Clinical Study

Emergence from Anaesthesia in Supine versus Prone Position in Patients Undergoing Lumbar Laminectomy: A Study of 60 Cases

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Received 1 March 2012; Accepted 5 April 2012

Academic Editors: J. P. Estebe and E. Freye

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Background. Emergence in supine position in patients undergoing surgery in prone position leads to tachycardia and hypertension, coughing, and the loss of monitoring when patients are rolled to supine position at the end of surgery, aim of this prospective randomized trial was to study whether prone emergence causes less hemodynamic stimulation, coughing, and monitor disconnection compared to supine emergence in patients undergoing lumbar laminectomy. *Patients and Methods*. This study was conducted on 60 patients who underwent Lumbar laminectomy in prone position. Patients were anaesthetized using injected fentanyl $2 \mu g kg^{-1}$, midazolam $0.1 mg kg^{-1}$, and thiopentone $5-6 mg kg^{-1}$ and vecuronium bromide. At the end of surgery patients were randomized into prone or supine group of 30 each. Supine group patients were rolled back and prone were left undisturbed. Extubation was done after complete reversal of neuromuscular block. Heart rates and MAP were noted at various points of time. Coughing, vomiting, monitor disconnection if any. *Results*. Mean arterial pressure and heart rate were significantly higher in supine patients as compared to prone patients before and after extubation (*P* value < 0.05). Incidence of coughing, vomiting and monitor disconnection was highly significant in prone group than in supine group. *Conclusion*. Emergence and extubation in prone position can be safely performed in selected group of patients undergoing surgery in prone position.

1. Introduction

Emergence from anaesthesia in supine position in patients undergoing surgery in prone position leads to hemodynamic changes in the form of tachycardia and hypertension, coughing, and loss of monitoring when patients are rolled to supine position at the end of surgery [1]. Lifting and turning of head during position change from prone to supine causes tracheal irritation because of presence of endotracheal tube, thereby precipitating cough and bronchospasm, and leads to haemodynamic changes [2, 3]. These changes may lead to increased surgical bleeding, myocardial ischemia, and increased abdominal and intracranial pressure. Various drugs like injected esmolol, [4] intracuff [5] intravenous lidocaine [3], and alpha agonist dexmedetomidine have been tried to attenuate circulatory and airway reflexes during extubation in supine position. Emergence in prone position has been found to be associated with less hemodynamic alterations, less coughing and vomiting and monitor disconnections in patients undergoing lumbar surgery [6, 7]. We

have taken up this study as there are very few [8] studies that have demonstrated the safety and efficacy of emergence from anaesthesia in prone position. We present our initial experience of emergence from anaesthesia and extubation in prone position as compared to supine position in patients undergoing lumbar laminectomy.

2. Patients and Methods

After the approval from institute ethics committee and obtaining written informed consent, 60 patients of ASA grade 1 and 2, aged 18–60 years undergoing lumbar laminectomy in the prone position under GA with endotracheal intubation, were included in the study. They were randomly divided into two groups of 30 each: Group S: supine group where patients were rolled back to supine position at the end of surgery for emergence from anaesthesia and extubation and Group P: prone group where patients were left undisturbed in the prone position itself at the end of surgery until extubation. Randomization was done at the conclusion of

surgery with the help of sealed envelopes. Exclusion criteria were difficult airway, obesity (BMI > 35 kg/m^2), history of bronchial asthma or reactive airways, were symptomatic gastro esophageal reflex. All the patients were anaesthetized using injection fentanyl $2 \mu g k g^{-1}$, midazolam $0.1 m g k g^{-1}$, and thiopentone 5-6 mg kg⁻¹, and neuromuscular blockade was achieved using vecuronium bromide. They were intubated with appropriate sized cuffed endotracheal tube. Maintenance of anaesthesia was done with oxygen + nitrous oxide mixture (50:50) and isoflurane, intermittent doses of fentanyl and vecuronium bromide. Patients were rolled into prone position lying on a pair of axial rolls on the operating table with head turned to one side (approximately 45 degree) and were resting in a ring so as to avoid any pressure on eye balls. At the end of procedure and skin stitch application inhaled anaesthetics, N₂O and isoflurane were discontinued and patients were given 100% oxygen. Patients in the prone group were left undisturbed to be in the same position whereas those in the supine group were rolled back to supine position. Reversal of neuromuscular block was done with injected neostigmine and glycopyrrolate, after assessing the respiratory efforts. Once patients started responding to verbal command and had achieved adequate tidal volume (8–10 mL) and respiratory rate of 10–20/min trachea was extubated in prone position itself. While extubating patients in prone position, we took all the precautions for the airway management to be safe: the bed from postanaesthesia care unit was ready and positioned by the side of operating table to turn the patient to supine position immediately and all the preparations for reintubation in case the need arises. While patients in the other group were rolled supine and then reversed and extubated. Heart rate and mean arterial pressure were recorded at the baseline before changing the position, after surgery, before extubation, and 5 minutes after extubation. Any episode of coughing, vomiting, and monitor disconnection was also recorded.

3. Statistical Analysis

Haemodynamic data was analyzed using unpaired *t*-test between two groups. Nonparametric data like incidence of coughing, vomiting, and monitor disconnection was compared between two groups using Fisher's exact test.

4. Results

Patient demographic data, total fentanyl consumption, total duration of anaesthesia, total duration of surgery, and fluid irrigation time were comparable in both the groups (Table 1).

Heart rate and mean arterial pressure were significantly higher before and after extubation in patients who were extubated in supine position, as compared to patients extubated in prone position (Table 2).

