Research Paper

Volume : 2 | Issue : 3 | Mar 2013 • ISSN No 2277 - 8179

Medical Research

KEYWORDS : Laproscopic surgery, gastric pH, trendelenburg position, reverse trendelenburg position

Gastric pH change during laproscopic surgery

Mohd Asim Rasheed	Assistant Professor, Department of Anaesthesiology, Government Medical College, Haldwani.
Urmila Palaria	Assistant Professor, Department of Anaesthesiology, Government Medical College, Haldwani.
Afreen Hasan	Junior resident , Department of Biochemistry, Era's Lucknow Medical college, Lucknow.

ABSTRACT

Title: Comparison between trendelenburg and reverse trendelenburg positioning on gastric pH during laparoscopic procedures under general anaesthesia: A prospective observational study.

Background: Patient positioning during laproscopic surgery under general anaesthesia may alter the gastric pH in the presence of pneumoperitoneum.

Aims: This study was carried out to determine whether significant change in gastric pH occurs during laproscopic surgeries and whether this change is related to patient positioning.

Settings and Designs: Prospective observational study in the Department of Anaesthesiology and Critical Care in a tertiary care teaching hospital.

Materials and Methods: 50 adult ASA class I and II female patients between 25 to 40 years undergoing diagnostic laproscopy for infertility under general anaesthesia were selected in group T(trendelenburg) and another 50 adult female patients of the same ASA status and age group scheduled for laproscopic cholecystectomy under general anaesthesia were selected in group RT(reverse trendelenburg) . Five to eight ml of gastric secretions were aspirated, before the change in patient position and the same amount before reversal of neuromuscular block, for analysis of pH.

Statistical analysis: Statistical difference of means between the groups was calculated using the unpaired t-test. Statistical difference of means between the pre and post-positioning pH value in the same group was calculated using the paired t-test. Differences were considered significant when the P value was <0.05.

Results: The pre-positioning and post-positioning pH values in the T group was 2.528 and 3.272 respectively (P=0.001) and the pre and post-positioning pH values in the RT group was 2.644 and 3.028 respectively (P=0.001).

The pre-positioning pH values of gastric fluid in the T group and RT group was statistically insignificant. Similarly, the post-positioning pH values of gastric fluid in the T group and RT group was statistically insignificant.

Conclusion: Significant change in gastric pH occurs during laproscopic surgeries, irrespective of the patient position during the intra-operative period. Therefore patient positioning does not effect the extent of pH change.

INTRODUCTION

Change in patient positioning is a common manoveur during laproscopic surgeries. Such alterations produce marked physiological and haemodynamic changes during the intra and post-operative period. In our routine anaesthetic practice we usually get a large amount of yellowish or greenish-yellow-coloured fluids on oro/naso-gastric suctioning in comparison to normal whitish gastric fluids in the intra-operative period during laproscopic surgeries. In this prospective, observational study we investigated the pre- and post-positioning pH values of gastric secretion in patients undergoing laproscopic surgeries in trendelenburg and reverse trendelenburg position to find any change so as to assess the effect of patient positioning on the values of gastric pH.

METHODS

After obtaining Institutional Ethical Committee approval and informed consent, 50 adult ASA class I female patients between 25 to 40 years undergoing diagnostic laproscopy for infertility under general anaesthesia were selected in group T and another 50 adult female patients of the same ASA status and age group scheduled for laproscopic cholecystectomy under general anaesthesia were selected in group RT. Patients on antacids, H2 blockers or on proton pump inhibitors, patients with history of gastro-oesophageal reflux were excluded from the study. Any patient with BMI more than 30 was also excluded from the study.

Patients were premedicated with inj. Ondensetron 0.1mg/kg and inj. Midazolam 0.15 mg/kg 15 minutes prior to surgery. Perioperative monitoring included electrocardiography, non-invasive blood pressure monitoring, pulse oximetry and end tidal capnography.

