograms of fentanyl and was maintained with a continuous infusion of propofol. 2 % lidocaine was also used for the operative procedure. Intra operative vital parameters were recorded to monitor the quality of anaesthesia. All the intra operative vital parameters were within normal limits. Propofol is a suitable agent to accomplish maxillo facial surgical procedures. It is safe and effective.

Key words: Propofol, Local anaesthesia, Maxillo facial surgical procedures.

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Introduction

Pain may be defined as an unpleasant experience. Post operative pain causes anxiety and fear, which is especially true in maxillo facial surgical procedures. Local anaesthesia or nerve blocks do not help in relieving anxiety and apprehension towards maxillo facial surgical procedures but act as an adjunct to the general anesthetic drugs. Various drugs like barbiturates, opioids and scopolamines were used for sedation, rather than full anaesthesia since 1945 [1]. Intravenous agents like midazolam, methohexital, thiopentone and ketamines have been used successfully in various maxillo facialsurgical procedures but with the introduction of propofol (2,6 di-isopropyl phenol) by Kay and Rolly in 1977, it seems that the most optimal induction and maintenance agent was obtained in general anaesthesia. Propofol merits a rapid onset of action and reliable maintenance of anaesthesia throughout the general anaesthetic procedure and in combination with local anaesthetic it is a safe alternative to other intravenous agents like midazolam, ketamines and thiopentane. Many a drug have been used but propofol is preferred due to its [2, 3, 4, 5] rapid induction, short duration of action, maintenance of vital parameters and rapid recovery. Hence a study has been undertaken to assess the safety and efficacy of propofol in terms of onset of action, intra-operative conditions, recovery and side effects.

Materials and Methods

The study included 25 patients of either sex with their age ranging from 10-40 years requiring maxillo facial surgical procedures like:

- Incision and Drainage of abscess in the maxillo facial region.
- Treatment of adult jaw fractures with open reduction and internal fixation.
- Circum mandibular wiring in children for open cap splint fixation.
- Surgical extraction of impacted molar tooth.

The procedure was explained to the patients and a written informed consent was obtained. A record of detailed case history of the patient was maintained with their past exposure to anaesthetics, previous surgical procedures, allergy to drugs and eggs. Routine blood investigations were carried out.

Inclusion criteria

- Age group between 10-40 years.

- Only American society of anaesthesiology risk category 1 and 2 patients were included in the study.
- Patients with no history of hypersensitivity to any of the drugs being used and their constituents were included in the study.

Exclusion criteria

- Patients with reported history of anaesthetic related complications, pregnant patients, nursing mothers, obese patients, and who were addicted to sedatives, drugs, alcohol, allergic to eggs and local anaesthetics were excluded from this study.

Induction of anaesthesia [6, 7, 8, 9, 10]**:** Propofol in the dose of 2 mg/kg was given along with 1mg midazolam and fentanyl 50 micro grams for induction.

Maintenance of anaesthesia [11]**:** Following induction, patient was ventilated with 100% oxygen for 3-5 minutes. In some cases nasal airway was inserted, oxygen was supplemented through the nasal catheter entering into the nasal airway. Maintenance was achieved with 4-10 mg/kg/hr of propofol and titrated to the required point of maintenance.

The study was conducted under the guidance of an experienced anaesthetist. Patients were given local anaesthetic injection of 2% lignocaine solution 5-7 minutes after administration of propofol. The surgical procedures were carried out by an experienced oral and maxillo facial surgeon. Anaesthesia was maintained by means of propofol drip drip rate was adjusted to the end point. The various parameters that were evaluated were time of onset of action, intra operative conditions (by pulse oximeter), recovery and complications. Recording were made at 5 minutes after induction and every 10 minutes during surgery till the end of the surgical procedure. Onset of action of the drug was calculated by the time elapsed between induction and onset of signs of end point of anaesthesia. Intra operative conditions were continuously monitored by pulse oximeter Recovery period was calculated from the last dose of the drug to the time when the patient can orient himself to time, place and other people. In the post operative period the patient was assessed for any complications like cough, nausea, vomiting, restlessness or convulsions.

Results

The study comprised of 25 patients of either sex who were sedated with propofol and whose age ranged from 10-40 years. As this was an observational study no statistical comparison was done. The results are presented as average ± standard deviation with different time intervals with respect to vital parameters.

Age and Sex incidence: The age and sex incidence shows a mean age of 29.04 years and the male: female ratio was 20:5.

