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A Study to Evaluate the Effect of Low Pneumoperitonium Pressure on Post-Operative Pain in Laproscopic Cholecystectomy – A Progressive Study

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ABSTRACT

Background: A pneumoperitoneum of 12 to 16 mm Hg is used for laparoscopic cholecystectomy.1,2 Lower pressures are claimed to be safe and effective in decreasing cardiopulmonary complications and painLaparoscopic cholecystectomy has become the gold standard treatment for gall bladder disease. **Aims and objectives:** To assess the benefits and harms of low pressure pneumoperitoneum compared with standard pressure pneumoperitoneum in people undergoing laparoscopic cholecystectomy. **Methods:** 50 patients undergoing laparoscopic cholecystectomy in maharishi markendeshwar medical college surgery department will be randomized into low pressure pneumoperitoneum (10 mmHg) and standard pressure pneumoperitoneum (14mmHg). The degree of postoperative pain was assessed by mean of visual analogue scale at 4,8,12,24 hours postoperatively. **Results & Conclusion:** Based on these results, an IAP from 8 to 12 mm Hg is recommended for laparoscopic surgery, to avoid complications caused by hemodynamic derangements.

Keywords: laparoscopic, Pneumoperitoneum, postoperatively.

INTRODUCTION

A pneumoperitoneum of 12 to 16 mm Hg is used for laparoscopic cholecystectomy.[1,2] Lower pressures are claimed to be safe and effective in decreasing cardiopulmonary complications and painLaparoscopic cholecystectomy has become the gold standard treatment for gall bladder disease.

Since its introduction in 1987, this procedure is being performed keeping a pneumoperitoneum pressure of 14-15 mmHg with the belief that more pressure provides more space. There has been an observation that significant number of patients do complain of postoperative pain more specially in the shoulder tip, at the operative site and the back.[3,4] Shoulder tip pain at times is so severe requiring injectable analgesics and significantly disturbs the patient of its belief that laparoscopic surgery is comparatively pain free compared to open surgery. The reported incidence of Shoulder tip pain following LC varies from 30-50% .[5,6]

Although the exact mechanism of pain after laparoscopic cholecystectomy is yet to be claried but shoulder tip pain particularly seems to be linked to the CO insufflation. The underlying pathologies could be either diaphragmatic stretching or an phrenic nerve neuroprexia and release of inammatory mediators. It is also reported that CO under the diaphragm is responsible for much of the shoulder tip pain and there is a strong correlation between the amount of gas, type of gas and rate of insufflation and severity of pain.[7,8] Therefore, it becomes a logical thinking, that in one way or the other CO2 pneumoperitoneum seems to be the underlying cause of pain. Various authors have also suggested that the loss of visceral surface tension after creation of pneumoperitoneum results in increase weight on the diaphragmatic attachments of liver and hence shoulder 4,5,6 tip pain. In an attempt to address this important parameter which affects the outcome of the Laparoscopic Cholecystectomy, different authors have put forward their views for different reasons of getting Shoulder tip pain and there remedies. Many authors, though with the convicting results through their studies have shown that keeping a low pressure of pneumoperitoneum during Laparoscopic Chole cystectomy does reduce significantly shoulder tip pain. Taking forward these observation we aimed to study the effect of low pressure pneumoperitoneum on shoulder tip pain in Laparoscopic Cholecystectomy.[9,10]

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Aims and objectives

To assess the benefits and harms of low pressure pneumoperitoneum compared with standard pressure pneumoperitoneum in people undergoing laparoscopic cholecystectomy.

MATERIALS AND METHODS

50 patients undergoing laparoscopic cholecystectomy in maharishi markendeshwar medical college surgery department will be randomized into low pressure pneumoperitoneum (10 mmHg) and standard pressure pneumoperitoneum (14mmHg). The degree of postoperative pain was assessed by mean of visual analogue scale at 4,8,12,24 hours postoperativelyI

Inclusion criteria

All patients with symptomatic cholelithiasis will be included in the study

Exclusion criteria

Patients with severe comorbidities,morbid obesity and history of previous laprotomy will not be included in the study.