Patients were preoxygenated with 100% oxygen through a face-mask for more than 3 min. Anaesthesia was then induced with Inj. Sodium Thiopental (5 mg/kg i.v) and tracheal intubation was facilitated with i.v vecuronium (0.1mg/kg).Maintenance of anaesthesia was done with FiO_2 of 0.5 in 0.6% isoflurane. Patient's lungs were ventilated to target $EtCO_2$ concentration of 35-40 mm of Hg using open circuit with fresh gas flow of 8 lt/min. A naso/orogastric tube was inserted upto 50-cm mark and 5-8 ml of gastric aspirate was withdrawn before tilting the table in the 30 degrees trendelenburg or 30 degree reverse Trendelenburg position (according to the surgical requirement and the group allotted) and send to biochemical laboratory for estimation of the gastric pH. The second sample of gastric aspirate was taken through the naso/orogastric tube immediately after completion of surgery and before bringing the operating table to the neutral position (removing the tilt) and before reversal of the residual neuromuscular block and was analysed in the similar way. The analysis of pH was done with the help of pH analyser EUTECH instruments pH700. Investigators analyzing the pH were unaware about the type of operation as well as the pre- and post-positioning status of the sample. The peritoneal pressures in all the cases were kept between 10 to 12 mm of Hg.

Patients from whom adequate amount of gastric aspirates could not be obtained were excluded from the data analysis. Patients had standard post-operative care after extubation following reversal of residual neuromuscular blockade. Duration of anaesthesia was also noted in all the cases.

Statistical Analysis

Data was analysed using the statistical package for social science (SPSS)(version 10.0). Statistical difference of means between the groups was calculated using the unpaired t-test. Statistical difference of means between the pre and post-positioning pH value in the same group was calculated using the paired t-test. Differences were considered significant when the P value was <0.05.

RESULTS

Four patients in the T group and five in the RT group were ex-

cluded as we could not aspirate the desired amount of gastric secretion. In their place, we included four new patients in the T group and five in the RT group. Age and duration of anaesthesia was statistically insignificant between the T and RT group[Table 1].

The pre-positioning and post-positioning pH values in the T group was 2.528 and 3.272 respectively (P=0.001) and the pre and post-positioning pH values in the RT group was 2.644 and 3.028 respectively (P=0.001) [Table 2].

The pre-positioning pH values of gastric fluid and the post-positioning pH values of gastric fluid in the T group and RT group was also statistically insignificant. [Table 3].

DISCUSSION

Ryle's tube insertion is a common practice during laproscopic procedures and often shows yellowish or greenish-yellow coloured gastric fluid on aspiration just before extubation. Since gastric secretions are colourless, such colour change indicates reflux of duodenal contents and bile into the gastric cavity. Also 80% of gall stone disease patients have abnormal duodenogastric reflux(DGR) and antroduodenal motility in both pre- and post-operative periods.[1] Since the advent of laproscopic surgeries numerous studies have been made to assess the effect of pnumoperitoneum and patient positioning on the various physiological parameters. An alteration is seen in the inspiratory muscle response and the respiratory pattern during the head down tilt position. The short-time (30 min) head-down tilt posture (-30 degrees relatively horizontal) increased the inspiratory time, decreased breathing frequency, inspiratory and expiratory flow rate and increased the airway resistance compared with values in vertical posture in a spontaneously breathing patient.[2,3] Similarily the haemodynamic and ventilatory effects between trendelenburg and reverse trendelenburg position during laparoscopy with CO2-insufflation were assessed. It was found that there was no stastistical difference between either group in respect to haemodynamic parameters but pH value and PaCO2 did respectively decrease and increase significantly in patients after trendelenburg position.[4-6]

Concerns were raised of the effect of trendelenburg positioning on the cerebral perfusion and blood flow and it was found that even prolonged steep trendelenburg positioning and CO_2 pneumoperitoneum does not compromise cerebral perfusion,[7,8] whereas reverse trendelenburg positioning reduced intracranial pressure during craniotomy.[9-11]

Patient positioning may also affect the bi-spectral index value. There occurs a significant increase in BIS values in head-down position and decrease in BIS value in head-up position as compared with neutral position. So changing a patient's position significantly affects the BIS values, which might affect the interpretation of anaesthetic depth.[12]

There occurs an increase in left ventricular end-systolic wall stress (LVESWS) due to pneumoperitoneum during laproscopy which causes an increase in myocardial oxygen demand but postural changes during pneumoperitoneum had no impact on cardiac function in either obese or normal weight subjects.[13-15]

Gastric secretion has an acidic pH that protects against ingestion of unsuitable substances.[16] We studied the effect of patient positioning on gastric pH during laparoscopic procedures. In our study we found that a significant change in pH occurred during laproscopic surgeries. Such change was not related to patient positioning. The significant alkaline alteration in gastric secretion indicate that regurgitation of duodenal contents into the stomach might takes place during laproscopic procedures. Alteration in gastric pH also takes place during open cholecystectomy possibly because of bowel manipulation in the background of abnormal DGR.[17]

There was a significant difference among the parameters of age and duration of surgery between the two group of patients. We speculate that these differences were because of randomization of patients as well as shorter duration of diagnostic laproscopic procedures. The significant difference between the pH in the pre- and post-positioning period in both the groups despite a significant difference in duration of anaesthesia highlights the fact that positioning of patient causes change in gastric pH in the presence of pneumoperitoneim irrespective of the duration of surgery.

