



Post Laparoscopy Pneumoperitoneum – Residual CO₂ or Breach of Gastro Intestinal Tract – A Dilemma

KEYWORDS

Post laparoscopy Pneumoperitoneum, Laparoscopic Cholecystectomy, laparoscopic appendicectomy, Chest Radiographs.

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ABSTRACT *The objective of this study was to determine the time required for absorption of carbon dioxide used for creating pneumoperitoneum after laparoscopic surgery using erect chest radiographs. 50 patients who underwent laparoscopy (25 patients who underwent laparoscopic cholecystectomy and 25 patients who had laparoscopic appendicectomy) were included in this study. Postero Anterior chest x ray in standing position were done on day 1, day 3, day 5 and day 7 post laparoscopy in all patients who had pneumoperitoneum. The presence and volume of pneumoperitoneum was noted and correlated with age, gender and type of surgery. The male to female ratio was 1:2 overall but 1:4 for laparoscopic cholecystectomy group and 1:1 for the laparoscopic appendicectomy group. Young adults up to 45 years tend to retain pneumoperitoneum for a long period (up to 7 days) as compared to old patients with age more than 45 in whom pneumoperitoneum resolved within 5 days. The time required for complete resolution of pneumoperitoneum was noted. In 18 patients (36%) there was no evidence of pneumoperitoneum on day 1 post surgery. Another 22 patients (44%) had complete resolution of pneumoperitoneum by day 5 after surgery. The remaining 10 patients had no pneumoperitoneum on day 7 post laparoscopy. We conclude that post laparoscopy surgery pneumoperitoneum persists up to 7 days even after using CO₂ as insufflating gas.*

Introduction

Laparoscopic surgery has come a long way since its inception. Gone are the days when laparoscopic Surgery was performed rarely and in exceptional cases. Nowadays laparoscopic surgery is the norm and gold standard of treatment in many conditions. One of the necessity and essential requirement of laparoscopic surgery is creation of pneumoperitoneum with gas so that anterior abdominal wall is lifted away from organs creating a potential space in which the surgeon can maneuver his instruments and perform the surgery. Various gases have been used to create pneumoperitoneum like Nitrous oxide, air, helium or Carbon dioxide.¹ Nitrous oxide and air is rarely used because of their combustible nature and helium is too costly and rare to be used as the ideal insufflating gas. Carbon dioxide is the standard gas used for creating pneumoperitoneum all over the world because it does not support combustion, is cheap and has a rapid diffusion capacity.² Carbon dioxide is 20 times more soluble in serum than room air or oxygen and has shown to be absorbed 32 times more quickly than room air.³ Because of carbon dioxide insufflation during laparoscopy some amount of gas may remain behind in peritoneum as a residual gas. Presence of Pneumoperitoneum post laparoscopic surgery especially in patients who come for follow up with complaints of abdominal pain or fever puts the surgeon in a dilemma as pneumoperitoneum can be because of residual carbon dioxide or because of breach of gastrointestinal tract.

Material and Method-

The study was conducted in a medical college hospital as a hospital based prospective study. 50 patients who underwent laparoscopic surgery (25 patients of laparoscopic cholecystectomy and 25 patients of laparoscopic appendicectomy) were included in this study. Laparoscopic cholecystectomy and laparoscopic appendicectomy surgeries were chosen because they are the most commonly performed surgeries and they represent upper and lower abdominal surgery respectively.

Laparoscopic Cholecystectomy was performed using the standard American technique. Four trocars were used, 10mm trocars 2 and 5 mm trocars 2. A 10 mm Intraumbilical trocar was introduced with open technique and after insufflation with CO₂ other trocars were introduced under vision. Calots

triangle was dissected, the cystic artery and cystic duct was dissected, clipped and cut. Gall bladder was dissected from gall bladder fossa and removed from body after confirming hemostasis. Before removing trocars, pneumoperitoneum was evacuated from the infraumbilical trocar. Trocars were removed and port incision closed with monofilament non-absorbable suture.

Laparoscopic appendicectomy was done by the conventional three trocar method. A 10 mm infraumbilical trocar was inserted with open technique and pneumoperitoneum was created using CO₂. Another 10 mm trocar was inserted in suprapubic region and a 5 mm trocar was introduced in right iliac region under vision. Appendix was identified; the meso-appendix was dissected, cauterized and cut. Appendix was then ligated at base using preformed chromic catgut loop twice. Appendix was cut 1 cm above the catgut loop and removed from the 10 mm suprapubic trocar. Hemostasis was confirmed and pneumoperitoneum was evacuated from the infraumbilical trocar. Trocars were removed and port incision was closed with non absorbable monofilament suture.

Karl Storz CO₂ insufflator was used in all cases. CO₂ was used in all cases and the intra-abdominal pressure was maintained at 12mm of Hg.

All patients were subjected to erect chest radiographs after taking their consent, on day 1, day 3, day 5 and on day 7 after surgery. The patients who had complete resolution of pneumoperitoneum were not subjected to subsequent chest radiographs. All patients were discharged on day 3 after subjecting the patients who had a pneumoperitoneum on day 1 to a chest radiographs. The patients who had evidence of pneumoperitoneum on day 3 were contacted by phone and were followed on OPD basis for chest radiographs on day 5 and day 7. The pneumoperitoneum was measured and graded as done by Millitz et al, as absent, trace (1-5mm), mild (6-10mm) or moderate (11-15mm). We tried to correlate the presence of pneumoperitoneum with age, gender and type of surgery.