Onset of action: The onset of action was assessed with the onset of signs of sedation end points, that is slurred speech and presence of ptosis (verills sign). The time of onset ranged from 3 – 4 minutes with a mean time of 3.72 minutes.

Intra operative conditions

Blood pressure: A noticeable fall in blood pressure was observed intra operatively at 10 and 20 minute intervals. The mean systolic pressure at 10 and 20 minute intervals was 117.2 mm/hg with a standard deviation of ± 7.37 to 6.78, and a range of 110-140 mm/hg. The mean diastolic pressure at 10 and 20 minute intervals was 73.2 to 75.2 mm/Hg with a standard deviation of ± 5.57 to 5.10 and a range of 70-90 mm/Hg. None of the patients required any medication intra operatively as this was clinically not significant and required no treatment. In all the patients the systolic, diastolic and mean arterial pressures returned almost to baseline at the time of discharge.

Heart rate: There was no significant change in heart rate after administration of propofol or intra operatively, which ranged between 74-110/minutes.

Oxygen saturation: Oxygen saturation was measured from a pulse oximeter and there was no significant change between pre drug and post drug values as the patients were well ventilated with 100 % for 2-3 minutes after induction and supplemented with oxygen. The range was between 96 % - 99 %.

Respiratory rate: There was no significant variation seen in the respiratory rate, pre operatively, intra operatively and post operative stage. Respiratory rate ranged from 14-22 times/min.

Side effects: like cough, nausea, vomiting, restlessness or convulsions were not reported in any of the patients.

Discussion

Often maxillo facial surgical procedures cause apprehension, anxiety and pain to the patient. Larry P.P et al., [3] stated that intravenous sedation or general anaesthesia is indicated for relief of anxiety. In combination with local anaesthesia propofol is a safe alternative to other drugs used in general anaesthesia. Sarasin D.S. et al., [12] compared the effects of midazolam and propofol on

explicit and implicit memory, cognition and psychomotor function in patients undergoing maxillo facial surgical procedures with local anaesthesia, they have concluded that midazolam and propofol generally produce equivalent impairments, but the duration of effects of propofol was shorter.

The advancement in the pharmacology and anaesthesiology dictates us to adopt safe and alternative sedative techniques for maxillo facial surgical procedures, so that patient feels comfortable, confident to undergo such procedures and the surgeon would be satisfied to work in a controlled environment. Wylie [13] states that for over 50 years, thiopental was the standard anaesthetic drug used to induce anaesthesia. Study of the structure activity relations of barbiturates derivatives and the physiologic modeling of the disposition of thiopental and methohexital profoundly influenced understanding of the pharmacology of fast acting intravenous drugs. However, propofol now holds this pivotal position, with a kinetic and dynamic profile closer to the ideal suitable for short and prolonged use for both anaesthesia and sedation and a good vehicle for bringing to a wide audience new thinking about intravenous anaesthesia and new techniques notably target controlled infusion. Milan N. Pastuovic et al., [4] concluded that propofol is a suitable agent for induction and maintenance of general anaesthesia for maxillo facial surgical procedures. It provides a smooth induction of anaesthesia with few excitatory effects.

In a study conducted by N. Meckenzie and I.S. Grant [14] the onset of action of propofol ranged from 29.77 to 31.43 seconds, by Peter S. Sebel [7] from 22 to 125 seconds, by Joseph E. Cillo [15] it was less than 40 seconds, by Chandra Rodrigo. et al [16] from 2 to 13 minutes, in this study the onset of action ranged from 3 to 4 minutes with a mean of 3.72 minutes and a standard deviation of $\pm$ 0.46 which is in the similar range to the studies conducted above.

