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Original Research Article

A study of laparoscopic cholecystectomy using spinal anaesthesia

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ABSTRACT

Background: General anaesthesia (GA) is the anaesthetic technique of choice for laparoscopic cholecystectomy (LC). The main reasons for selecting spinal anaesthesia (SA) as the first choice for laparoscopic cases were its advantages like total muscle relaxation, a conscious patient, economical, relatively uneventful recovery after, pain free early postoperative period and the protection from potential complications of general anaesthesia.
Methods: It is a retrospective study conducted between June 2006 and July 2009. Patients undergoing laparoscopic abdominal procedures were offered SA as the first choice was included in this study. Out of 134 patients in study group 29 patients had acute cholecystitis and 105 underwent elective cholecystectomy were included. Patients who preferred general anesthesia or had contraindications for SA, like children less than 10 years of age, spinal deformity, cardiac problems and skin pathology overlying the SA site, were operated on while under general anesthesia and kept as controls.
Results: Out of 134 patients, 103 patients were females, average age was 41.8 years. LC was performed in all patients, 26 of had acute cholecystitis. 28 (20.89%) patients HAD hypotension, 32 (23.88%) observed anxiety, neck or shoulder pain, for which injection Ketamine had given and 1 (0.74%) patient required conversion because of anxiety, despite sedation where as one patient required conversion to general anaesthesia due to failure of SA effect. Laparoscopic cholecystectomy required an average of 28.4 minutes and 41.1 minutes, respectively, in elective and emergency settings. 5.9% (8) patients experienced more than vomiting episodes compared to 33% those under general anaesthesia. Injectable diclofenac was given in 49 (36.56%) of patients for their abdominal pain within 2 hours postoperatively and an oral analgesic was required in 106 (79.10%) patients within the first 24 hours postoperatively compared with 91.3 (91.3%) patients requiring injectable analgesia in the general anaesthesia group of patients. Average time to discharge was 1.9 days.
Conclusions: Laparoscopic surgery done with the patient under spinal anaesthesia has several advantages general anaesthesia. Laparoscopic cholecystectomy using spinal anaesthesia is a better alternative as there is no intubation related airway obstruction. There was excellent muscle relaxation; decreased surgical bed oozing, economical, pain free early post-operative period. A little risk of unrecognised hypoglycaemia was observed in a diabetic patient.

Keywords: Laparoscopic cholecystectomy, General anaesthesia, Spinal anaesthesia, Ketamine, Diclofenac

INTRODUCTION

Conventionally general anaesthesia remains the choice for the majority of open abdominal surgical procedures, and regional anaesthesia is preferred only for patients who are at high risk while under general anesthesia. Endotracheal general anaesthesia (GA) is the anaesthetic technique of choice for laparoscopic cholecystectomy

(LC). The main reasons for selecting spinal anaesthesia (SA) as the first choice for laparoscopic cases were its advantages. The advantages of a spinal anaesthesia over general anesthesia include uniform total muscle relaxation, a conscious patient, economical, relatively uneventful recovery after, pain free early postoperative period and the protection from potential complications of general anesthesia.[1,2] It was thus a logical extension that we shifted to SA for all our LC. The world literature until about 5 years ago suggested only general anesthesia as the anaesthetic option for abdominal laparoscopic surgery, and it is only recently that report of laparoscopic surgery being performed with select patients under spinal or epidural anaesthesia have started to appear.[2-9]

METHODS

It is a retrospective study conducted between June 2006 and July 2009. According to American Society of Anesthesiologist's (ASA grade I and II) patients undergoing laparoscopic abdominal procedures were offered spinal anaesthesia as the first choice. A total of 134 patients have undergone abdominal laparoscopic cholecystectomy under spinal anaesthesia in study group. Out of 134, 29 patients had acute cholecystitis and 105 underwent elective cholecystectomy were included.

Patients who preferred general anesthesia or had contraindications for spinal anaesthesia, like children less than 10 years of age, spinal deformity, cardiac problems and skin pathology overlying the spinal anaesthesia site, were operated on while under general anesthesia and kept as controls (Table 1).

Table 1: Exclusion criteria for laparoscopic cholecystectomy spinal anaesthesia.

