



SPINAL ANAESTHESIA FOR GENERAL LAPAROSCOPIC SURGERY

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ABSTRACT

Objectives: Laparoscopic abdominal surgery is conventionally done under general anesthesia. Spinal anesthesia is usually preferred in patients where general anesthesia is contraindicated. The objective of our study was to use spinal anesthesia as the first choice for laparoscopic surgery cases at small scale hospitals with the intention that it is a good alternative to GA with no or insignificant side effects. **Methodology:** Spinal anesthesia was used in 223 elective laparoscopic surgery patients. Intraabdominal pressure was kept at 12mm Hg to 14mm Hg. Sedation was given if required, and conversion to general anesthesia was done in long surgery patients, not responding to sedation or with failure of spinal anesthesia. Results were compared with those of 79 patients undergoing laparoscopic surgery while under general anesthesia. **Results:** Less than 10% (21) experienced neck or shoulder pain, or both. Intravenous Diclofenac or Fortwin was required/given in all patients (99%), while Ketamine had to be given to 33 (12%) patients. 5 (less than 3%) patients required conversion because of extended duration of surgeries. We have not experienced failure of SA effect. **Conclusion:** The evidence suggests the safety of the use of spinal anaesthesia in general laparoscopy procedure with minimal side effects which can easily be managed with the available pharmacological drugs even at small scale hospitals. RA may provide certain advantages over GA, such includes lack of airway manipulation, maintenance of spontaneous respiration, effective post-operative analgesia, minimal nausea and vomiting, and early recovery and ambulation. RA may be considered comparable to GA in laparoscopic procedures regarding surgical conditions, intra- and post-operative complications, and hospital length of stay, but may be superior to GA with respect to the PONV, Post-Operative Analgesia, Early Recovery and Anesthesia Cost.

KEY WORDS: Laparoscopic surgery, Spinal Anesthesia.

INTRODUCTION

The introduction of laparoscopy in the field of surgery in the mid-1950s revolutionized surgical techniques due to reduction in overall medical costs, reduced bleeding, less post-operative surgical and pulmonary complications, and early recovery. The world literature suggested GA as the sole anesthetic option for abdominal laparoscopic surgery and various myths and facts discouraged the use of regional anaesthesia (RA). It is only recently that reports of laparoscopic surgery being performed with select patients under spinal or epidural anesthesia have started to appear.^[1-6]

Since the initiation of the application of laparoscopy in various day-care surgeries, a more favourable anesthetic technique is required allowing early recovery and ambulation. The advantages of uniform total muscle relaxation, prevention of airway manipulation, an awake and spontaneously breathing patient intraoperatively,

minimal nausea and vomiting, cost effective and relatively early uneventful recovery after spinal anesthesia on the one hand and the protection from potential complications and high medicine cost of general anesthesia on the other, were the main reasons for selecting spinal anesthesia as the first choice.

Recently, RA has been documented to be equally favourable in laparoscopic surgeries.^[7] This is a retrospective study of patients having laparoscopic surgery under spinal anesthesia since 2013 at our peripheral (small scale) hospitals.

METHODOLOGY

All patients undergoing elective laparoscopic abdominal procedures were offered SA as the first choice. Since initiation of our study, 223 patients have undergone abdominal laparoscopic surgery while under SA. Patients who preferred GA or had contraindications for SA, like

children less than 10 years of age, patients with clotting disease, spinal deformity, and skin pathology overlying the SA site, were operated under GA and kept as controls.

All patients subjected for lignocaine sensitivity and were premedicated 45 minutes before surgery with glycopyrrolate 0.2 mg IM, Inj. Ondemsetron and inj. TT 0.5cc IM. SA was administered using a 23 G or 25 G lumbar puncture spinal needle in L2-L3 intervertebral space. 3 mL to 4 mL of Sensorcaine (Bupivacaine HCl 5mg [0.5%Heavy]) +/- Clonidine was used. Head down tilt 10 degrees to 20 degrees was kept for 5 minutes.