None of the patient blood pressure in this study had any changes exceeding more than 20 % of the baseline values which was defined by Jeffery Bennet et al [10] and also corroborates with the study done by M. Zacharias et al [2]. According to Wylie [13] this could be because of two reasons, one is if there is adequate pre operative hydration and the other reason is slow, controlled titration of propofol dose to achieve the desired effect, which was employed in this study. However, in studies done by Peter S. Sebel and Jane D. Lowden [7] they observed statistically significant decrease in systolic blood pressure of approximately 30 % and also in studies done by M.A. Claeys et al [8] who reported a significant decrease in systolic arterial pressures in the range of 19 % to 30 %. Many authors attribute several reasons to hypotension produced by propofol. According to Wylie [13] it is concentration dependent decrease in arterial blood pressure, Joseph E. Cillo[15] states that propofol shows a simultaneous decrease in heart contractility (negative ionotropy) and after load reduction which leads to hypotension, Mackenzie and Grant [14] speculate that propofol induced hypotension is mediated by an inhibition of the sympathetic nervous system and impairment of the baroreflex regulatory mechanism, Li et al [17] postulate that the disturbance in Ca^{2+} transport and availability may cause a decrease in energy production and produce propofols negative ionotropic effect. Claeys and co workers[8] concluded that the major haemodynamic effect of propofol was a decrease in arterial pressure and that blood pressure decreased because of lowered systemic vascular resistance and not because of reduced stroke volume or cardiac output. One of the other most important reasons for no changes in the blood pressure of the patients in this study could be because as Joseph E. Cillo [15] states continuous infusion of propofol at variable rates minimizes the peaks and volleys of blood concentrations of intravenous anaesthetics that are seen with incremental bolus techniques. By maintaining a constant plasma concentration of propofol, this technique decreases the amount of drug administered, stabilizes the level of anaesthesia, and shortens recovery time. Continuous infusion of propofol minimizes the risks of hypotension and bradycardia and produces haemodynamic stability, which corroborates with the similar technique which was employed for all the patients in this study.

In this study there was no statistically significant variation seen in heart rate intra operatively in any of the patients which corroborates with the studies of Kevin J Mccann et al [18] and M.A. Claeys et al [8], it can be attributed to depression of baroreflex sensitivity by the intravenous propofol and resetting the heart rate at lower arterial pressures or a slower heart rate despite decreased arterial pressures. Chirstopher J Meyers et al [5] in their study stated, that increased heart rate results from a number of factors including the small doses of propofol administered, surgical stimulation leading to endogenous catecholamine release, and

exogenous catecholamine administered with the local anaesthetic.

Arterial oxygen desaturation has always been a significant cause of concern during maxillo facial surgical procedures. The reasons attributed according to Zunal Kucukyavaz et al [19] are apnea and hypoventilation. Joseph E. Cillo [15] states that propofol produces dose dependant respiratory depression with apnoea and is relatively minor and can be well managed if they are properly monitored. Wylie [13] also states that apnoea is common following an induction dose of propofol, the incidence and duration depend upon the dose and rate of administration of propofol and synergistic effects of opiates or sedative premedication. In this study none of the patients oxygen saturation percent fell below 96 %, nor any patients experienced apnoea (a period of breathlessness greater than 30 seconds) requiring positive pressure ventilation. This corroborates with studies done by Milan N. Pastuovic et al [4] (oxygen percent saturation not <90 %), Jeffery Bennet et al [10] (oxygen percent saturation not <92%), Larry P. Parworth [3] (oxygen saturation, average remained above 99%), and Chirstopher J. Meyers . et al [5] (oxygen saturation in the range of 98% to 100%). The main reason which we can attribute for maintenance of oxygen saturation in this study, is that all the patients received 100 % oxygen during induction for 3-5 minutes and also continuous supplementation of oxygen throughout the surgical procedure

Despite the fact that propofol is thought to cause respiratory depression, there was no significant changes in the respiratory variables during the study, which in our case was respiratory rate. There was no significant decrease in respiratory rate in all our patients, which corroborates with other studies done by various authors like M. Zacharias et al [2], Larry P Parworth et al [3], Stokes D.N. et al [20] and Peter S. Sebel .et al [7]. However according to Peter S Sebel et al [7] different studies reported changes in respiratory rate as variable or decreased, non invasive measurement of the respiratory cycle (induction plethysmography and the pneumotachography) have demonstrated that propofol causes significant decreases in tidal volume, mean inspiratory flow rate, and functional residual capacity Samiei R.S [21]. The changes in breathing pattern may suggest that the ventilatory depression of propofol results from a decrease in central inspiratory drive as opposed to a change in central timing. In this study we can attribute continuous surgical stimuli during the course of surgery could have counteracted the ventilatory depressant effect of propofol which corroborates with the studies of M. Zacharias et al [2], Peter S. Sebel et al [7] and Davis B [22].

Conclusion

Maxillo facial surgical procedures can be accomplished using propfol and local anaesthesia. This technique is safe, effective and comfortable for anaesthetist, surgeon as well as the patient.

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