Tube Migration during Laparoscopic Gynecological Surgery

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ABSTRACT

Background: The positioning (trendelenburg) and pneumoperitoneum during laparoscopic gynecological surgeries may cause cephalad movement of diaphragm and subsequent endobronchial intubation.

Patients & Methods: 50 ASA I/II patients posted for laparoscopic ligation were included in the study. Standardized anaesthesia technique was employed in all the patients. The distance of endotracheal tube to carina was measured in supine position, trendelenberg position, 5 min and 25 minutes post pneumoperitoneum and after deflation of pneumoperitoneum.

Results: The mean distance from the tip of the ETT to the carina was 3.41 ± 1.3 cm, 2.96 ± 1.4 , 2.0 ± 1.5 and 1.7 ± 1.6 in supine position, trendelenburg position and 5min and 25 min post pneumoperitoneum. (P<0.01) Following deflation the carina moved back to its position to some extent and was 2.5 ± 1.5 from the tip of endotracheal tube.(P< 0.05)

Conclusion: We conclude that pneumoperitoneum and trendelenburg position during laparoscopic surgeries may lead to cephalad migration of carina.

KEYWORDS : Tube Migration, Laparoscopic Gynaecological Surgery

Gynaecological surgeries like tubal ligation under GA are often performed via laparoscopy because it offers the advantages of a smaller incision, decreased postoperative pain and short recovery time. The combination of increased abdominal pressure and trendelenberg position may produce a cephalad displacement of diaphragm and movement of carina toward the relatively fixed endotracheal tube.^{1,2} These changes increase the risk of bronchial intubation or interaoperative complications like hypoxemia, bronchospasm or barotrauma.² The potential for inadvertent right mainstem bronchial intubation and hypoxemia associated with Trendelenburg positioning was first highlighted by Wilcox and Vandam.³ The purpose of this study was to investigate the change in distance between tip of ETT and the carina in supine and trendelenburg positions before and after abdominal insufflation of CO₂ in patients undergoing elective laparoscopic gynecological surgeries. In this study, the position of carina was also measured after deflation of pneumo peritoneum.

PATIENTS & METHODS

After approval of institutional review board, and written informed consent 50 ASA I/II female patients aged 18-40 years were studied. In the operation theatre the patients were attached to standard monitors - Heart rate, SPO_2 , NIBP and an EKG were recorded throughout the procedure. All patients underwent general anaesthesia with endotracheal intubation, and each subject served as her own control. General

anesthesia was induced with IV propofol 2- 2.5 mg kg⁻¹ and trachea was intubated with size 7 cuffed PVC endotracheal tubes, following IV vecuronium 0.1mg kg⁻¹ and 3 minutes of mask ventilation (with isoflurane 1.5% in Oxygen and air). The ETT was fixed at 18 cm at the right angle of mouth. Proper positioning of ETT was confirmed by the presence of bilateral breath sounds and EtCO₂, and tube was taped to the maxilla and mandible. With the patient breathing 100% O₂ and her head in neutral position, the flexible fibreoptic bronchoscope was inserted through the ETT. The distance from carina to the tip of endotracheal tube was measured using a fibreoptic bronchoscope in supine position and after 15° trendelenberg position. The peritoneum cavity was insufflated with CO₂ to a pressure of 12-14 cm H₂O and distance from carina to the tip of endotracheal tube was noted 5 minutes and 25 minutes later. The readings were repeated 5 minutes after deflation of pneumoperitoneum. Before each measurement, the position of endotracheal tube was checked in relation to teeth to ensure fixation. All the measurements were made by the same observer during apnoeic phase of ventilation.

In case of Endobronchial intubation the ETT was withdrawn 2 cm above the carina to document any further movement of the ETT. All data are reported as mean ± SD. Statistical analysis was performed by using one- way analysis of variance ANOVA, pair wise multiple comparison procedures were performed using the Bonferroni's method. A P value <0.05 was taken as significant.

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RESULTS

The patient characteristics and duration of surgery was similar in all the patients (Table 1). All the patients underwent bronchoscopy uneventlyfully. There were no endobronchial intubations after induction of anaesthesia. The mean distance from the tip of the ETT to the carina was 3.41 ± 1.3 cm. The distances were 2.96 ± 1.4 , 2.0 ± 1.5 and 1.7 ± 1.6 in trendelenburg position and 5min and 25 min post pneumoperitoneum. (P<0.01) Following deflation the carina moved back to its position to some extent and was 2.5 ± 1.5 from the tip of endotracheal tube.

 Table 1

 Showing patient characteristics and type of surgery

Patient Chara	cteristic					
Age (years)				27.98 ±c3.32		
Weight (kg)				45.94 ± 8.75		
Height (cms)				150.7 ± 7.9		
BMI (wt/ ht ²)				20.25 ± 3.7		
Duration of surgery (minutes)				26.96 ± 7.16		
Type of Surge	ery					
MTP Lap				73%		
Plain Lap				27%		
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Figure 1 Carinal distance from ETT tip at various times during laparocopic surgeries

DISCUSSION

Our study demonstrates that Laparoscopic gynaecological surgery decreases the distance between the ETT tip and the carina. The ideal position of ETT (midtracheal) is possible only if tracheal length is more than 12 cm.⁴ This is because distance between distal end of the ETT cuff and the proximal end is about 6 cms in adults.⁵ Female patients have tracheal length less than 12 cm and therefore have less margin of safety for endobronchial intubation.

The mean distance from the tip of the ETT to the carina was 3.41±1.3 cm in beginning and 2.96±1.4 in trendelenburg position. This distance was progressively less 5min and 25 min post pneumoperitoneum. So, abdominal insufflation is the main factor for tube migration and not mere position change. The results are consistent with previous studies and showed that distance between ETT tip and carina significantly decreased after positioning and pneumo peritoneum. Trendelenberg position has been shown to cause movement

of lungs close to ETT; this is further exaggerated by pneumoperitoneum.

However, there was no incident of endobronchial intubation. This may be because of the fact that mean distance from the tip of the ETT to the carina was 3.41 ± 1.3 cm in the beginning which was more than the previous studies. (2.1 ± 0.8 in study by Loboto etal.).¹ Moreover, duration of surgery was short in all the cases (< 30 minutes) in most cases. Probably the ETT continues to moves for a longer time and it is not possible to assess the time at which the ETT reaches its final recorded position. Moreover even at 25 minutes the ETT was at a safe distance (1.7 ± 1.6) from carina.

In a resent study it was reasoned that the discrepancy between movement of the carina and the vocal cords may cause tracheal shortening after abdominal insufflation in trendelenburg position. This decrease in tracheal length accompanying the movement of carina towards ETT decreases the distance between the ETT tip and carina and may result in endobronchial intubation.

Our study also demonstrates that the carina position remains shifted even after deflation of pneumoperitoneum. This signifies that respiratory changes during laparoscopic surgery like decreased FRC, increased closing volume of smaller airways (V/Q mismatch), decreased pulmonary compliance and increased airway resistance may persist after surgery.⁶

So, in conclusion carinal migration and subsequent endobronchial intubation should be considered a possibility in case of hypoxemia associated with increased airway pressure especially in laparoscopic surgeries, particularly in trendelenburg position.

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