

Original Article

To evaluate low pressure pneumoperitoneum laparoscopic cholecystectomy

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ABSTRACT:

Aim: The aim of this study to determine the low-pressure pneumoperitoneum laparoscopic cholecystectomy. **Materials and methods:** This research comprised a total of 100 patients who were hospitalised for elective laparoscopic cholecystectomy. Patients undergoing open cholecystectomy after conversion. The research did not include patients with acute inflammation or any other choledocholithiasis or gallstone-related complications. Every patient was asked for written informed permission after being told about the research. **Results:** The average surgical time was 36.58±6.66 minutes. The visual analogue scale pain ratings for postoperative shoulder tip pain were 4.6±0.34, 2.5±0.13, and 0.23±0.05, respectively, at 5, 10, and 24 hours. In 91% of the patients, oral feeds were begun on the first postoperative day. On the 0th postoperative day, 95% of the patients were ambulating. The average length of stay after surgery was 1.3±0.11 days. On average 6 months of follow-up, no serious problems were noted. **Conclusion:** LPPLC is a safe procedure, especially in the hands of an experienced surgeon with clinically insignificant systemic effects. But the comfort level of surgeon is better in normal pressure when compared with low pressure.

Keywords: low-pressure pneumoperitoneum, laparoscopic cholecystectomy, cholelithiasis, shoulder tip pain

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INTRODUCTION

Gall stone disease has been around for a very long time, as shown by the skeletal remains of a young Egyptian lady who lived about the year 2000 B.C. ¹ Although Philip Mouret performed the first laparoscopic cholecystectomy in 1987 in Paris, France, it wasn't until September 1988 when Reddick and Oslen used a method that rapidly gained approval and became a routinely used procedure. Mouret was the one who performed the first laparoscopic cholecystectomy. ^{2,3} Laparoscopic cholecystectomy is now the treatment of choice for patients who are experiencing symptoms related to cholelithiasis. Before the year 1960, very little was understood about the consequences that increased intra-abdominal pressure induced by gas insufflation would have on a person's physiological system. In the year 1966, Kurt Semm developed an automated insufflation device that was able to monitor the pressure within the abdomen. ⁴ At the moment, the standard range for the measurement of intra-abdominal pressure is 12–15 mmHg. ⁵

It is recommended in international standards that "the lowest intra-abdominal pressure enabling proper exposure of the operation field rather than a routine pressure" be used during pneumoperitoneum procedures. This will help to lessen the negative impact pneumoperitoneum has on normal physiology

as well as pain experienced after surgery. ⁶ Pneumoperitoneum that has a low pressure is defined as having a pressure between 6 and 10 mmHg. ⁷ The fundamental difficulty with low-pressure pneumoperitoneum is its lack of safety, namely the insufficiency of exposure, which results in longer than typical operating periods, an increased probability of complications occurring during the operation, and maybe an increased frequency of having to convert to open cholecystectomy. ⁸ The use of low-pressure pneumo-peritoneum in the range of 6–10 mmHg is done so as to cause the least amount of disruption to the normal physiology of the patient while still providing a proper working environment.

During laparoscopic cholecystectomy, a number of clinical investigations have been performed in order to make a comparison between using low-pressure pneumoperitoneum and using normal pressure pneumoperitoneum. ⁹ After laparoscopic cholecystectomy, it was demonstrated that a high intra-abdominal pressure pneumoperitoneum was more closely associated to hemodynamic parameter alterations and increased peritoneal absorption of carbon dioxide than a low-pressure pneumoperitoneum. This was in comparison to a pneumoperitoneum that had a low pressure. ¹⁰ Low-pressure pneumoperitoneum offers the same amount of security and flexibility to the surgeon doing a

laparoscopic cholecystectomy as normal pressure pneumoperitoneum does. Additionally, it assists in the reduction of early postoperative issues, notably soreness experienced in the shoulder after surgery. The purpose of the present study was to conduct an analysis of the low-pressure pneumoperitoneum approach that is used during laparoscopic cholecystectomy.

MATERIALS AND METHODS

The general surgery department conducted this research. This research comprised a total of 100 patients who were hospitalised for elective laparoscopic cholecystectomy. patients undergoing open cholecystectomy after conversion. The research did not include patients with acute inflammation or any other choledocholithiasis or gallstone-related complications. Every patient was asked for written informed permission after being told about the research.