Criteria	No of patients
Children less than 10 years	1
Spinal deformity	1
Cardiac problems	4
Skin pathology overlying the SA site	0
Patients preference	6

Preloading with 1000 mL Ringer Lactate was done, and patients were pre-medicated 45 minutes before surgery with injection Ranitidine 50 mg intravenously and inj. Metoclopramide 10 mg intramuscularly. SA was administered using a 25FG lumbar puncture needle in LI-L2 intervertebral space. 3 ml of heavy bupivacaine mixed with 25 microgram Fentanyl was used. Head down tilt to 20 degrees was kept for 10 minutes. The segmental level achieved was T4-T5 to enable introduction of the epigeneral anesthesia stric port. The patient was monitored or b nod pressure Sp02, heart rate and patient anxiety. During surgery oxygen supplementation was administered through a Ventimask, at the rate of 5 L/minutes. Injection Tramadol 25 mg or Pentazocine 15 mg was administered as slow IV or in drip in ail patients. 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 dose of ketamine is repeated and if patient was still anxious and uncomfortable conversion to general anesthesia was done. Bradycardia below 50/minute was managed by 0.3 mg 0.6 drug atropine IV or 0.2 mg glycopyrrolate. Hypotension, defined as a fall in BP of greater than 20% of original BP at any time after SA during or after surgery, was managed by 3 mg to 6 mg mephentermine IV intermittently up to a maximum of' 15 mg. The laparoscopic procedures were carried out in the standard fashion with four ports without any modifications. The intraperitoneal pressure was kept between 8 mm Hg to 12 mm Hg.

The postoperative parameters evaluated included operative site pain, assessed by a verbal numeric pain scale as, no pain and mild bearable pain, neither requiring any medication and moderate pain and severe pain, both requiring medication. The other parameters included urinary retention, headache and the incidence of postoperative vomiting. These were compared with corresponding parameters of 100 patients undergoing LC while under general anesthesia in the same unit.

Statistical analysis

Statistical analysis was denoted by using Z test and P value <0.01 was considered to be significant.

RESULTS

This study includes 134 patients who underwent laparoscopic cholecystectomy while under SA and 100 patients who underwent laparoscopic cholecystectomy while under general anesthesia. Out of 134 patients, 103 patients were females, and the average age was 41.8 years. Laparoscopic cholecystectomy was performed in all patients, 26 of whom had acute cholecystitis. Hypotension requiring support was recorded in 28 (20.89%) patients. 32 (23.88%) experienced anxiety, neck or shoulder pain, for which lnj Ketamine had given. Only 1 (0.74%) patient required conversion because of anxiety, despite sedation where as one patient required conversion to general anesthesia due to failure of SA effect. Laparoscopic cholecystectomy required an average of 28.4 minutes and 41.1 minutes, respectively, in elective and emergency settings.

Postoperatively, 5.9% (8) patients experienced one or more vomiting episodes compared to 33% with those under general anesthesia. The incidence of postoperative urinary retention requiring catheterization was however seen significantly more in patients after SA. Injectable diclofenac was necessary in 49 (36.56%) of patients for their abdominal pain within 2 hours postoperatively and an oral analgesic was required in 106 (79.10%) patients within the first 24 hours postoperatively compared with 91.3(91.3%) patients requiring injectable analgesia in the

general anesthesia group of patients. Thus, significantly more patients required injectable analgesics after general anesthesia. Postural headache persisting for an average 2.3 days was seen in 8 (5.9%) patients and responded to patients being in a lying posture and increased intake of fluids and salt. Average time to discharge was 1.9 days (Table 2).

Table 2: Results of study patients under spinal anesthesia and control patients under general anaesthesia.

	Spinal anaesthesia (n = 134)	General anaesthesia (n = 100)	P value*
Age			-
Average year	41.8%	39.2%	
Sex			
Females	103 (76.8%)	78 (78%)	-
Males	31 (23.2%)	22 (22%)	
Indication			
Ac cholecystitis + cholelithiasis	26 (19.4%)	14 (14%)	-
Ch. Cholecystitis + cholelithiasis	108 (80.6%)	86 (86%)	
Operative time			
Elective surgery in minutes	28.4	32.2	NS
Emergency surgery in minutes	41.1	42.4	
Perioperative			
Hypotension	28 (20.89%)	-	-
Anxiety/neck and shoulder pain	32 (23.88%)	-	
Stomach distension requiring RT	2 (1.49%)	82 (82%)	<0.01
Conversion to GA	2 (1.49%)	NA	-
Postoperative			
Vomiting	4 (2.9%)	33 (33%)	<0.01
Pain treated with injectable analgesic	49 (36.56%)	96 (96%)	
Pain treated with oral analgesic	106 (79.10%)	91 (91%)	
Urinary retention	18 (13.43%)	3 (3%)	
Headache	8 (5.97%)	0	
Average stay in hospital in days	**1.9**	**2.1**	**NS**

