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Benefits of Segmental Spinal Anaesthesia in Patients Undergoing Laproscopic Cholecystectomy: A Retrospective Study

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Abstract **Original Research Article**

Background: Segmental Spinal anaesthesia (SA) is reported to be having excellent results in terms of post-operative pain, analgesia requirement, relatively less complications and reduced hospital stay. 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. ***Materials and Methods***: It is a retrospective study conducted between October 2020 and September 2022. 160 Patients in study group undergoing laparoscopic abdominal procedures were operated under Spinal Anesthesia. In study group 45 patients had acute cholecystitis and 115 underwent elective cholecystectomy were included. 100 Patients who were operated under General anesthesia were kept as control. ***Results:*** Out of 160 patients, 105 patients were females, average age was 43.8 years and 55 male patients with average age was 39.2 years laparoscopic cholecystectomy was performed in all patients. Out of 160 patients 45(28.12%) of had acute cholecystitis. 32 (20%) patients HAD hypotension, 35 (21.88%) observed anxiety, neck or shoulder pain, and 1 (0.62%) patient required conversion because of anxiety, despite sedation where as one patient required conversion to general anaesthesia due to failure of SA effect. ***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: Diclofenac, General anaesthesia, Ketamine, Laparoscopic cholecystectomy, Spinal anaesthesia.

INTRODUCTION

The name segmental spinal is often widely used synonymously with thoracic spinal anaesthesia. But in real sense segmental spinal anaesthesia means "Blocking of the required dermatomes essential for the proposed surgical procedure with very low effective local anesthetic drug dose." This often necessitates dural puncture at high lumber or thoracic levels apart from the conventionalspinal below L1. Lower the dose of local anesthetic drug used more likely it is to produce a true segmental block [1]. Endotracheal general anaesthesia (GA) is the anaesthetic technique of choice for laparoscopic cholecystectomy.

In the recent times, regional blocks like low thoracic epidural [2] spinal [3] segmental thoracic spinal [4] and combined spinal-epidural [5] blocks have been administered in laparoscopic cholecystectomy and were found to be safe and effective alternate to GA with various advantages. Hamad MA [6] as first used spinal anaesthesia (SA) in the effective management of laparoscopic cholecystectomy. Since all laparoscopic procedures are merely a change in access and still require the same anaesthesia.

The main reasons for selecting Segmental 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 [7, 8].

The world literature until about few 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 [3, 9-12].

METHODS

A retrospective study conducted between October 2020 and September 2022. According to American Society of Anesthesiologist's (ASA grade I and II) patients undergoing laparoscopic abdominal procedures were offered segmental anaesthesia as the first choice. A total of 160 patients have undergone abdominal laparoscopic cholecystectomy under spinal anaesthesia in study group. Out of 160, 45 patients had acute cholecystitis and 115 underwent elective cholecystectomy were included. Patients who were operated under GA were kept as control.

Preoperatively all the instructions were given to patients, that any pain, discomfort or anxiety, then systemic medications or conversion to general anesthesia. Preloading with 1000 mL Ringer Lactatewas done, and patients were pre-medicated 45 minutes before surgery with injection Ranitidine 50 mg intravenously and inj. Metoclopramide 10 mg intramuscularly. Spinal segmental Anaesthesia was given by midline approach in one of the intervertebral spaces between T7 to T12 spines, with the patient in sitting position. If the midline approach posed a difficulty, then paramedian approach was tried. The spinal was given very cautiously, with a 25 G Quincke spinal needle, until loss of resistance was felt.(Fig 1)

Once flow of clear CSF had confirmed correct placement, injection ropivacaine 0.75% (isobaric) 1.5ml, along with injection dexmedetomidine 6 mcg as adjuvant is given. The Patient was subsequently madeto lie supine.

The patient was monitored blood 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 all 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 0.6 mg atropine IV or 0.2 mg glycopyrrolate. Hypotension, defined as a fall in BP of greater than20% 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 patients of LC under general anesthesia in the same unit.

STATISTICAL ANALYSIS

All the demographic and clinical data of the participants were recorded. All data were processed, analyzed and disseminated by using MS Excel and SPSS version 23 program as per necessity.

RESULTS

This study includes 160 patients underwent laparoscopic cholecystectomy under SA and 100 patients underwent laparoscopic cholecystectomy under general anesthesia. Out of 160 patients, 105 patients were females, average age was 43.8 years and 55 male patients with average age was 39.2 years. Laparoscopic cholecystectomy was performed in all patients, 45 of whom had acute cholecystitis. Hypotension requiring support was recorded in 32 (20.0%) patients. 36 (22.50%) experienced anxiety, neck or shoulder pain, for which lnj Ketamine had given. Stomach distension requiring RT 2 (1.49%) in SA patients in compared to 82% in GA patents.

