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LAPAROSCOPIC CHOLECYSTECTOMY UNDER SPINAL ANAESTHESIA: A PROSPECTIVE FEASIBILITY STUDY

Surgery

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ABSTRACT

Laparoscopic Cholecystectomy (LC) is the gold standard treatment for uncomplicated chronic cholecystitis. It has been conventionally performed under general anaesthesia (GA), using balanced anaesthesia technique including inhalation agents, intravenous drugs and muscle relaxant drugs. Since few years, it is also being performed under spinal anaesthesia (SA). This study was designed to find feasibility of LC under SA for chronic cholecystitis in ASA grade 1 and 2 patients. This prospective study was conducted in 116 patients. The study included patients, randomly selected for SA, out of all patients undergoing LC. A detailed informed consent was taken explaining procedure of LC, SA and GA, complications of surgery, possibility of conversion to open cholecystectomy and GA. LC was performed with four ports technique. Standard intra-operative routine monitoring included non-invasive blood pressure, electrocardiogram, pO_2 levels, airway pressure and body temperature. Three patients required conversion to OC and five to GA.

KEYWORDS

Laparoscopic Cholecystectomy , Spinal Anaesthesia , Intra-abdominal Pressure

INTRODUCTION

GA with endotracheal intubation (EI) for controlled ventilation is the most common anaesthetic technique used to perform laparoscopic cholecystectomy (LC) to prevent aspiration; abdominal and respiratory discomfort and to prevent hypercapnia due to CO_2 pneumoperitoneum[1]. But advantages of spinal anaesthesia (SA) technique include quicker recovery, decreased postoperative nausea vomiting (PONV), fewer hemodynamic changes, less postoperative pain, shorter hospital stay, early diagnosis of complications, improved patient satisfaction and cost effectiveness[2]. Many studies have reported that SA was adequate and safe for (LC) in otherwise healthy patients.[3] In fact it offered better postoperative pain control than GA without limiting the recovery. LC in SA requires a cooperative patient, low intra-abdominal pressure (IAP) to reduce pain and ventilation disturbances and gentle surgical technique.[4, 5] However, SA may be associated with a few side effects such as the requirement of a higher sensory level, more severe hypotension, shoulder discomfort due to diaphragmatic irritation, and respiratory embarrassment caused by pneumoperitoneum. Further studies may be required to establish the advantage of SA over GA for its eventual global use in different patient populations.[6] The various effects of induction of pneumoperitoneum, an integral part of laparoscopy, can result in respiratory embarrassment and cardiovascular changes which are better managed by the use of GA. At higher IAP of more than 15mmHg, due to compression of inferior vena cava and other collaterals, the venous return is decreased, thus reducing cardiac output and blood pressure.[8,9] Various bradyarrythmias leading to atrioventricular blocks and cardiac arrest have been documented due to vagal stimulation on the insertion of a trocar, peritoneal stretch or carbon dioxide embolization.[10] The incidence of hypotension has been noted to be up to 20.5% and can be augmented by the reverse Trendelenburg position and increased intra-abdominal pressure.[11] However, various studies show that it can be easily prevented by liberally preloading the patient, reducing the head tilt, reducing the IAP and by the liberal use of vasopressures.

MATERIAL AND METHODS

This prospective study was undertaken on at Department of General Surgery, N C Medical College Panipat from October 2016 to July 2019. All patients were properly investigated including complete blood count, liver function test, kidney function tests, blood sugar, electrocardiogram and ultrasound of whole abdomen. History of acute pain abdomen, fever, increased leukocyte count; thickened gallbladder wall, pericholecystic fluid collections and subserosal oedema were taken as criteria for diagnosing AC. The American Society of Anaesthesiologists (ASA) Grade 1 & 2 patients undergoing laparoscopic abdominal procedures were offered SA as the first choice. Since October 2016, 116 patients have undergone abdominal laparoscopic cholecystectomy under SA. Patients, who preferred GA or had contraindications for SA, were not included in this study. In the study group, 19 patients had AC and 97 had chronic cholecystitis with cholelethiasis. Patients presenting with AC were operated at the earliest possible time after investigations were available. All patients were infused with 1000 ml Ringer Lactate as a precautionary preloading. All patients were operated with at least 6 hours fasting and pre-medicated 45 minutes before surgery with inj. Ranitidine 50mg intravenously and lnj. Metoclopramide 10mg intramuscularly. SA was administered using a 26FG lumbar puncture needle in L2-L3 intervertebral space. Three millilitre of Heavy Bupivacaine mixed with 25 microgram Fentanyl was used. Head down tilt to 20 degrees was kept for 10 minutes. The segmental level desirable to be achieved was T4-T5 to enable introduction of the epigastric port. During surgery, oxygen supplementation was administered through a ventimask at the rate of 5L/minutes. Injection Tramadol 25 mg or Pentazocine 15 mg was administered as slow IV or in drip in all patients. The patients were monitored for blood pressure, SpO_2, heart rate and anxiety. Injection Ketamine 25 mg was administered as slow 1V in patients complaining of anxiety, neck pain, shoulder pain, or both. If the patient was not relieved, a dose of Ketamine was repeated and if patient was still anxious and uncomfortable, conversion to GA was done. Bradycardia below 50 per minute was managed by 0.3 mg-0.6mg atropine IV or 0.2mg glycopyrolate. The IAP was kept between 10mm to 12 mmHg. The postoperative parameters evaluated included operative site pain, assessed by a verbal numeric pain scale: no pain, mild bearable pain not requiring any medication, moderate pain and severe pain, both requiring medication. The other parameters included were urinary retention, headache and the incidence of postoperative vomiting. Nasogastric tube was not put in routinely, but put in patients who showed distended stomach on laparoscopy. If on laparoscopic inspection, adhesions were found to be extensive, requiring expected longer operative time, a catheter was inserted per urethra to prevent urinary retention. Local infiltration of anaesthetic at trocar site before stitching was routinely done to decrease postoperative need for analgesics.

