

To study the low-pressure pneumoperitoneum laparoscopic cholecystectomy

Nevil Nitin Pachani¹, Dr. R. G. Naniwadekar², Nandan Madhwapathy³

¹3rd year Resident, Department of General Surgery, KIMS, Karad, Maharashtra, India

²Professor, Department of General Surgery, KIMS, Karad, Maharashtra, India

³Assistant Professor, Department of General Surgery, KIMS, Karad, Maharashtra, India

Email: nevilpachani@rocketmail.com

DOI: 10.47750/pnr.2022.13.S06.108

Abstract

Aim: The aim of this study to determine the low-pressure pneumoperitoneum laparoscopic cholecystectomy.

Materials and methods: This research comprised a total of 80 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 most prevalent presenting symptom (85%) 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 (80%) had numerous gallbladder stones. The gallbladder was normal in 40 instances (50%), distended in 24 cases (30%), and constricted in 16 cases (20%) intraoperatively, cholesterosis was present in 10 cases (12.5%), and biliary sludge was found in 16 cases (20%). There were no severe intraoperative complications. There was no conversion to normal pressure laparoscopic cholecystectomy or open cholecystectomy. The average surgical time was 35.85 ± 5.85 minutes. The visual analogue scale pain ratings for postoperative shoulder tip pain were 4.5 ± 0.33 , 2.4 ± 0.12 , and 0.22 ± 0.04 , respectively, at 5, 10, and 24 hours. In 91.25% 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 1.2 ± 0.51 days. On average 6 months of follow-up, no serious problems were noted

Conclusion: Experienced surgeons may safely use low-pressure pneumoperitoneum to perform laparoscopic cholecystectomy with a lower risk of early postoperative problems, such as shoulder tip discomfort. Only the lengthier learning curve holds it back from being optimal for general usage; in certain circumstances, its reduced intraoperative impact on hemodynamics makes it a worthwhile alternative.

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

INTRODUCTION

Gall stone illness has a very long history, as shown by the archaeological remains of a young Egyptian woman from 2000 BC. 1 Although Philip Mouret conducted the first laparoscopic cholecystectomy in 1987 in Paris, France, it wasn't until September 1988 when Reddick and Oslén employed a technique that quickly gained acceptance and became a commonly used treatment. 2,3 The preferred method of therapy for symptomatic cholelithiasis nowadays is laparoscopic cholecystectomy. Up until 1960, very little was known about the physiological effects of increased intra-abdominal pressure caused by gas insufflation. Kurt Semm created an automated insufflation system that could measure intraabdominal pressure in 1966. 4 Currently, the standard intra-abdominal pressure range is 12–15 mmHg. 5

In order to reduce the effects of pneumoperitoneum on normal physiology and to reduce postoperative discomfort, international guidelines advise using "the lowest intra-abdominal pressure enabling proper exposure of the operation field rather than a routine pressure." 6 A pressure of 6 to 10 mmHg is referred to as low pressure pneumoperitoneum. 7 The primary issue with low-pressure pneumoperitoneum is safety, namely the inadequacy of exposure leading to longer than normal operating times, an increased likelihood of intraoperative problems, and maybe an increased frequency of conversion to open cholecystectomy.

8 In order to minimise disturbance of normal physiology and concurrently give a suitable working area, low-pressure pneumoperitoneum in the range of 6–10 mmHg is used.

To compare low-pressure pneumoperitoneum with normal pressure pneumoperitoneum in laparoscopic cholecystectomy, several clinical studies have been conducted.⁹ When compared to a low-pressure pneumoperitoneum, a high intra-abdominal pressure pneumoperitoneum after laparoscopic cholecystectomy was shown to be more closely linked to hemodynamic parameter changes and higher peritoneal absorption of carbon dioxide.¹⁰ As with standard pressure pneumoperitoneum, low-pressure pneumoperitoneum provides the surgeon with the same level of security and adaptability during laparoscopic cholecystectomy. It also helps in lowering early postoperative problems, particularly postoperative shoulder discomfort. The goal of the current research was to assess the low-pressure pneumoperitoneum method used during laparoscopic cholecystectomy.

Materials and methods

The general surgery department conducted this research. This research comprised a total of 80 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 80 patients having elective laparoscopic cholecystectomy, with 46 females (57.5%) and 34 men (42.5%) participating. Half of the patients were 30-40 years old, followed by 40-50 years (27.5%), 20-30 years (13.75%), and under 20 years (7.5%). The most prevalent presenting symptom (85%) 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 (80%) had numerous gallbladder stones. The gallbladder was normal in 40 instances (50%), distended in 24 cases (30%), and constricted

in 16 cases (20%) intraoperatively, cholesterosis was present in 10 cases (12.5%), and biliary sludge was found in 16 cases (20%).

There were no severe intraoperative complications. There was no conversion to normal pressure laparoscopic cholecystectomy or open cholecystectomy. The average surgical time was 35.85 ± 5.85 minutes. The visual analogue scale pain ratings for postoperative shoulder tip pain were 4.5 ± 0.33 , 2.4 ± 0.12 , and 0.22 ± 0.04 , respectively, at 5, 10, and 24 hours. In 91.25% 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 1.2 ± 0.51 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	34	42.5
Female	46	57.5
Age		
Below 20	6	7.5
20-30	11	13.75
30-40	40	50
40-50	22	27.5
Above 50	11	13.75

Table 2: Operative time

Operative time (minutes)	Number	Percentage
20-30	12	15
30-40	60	75
40-50	8	10
>50	2	2.5
Mean operative time	35.85 ± 5.85	

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

Time after surgery (hours)	V.A.S (Score)
5	4.5 ± 0.33
10	2.4 ± 0.12
24	0.22 ± 0.01

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

Postoperative day	Number of patients	Percentage
0 th POD	73	91.25
1 st POD	5	6.25
>1 st POD	2	2.5

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 Bobhs, 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 Oslén, 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

Experienced surgeons may safely use low-pressure pneumoperitoneum to perform laparoscopic cholecystectomy with a lower risk of early postoperative problems, such as shoulder tip discomfort. Only the lengthier learning curve holds it back from being optimal for general usage; in certain circumstances, its reduced intraoperative impact on hemodynamics makes it a worthwhile alternative.

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):1121-23
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.* 2015:1
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.
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