Only 1 (0.62%) 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 30.4 minutes and 43.3 minutes, respectively, in elective and emergency settings.

Postoperatively, 10 (6.25%) 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 were given in 69 (43.12%) of patients for their abdominal pain within 2

hours postoperatively and an oral analgesic was given in 110 (68.75%) patients within the first 24 hours postoperatively compared with 91 (91%) 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 3.1 days was seen in 10 (6.25%) patients and responded to patients being in a lying posture and increased intake of fluids and salt. Average time to discharge was 1.8 days in SA patients when compared to 2.1 in GA patients (Table 1).

Fig 1: Segmental Anesthesia

Table 1: Results of study patients under spinal anesthesia and control patients under general anaesthesia

	Spinal anaesthesia (n = 165)	General anaesthesia (n = 100)	P* Value
Age			
Average year	41.8%	39.2%	
Sex			
Females	105 (76.8%)	78 (78%)	
Males	55 (23.2%)	22 (22%)	
Indication			
Ac cholecystitis + cholelithiasis	45 (28.12%)	14 (14%)	
Ch. Cholecystitis + cholelithiasis	115 (71.87%)	86 (86%)	
Operative time			
Elective surgery in minutes	30.4	34.2	
Emergency surgery in minutes	43.3	43.6	
Perioperative			
Hypotension	32 (20.0%)		<0.01
Anxiety/neck and shoulder pain	36 (22.55%)		
Stomach distension requiring RT	2 (1.49%)	82 (82%)	
Conversion to GA	1 (0.62%)		
Postoperative			
Vomiting	10 (6.25%)	33 (33%)	<0.01
Pain treated with injectable analgesic	69 (43.12%)	91 (91%)	
Pain treated with oral analgesic	110 (68.75%)		
Urinary retention	30 (18.75%)		
Headache	10 (6.25%)		
Average stay in hospital in days	1.8	2.1	

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

DISCUSSION

The introduction of spinal anaesthesia in 1898 by Bier, it is traditional in most cases to puncture the subarachnoid space (SAS) at level well below the termination of spinal cord to avoid the neural damage [13]. In 2006 the new era of studies on segmental spinal anaesthesia puncturing SAS at T10 for laparoscopic cholecystectomy started when J Van Zundert used this technique to anaesthetize a patient with severe obstructive lung disease [14]. 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. This present study intended to observe that open cholecystectomy

could possibly be done in a very convenient way under SA. When compared with GA, it has few advantages such as the relatively longer post-operative pain-free interval and reportedly minimal use of opioids in post-operative pain management.

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 Hgwhen using SA have all been reported to reduce the discomfort and chances of neck and shoulder pain. We have been operating at an average pressure of 10 mm of carbon dioxide, and no changes have been necessary inport placement in spinal anaesthesia compared with general anaesthesia patients. This agrees with a recent report by Tzovaras [9].

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*., [5] shoulder and neck pain occurred in 2 out of 6 patients who operated under Segmental anesthesia, and it was easily managed. 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]. In our study hypotension recorded in 32 (20%) which were in similar with Throngnumchai 20.2%, and Hyderally reported a 10% to 40% incidence [15, 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. Ciofolo *et al*., [11] concluded that epidural anesthesia for laparoscopy does not cause ventilator depression. Even in our series, none of the patients had any significant variation in PaO2 or PaCO2 during the surgery with spinal anaesthesia.

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. A specific advantage of spinal anesthesia seems to be the decrease in the requirement of postoperative analgesia. Injectable diclofenac was required by 43.12% of our spinal anaesthesia patients for their abdominal pain compared with a significantly greater number of our general anaesthesia patients (91%) requiring injectable analgesics within 2 hours after extubation.

The benefit of prolonged analgesia after SA is 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 which is in similar with Pursnani KG [5] and Hamad MA [6] studies.

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. The other studies shown variations 7.7% and 14% in Postural headache after open surgeries [15, 17]. Catheterization was required postoperatively in 30 (18.75%) of our patients compared with 11.7% in a study by Palachewa K [16] where 420 patients operated under spinal anaesthesia. The corresponding figure for patients operated on while under general anaesthesia was 3 (3%). The significantly lower incidence of urinary retention in patients operated under general anaesthesia is explainable by the prolongation of muscle paralysis with spinal anaesthesia.

In present study spinal anesthesia patiens had an incidence of 6.25% of postoperative vomiting which was significantly lower compared with spinal anesthesia. 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 1.8 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 pain free early postoperative period, a more rapid return of gut function and decreased postoperative nausea and vomiting. In patients undergoing laparoscopic cholecystectomy segmental spinal anesthesia can be a better choice as compared to general anesthesia particularly in those patients who have co-existent respiratory co-morbidities such as chronic obstructive airway disease.

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