All procedures will be performed under General standard anesthesia. Pneumoperitoneum will be created with CO insufflations using the standard veress needle technique, until abdominal pressure either 10mmHg or 14 mmHg will be reached. In low group the initial insufflation will be at 14mmHg for safe insertion, subsequently reduced to 10 mmHg. The insufflation will be maintained with an automatic insufflators. In all patients access will be achieved using 4 ports and standard American technique. The degree of postoperative pain will be assessed in a double blinded manner by mean of visual analogue scale at 4,8,12,24 hours postoperatively with scores ranging from 0(no pain) to 10 (unbearable pain) by a doctor who will be blind to the group allocation of the patients, allowing the patients to mark a point along the scale that represented pain at that time.Analgesic requirement will be recorded. The procedure was explained in detail and consent was taken. Post-operative analgesia will be administered in the form of injection Diclofenac post operatively in recovery room with additional doses when necessary. Need of additional analgesics over and above the postoperative Diclofenac and incidence of pain will be noted. Statistical analysis will be carried out using the Chi square and independent student Ttest. Ap value <0.05 will be taken as statistically significant.

1. **Age and Gender-**

The age of our patients ranged from 23 to 70 years The age of the female patients ranged from 23 to 62 years. The age of the male patients ranged from 39 to 70 years. Out of total 300 patients, 217 were females and 83 were men.

Normal pressure group	**N**	**AGE(years)**
Gender		**Range**
Male	34	39-70
Female	83	23-62
Total	117	23-70
Low pressure group	**N**	**AGE (years)**
Gender		**Range**
Male	73	39-70
Female	110	23-62
Total	183	23-70

2. **Table Comparing Age in Two Groups**

Table 1: ?

	Normal pressure	**Low pressure**	**TOTAL**
Group 1 Male	34 (41.73) [1.43]	73 (65.27) [0.92]	107
Group 2 Female	83 (75.27) [0.79]	110 (117.73) [0.51]	193
Marginal Column Totals	117	183	300 (Grand Total)

The chi-square statistic is 3.6488. The p-value is .056111. This result is not significant at $p < .05$

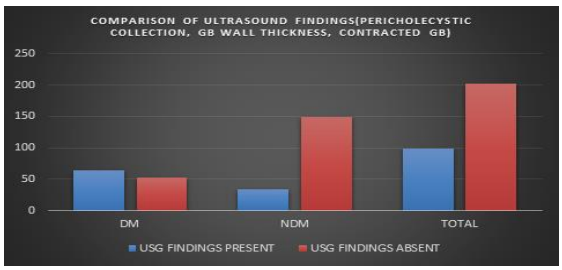
2. Ultrasound Findings

Diabetic Group	**GB wall Thickness>4mm Pericholecystic fluid collection**
Gender	**Contracted GB**
Male	10
Female	54
Total	64
Control group	**GB wall thickness>4mm Pericholecystic fluid collection**
Gender	**Contracted GB**
Male	4
Female	30
Total	34

Table 2: Pressure.

	USG Present	USG not present	Marginal Row Totals
Group 1 normal pressure	64 (38.22) [17.39]	53 (78.78) [8.44]	117
Group 2 low pressure	34 (59.78) [11.12]	149 (123.22) [5.39]	183
Marginal Column Totals	98	202	300 (Grand Total)

The chi-square statistic is 42.3365. The p-value is < 0.00001. This result is significant at p < .05.



