

**Comparative study of patients after laparoscopic surgery with and without drain for duration of gas under diaphragm: residual pneumoperitoneum**

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**Abstract**

**Background:** The role of routine drainage after LC to decrease postoperative morbidity is still an issue of considerable debate. The main reason to use drains in laparoscopic cholecystectomy is to avoid bile and blood collection requiring subsequent open procedures and to reduce post-operative Pain.

**Methods:** A prospective randomized comparative study was conducted at Department of general surgery Mata Chanan Devi Hospital, New Delhi. The aim was to study the effect of drain on residual pneumoperitoneum after laparoscopic cholecystectomy and to determine the duration of residual Pneumoperitoneum with and without drain. A total of 60 consecutive patients of admitted during study period and undergoing laparoscopic cholecystectomy were included in the study and randomly divided into two groups of 30 each i.e., with and without drain.

**Results:** Residual Pneumoperitoneum at 6, 12 and 24 hours was seen in 13.3%, 10% and 10% cases with usage of drain as compared to 20%, 6.7% and 6.7% cases without drain. No significant reduction in the Incidence of

Residual Pneumoperitoneum was noted with use of drain ( $p > 0.05$ ).

**Conclusion:** We conclude that routine use of drains is not justified as it use does not offer any significant advantage.

**Keywords:** Laparoscopic cholecystectomy (LC) , Drains, Pneumoperitoneum

**Introduction**

Laparoscopic cholecystectomy (LC) is the current preferred method of cholecystectomy. The role of routine drainage after LC to decrease postoperative morbidity is still an issue of considerable debate. The main reason to use drains in laparoscopic cholecystectomy is to avoid bile and blood collection requiring subsequent open procedures and to reduce post-operative Pain. Drainage of body cavities has been practiced in medicine for a long time<sup>1</sup>. Historical reports of drainage of chest empyema and ascites go back to the Hippocratic era<sup>2</sup>. However, abdominal drainage has always been a subject of controversy, practiced in confusion and subjected to local dogmas<sup>3</sup>

A hundred years have passed during which operative surgery and supportive care techniques have progressed

astonishingly; but what about drainage? Is the practice of drainage any less controversial, more rational and less confusing today<sup>4</sup>.

Cholecystectomy without sub hepatic drainage was first described in 1913, and since then surgeons were divided whether to use it as a routine drainage or not in uncomplicated cases<sup>5</sup>. Most surgeons continue to use routine sub hepatic drain for the fear of bile leak and bleeding<sup>6-8</sup>. Such complications invariably occurred in spite of sub hepatic drainage<sup>7</sup>. Easier convalescence, decreased rate of complications, and shortened hospital stay were the advantages of no drainage<sup>7</sup>.

Arguments of drainage from open era continues into the laparoscopic era, with another factor, that is, pneumoperitoneum being questioned. Pneumoperitoneum is considered the causative factor for postoperative nausea/vomiting, and postoperative pain, especially shoulder tip pain, following LC<sup>8</sup>.

Present study, therefore, aims to determine the role of routine drainage, after LC, and its effect on residual pneumoperitoneum.

## Materials and Methods

**Type of Study & Study Area:** A prospective randomized comparative study was conducted at Department of general surgery Mata Chanan Devi Hospital, New Delhi.

**Study Duration:** August 2015 onwards to July 2017

**Source of data:** Patients who were admitted for laparoscopic cholecystectomy.

## Inclusion criteria

- All patients admitted for laparoscopic cholecystectomy surgery.
- Patients who are willing to participate and give written valid informed consent.

## Exclusion criteria

- Surgical cause of Pneumoperitoneum i.e. Perforated gastric/ duodenal ulcer , Rupture diverticula
- Non-surgical cause of Pneumoperitoneum i.e. Bacterial peritonitis, Blunt abdominal Trauma, Positive pressure ventilation.
- Gynecological procedure with insufflations i.e. tubal patency test, pregnancy.
- Pregnant women

## Methodology

Approval from our institutional review board was taken before start of the study. Written informed consent was obtained in all patients after explaining the role of X-ray in evaluation of residual pneumoperitoneum and necessity of this study to undergo three X-ray exposures. Patients will also be explained the side effects of X-rays exposures if any.