The segmental level achieved was T4-T5 to enable introduction of the Epigastric port. The patient was monitored for blood pressure, SpO₂, EtCO₂, heart rate and patient anxiety. Patient anxiety was defined as anxiety that resulted in inability to complete the procedure under SA and requiring conversion to GA. During surgery, oxygen supplementation was optional and administered through a Ventimask, at the rate of 5 L/minutes. In almost all patients intravenous aqueous diclofenac, fortwin 20 mg and/or midazolam 1cc was administered as slow IV or in Drip. AT time of CO₂ Insufflations and in patients who still had persistence of pain, ketamine 50 mg administered as slow IV injection was used. If the patient was still anxious, conversion to

GA was done. We have not experienced intra and postoperative Hypotension.

After Co₂ insufflations and intraabdominal primary survey (with no evidence of contamination or peritonitis), infra diaphragmatic(bilateral) instillation of Lignocaine 8cc and Bupivacaine 12cc done in all patient to minimize shoulder and neck pain in almost all patients. The laparoscopic procedures were carried out in the standard fashion with single port to 5 ports without any modifications. The intraperitoneal pressure was kept between 10 to 14 mm Hg.

The postoperative parameters evaluated included operative site pain, 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, vomiting and overall patient satisfaction as graded by Karnofsky Performance Status at the time of first follow-up at 10 days postoperatively. The incidence of postoperative vomiting and pain was compared with corresponding parameters of 74 patients undergoing LC while under GA in the same unit.

The patients were routinely followed up for 1 month after surgery.

OBSERVATION TABLES

Table1: Laparoscopic Cholecystectomy (n= 104)

	Spinal anaesthesia	General anaesthesia	Conversion to GA	Conversion to Open Surgery
Emergency	0	0	0	
Elective	56	37	3	Nil
Additional/other Surgery*	9	0	0	0

Table 2: Laparoscopic Appendicectomy (n=172)

	Spinal anaesthesia	General anaesthesia	Conversion to GA	Conversion to Open Surgery
Emergency	0	0	0	
Elective	137	26	2	0
Additional Surgery*	6	1	0	0
Other Surgery*	21	7	0	0

This retro-prospective study included 223 patients who underwent abdominal laparoscopic surgery while under SA and 74 patients who underwent laparoscopic surgery while under GA from 2013 till date. The data were obtained by chart review. In the SA group, 156 patients were females, and the average age was 30-40 years. Laparoscopic cholecystectomy was performed in 104 patients (Table 1). Laparoscopic appendicectomy done in 172 patients. Additional and other surgery done in 37 patients (Table 2). Laparoscopic cholecystectomy (LC) was done in 104 patients, and ALL underwent elective cholecystectomy, and 9 had additional laparoscopic surgeries in the same sitting along with LC(LC+).

Laparoscopic appendicectomy (LA) was done in 172 patients, and ALL underwent elective appendicectomy, and 6 had additional laparoscopic surgeries in the same sitting along with LA(LA+).

*Additional and other Laparoscopic Procedure

- Incisional hernia & Umbilical Hernia
- Diagnostic laparoscopy
- Ovarian Surgery
- Hysterectomy
- Ectopic Pregnancy
- Adhesiolysis

We have not experienced intra and postoperative Hypotension, less than 10%(21) experienced neck or shoulder pain, or both. Intravenous Diclofenac or Fortwin was required/given in all patients (99%), while

Ketamine had to be given to 33 (12%) patients. 5(less than 3%) patients required conversion because of extended duration of surgeries. We have not experienced failure of SA effect.

Table 3:-Other Observations

		Spinal/SA	General/GA
Perioperative	Neck/shoulder pain	21(10%)	
	Hypotension	nil	
	Stomach distension required RT		22(30%)
Conversion to GA		5(2%)	
Postoperative	Vomiting	nil	22(30%)
	Abdominal pain treated with IV Analgesia	2(1%)	66(90%)
	Abdominal pain treated with Oral Medicine	55(25%)	
	Urinary Retention	2(1%)	nil
	Headache	12(5%)	

RESULTS

Postoperatively, significantly fewer patients experienced one or more vomiting episodes compared with those under GA. The incidence of postoperative urinary retention requiring catheterization was not significant in patients after SA or GA (**Table 3**). Injectable diclofenac was necessary in less than 1% of patients for their abdominal pain within 2 hours postoperatively and an oral analgesic was required in 55(25%) patients within the first 24 hours postoperatively compared with 66(90%) patients requiring injectable analgesia in the GA group of patients (**Table 3**). Thus, significantly more patients required injectable analgesics after GA. Postural headache persisting for an average 2.6 days was seen in 12(5%) patients and responded to patients being in a lying posture and increased intake of fluids and salt. Average time to discharge was 2-3 days. Karnofsky Performance Status showed a 98% satisfaction level in patients.