Results-

Table 1 to Table 3 summarizes the findings of this study. Table 1 correlates age group and type of surgery. Table 2 shows the

gender of patients and the duration required for resolution of pneumoperitoneum according to type of surgery. Table 3 pertains to days required for complete absorption of CO₂ according to age group.

Table 1 here- Table correlating type of surgery with gender and age group.

Age group	Laparoscopic Cholecystectomy		Laparoscopic appendicectomy		Total
	Male	Female	Male	female	
0-15 yrs	00	00	01	00	01
16-30 yrs	00	06	07	07	20
31-45 yrs	01	05	03	06	15
46- 60 yrs	03	05	01	00	09
>61 yrs	01	04	00	00	05
Total	05	20	12	13	50

Table 2 here – Absorption of Pneumoperitoneum according to gender, surgery and days required. Lap chol – laparoscopic cholecystectomy, Lap app – laparoscopic appendicectomy.

Gender	Day 1 No Pneumoperitoneum		Day 3 No Pneumoperitoneum		Day 5 No Pneumoperitoneum		Day 7 No Pneumoperitoneum	
	Lap Chol	Lap app	Lap chol	Lap app	Lap chol	Lap app	Lap chol	Lap app
	Male	2	3	0	2	3	4	0
Female	8	5	2	1	6	4	4	3

Table 3 here- Table showing relation between age and resolution of Pneumoperitoneum.

Age group	Day 1	Day 3	Day 5	Day 7
0-15 yrs	00	01	00	00
16- 30 yrs	04	00	09	07
31-45 yrs	04	03	05	03
46- 60yrs	07	01	01	00
> 61 yrs	03	00	02	00
Total	18	05	17	10

The male to female ratio was 1:2 overall with 17 males and 33 females. The laparoscopic Cholecystectomy group had a M:F ratio of 1:4 with 5 males and 20 females. The preponderance of females in laparoscopic cholecystectomy group is well documented as cholelithiasis is more prevalent in females of middle age. The laparoscopic appendicectomy group has a M:F ratio of nearly 1:1 with 12 males and 13 females. The patients in the laparoscopic appendicectomy are predominantly in young age group as appendicitis is known to be an illness of young adults.

In 18 patients (36%) there was no evidence of pneumoperitoneum on day 1 post surgery. Another 22 patients (44%) had resolution of pneumoperitoneum by day 5 after surgery. The remaining 10 patients had no evidence of pneumoperitoneum on day 7 after surgery.

In 18 patients there was evidence of trace pneumoperitoneum, 9 patients had mild pneumoperitoneum whereas 5 patients had moderate pneumoperitoneum.

Our study showed an inverse correlation between age and duration of pneumoperitoneum with younger people requiring more days for complete absorption of carbon dioxide as compared to old people who required less time for absorption of CO₂. Patients between 16 to 45 years were observed to require up to 7 days for absorption of CO₂ where as patients more than 45 years took less than 5 days for absorption of CO₂.

Discussion-

Many studies have been done to find out the duration for which post laparoscopy pneumoperitoneum persists. Some studies used chest radiographs to determine pneumoperitoneum whereas others used CT scan to ascertain pneumoperitoneum.^{4,5} Some studies were done on animals but most were done on patients.⁶ All most all studies were related to one type of laparoscopic surgery. Millitz et al studied post laparoscopy pneumoperitoneum in patients who underwent laparoscopic cholecystectomy whereas Lemay et al studied duration of pneumoperitoneum in patients who underwent laparoscopic tubal ligation.⁷ Gayer et al have stated that neither the presence or absence of pneumoperitoneum can predict whether gastro intestinal tract is intact.⁸

The present study compares two types of surgeries, laparoscopic cholecystectomy which is an upper abdominal surgery and laparoscopic appendicectomy which is a lower abdominal surgery and the time required for resolution of pneumoperitoneum.

In 36% patients there was no evidence of pneumoperitoneum on day 1 post surgery as seen on chest radiographs. In 32 patients (64%) there was evidence of pneumoperitoneum on day 1 post surgery. We graded the pneumoperitoneum as described by Millitz et al, as trace in 18 patients, mild in 9 patients and moderate in 5 patients. In our study all patients has resolution of pneumoperitoneum in 1 week. This correlates with studies by Millitz et al, Lemay et al and Draper et al.⁹ Other studies by Schauer PR et al, Feingold DL et al and Stanley IR et al have concluded that pneumoperitoneum resolves within 24 to 48 hours after laparoscopic surgery.^{6,10,11} In our study we found that young adults up to 45 years tend to retain post laparoscopic pneumoperitoneum for a longer period than old patients. This may be due to the fact that younger people have good muscle tone which may cause entrapment of air between lower part of ribcage as shown by Millitz et al and Bryant et al¹², but more studies need to be carried out for definite conclusions.

We conclude that post laparoscopy pneumoperitoneum may persist for a duration of 1 week which is because of slow absorption of CO₂ in to blood than previously thought.



Pneumoperitoneum day 1 post laparoscopy surgery



Pneumoperitoneum post laparoscopy day 3



post laparoscopy day 5

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