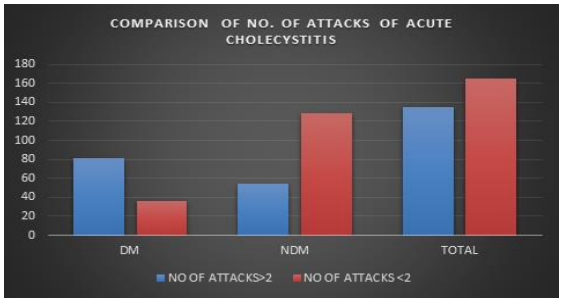
3. PREVIOUS ATTACKS > 2

Normal pressure GROUP	N
Gender	
Male	14
Female	67
Total	81
Control group	**N**
Gender	
Male	30
Female	24
Total	54

Table 3: Pressure

	No Of Attacks Present	No Of Attacks Not Present	Marginal Row Totals
Normal pressure	81 (52.65) [15.27]	36 (64.35) [12.49]	117
Low pressure	54 (82.35) [9.76]	129 (100.65) [7.99]	183
Marginal Column Totals	135	165	300 (Grand Total)

The chi-square statistic is 45.5004. The p-value is. This result is significant at p < .05.

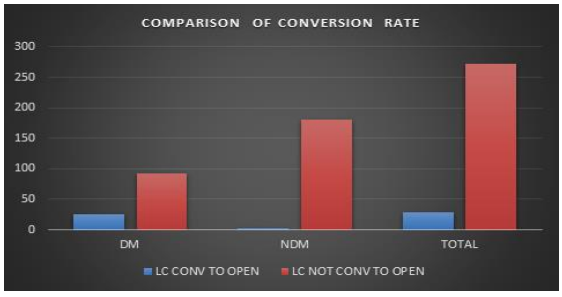


4. Laparoscopic Cholecystectomy Converted To Opencholecystectomy

Normal pressure GROUP	N
Gender	
Male	15
Female	10
Total	25
Control group	**N**
Gender	
Male	2
Female	1
Total	3

Table 4	Lc Conv To Open	Lc Not Conv To Open	Marginal Row Totals
Normal pressure	25 (10.92) [18.15]	92 (106.08) [1.87]	117
Low pressure	3 (17.08) [11.61]	180 (165.92) [1.19]	183
Marginal Column Totals	28	272	300 (Grand Total)

The chi-square statistic is 32.825. The p-value is. This result is significant at p < .05



5. Calots Triangle Identified and Not Identified

Low Pressure Group	Identified	Not Identified
Gender		
Male	24	10
Female	69	14
Total	93	24
Normal pressure group	**Identified**	**Not identified**
Gender		
Male	70	3
Female	90	20
Total	160	23

Table 5: Pressure

Table 5	CT Identified	CT not Identified	Marginal Row Totals
Group 1 normal pressure	93 (98.67) [0.33]	24 (18.33) [1.75]	117
Group 2 low pressure	160 (154.33) [0.21]	23 (28.67) [1.12]	183
Marginal Column Totals	253	47	300 (Grand Total)

The chi-square statistic is 3.4094. The p-value is .064827. This result is not significant at p < .05.

6. Time Taken to Complete the Surgery

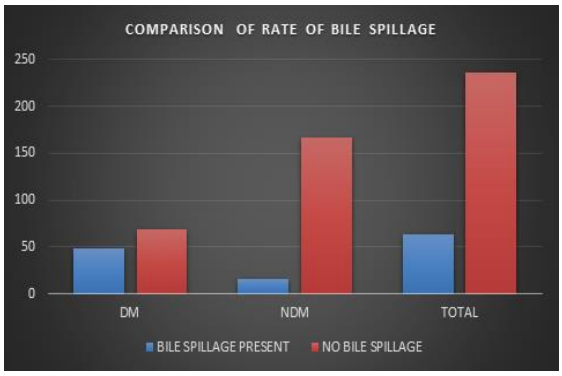
Normal pressure GROUP	Mean time
Gender	
Male	110 min
Female	101 min
Control group	**Mean time**
Gender	
Male	69
Female	90

7. Bile spillage

Normal pressure GROUP	N
Gender	
Male	15
Female	33
Total	48
Control group	**N**
Gender	
Male	6
Female	10
Total	16

Table 6: ?

	bile spillage present	no bile spillage	Marginal Row Totals
Group 1	48 (24.96) [21.27]	69 (92.04) [5.77]	117
Group 2	16 (39.04) [13.6]	167 (143.96) [3.69]	183
Marginal Column Totals	64	236	300 (Grand Total)



8. Injury to Cystic Duct/ Common Bile Duct/Cystic Artery/ Any Other Structures

Normal pressure GROUP	N
Gender	
Male	12
Female	16
Total	28
Control Group	**N**
Gender	
Male	8
Female	10
Total	18

Table 7: ?