DISCUSSION

Discussion needs evidence to suggest safety of spinal anaesthesia with minimal side effects, which can easily be managed with the available pharmacological drugs at small scale hospitals and to confirm added advantage of SA that includes lack of airway manipulation, maintenance of spontaneous respiration, effective post-operative analgesia, minimal nausea and vomiting, and early recovery and ambulation.

Regional anesthesia is seldom used in abdominal laparoscopic surgeries except for diagnostic laparoscopies. The prime indication for using regional anesthesia in therapeutic laparoscopy is still limited to patients unfit for GA, and the preferred type of regional anesthesia is epidural anesthesia. Thus, reports of laparoscopic surgery being done with patients under spinal anesthesia are even scarcer than those of patients under epidural anesthesia.^[1-4] The main concerns associated with the use of RA are accelerated hypotension due to sympathetic blockade, Ventilatory changes due to the higher sensory levels required, occurrence of shoulder-tip pain due to diaphragmatic

irritation, and increased surgical time due to limitation of the intra-abdominal pressure.

We have been performing the majority of our open abdominal surgeries primarily with patients under spinal anesthesia (SA) for the many years. Rarely in upper abdominal surgeries, especially those of the cardio esophageal junction or liver, supplemental sedation or conversion to GA is required. It was thus logical that after performing the initial laparoscopic surgeries using GA, we shifted to SA as the anesthesia of choice for almost all our abdominal laparoscopic procedures.

The optimal anterior abdominal wall relaxation and the conscious and receptive patient under SA together spurred us to try out SA for all our laparoscopic surgery patients. Another reason for preferring SA was preventing the potential problems of GA, Postoperative Monitoring after GA and high medicine cost associated with GA. The initial concern was never the subcostal level of anesthesia (T4-T5) for the epigastric and subcostal ports because we had been successfully making upper abdominal incisions in open abdominal surgeries without discomfort to the patient^[1]. 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^[1,2].

We have always been operating at an average pressure of 10-12mm of carbon dioxide, and no changes have been necessary in port placement in SA compared with GA patients. This agrees with a recent report by Tzovaras^[1,4]. Surprisingly, neck pain and shoulder pain have never been a major problem in our patients.

They occurred in only 21 patients, none of whom required conversion to GA. Pursnani et al^[5] noted that shoulder and neck pain occurred in 2 of their 6 patients operated on while under epidural anesthesia, and it was easily managed. On the other hand, in the series of

Hamad *et al.*,^[2] 10 LC were done with patients under SA, and one patient had to be given GA because of intolerable shoulder pain. Chiu *et al.*^[6] also noted shoulder pain in 1 of 11 patients of B/L spermatic varices operated on while under epidural anaesthesia. We have encountered discomfort and anxiety in our elective laparoscopy patients but was easily managed by sedation. The reasons for conversion in our series were either an incomplete effect of SA or prolongation of surgical time to beyond the effective time of SA, as was seen in 5 patients. Conversion to GA because of abdominal distension discomfort during epidural anaesthesia was reported in 1 of 11 patients in the study of Chiu *et al.*^[6] One of 6 patients in the Ciofolo *et al.*^[7] study required conversion to an open procedure because of uncontrolled movements under epidural anaesthesia.

GA patients unlike SA 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 2 modes of anaesthesia during laparoscopic surgery. In this context as a general overview, it can be stated that spontaneous physiological respiration during SA would always be better than an assisted respiration, as in GA. The potentiality of intubation and ventilation-related problems including an increase in mechanical ventilation to achieve an adequate ventilation pressure exists during GA compared with SA.^[1,5] In addition, pulmonary function takes 24 hours to return to normal after laparoscopic surgery performed using GA.^[11] 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.*^[12] documented a greater increase in PaCO₂ after CO₂ pneumoperitoneum when the patient was under GA compared with when the patient was breathing spontaneously. Similarly Rademaker *et al.*^[13] showed greater forced Ventilatory capacity during GA. On the other hand, Chiu *et al.*^[6] reported significant arterial blood gas alterations during epidural anaesthesia. Ciofolo *et al.*^[14] concluded that epidural anaesthesia for laparoscopy does not cause Ventilatory depression. Even in our series, none of the patients had any significant variation in PaO₂ or PaCO₂ during the surgery with SA.