METHODOLOGY

Four ports were used for the laparoscopic cholecystectomy: two ports each with a diameter of 10 mm in the epigastrium and umbilical areas, and two ports each with a diameter of 5 mm in the right hypochondrium and flank, respectively. Through the use of carbon dioxide insufflation at a pressure of 8 mm Hg, low pressure pneumoperitoneum was produced. The remaining procedures were performed in the same way as a traditional laparoscopic cholecystectomy. The length of the procedure, intraoperative complications and how they were handled, conversion to a normal pressure pneumoperitoneum and the reason for conversion, conversion to an open cholecystectomy and the reason for conversion, assessment of postoperative pain, beginning oral feedings, drainage and postoperative drain removal, ambulation, and length of hospital stay were all noted. The Visual Analogue Scale of Discomfort was used to evaluate postoperative shoulder tip pain at 4, 8, and 24 hours following surgery (V.A.S). The pain scale, which let patients to identify the point on the scale that best described their shoulder tip discomfort at the moment, had ratings ranging from 0 (no pain) to 10 (agonising pain). The scale's purpose was to assess the existence and degree of widespread postoperative pain, and patients were informed of this. The duration of each patient's hospital stay and their postoperative analgesic needs were also noted.

STATISTIC EVALUATION

All data was tabulated, followed by graphical analysis and statistical analysis using ratios and percentages. For continuous and descriptive data, the data is represented as mean standard deviation or n (%), respectively. For subgroup analysis, the appropriate statistical test was run on the data that were available.

RESULTS

The research included 100 patients having elective laparoscopic cholecystectomy, with 57 females (57%) and 43 men (43%) participating. 48% of the patients were 30-40 years old, followed by 40-50 years (28%), 20-30 years (14%), and under 20 years (7%). The most prevalent presenting symptom (86%) was pain in the right upper quadrant. All of the patients had cholelithiasis confirmed by ultrasonography but no symptoms of inflammation. The majority of the patients (81%) had numerous gallbladder stones. The gallbladder was normal in 52 instances (52%), distended in 29 cases (29%), and constricted in 19 cases (19%) intraoperatively, cholesterosis was present in 12 cases (12%), and biliary sludge was found in 19 cases (19%). There were no severe intraoperative complications. There was no conversion to normal pressure laparoscopic cholecystectomy or open cholecystectomy. The average surgical time was 36.58 ± 6.66 minutes. The visual analogue scale pain ratings for postoperative shoulder tip pain were 4.6 ± 0.34 , 2.5 ± 0.13 , and 0.23 ± 0.05 , respectively, at 5, 10, and 24 hours. In 91% of the patients, oral feeds were begun on the first postoperative day. On the 0th postoperative day, 95% of the patients were ambulating. The average length of stay after surgery was 1.3 ± 0.11 days. On average 6 months of follow-up, no serious problems were noted.

Table 1: Age and gender distribution of the patients

Gender	Number	Percentage
Male	43	43
Female	57	57
Age		
Below 20	7	7
20-30	14	14
30-40	48	48
40-50	28	28
Above 50	3	3

Table 2: Operative time

Operative time (minutes)	Number	Percentage
20-30	16	16
30-40	72	72
40-50	11	11
>50	1	1
Mean operative time	36.58 ± 6.66	

Table 3: Mean scores of postoperative shoulder tip pain on V.A.S

Time after surgery (hours)	V.A.S (Score)
5	4.6 ± 0.34
10	2.5 ± 0.13
24	0.23 ± 0.05

Table 4: Distribution of patients according to postoperative day of start of oral feeds

Postoperative day	Number of patients	Percentage
0 th POD	91	91
1 st POD	6	6
>1 st POD	3	3