The patients undergoing laparoscopic cholecystectomy were divided into two groups. One group with drain and the other group without drain. Allocation of drain or not to drain will be based on randomization.

All patient (with and without drain) underwent series of upright chest PA view X-rays at intervals of 6 hrs, 12 hrs, and 24 hrs to see the persistence of residual pneumoperitoneum i.e. gas under diaphragm after Laparoscopic cholecystectomy. X-rays was done with proper lead apron over pelvic region to avoid pelvic exposure.

## Statistical Analysis

All the data was entered in Microsoft Excel sheet and then transferred to SPSS software ver. 21 for statistical analysis. Chi-square test was used for qualitative data while unpaired t-test was used for quantitative data. A p-value of less than 0.05 was taken as significant.

## Results

The mean age of the study subjects was 54.83 years with 41.7% of subjects were over 60 years of age. Female predominance was seen in the study group with 75% females to 25% males.

A total of 60 subjects were divided randomly into two groups of 30 each based on the use of drain during the surgery.

**Table 1. Association of Incidence of Residual pneumoperitoneum with use of Drain**

Residual Pneumoperitoneum	Use of Drain		Total	p- value
	No	Yes		
6 hrs	6	4	10	0.73
	20.0%	13.3%	16.7%	
12 hrs	2	3	5	1.00
	6.7%	10.0%	8.3%	
24 hrs	2	3	5	1.00
	6.7%	10.0%	8.3%	

Residual Pneumoperitoneum at 6, 12 and 24 hours was seen in 13.3%, 10% and 10% cases with usage of drain as compared to 20%, 6.7% and 6.7% cases without drain. No significant reduction in the Incidence of Residual Pneumoperitoneum was noted with use of drain ( $p>0.05$ ).

**Table 2. Association of Incidence of Residual pneumoperitoneum with use of suction/ irrigation after the procedure**

Suction/ Irrigation	Residual Pneumoperitoneum		Total
	No	Yes	
No	35	5	40
	87.5%	12.5%	100.0%
Yes	15	5	20
	75.0%	25.0%	100.0%
Total	50	10	60
	83.3%	16.7%	100.0%
p- value - 0.277			

Incidence of Residual Pneumoperitoneum at 6 hours was observed as 25% and 12.5% with and without use of suction irrigation post-surgery. The difference was however non-significant.

**Table 3. Comparison of duration of surgery with use of Drain**

Variables	Use of Drain	N	Mean	SD	p- value
Duration of Surgery (mins)	Yes	30	66.53	20.84	<0.01
	No	30	50.00	8.03	

The duration of surgery was significantly more in cases with use of drain as compared to no drain (66.53 vs 50.0 mins;  $p<0.01$ ).

**Table 4. Comparison of duration of surgery with Incidence of Residual pneumoperitoneum**

Variables	Residual Pneumoperitoneum	N	Mean	SD	p- value
Duration of Surgery (mins)	Yes	10	57.36	17.01	0.38
	No	50	62.80	21.46	

No association was observed between duration of surgery and Incidence of Residual Pneumoperitoneum ( $p=0.38$ ).

## Discussion

The present study was conducted with the objective of studying the effect of drain on incidence of residual pneumoperitoneum after laparoscopic cholecystectomy and to determine the duration of residual Pneumoperitoneum with and without drain.

Persistent pneumoperitoneum is a frequent finding after laparoscopic procedure and is responsible for postoperative abdominal or shoulder pain. It is generally considered a referred pain due to irritation of the diaphragm. In present study, overall Incidence of Residual Pneumoperitoneum at 6, 12 and 24 hours was observed as 16.7%, 8.3% and 8.3% respectively.