	Injury present	No injury	Marginal Row Totals
Group 1	28 (17.94) [5.64]	89 (99.06) [1.02]	117
Group 2	18 (28.06) [3.61]	165 (154.94) [0.65]	183
Marginal Column Totals	46	254	300 (Grand Total)

The chi-square statistic is 10.9227. The p-value is .00095. This result is significant at p < .05.

GROUP1			GROUP 2		
N= 117			N= 183		
Male=34			Male=73		
Female=83			Female=110		
Age group=23-70			Age group= 23-70		
USG	Gb wall thickness >4mm	64	USG	Gb wall thickness >4mm	34
	Pericholecystic fluid collection			Pericholecystic fluid collection	
	Contracted GB			Contracted GB	
No. Of attacks >2	81		54		
Laparoscopic cholecystectomy converted to open Cholecystectomy	25		3		
Calot's triangle	Identified Not	24	Calot's Triangle	Identified Not 23	
	Identified	93		Identified 160	
Time Taken To Complete Surgery	105.5 min		79.5 min		
Bile Spillage	48		16		
Injury To Cystic Artery/ Cbd Injury/ Injury To Other Structures	28		18		

DISCUSSION

A study by Srikantaiah Hiremath showed that bilirubin (Direct and total), AST, ALT, and GGT elevations could occur after laparoscopic cholecystectomy. When analyzed together with the data collected from previous studies, these changes may be attributed to the reduction of portal venous flow under high pressures of a pneumoperitoneum.[11]

In the study conducted by Deepaesh Benjamin Kanwer, Lileswar Kaman, Nedounsejiane M, Bikash

Medhi, Ganga Ram Verma, Indu Bala they found that low pressure pneumoperitoneum does result in some benefit to the patient in the form of lower intensity of postoperative pain but the impact on intra-operative hemodynamics is not significant.[12]

Gurusamy K, Vaughan J, Davidson BR in a study came to the conclusion that Laparoscopic cholecystectomy can be completed successfully using low pressure in approximately 90% of people undergoing laparoscopic cholecystectomy. However, no evidence is currently available to support the use of low pressure pneumoperitoneum in low anaesthetic risk patients undergoing elective laparoscopic cholecystectomy. The safety of low pressure pneumoperitoneum has to be established. Further well-designed trials are necessary, particularly in people with cardiopulmonary disorders who undergo laparoscopic cholecystectomy.[13]

Ali Akkoc et al in there study found out that lower insufflation pressure may result in more increased hemorrhage; but it is associated with less postoperative pain scores in the early postoperative period.[14]

Krishnegowda, U., kumar Gupta, A., Sharma, R. et al. In one of there study concluded with the following remarks. The use of the low pressure pneumoperitoneum in laparoscopic cholecystectomy achieved reduction in both the intensity and frequency of postoperative pain.[15]

Mario Schietroma, Beatrice Pessia, Derna Stifini, Laura Lancione, Francesco Carlei, Emanuela Marina Cecilia, Gianfranco Amicucci in there maiden study came to the conclusion that reducing the pressure of the pneumoperitoneum to 6-8 mmHg is feasible during LA. Reduced insufflation pressures can also lead to reduction in p.o. inflammatory response and, possibly, avert p.o. immunosuppression. The low-pressure technique could be employed in the majority of patients subjected to LA with reasonable safety by an experienced surgeon. We need detailed studies concerning the effects of various degrees of intra-abdominal pressure on systemic inflammation and immune response in laparoscopic surgeries, especially during and after laparoscopic oncology operations.[16]

CONCLUSION

Based on these results, an IAP from 8 to 12 mm Hg is recommended for laparoscopic surgery, to avoid complications caused by hemodynamic derangements.

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