Pnemoperitoneum along with change in patient position either in the head up (Reverse trendelenburg) or head down (trendelenburg position) may causes movement of duodenal content into the stomach. But we found that significant change also occured in the reverse trendelenburg position. This change in gastric pH may be presumed because of the effect of pneumoperitoneum. pH may also increase in Reverse trendelenburg postion if there is surgical manipulation of duodenum, bile duct or gallbladder in the background abnormal DGR along with anaesthesia- induced relaxed pylorus.[18]

Post operative gastric pH over 24 hrs have been measured following cholecystectomy and have demonstrated a shift towards alkalinity possibly due to increased DGR.[19,20] but our study has emphasized the change in gastric pH during laproscopic procedures. It has already been proved that duodenal contents have adverse effects when it gets accumulated in abnormal sites or in abnormal amounts. [21,22] This qualitative as well as quantitative change in the gastric content along with abnormal DGR-mediated ongoing gastric reflux of irritant bile in the background of deranged gastric motility after GA leads to increased incidence of post-operative nausea and vomiting. Further studies to estimate the relationship between the incidence of post-operative nausea and vomiting and patient positioning during laparoscopic surgery is required to establish this assumption.

CONCLUSION

In conclusion, significant change in gastric pH occurs during laproscopic surgeries, irrespective of the patient position during the intra-operative period. Therefore patient positioning does not effect the extent of pH change.

Table 1: Demographic parameter of patients and duration of general anaesthesia

	Group	n	Mean	Std. Deviation	Std. Error Of Mean	t-value	p-value
Age	Trendelenburg	50	28.88	2.2	0.41	1.2	0.21
	reverse Trendelenberg	50	29.49	2.7	0.5		
Duration of anaesthesia	Trendelenburg	50	57.20	11.5	2.3	1.4	0.15
	Reverse Trendelenberg	50	60.40	10.6	2.1		

Statistical significant accepted when P value is <0.05

Table 2: Pre and Post positioning PH in the T and RT group.

Group Trendelenburg (T)	N	Mean ± SD	SE of mean	t-value	p-value
Pre position PH	50	3.27±.63	.12	6.3	.001
Post position PH	50	2.52 ±.23	.04		
Group Reverse Trendelenburg (RT)					
Pre position PH	50	3.02 ±.37	6.3	5.7	.001
Post position PH	50	2.64 ±.21	.04		

Table 3 : Pre and Post positioning pH value of gastric fluid

		N	Mean	Std. Deviation	Std. Error Mean	t- value	p- Value
Pre position PH	Trendelenburg	50	2.52	.2	.04	1.8	.07
	Reverse Trendelenberg	50	2.64	.2	.04		
Post position PH	Trendelenburg	50	3.27	.6	.1	1.6	.1
	Reverse Trendelenberg	50	3.02	.3	.07		