In a similar study Sarvestani et al.<sup>9</sup> also observed the Incidence of Residual Pneumoperitoneum at 6, 12 and 24 hours. At the end of 24 hours, 17 (30.9%) patients had no residual pneumoperitoneum, 23 (41.81%) had mild residual pneumoperitoneum, 8 (14.54%) had moderate and seven (12.72%) had severe pneumoperitoneum. In a similar study, Millitz et al.<sup>10</sup> observed that no evidence of pneumoperitoneum was seen on chest radiographs after 6 hours of surgery in 27 (54%) of the 50 patients who completed the study. Schauer et al.<sup>11</sup>, reporting in 1997, using plain upright chest films, found that free air was uncommon after 24 h following laparoscopic cholecystectomy, except in cases with small bowel perforation. Shelke et al.<sup>12</sup> in their study observed that 18 patients (36%) out of 50, had no evidence of pneumoperitoneum on day 1 post surgery. Another 22 patients (44%) had complete resolution of pneumoperitoneum by day 5 after surgery. Lee HC et al.<sup>13</sup> in their study observed that out of the 384 patients, 93 patients (24.2%) had postoperative pneumoperitoneum. Residual Pneumoperitoneum at 6, 12 and 24 hours was seen in 13.3%, 10% and 10% cases with usage of drain as compared to 20%, 6.7% and 6.7% cases without drain. No significant reduction in the Incidence of Residual Pneumoperitoneum was noted with use of drain ( $p>0.05$ ). Some publications recommend the use of a short-term drain postoperatively based on the theory that high-pressure CO<sub>2</sub> insufflation during the operation and the accumulation of gas in the right subphrenic area (residual pneumoperitoneum) leads to complain of abdominal pain, shoulder tip pain, and nausea/vomiting postoperatively. To the best of our knowledge, no study have directly compared the incidence of residual pneumoperitoneum with respect to use of drain. All the studies made an indirect comparison between use of drain and no drain

with difference in postoperative pain, nausea and vomiting.

According to the Cochrane Database Systemic Review, randomized clinical studies show no benefit of a drain. Some studies even claim that drains are harmful. They conclude that tendency of surgeons to use or not use drains seems to be a matter of habit and experience<sup>14</sup>. Gouda et al.<sup>15</sup> in a similar randomized trial, showed no statistically significant difference in postoperative pain, nausea and vomiting, wound infection or abdominal collection between the two groups. They concluded that routine use of a drain in non-complicated laparoscopic cholecystectomy has nothing to offer; in contrast, it is associated with longer hospital stay. Similarly Rathi PK et al.<sup>16</sup> also observed that routine placement of drain after laparoscopic cholecystectomy leads to drain site pain and discomfort rather than offering any advantage on post-operative pain and nausea/ vomiting. Similar results were also observed by Sharma et al.<sup>17</sup> and Shamim et al.<sup>18</sup> who also conclude that routine use of drains cannot be justified as it offers no significant advantage with post-op pain and nausea/ vomiting. Contrary to these results Nagpal A et al.<sup>19</sup> and Tzovaras G et al.<sup>20</sup> observed even higher incidence of postoperative pain with use of drain as compared to no drain.

In present study, no association was observed between duration of surgery and incidence of Residual Pneumoperitoneum ( $p=0.38$ ). Similar results were also observed by Draper K et al.<sup>21</sup> where duration of the pneumoperitoneum did not correlate with initial volume of CO<sub>2</sub> used and length of time for the procedure.

In present study, however we observed that duration of surgery was significantly more in cases with use of drain as compared to without drain (66.53 vs 50.0 mins;  $p<0.01$ ). Similar to our results, Nagpal et al.<sup>19</sup> also

observed mean operative time in groups A (with drain) and B (without drain) as 93.1 and 86.0 minutes respectively ( $p < 0.05$ ). However in a study by Sharma et al.<sup>64</sup> average operative time in both the groups was same (p-value 0.977).

### Conclusion

Postoperative pneumoperitoneum is a common phenomenon after laparoscopic abdominal surgery. However residual pneumoperitoneum following laparoscopic surgery resolves within 24 hours in most of patients. No association was observed in present study between incidence of residual pneumoperitoneum and its resolution frequency and rate with use of drain. However use of drain is associated with increased duration of surgery. The authors thus conclude that routine use of drains is not justified as its use does not offer any significant advantage.

