

Comparison of General Anesthesia With Isoflurane/N₂O and Propofol/Alfentanil on Optimal Extubation in Mandibular Fractures With Arch Bar

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Received 2015 March 01; Accepted 2015 May 15.

Abstract

Background: Due to the use of the arch bar in many of jaw fractures and fixation of mandible and maxilla, lack of adequate access to airways and further bleeding during surgery, recognition of anesthetic agents that produce better hemodynamic stability and recovery has special importance.

Objectives: The aim of this study was to compare the maintenance of anesthesia with propofol/alfentanil versus isoflurane/N₂O in patients candidate for arch bar fixation.

Patients and Methods: In this randomized, double-blind clinical trial, 60 patients were randomly divided into two equal groups of P (propofol + alfentanil) and I (isoflurane + N₂O). Blood pressure and heart rate were measured every five minutes, since 5 minutes before induction to 15 minutes after extubation. Presence of backing and level of patient cooperation were also recorded.

Results: The mean systolic blood pressure after extubation was significantly higher in group P ($P = 0.024$). Time interval between discontinuation of anesthetics and extubation was significantly lower in group P ($P = 0.015$).

Conclusions: Patients who received propofol/alfentanil were extubated in shorter time than those who received isoflurane/N₂O.

Keywords: Anesthesia, Mandibular Fractures, Airway Extubation

1. Background

Mandibular fractures are common injuries able to cause disability in case of inappropriate treatment (1). These fractures are often mixed. Non-surgical treatment may be applied when there is little or no displacement. The goal of surgical treatment is stable fixation of fractures and soft tissue healing. Mandibular fixation is usually performed by two methods of rigid and non-rigid fixation (2).

Mandibular fracture can cause excessive bleeding and increased risk of aspiration of blood, bone, broken teeth and soft tissue. Securing the airway is the first step in these cases. Unilateral mandibular fractures are usually stable, but bilateral fractures are often unstable (3). Due to the use of the arch bar in many of jaw fractures and fixation of mandible and maxilla, lack of adequate access to airways, and further bleeding during surgery, recognition of anesthetic agents that produce better hemodynamic stability and recovery has special importance (4).

Propofol creates lower reduction in blood pressure in healthy subjects and in doses used in oral and maxillofacial surgery, while in patients with heart disease or hypovolemia and in use of higher doses of the drug, the probability of hypo tension is more (5, 6). Alfentanil clearly reduces the required amount of propofol for anesthesia. It also enhances the depressive effects of propofol on heart rate and blood pressure (7).

Isoflurane with 70% N₂O has more respiratory depression but lower cardiac depression compared to older inhalational anesthetics like halothane, does not stimulate myocardial catecholamine release and has low hepatic and renal toxicity (8).

Because of the use of arch bar for jaw fixation in patients with mandibular fractures, intubating these patients is performed through the nose. Despite preoperative explanations about jaw fixation, patients are usually agitated and anxious during their recovery. Therefore, the use

of medications with slower recovery and more relaxation is important.

2. Objectives

In this study, we compared maintenance of anesthesia with propofol-alfentanil versus isoflurane-N₂O in patients candidate for arch bar fixation.

3. Patients and Methods

In this randomized, double-blind clinical trial (IRCT2015072412642N16), from February 2011 to February 2012, 60 patients aged 15 - 50 years, ASA I classification with fracture of the mandible admitted to Shahid Rajaei hospital, Qazvin city entered the study. Patients with a history of repeated use of narcotics, sedatives and antihypertensives during the past six months and patients with hypertension and impaired consciousness were excluded from the study. Patients were randomly divided into two equal groups of P (propofol + alfentanil) and I (isoflurane + N₂O). The process of dividing patients into two groups was by randomly selecting a blue or green card, by a person not involved in the study. Green card indicated group P and the blue card as group I.

All patients received midazolam 0.02 mg/kg and fentanyl 0.002 mg/kg for premedication. Then, anesthesia was induced by propofol 2 mg/kg and atracurium 0.5 mg/kg and after 3 minutes, nasal intubation with an endotracheal tube with appropriate size was performed. For maintenance of anesthesia, patients in the group P received the combination of propofol 100 µg/kg/minute and alfentanil 1 µg/kg/minute. Also patients in group I received isoflurane 1.2% (1 MAC) with mixed O₂/N₂O (50: 50).

Blood pressure and heart rate were measured every five minutes, since 5 minutes before induction to 15 minutes after extubation. Presence or absence of bucking and level of patient cooperation were evaluated as opening eyes along with lifting head or legs, and pressing the physicians' hand for five second. Occurrence of vomiting and the amount of intraoperative bleeding of both groups was recorded by an individual not aware of the study methodology. All statistical analyses were performed with SPSS software 21 package and using descriptive statistics and student t-test, repeated measure and chi-square tests. Statistical significance was considered at $P \leq 0.05$.

4. Results

Sixty patients were recruited in the study. They were divided into two equal groups. There were 17 men in group P

and 21 men in group I. The mean age of group P was 36.1 ± 10.6 years and 31.2 ± 7.2 in group I. Hemodynamic parameters including systolic (SBP) and diastolic (DBP) blood pressure and heart rate (HR) were recorded before and after intubation (Table 1).