17 patients had coughing, 6 patients had vomiting, and 18 had monitor disconnection during emergence from anesthesia and extubation, while only 4 patients had coughing, none had vomiting, and 2 had monitor disconnection in 2 patients, during emergence in prone position. Incidence of monitor disconnection was significantly higher in supine

TABLE 1: Patient's characteristics.

Characteristics	Supine $(n = 30)$	Prone $(n = 30)$	P value
Age (yrs)	43.23 ± 12.21	42.12 ± 11.19	NS
Sex	19/11	24/6	NS
Weight (Kgs)	59.12 ± 9.34	57.23 ± 10.51	NS
Total fentanyl consumption (µg)	142 ± 23	140 ± 19	NS
Duration of anesthesia (min)	85.36 ± 7.34	83.45 ± 6.29	NS
Duration of surgery (min)	71.3 ± 8.3	67.13 ± 7.1	NS

group as compared to prone group. (P value < 0.00001) (Table 3). None of the patients in either group had any airway-related complications like regurgitation, aspiration, or required reintubation.

5. Discussion

Lumbar laminectomy is performed in prone position and there is a choice for the anesthesiologist to plan emergence from anaesthesia and extubation either in prone position or turn the patient to supine before emergence and extubation. However, this choice is governed by the fact of allowing minimum or no complication after extubation. The problems that can be associated with emergence and extubation are cardiovascular response, respiratory complications including coughing and hypoxemia, airway obstruction, and pulmonary aspiration. In the present study we primarily considered the hemodynamic alterations, coughing and monitor disconnection, as the most important problems after extubation because these merit consideration for patients with cardiovascular disease, increased intracranial pressure, and pulmonary hyperreactivity. As a general rule patients should be extubated awake. Extubation under deep anaesthesia decreases cardiovascular stimulation and reduces the incidence of coughing and straining on the endotracheal tube. However, the incidence of respiratory complications has been found to be greater after extubation under deep anaesthesia, regardless of the type of operation [9]. All our patients were extubated awake, and the end point of wakefulness was eye opening with spontaneous ventilation.

Extubation in prone position may be advantageous in patients in whom surgery has been done in prone position. Prone position itself keeps the airway patent, protects it from aspiration to a large extent, but certainly is the most difficult situation for laryngoscopy and reintubation, if required. Patients with suspected difficult intubation, obese, and with chronic respiratory diseases are not the suitable candidates for extubation in prone position. The relative ease of reintubation in supine position does merit its use in these patients. Tracheal extubation is associated with 10–30% rise in arterial pressures and heart rate, lasting for 10–15 minutes. 11 Patients with coronary artery disease experience a 40–50% reduction in ejection fraction [10]. We observed significantly less alterations in arterial pressures and heart rate in patients who were extubated in prone position.

	Baseline	After surgery	Before extubation	After extubation
Heart rate				
S	87.63 ± 11	81.3 ± 13.1	96.15 ± 14.21	94.29 ± 14.56
Р	84.15 ± 14	79.63 ± 15.23	$85.39 \pm 13^*$	$80.12 \pm 7.9^{*}$
MAP				
S	92.44 ± 9.34	95.48 ± 11.23	111.74 ± 11	106.52 ± 9.1
Р	92.35 ± 10.34	97.35 ± 9.45	$100.34 \pm 7^{*}$	$94.24 \pm 9.12^{*}$

TABLE 2: Blood pressure and heart rate changes in both the groups.

S: supine; P: prone.

*P value <0.05 (unpaired *t*-test between supine and prone groups).

MAP: Mean arterial pressure.

TABLE 3: Complications during emergence from anaesthesia.

	Monitor disconnection $(n = 30)$	Coughing $(n = 30)$	Vomiting $(n = 30)$
S	18 (60%)	17 (56.67%)	6 (20%)
Р	2 (6.67%)	4 (13.33%)	0 (0%)
P value	P < 0.00001	0.0009	0.023
	Highly significant	Highly significant	Significant

S: supine; P: prone; *P value calculated by Fisher's exact test.

Increased hemodynamic changes in supine position group were probably because the patients were turned to supine from prone position resulting in tracheal irritation. Perhaps same reason can also be assigned to the reported reduction in the incidence of coughing in this study observed in the prone position group of patients as compared to supine position group. So far only three studies have described emergence and extubation in prone position. Olympio et al. [6], in their study on prone emergence in patients undergoing lumber surgery, concluded that prone emergence and extubation is associated with less hemodynamic stimulation, less coughing and less disruption of monitors without any adverse effects They included patients who were smokers or with reactive airways and excluded patients with difficult airway and obesity. In our study we excluded smokers and those with the history of reactive airways. Another study by Yörükoğlu et al. [7] compared prone extubation with supine extubation with or without prior injection of intravenous lignocaine and concluded that prone emergence and supine emergence with intravenous lignocaine provide an optional approach to conventional supine emergence and prone extubation offers less cough, additional hemodynamic stability, and continuation of monitoring. This finding again supports the finding of Olympio et al. [6]. Srivastava et al. [11] performed their study in patients undergoing PCNL and included hypertensive patients in their study, in which they found that the mean arterial pressure was significantly higher in supine hypertensive patients as compared to prone hypertensive patients before and after extubation. Maintaining the monitor connectivity is very important to observe vital parameters during emergence because reconnection of cables to patient takes time. Extubation in prone position preserves the monitor connectivity and any change in the vitals can be treated on time. There are many complications

associated with extubation. This study was conducted on limited number of patients with few end points. Further studies can be conducted in larger number of patients to delineate the influence of specific position on incidence of complications. This study demonstrates that emergence and extubation can be safely performed in prone position, in selected group of patients undergoing surgery in prone position. These findings may merit considerations especially in patients with cardiovascular disease, increased intracranial pressure, and pulmonary hyperreactivity.

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