DISCUSSION

When it comes to treating benign gall bladder problems, LC is unrivalled. Most laparoscopic procedures need a pneumoperitoneum to be performed. Pneumoperitoneum itself increases intra-abdominal pressure, which affects the cardiorespiratory system and decreases venous return to the right atrium and (hence) cardiac flow. Over the last two millennia, people have struggled with gallstone disease, the most prevalent biliary pathology.¹¹ Over the course of many centuries, several novel and inventive approaches have been presented to the management of people with symptomatic gallbladder stone disease. In the past, biliary colic was treated with the intravenous infusion of magnesium sulfate-rich water. As surgical methods advanced, doctors like John Bobbs, an Indian surgeon, and others performed cholecystolithotomy, which helped with the immediate pain but led to a greater recurrence rate.¹¹ Then, a method of treating bile acid buildup in the body was developed. There are now two medicines on the market for the oral dissolving of gall stones, however both treatments have narrow indications and a high recurrence rate. Due to its high incidence and recurrence, cholecystectomy is the standard therapy for gallstones. Today, cholecystectomy is the most frequently performed major abdominal operation by general surgeons anywhere. Despite the lack of a comprehensive data set, it has been estimated that between 10 and 25 percent of all procedures in India are biliary tract-related.¹² Karl Langenbuch of Berlin conducted the first cholecystectomy on July 15, 1882, and his iconic words, "The gall bladder should be removed not because it contains stones, but because it generates them," have since become part of medical lore.¹³ Even though cholecystectomy is still the recommended therapy for patients with symptomatic cholelithiasis, surgeons, gastroenterologists, interventional radiologists, and more recently surgical endoscopists have been at odds about the best way to do this. In 1987, a French surgeon named Philip Mouret conducted the first laparoscopic cholecystectomy.¹⁴ However, the technique for laparoscopic cholecystectomy as it is commonly used was developed by Reddick and Oslen, who performed the first case in September 1988. Almost overnight, the method became the gold standard for treating

biliary calculus illness.¹⁵ The present technique for laparoscopic cholecystectomy was developed by Reddick EJ et al (1990) in 1988, and it was made available as an outpatient service. During a laparoscopic cholecystectomy, the surgeon will often start at Calot's triangle, make their way to porta hepatis to identify structures, and then dissect towards the fundus.¹⁶ Pneumoperitoneum, induced by carbon dioxide insufflation using a pressure-regulating automated insufflator, allows for optimal visualisation of the gallbladder architecture during laparoscopic cholecystectomy. The old adage among surgeons who relied on laparoscopic techniques was "the greater the pressure, the better the view." Even in obese persons, it's likely that intra-abdominal pressures over 12 mmHg do not effectively increase the gas-filled abdominal cavity. Both hypercapnia and raised intra-abdominal pressure, both of which are maintained during the surgery, are linked with a wide range of unfavourable outcomes. Positioning of the patient, the administration of exogenous insufflation gas, carbon dioxide, and the development of pneumoperitoneum all contribute to the physiologic alterations seen during laparoscopic cholecystectomy. In the first reports of laparoscopic sterilisation, gynaecologists noted shoulder soreness. After a laparoscopic cholecystectomy, it is not uncommon to have shoulder soreness. One-third to one-half of individuals undergoing laparoscopic cholecystectomy report experiencing this.¹⁷ Simple analgesics like paracetamol and codeine are generally effective in treating the pain, which often lasts for two to three days.¹⁸ Shoulder discomfort during laparoscopic surgery has been linked to a variety of potential sources, including the use of carbon dioxide pneumoperitoneum, peritoneal stretching, diaphragmatic irritation, diaphragmatic damage, and shoulder abduction.¹⁹ Excitation of the phrenic nerve is suspected when shoulder tip discomfort persists for an extended period of time. Although some writers have pointed to CO₂ pneumoperitoneum as a common source of shoulder discomfort, others have suggested that carbon dioxide combines with fluid in the peritoneal cavity to generate carbonic acid, an irritant substance.²⁰ In an effort to lessen the frequency of shoulder-tip discomfort after laparoscopic cholecystectomy, several techniques, such as low-pressure insufflations, have been tested. rate of insufflation is too sluggish Local anaesthetic irrigation of the diaphragm as a preventative measure Local anaesthesia of the abdominal wall and surrounding organs to facilitate surgery.²¹⁻²⁴ In the early phases of postoperative rehabilitation, the use of low-pressure pneumoperitoneum reduces the need for postoperative analgesics, shortens the length of stay in the hospital, and increases patient satisfaction. When it comes to laparoscopic cholecystectomy, low-pressure pneumoperitoneum is still a viable choice for patient safety. Shoulder tip discomfort is one problem that is greatly reduced

when this is used. To that end, low-pressure laparoscopic cholecystectomy would become a technically tough technique, even in experienced hands, particularly in challenging patients, requiring sound surgical judgement. Having to increase the pressure throughout the treatment is not always a sign of failure, but just proves the need for a skilled laparoscopic surgeon to carry it out. In order to ensure a high level of patient safety, it forces the surgeon's attention to be concentrated on the procedure's technical details and uniform execution.

CONCLUSION

LPPLC is a safe procedure, especially in the hands of an experienced surgeon with clinically insignificant systemic effects. But the comfort level of surgeon is better in normal pressure when compared with low pressure. Low pressure pneumoperitoneum less postoperative pain and low overall analgesics consumption seen supported by moderate quality of evidence.