For multiple surgeries including laparoscopic cholecystectomy, average operative time was 42-50 minutes, which compares with operative time for our GA patients. Thus, there was no difference in the **operating time** while using SA. Instead, the time from application of total anaesthesia to wheeling the patient out of the operating room actually decreases appreciably when the patient is being operated on while under SA, because the intubation and extubation time of GA 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 GA, and the patient is always receptive and more compliant to suggestions. A specific advantage of SA seems to be the decrease in the requirement of postoperative analgesia. Injectable diclofenac was required by 1% of our SA patients for their abdominal pain compared with a significantly greater number of our GA patients (90%) requiring injectable analgesics within 2 hours after extubation. The injectable analgesic was usually required between 2 hours to 6 hours after surgery versus within 2 hours after extubation when GA was used. The benefit of prolonged analgesia after SA has also been noted in other studies^[1,2,5]. Postural headache was seen in less than 5% of patients, persisted for an average of 2.6 days, and responded to the patient lying down and an increased intake of fluids and salt. This complaint, which is not usually seen with GA, 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%^[8-10] after SA in open surgery. This again is no different from our figures of 5%.

Complications like sore throat, relaxant-induced muscle pain, dizziness, and postoperative nausea and vomiting (PONV) often create high morbidity after GA. In this context, PONV is particularly troublesome, and antiemetics may be required in as many as 50% of patients^[1] and can delay discharge from the hospital and substantially increase the cost of anaesthesia.^[1] Another important advantage of SA is that other complications specific to GA, including cardiac, myogenic, and possible cerebral complications, do not occur with SA. Mobilization and ambulation in both SA and GA patients was achievable within 6 hours to 8 hours after surgery. Average time to discharge was 2.3 days. Port-site infection was seen in 10 patients, which was similar to that in GA patients. Karnofsky performance status showed a 95% to 100% satisfaction level in 98% of patients. This means that the patient was happy and would probably recommend this approach to friends. This is actually true because a sizeable number of our patients now actually demand that they be operated on while under SA.

Turkstani *et al.* found significantly lower pain scores with lower analgesic consumption in the post-operative period in those with spinal anaesthesia. The total length of hospital stay was not significantly different but the total cost of anaesthesia was significantly less in the spinal anaesthesia group.^[15]

Imbelloni *et al.* found spinal anaesthesia to be a safe and cost-effective technique^[16] Ellakany, found comparable surgical conditions with superior post-operative analgesia and significantly better satisfaction scores among patients in the spinal anaesthesia group.^[17] Mehta *et al.*, found better post-operative analgesia with spinal

anaesthesia in comparison to GA for LC. They found no significant difference between the groups regarding intraoperative complications, recovery, length of hospital stay and degree of satisfaction. There was no incidence of nausea and vomiting in the patients who received spinal anaesthesia.^[18]

All the studies in the literature suggest that RA may be considered comparable to GA in laparoscopic procedures regarding surgical conditions, intra- and post-operative complications, and hospital length of stay, but may be superior to GA with respect to the PONV, Post-Operative Analgesia, Early Recovery and Anesthesia Cost.^[1]

CONCLUSION

Laparoscopic procedures have been traditionally performed under GA due to the concerns about pneumoperitoneum-related respiratory changes associated with it. However, recently the use of RA has been introduced for these laparoscopic procedures. The evidence suggests the safety of the use of spinal anaesthesia in general laparoscopy procedure with minimal side effects which can easily be managed with the available pharmacological drugs even at small scale hospitals. RA may provide certain advantages over GA, such includes lack of airway manipulation, maintenance of spontaneous respiration, effective post-operative analgesia, minimal nausea and vomiting, and early recovery and ambulation. RA may be considered comparable to GA in laparoscopic procedures regarding surgical conditions, intra- and post-operative complications, and hospital length of stay, but may be superior to GA with respect to the PONV, Post-Operative Analgesia, Early Recovery and Anesthesia Cost. However, the safety of RA in laparoscopic procedures among various types of patient populations still needs to be verified by further studies. Additionally, the technique of anaesthesia for laparoscopic procedures remains a debatable issue and most of the time it depends upon the experience and competency of the anesthesiologist.

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