RESULTS

Gender distribution was 94 females (81.03%) and 22 males (18.97%). Mean age was 43.47 years; with highest age of 82 years of a female and youngest was 15 years of a male. Three patients, two males and one female were less than 20 years of age. Three patients were of more than 70 years of age, (Table 1). Ninteen patients (16.38%) presented as AC and ninety seven patients (83.62%) presented as chronic cholecystitis with cholelethiasis. Two patients (10.52%) presented with phlegmon. Thirteen patients (68.42%) presented with either mucocle or pyocele of gall bladder. Four patients (21.05%) had perforation of gall bladder, (Table 2). Indication for surgery in rest of the patients was cholelethiasis with chronic cholecystitis.

Table 1 *Age and sex wise presentation of patients (n=116)*

S. No.	Age in years	No. Of Patients	Male	Female
1	10-20	3	2	1
2	21-30	26	5	21
3	31-40	21	3	18
4	41-50	32	6	26
5	51-60	21	3	18
6	61-70	10	1	9
7	>70	3	2	1
8	Total	116	22	94

Operating time in chronic cholecystitis group was 19 to 32 minutes, average being 25.3 minutes while in AC group it was 31 to 72 minutes, average being 46.6 minutes, Table 3. Operating time was more in general for AC group because of inflammation at various stages, increased vascularity, oedema and adhesions. This required more careful and time consuming dissection of cystic duct and artery. Achieving "critical view of

Table 2 Presentation characteristics of patients with acute cholecystitis. (n = 19)

Presentation	Number	Percentage
GB/ phlegmon	2	10.52
GB/empyema/ mucocele	13	68.42
GB/perforation	4	21.05

Table 3 Operating time (in minutes) in Acute Cholecystitis Group and Chronic Cholecystitis Group

Acute Cholecystitis	46.6	(31-72)
Chronic Cholelethiasis	25.3	(19-32)

Table 4 Side effects during surgery

Complication	No. of Pts	Percentage
Hypotension	24	20.69%
Stomach distension	2	1.72%
Anxiety, Shoulder Pain	28	24.14%
Conversion to GA	5	4.31%
Conversion to OC	3	2.59%

safety" in calot's triangle by dissecting the entire infundibulum off the liver bed and by freeing it of all fatty tissue, both in its dorsal and ventral aspects was little more demanding in AC.

During operation, 24 patients (20.69%) had hypotension, 28 (24.14%) had anxiety associated with neck & shoulder pain. Ryles tube had to be inserted in 2 patients (1.72%). Five patients (4.31%) required conversion to GA, due to inadequate effect of SA in 3 patients, anxiety associated shoulder pain in 1 patient and complex adhesions requiring conversion to OC in another, Table 4. In total 3 patients (2.59%) required conversion to OC; one for troublesome bleeding from aberrant artery; one for complex adhesions and third for troublesome anxiety associated with shoulder pain. In postoperative period 41 patients (35.34%) required injectable analgesics, in 101 patients (87.07%) pain was manageable with oral tablets, 3 patients (2.59%) had manageable vomiting, 14 patients (12.07%) required catheterisation for retention of urine, 2 patients (1.72%) had fever managed with Paracetamol infusion and 6 patients (5.17%) had headache requiring caffeine and high sugar diet, Table 5.