*P value was used to denote significance by Z test; Values <0.01 are considered to be significant

DISCUSSION

Regional anaesthesia is seldom used in abdominal laparoscopic surgeries except for diagnostic laparoscopies. The prime indication for using regional anaesthesia in therapeutic laparoscopy is still limited to patients unfit for general anaesthesia, and the preferred type of regional anaesthesia is epidural anaesthesia.[7,9,10] Thus, reports of laparoscopic surgery being done with patients under spinal anesthesia are even scarcer than those of patient's under epidural anesthesia. The optimal anterior abdominal wall relaxation and the conscious and receptive patient under spinal anaesthesia together with our experience of spinal anaesthesia in open cholecystectomies for last eight years inspired us to try out SA for all our LC. Another reason for preferring spinal anaesthesia was preventing the potential problems of general anaesthesia. The initial concern was never the subcostal level of anaesthesia (T4-T5) for the epigastric and subcostal posts because we had been successfully making upper abdominal incisions in open abdominal surgeries without discomfort to the patient. The pneumoperitoneum induced rise in intra-abdominal pressure including pressure on the diaphragm and carbon dioxide-induced peritoneal irritation were factors to be considered. Changes in methodology of port-site placement and using nitrous oxide, which is less irritating for the peritoneum compared with carbon dioxide, and maintaining a low intraperitoneal pressure of 8mm Hg when using SA have all been reported to reduce the discomfort and chances of neck and shoulder pain.[10] We have been operating at an average pressure of 10 mm of carbon dioxide, and no changes have been necessary in port placement in spinal anaesthesia compared with general anaesthesia patients. This agrees with a recent report by Tzovaras.[7]

Surprisingly anxiety, neck pain and shoulder pain have never been a major problem in present study patients. They occurred only in 23.88% of patients for which inj.

Ketamine was given. Only one patient required conversion to general anaesthesia. According to Pursnani et al shoulder and neck pain occurred in 2 out of 6 patients who operated under epidural anesthesia, and it was easily managed.[8] On the other hand, in the series of Hamad et al, 310 laparoscopic cholecystectomy were done with patients under spinal anaesthesia, and one patient was given GA because of intolerable shoulder pain.10 Chiu et al also observed shoulder pain in 1 of 11 patients of B/L spermatic varices operated on while under epidural anaesthesia.[11] The other reason for conversion in our series was an incomplete effect of spinal anaesthesia. Conversion to GA because of abdominal distension discomfort during epidural anaesthesia was reported in 1 of 11 patients in the study by Chiu et al.[12] According to Ciofolo et al out of 6 patients 1 patient required conversion to an open procedure because of uncontrolled movements under epidural anesthesia, in addition to spinal anaesthesia - related hypotension, the pneumoperitoneum- induced rise in intra-abdominal pressure could be another cause for the persistence of hypotension.[11] When we compared our hypotension figures recorded in 28 (20.89%) patients with figures in patients undergoing open surgery with spinal anaesthesia, we found a comparable picture. Thus while Bernd reported hypotension in 5.4% of their spinal anaesthesia patients, Palachewa had an incidence of 15.7%, Throngnumchai 20.2%, and Hyderally reported a 10% to 40% incidence.[13-16] This then conclusively proves that the incidence of hypotension is no different whether laparoscopic surgery or open surgery is being done with spinal anaesthesia and that an intraperitoneal pressure of between 8 mm Hg to 12 mm Hg does not add to the problem of decreased venous return and persistence of hypotension. Although Chui have mentioned that a high spinal anaesthesia block of up to T2-T4 may cause myocardial depression and reduction in venous return, this was never substantiated in our series.[17] An added cardiovascular advantage cited has been the decrease in surgical bed oozing because of hypotension, bradycardia, and improved venous drainage associated with spinal anaesthesia.[18]