After the operation, the time interval between discontinuation of anesthetics until the onset of patient' cooperation for extubation was measured. The average of this time was 7.8 ± 1.2 minutes in group I and 6.9 ± 1.5 minutes in group P, which was statistically significant between the two groups ($P = 0.015$). Mean \pm SD of bucking was 1.8 ± 0.8 in group I and 1.7 ± 0.8 in group P ($P = 0.718$). The average amount of bleeding was 163.8 ± 50.3 mL in group I and 152.5 ± 60.1 mL in group P ($P = 0.431$).

The results showed that the mean systolic blood pressure after extubation was significantly higher in group P ($P = 0.024$), while there was no significant difference between diastolic blood pressure ($P = 0.261$) and heart rate ($P = 0.123$). Meanwhile, none of the subjects in both groups had vomiting or laryngospasm.

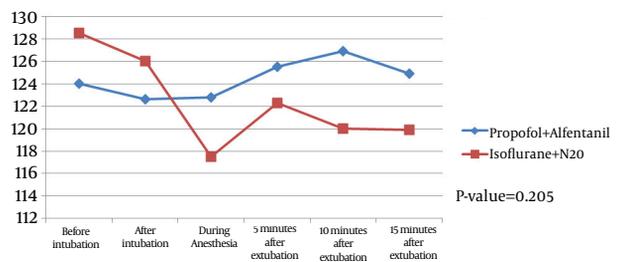


Figure 1. Overall Average of Systolic Blood Pressure

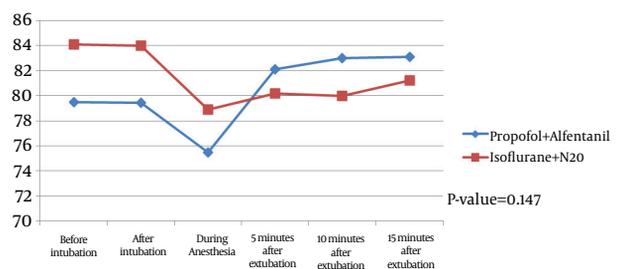


Figure 2. Overall Average of Diastolic Blood Pressure

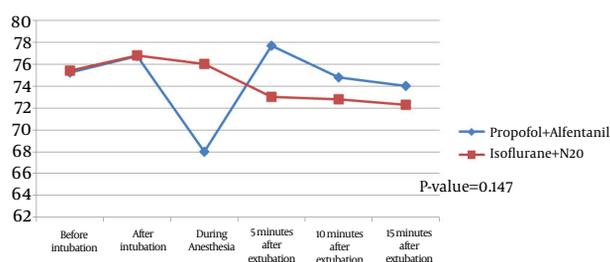
5. Discussion

There was no significant difference between hemodynamic parameters during anesthesia with propofol-alfentanil and isoflurane-N₂O, but systolic blood pressure

Table 1. Hemodynamic Parameters Before and After Intubation

Parameters	Before Intubation		P Value	After Intubation		P Value
	Group I	Group P		Group I	Group P	
SBP	128.3 ± 23.1	123.7 ± 17	0.378	125.8 ± 15.1	122.5 ± 17.7	0.436
DBP	84.2 ± 13.8	79.5 ± 11.5	0.160	84 ± 10.4	79.4 ± 8.9	0.073
HR	75.4 ± 9.2	75.2 ± 9	0.960	76.8 ± 7.5	76.7 ± 7.9	0.974

Abbreviations: DBP, Diastolic Blood Pressure; HR, Heart Rate; SBP, Systolic Blood Pressure.

**Figure 3.** Overall Average of Heart Rate

after extubation was significantly higher in group P. Also the time interval between discontinuation of anesthetics and extubation was significantly lower in propofol group.

Mandibular fractures are common after facial trauma, which can disrupt normal life and has complications if not treated properly. These complications include impaired speech, difficulty in chewing followed by malnutrition and negative impacts on social and physical health (9, 10). There are challenges in mandibular fracture surgery that can lead to problems in anesthesia and surgery. Because of arch bar placement and lack of adequate access to airway, optimal extubation is of utmost importance in these patients. Also increase in systolic blood pressure due to severe pain in recovery is of challenges in this operation (11)

In this study, two commonly used combinations for general anesthesia were compared. All these four drugs have their own side effects and benefits. Recovery and awakening in propofol is faster than isoflurane, but the recovery period of alfentanil is more than nitrous oxide (12).

So far no study has been conducted to evaluate different anesthesia methods in patients with mandibular fractures with arch bars. Hong and colleagues evaluated the effects of sevoflurane/N₂O and propofol/fentanyl in hysteroscopy (13) and showed that sevoflurane/N₂O combination is more appropriate in recovery from anesthesia and return to hemodynamic stability. Also Bali et al. demonstrated that combination of isoflurane and alfentanil during spontaneous ventilation is a safe technique in jaw and

dental surgeries (14).

In conclusion, it seems that patients in propofol/alfentanil group are extubated during shorter period compared with isoflurane/nitrous oxide group. Although this difference in time was statistically significant, 53.4 seconds difference is clinically worthless and it is concluded that these drugs provided similar extubation conditions for patients with mandibular fractures with arch bar.

Footnote

Authors' Contribution: Study concept and design: Majid Golestani Eraghi; acquisition of data: Soheil Etemadi; analysis and interpretation of data: Seyed Mohamadreza Hashemian; Maziyar Mahjoubifard; drafting of the manuscript: Niloofar Dadashpoor; critical revision of the manuscript for important intellectual content: Seyed Abbas Hoseini Jahromi; statistical analysis: Seyed Abbas Hoseini Jahromi; administrative, technical, and material support: Alireza Jahangirifard; study supervision: Soheil Etemadi.

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