Table 6 Postoperative Observations

Symptom	No.	Percentage
Pain requiring injections	41	35.34
Pain requiring oral tablets	101	87.07
Vomitting	3	2.59
Urinary Retention	14	12.07
Headache	6	5.1
Transient Fever	2	1.72

DISCUSSION

SA is being increasingly used for therapeutic LC.[3,4,6] LC requires a cooperative patient, low IAP to reduce pain, minimum ventilation disturbances, gentle surgical technique and a supportive operating room staff. Anxious and uncooperative patients are sometimes troublesome because of excessive movements, while LC requires a comfortable patient not resorting to unnecessary movements. Subcostal level of anaesthesia (T4-T5) for the epigastric and subcostal ports is sufficient for upper abdominal and subcostal incisions and open abdominal surgeries are successfully done without any discomfort to the patient. The pneumoperitoneum induced rise in IAP including pressure on the diaphragm and CO_2 induced peritoneal irritation could be overcome by maintaining a low IAP of 8-12 mm of Hg. Lower IAP has been reported to reduce the discomfort and chances of neck and shoulder pain[14]. Anxiety associated with shoulder pain in conscious patients is sometimes troublesome in otherwise anxious patients but is usually comfortably manageable. One patient (0.86%) required conversion to GA for troublesome shoulder pain in this study. Pursnani et al (1998)[1] noted that shoulder and neck pain occurred in two out of six patients operated under epidural anaesthesia, and it was easily managed. On the other hand, in the series of Hamad et al (2003)[3], out of three hundred ten LC performed under SA, only one patient had to be given GA because of intolerable shoulder pain. Chiu et al (1996)[15] also noted shoulder pain in 1 of 11 patients of bilateral spermatic varices operated under epidural anaesthesia. Alok et al[16] tried lignocaine injection in phrenic nerve to prevent right shoulder pain.

Major reason for conversion to GA in three patients (2.59%) in this study was because of inadequate effect of SA leading to inappropriate abdominal muscle relaxation. The reason for inadequate effect may be faulty drug as this problem was encountered consecutively in three patients and did not recur after change of batch of drug. Other reasons for this can be problems with lumbar puncture; errors in the preparation and injection of solutions; inadequate spreading of drugs through cerebrospinal fluid and failure of drug action on nervous tissue.[17] Adequate muscle relaxation, which is not available with inadequate SA, is an important factor in requirements of amount of IAP and successful LC. Chiu et al (1996)[15] reported this reason for conversion in 9.09% patients. Ciofolo et al[18] reported this reason for conversion in 16.67 % of cases.

Hypotension in our study, 20.69%, was comparable to that associated with SA for open surgery and no extra severity of hypotension was noted. Palachewa et al (2001)[13] reported hypotension in 15.7% of cases while Throngnumchai et al (1999)[19] reported it in 20.2% of their cases of SA group for open surgeries. Hence it is clear that at lower IAP (8-12mmHg) and after preloading with 1000 ml of ringer lactate hypotension severity is same as in open surgery. This further allays the fear of decreased venous return from IVC and splanchnic veins because of pneumoperitoneum induced increase in IAP. No case of myocardial depression was encountered in this study, which has been reported by Chiu et al (1996).[15] In fact Casey, 2000[20] has cited an added advantage of decrease in oozing from surgical bed because of mild hypotension.

Spontaneous physiological respiration in conscious or mildly sedated patient in SA offers a major advantage over GA. There is no increase in ventilation pressure as occurs in GA. There is no difference in actual operating time with GA or SA. Moreover problems associated and time consumed in intubation and extubation is avoided in SA. This drastically reduces the time spent on application of total anaesthesia to taking the patient out of the operating room. There was no restlessness as is commonly seen after GA, and the patient is always receptive and more compliant to suggestions. Patient returns to normal physiology and gut motility much sooner than in GA, in which it takes about 24 hours. (Putensen-Himmer et al, 1992).[14] In the present series, none of the patients had any significant variation in respiratory parameters during the surgery.

Postoperative analgesia was better in SA as patient did not require analgesics until after 2 hours of surgery. Turkstani *et al*[21] compared GA with spinal anaesthesia in 50 patients undergoing laparoscopic cholecystectomy (LC) and found significantly lower pain scores with lower analgesic consumption in the post-operative period in those with SA. Postural headache was seen in 5.17% of patients in this study. This delayed ambulation for some time but could be easily managed with the caffeine and high salt and fluid intake. All of the patients were motivated to take more fluids early. The significantly high incidence of urinary retention in patients operated under SA could be due to the prolongation of muscle paralysis with SA. Complications like sore throat, relaxant induced muscle pain, dizziness, and PONV, which often create high morbidity after GA, were obviously not seen in this study. PONV was seen only in 2.59% of cases which is far less than as reported in 8.1% in study by Sinha et al (2009).[11] Cardiac, myogenic, and possible cerebral complications associated with GA were not seen

in this study. This study correlates well with the statement that SA is associated with not only less postoperative mortality but also less incidence of complications e.g., deep venous thrombosis, pulmonary embolism, respiratory depression, postoperative pulmonary complications, myocardial infarction or renal failure when compared to GA.[3,22]

It can be safely concluded that LC can be very well done in SA. In fact SA is better alternative to GA because of avoidance of cardiac, respiratory and muscular complications, involving far less cost, less time consuming, early return to normal gut motility and physiology, no risk of missed hypoglycaemia specific to diabetic patients operated in GA, less operative field ooze, less PONV and provides obvious advantage in old patients with COPD.

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