### References

1. Robinson JO. Surgical drainage: a historical perspective. *Br J Surg*. 1986;73:422-6.
2. Moshe Schein. To Drain or not to Drain? The Role of Drainage in the Contaminated and Infected Abdomen: An International and Personal Perspective. *World J Surg*. 2008;32:312-21.
3. Henrik P, Nicolas D, Valentin, Pierre-Alain C. Evidence-based Value of Prophylactic Drainage in Gastrointestinal Surgery. *Ann Surg*. 2004;240:1074-85.
4. Mellor SG, Thomas MH, Donnellan BS. Cholecystectomy: safe or not safe to drain? *J R Soc Med*. 1988;81:566-8.
5. Fraser I, Everson NW, Nash JR. A randomised prospective trial of two drainage methods after cholecystectomy. *Ann R Coll Surg Engl*. 1982;64:183-5.
6. Diez JA, Pujato MR, Ferreres AR. The need of drainage after cholecystectomy. *HPB Surg*. 1990;3:5-10.
7. McCormack TT, Abel PD, Collins CD. Abdominal drainage following cholecystectomy: high, low, or no suction? *Ann R Coll Surg Engl*. 1983;65:326-328.
8. Nursal TZ, Yildirim S, Tarim A, Noyan T, Poyraz P, Tuna N, et al. Effect of drainage on postoperative nausea, vomiting, and pain after laparoscopic cholecystectomy. *Langenbecks Arch Surg*. 2003;388:95-100.
9. Amene Sabzi Sarvestani & Zamiri M. Residual pneumoperitoneum volume and postlaparoscopic cholecystectomy pain. *Anesthesiology and pain medicine*. 2014 Oct;4(4):e17366-73.
10. Millitz K, Moote DJ, Sparrow RK, Girotti MJ, Holliday RL, McLarty TD (1994) Pneumoperitoneum after laparoscopic cholecystectomy: frequency and duration as seen on upright chest radiographs. *AJR* 163: 837–839.
11. Schauer PR, Page CP, Ghias AA, Miller JE, Schwesinger WH, Sirinek KR (1997) Incidence and significance of subdiaphragmatic air following laparoscopic cholecystectomy. *Am Surg* 63: 132–136.
12. Rahul Ramkrishna Shelke et al. Post Laparoscopy Pneumoperitoneum – Residual CO<sub>2</sub> or Breach of Gastro Intestinal Tract – A Dilemma. *Indian Journal of Applied Research*. 2013; 3(4):379-81.
13. Lee CH, Kim JH, Lee MR. Postoperative pneumoperitoneum: guilty or not guilty?. *Journal of the Korean Surgical Society*. 2012 Apr 1;82(4):227-31.
14. Gurer, Ahmet, et al. "Is a Drain Required after Laparoscopic Cholecystectomy?." *The Eurasian Journal of Medicine* 45.3 (2013): 181.

15. El-labban, Gouda, et al. "Laparoscopic elective cholecystectomy with and without drain: A controlled randomised trial." *Journal of minimal access surgery* 8.3 (2012): 90.
16. Rathi, Prem Kumar, et al. "Laparoscopic Cholecystectomy without the use of Drain in Selected Cases." *JLUMHS* 10.03 (2011): 117.
17. Sharma A, Mittal S. Role of Routine Subhepatic Abdominal Drain Placement following Uncomplicated Laparoscopic Cholecystectomy: A Prospective Randomised Study. *Journal of Clinical & Diagnostic Research*. 2016 Dec 1;10(12).
18. Shamim M. Routine sub-hepatic drainage versus no drainage after laparoscopic cholecystectomy: open, randomized, clinical trial. *Indian Journal of Surgery*. 2013 Feb 1;75(1):22-7.
19. Nagpal, Aman, et al. "Drainage in Cholecystectomy: Required or Not? A Comparative Randomized Study in Northern Indian Subjects." *World Journal of Laparoscopic Surgery* 5.2 (2012): 63-66.
20. Tzovaras, George, et al. "Is there a role for drain use in elective laparoscopic cholecystectomy? A controlled randomized trial." *The American Journal of Surgery* 197.6 (2009): 759-763.
21. Draper K, Jefson R, Jongeward R Jr, Mcleod M. Duration of post-laparoscopic pneumoperitoneum. *Surg Endosc* 1997;11(8):809- 811.