Statistical significant accepted when P value is <0.05

Volume : 2 | Issue : 3 | Mar 2013 • ISSN No 2277 - 8179

REFERENCE

1. Passaro U, Vasapollo L, Carnevale L, Corsini F, Marano S, Piraino A, et al. Duodeno gastric reflux in gall bladder stones and after laproscopic cholecystectomy. Minerva Chir 2001;56: 139-146. | 2. Segizbaeva MO, Pogodin MA, Lavrova IN, Balykin MV, Aleksandrova NP. Effect of head-down tilt on respiratory responses and human inspiratory muscles activity.Fiziol Cheloveka. 2011 Mar-Apr;37(2):52-9. | 3. Fahy BG, Barnas GM, Nagle SE, Flowers JL, Njoku MJ, Agarwal M. Effects of trendelenburg and reverse trendelenburg postures on lung and chest wall mechanics. J Clin Anesth. 1996 May;8(3):236-44. | 4. Tang CS, Tsai LK, Lee TH, Su YC, Wu YJ, Chang CH, Tseng CK. The hemodynamic and ventilatory effects between trendelenburg and reverse trendelenburg position during laparoscopy with CO2-insufflation. Ma Zui Xue Za Zhi. 1993 Dec;31(4):217-24. | 5. Suh MK, Seong KW, Jung SH, Kim SS. The effect of pneumoperitoneum and trendelenburg position on respiratory mechanics during pelviscopic surgery. Korean J Anesthesiol. 2010 Nov;59(5):329-34. Epub 2010 Nov 25. | 6. Perilli V, Sollazzi L, Bozza P, Modesti C, Chierichini A, Tacchino RM, Ranieri R. The effects of the reverse trendelenburg position on respiratory mechanics and blood gases in morbidly obese patients during bariatric surgery. Anesth Analg. 2000 Dec;91(6):1520-5. | 7. Kalmar AF, Dewaele F, Foubert L, Hendrickx JF, Heeremans EH, Struys MM, Absalom A. Cerebral haemodynamic physiology during steep trendelenburg position and CO(2) pneumoperitoneum. Br J Anaesth. 2012 Mar;108(3):478-84. Epub 2012 Jan 17. | 8. Kalmar AF, Foubert L, Hendrickx JF, Mottrie A, Absalom A, Mortier EP, Struys MM. Influence of steep trendelenburg position and CO(2) pneumoperitoneum on cardiovascular, cerebrovascular, and respiratory homeostasis during robotic prostatectomy. Br J Anaesth. 2010 Apr;104(4):433-9. Epub 2010 Feb 18. | 9. Rolighed Larsen JK, Haure P, Cold GE. Reverse trendelenburg position reduces intracranial pressure during craniotomy. J Neurosurg Anesthesiol. 2002 Jan;14(1):16-21. | 10. Tankisi A, Rolighed Larsen J, Rasmussen M, Dahl B, Cold GE. The effects of 10 degrees reverse trendelenburg position on ICP and CPP in prone positioned patients subjected to craniotomy for occipital or cerebellar tumours. Acta Neurochir (Wien). 2002 Jul;144(7):665-70. | 11. Haure P, Cold GE, Hansen TM, Larsen JR. The ICP-lowering effect of 10 degrees reverse trendelenburg position during craniotomy is stable during a 10-minute period. J Neurosurg Anesthesiol. 2003 Oct;15(4):297-301. | 12. Kaki AM, Almarakbi WA. Does patient position influence the reading of the bispectral index monitor? Anesth Analg. 2009 Dec;109(6):1843-6. | 13. Prior DL, Sprung J, Thomas JD, Whalley DG, Bourke DL. Echocardiographic and hemodynamic evaluation of cardiovascular performance during laparoscopy of morbidly obese patients. Obes Surg. 2003 Oct;13(5):761-7. | 14. Casati A, Comotti L, Tommasino C, Leggieri C, Bignami E, Tarantino F, Torri G. Effects of pneumoperitoneum and reverse trendelenburg position on cardiopulmonary function in morbidly obese patients receiving laparoscopic gastric banding. Eur J Anaesthesiol. 2000 May;17(5):300-5. | 15. Larsen JF, Svendsen FM, Pedersen V. Randomized clinical trial of the effect of pneumoperitoneum on cardiac function and haemodynamics during laparoscopic cholecystectomy. Br J Surg. 2004 Jul;91(7):848-54. | 16. Guyton AC, Hall JE, Editors. Textbook of medical physiology. 9thed. Philadelphia: W.B. Saunders Company; 1996. Pp.817. | 17. Biswas BK, Bhattarai B, Bhakta P, Dey S, Bhattacharyya P. Intra-operative change of gastric pH during laprotomic cholecystectomy under general anaesthesia. Indian J Anaesth 2012;56:40-3. | 18. Russell RC. The gall bladder and bile ducts. In: Mann CV, Russell RC, Williams NS, editors. Bailey and Love's short practice of surgery. 22nd ed. London:ELBS;1995. pp737-742. | 19. Brown TH, Walton G, Cheadle WG, Larson GM. The alkaline shift in gastric pH after cholecystectomy. Am J Surg 1989;157:58-65. | 20. Chen MF, Wang CS. The prospective study of the effect of cholecystectomy on duodenogastric reflux in humans using 24 hour gastric hydrogen monitoring. Surg Gynecol Obstet 1992;175:52-6. | 21. Stein HJ, Kauer WK, Feussner H, Siewert JR. Bile acids as components of the duodenogastric refluxate: Detection, relationship to bilirubin, mechanism of injury and clinical relevance. Hepatogastroenterology 1999;46:66-73. | 22. Dixon MF, Neville PM, Mapstone NP, Moayyedi P, Axon AT. Bile reflux gastritis and Barrett's oesophagus: Further evidence of a role for duodenogastro-oesophageal reflux? Gut 2001;49:359-63. |