Unlike general anesthesia, spinal anesthesia patients frequently have an additional problem of stomach inflation as a result of mask ventilation. This often requires Ryle's tube intubation, which amounts to unnecessary intervention in a body cavity. The main debatable point however seems to be the status of respiratory parameters among the two modes of anesthesia during laparoscopic surgery. In this context as a general over view, it can be stated that spontaneous physiological respiration during Spinal anesthesia would always be better than an assisted respiration, as in general anaesthesia. The potentiality of intubation and ventilation-related problems including an increase in mechanical ventilation to achieve an adequate ventilation pressure exists during general anesthesia compared with spinal anaesthesia.[8,9] In addition, pulmonary function takes 24 hours to return to normal after laparoscopic surgery performed using general anestheia.[19] However, the observations are not uniform, and conflicting reports of respiratory parameter alterations while patients are under regional and general anaesthesia are present. Nishio et al reported a greater increase in $PaCo_2$ after CO_2 pneumoperitoneum when the patient was under general anaesthesia compared with when the patient was breathing spontaneously.[20] Similarly Rademaker et al showed greater forced ventilatory capacity during general anaesthesia whereas Chiu et al reported significant arterial blood gas alterations during epidural anesthesia.[12,21] Ciofolo et al concluded that epidural anesthesia for laparoscopy does not cause ventilatory depression.[22] Even in our series, none of the patients had any significant variation in PaO_2 or $PaCO_2$ during the surgery with spinal anaesthesia.

The surgical time for laparoscopic cholecystectomy had no difference in operating time while being operated under spinal anaesthesia or general anaesthesia. Instead, the time from application of total anesthesia to wheeling the patient out of the operating room actually decreases appreciably when the patient is being operated on while under spinal anesthesia, because the intubation and extubation time of general anesthesia is saved. Perioperative shoulder pain never persisted in the postoperative period. In the postoperative period after SA, there was no restlessness as is commonly seen after general anesthesia, and the patient is always receptive and more compliant to suggestions. A specific advantage of spinal anesthesia seems to be the decrease in the requirement of postoperative analgesia. Injectable diclofenac was required by 36.56% of our spinal anaesthesia patients for their abdominal pain compared with a significantly greater number of our general anaesthesia patients (96%) requiring injectable analgesics within 2 hours after extubation.

The injectable analgesic was usually required between 2 hours to 6 hours after surgery in spinal anaesthesia versus within 2 hours after extubation when general anaesthesia was used. The benefit of prolonged analgesia after SA has also been noted in other studies.[8-10] Postural headache was seen in 5:9% of patients persisted for an average of 2.3 days, and responded to the patient lying down and an increased intake of fluids and salt. This complaint, which is not usually seen with general anaesthesia, was in fact the only patient complaint in the postoperative period. The incidence of spinal headache has been variously quoted as 3.3%, 7.7%, and 14%, after spinal anaesthesia in open surgery.[14-15] Thus there is no different from present study of 5.9%. Catheterization was required postoperatively in 18 (13.43%) of our patients compared with 11.7% in a study of 420 patients operated on while under spinal anaesthesia.[14] The corresponding figure for patients operated on while under general anaesthesia was 3 (3%). The significantly lower incidence of urinary retention in patients operated on while under general anaesthesia is explainable by the prolongation of muscle paralysis with spinal anaesthesia.

Complications like sore throat, relaxant-induced muscle pain, dizziness, and postoperative nausea and vomiting (PONV) often create high morbidity after general anaesthesia.[18] In this context PONV is particularly troublesome, and antiemetics may be required in as many as 50% of patients, and can delay discharge from the hospital in 7% of patients.[23,24]

In present study the problem with PONV was seen in 2.9% of spinal anaesthesia patients, but has been reported as high as 8.1% in another study of spinal anaesthesia.[14] PONV is highest after general anaesthesia, especially when nitrous, opiate, or reversal agents are used. In their presence, the rate can vary up to 60% to 70%.[25,26] Even with the newer agents like propofol and isoflurane, the incidence is as high as 30% and substantially increases the cost of anesthesia.[27] In present study general anesthesia patients had an incidence of 33% of PONV, which was significantly higher compared with spinal anesthesia patients. Another important advantage of SA is that other complications specific to general anesthesia, including cardiac, myogenic, and possible cerebral complications do not occur with spinal anaesthesia. Mobilization and ambulation in both spinal anaesthesia and general anaesthesia patients was achievable within 8 hours to 12 hours after surgery. Average time to discharge was 1.9 days.

CONCLUSION

From the present study it was concluded that laparoscopic cholecystectomy using spinal anesthesia is a better alternative as there is no intubation related airway obstruction, little risk of unrecognized hypoglycaemia in a diabetic patient, excellent muscle relaxation, decreased surgical bed oozing, economical, pain free early post-operative period, a more rapid return of gut function and decreased postoperative nausea and vomiting. This is in addition to the obvious advantages in an old patient or those with COPD or other systemic diseases like hepatic and renal disease and diabetes.

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