REFERENCES

1. Shahedi WH. The biliary system through the ages. *Int Surg.* 1979;64:63.
2. Mouret P. From the first laparoscopic cholecystectomy to the frontiers of laparoscopic surgery: the prospective futures. *Dig Surg.* 1991;8:124.
3. Reddick EJ, Olsen DO. Laparoscopic laser cholecystectomy: a comparison with mini lap cholecystectomy. *Surg Endoscopy.* 1989;3:131.
4. Alan MP, Charles YJ, Peter R. Anaesthesia for a patient undergoing laparoscopic cholecystectomy. *Anaesthesiol.* 1990;73:1268-70.
5. Alijani A, Hanna GB, Cuschieri A. Abdominal wall lift versus positive - pressure capnoperitoneum for laparoscopic cholecystectomy -randomized controlled trial. *Annals Surg.* 2004;239(3):388-94.
6. Litynski GS. Semm and an automatic insufflator. *JLS.* 1998;2(2):197-200.
7. Hypolito OH. Creation of pneumoperitoneum: noninvasive monitoring of clinical effects of elevated intraperitoneal pressure for the insertion of the first trocar. *Surg Endosc.* 2010;24(7):1663-9.
8. Neudecker J. The European Association for Endoscopic Surgery clinical practice guideline on the pneumoperitoneum for laparoscopic surgery. *Surg Endosc.* 2002;16(7):1121-43
9. von Strauss Und Torney M, Dell-Kuster S, Hoffmann H, von Holzen U, Oertli D, Rosenthal R. Microcomplications in laparoscopic cholecystectomy: impact on duration of surgery and costs. *Surg Endosc.* 2012;1
10. Umar A, Mehta KS, Mehta N. Evaluation of hemodynamic changes using different intra-abdominal pressures for laparoscopic cholecystectomy. *Indian J Surg.* 2013;75:284-9.
11. Shehadi WH. The biliary system through the ages. *Int Surg.* 1979;64(6):63-78.
12. Bhansali SK. Management of cholelithiasis and cholecystitis. (Experience with 118 cases). *Indian J Surg.* 1976;38:436-453.
13. Hardy KJ. Events and circumstances surrounding the first cholecystectomy. *The Australian and New Zealand Journal of Surgery.* 1993;63:56-64.
14. Mouret P. From the first laparoscopic cholecystectomy to the frontiers of laparoscopic surgery: The future prospectives. In: *Digestive Surgery.* 1991;8:124.

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15. Reddick EJ, Olsen DO. Out patient laparoscopic laser cholecystectomy. *Am J Surg.* 1990;160:485-498.
16. Kumar A, Thombare MM, Sikora SS, Saxena R, Kapoor VK, Kaushik SP. Morbidity and mortality of laparoscopic cholecystectomy in an institutional setup. *J Laparoendosc Surg.* 1996;6:393-397.
17. Lepner U, Goroshina J, Samarutel J. Postoperative pain relief after laparoscopic cholecystectomy: a randomized prospective double-blind clinical trial. *Scand J Surg.* 2003;92:121-124
18. Watt-Watson J, Chung F, Chan VW. Pain management following discharge after ambulatory sameday surgery. *J Nurs Manag.* 2004;12:153-161.
19. Kojima Y, Yokota S, Ina H. Shoulder pain after gynaecological laparoscopy caused by arm abduction. *Eur J Anaesthesiol.* 2004;21:578-579.
20. Collins KM, Docherty PW, Plantevin OM. Postoperative morbidity following gynaecological outpatient laparoscopy: A reappraisal of the service. *Anaesthesia.* 1984;39:819-822.
21. Sarli L, Trivelli M, Roncoroni L. Prospective randomized trial of low-pressure pneumoperitoneum for reduction of shoulder-tip pain following laparoscopy. *Br J Surg.* 2000;87(9):1161-1165.
22. Berberoglu M, Dilek ON, Ercan F. The effect of CO2 insufflation rate on the post laparoscopic shoulder pain. *J Laparoendosc Adv Surg Tech A.* 1998;8:272-277.
23. Ng A, Smith G. Is intraperitoneal levobupivacaine with epinephrine useful for analgesia following laparoscopic cholecystectomy? A randomized controlled trial. *Eur J Anaesthesiol.* 2004;221:653-657.
24. Gharaibeh KI, Al-Jaberi TM. Bupivacaine instillation into gallbladder bed after laparoscopic cholecystectomy: does it decrease shoulder pain? *J Laparoendosc Adv Surg Tech A.* 2000;10:137-141