COMPARATIVE ANALYSIS OF SPINAL VS GENERAL ANAESTHESIA FOR LAPAROSCOPIC CHOLECYSTECTOMY: A PROSPECTIVE RANDOMIZED STUDY

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Abstract

INTRODUCTION: Spinal anaesthesia has not been routinely employed as a sole technique for laparoscopic cholecystectomy. This study was conducted to compare the advantages and disadvantages of these two methods of anaesthesia employed in laparoscopic cholecystectomy. METHODS: We compared hundred successive patients of laparoscpic cholecystectomy , between January 2008 and June 2009, who were randomly divided into two equal groups; one group was subjected to GA whereas the other underwent spinal anesthesia. The inclusion criteria of this study were ASA I& II grade patients, BMI< 30 with normal coagulation profile. Hyperbaric 3 ml plain bupivacaine 0.5% was administered for spinal anaesthesia. Intraoperative parameters, postoperative pain and recovery in general, as well as patient satisfaction at follow-up were prospectively recorded to assess the feasibility and safety of the procedure.OBSERVATION: None of the patients had significant haemodynamic perturbation other than transient hypotension and bradycardia during surgery. The mean operative time was 40.25 minutes. There was no statistical significance in post operative pain and vomiting in both groups. Recovery was uneventful and without any morbidity or mortality. CONCLUSION: All of the patients and surgeons were satisfied with laparoscopic cholecystectomy under spinal anaesthesia, therefore this form of anaesthesia may be an appropriate choice and can increase the number of patients eligible for surgery. However this approach requires a cooperative patient, a skilled laparoscopic surgeon, a gentle surgical technique and an enthusiastic anaesthesiologist.

INTRODUCTION

Laparoscopic choecystectomy has become the treatment of choice for cholelithiasis owing to its obvious advantages over open cholecystectomy. This surgery is conventionally performed under general anaesthesia. Regional anaesthesia has not been used frequently as the sole anesthetic procedure in the present scenario. The purpose of the study is to assess whether spinal anesthesia is, or not superior to the standard general anesthesia for fit patients undergoing laparoscopic cholecystectomy.

METHOD

This is a prospective case controlled randomized study, where all the selected consecutive patients undergoing cholecystectomy were included. The study cohort included 100 ASA I &II patients, divided into two equal groups, admitted in Subharti Medical College, Meerut from January 2008 to June 2009, who ranged in age from20 to60 years. This study was started only after obtaining approval from institutional ethical committee and written informed consent from the patients after full explanations of the procedure. The inclusion criteria were elective laparoscopic cholecystectomy, patients of category ASA I& II, BMI< 30 and patients with normal coagulation profile. The exclusion criteria were patients with previous abdominal surgeries, contraindication for pneumoperitoneum and spinal anesthesia like spinal deformity as well as contracted gall bladder, suspected common bile duct stone, acute cholecystitis, cholangitis and pancreatitis.

All patients, who were in spinal anaesthesia group, were informed about spinal anesthesia in detail, that any anxiety, discomfort or pain during surgery would be dealt with intravenous medication. The patients were also informed

about the probability of conversion to general anesthesia, if needed. Preoperative preparations were standard for all patients. Each patient received Diazepam 5mg, Ranitidine 150mg and Metoclopramide 10 mg orally on the previous night of surgery.

An intravenous access was achieved in the pre operative room and all patients were pre loaded with 500 ml of Ringer's Lactate solution and premedicated with Ondensetron 4mg and Midazolam 1mg.In the operation theater, after establishing non invasive monitor, the spinal group of patients were positioned in the right decubitus, a 25 G pencil point spinal needle was introduced into the subarachnoid space at the L_2-L_3 intervertebral space and 3 ml hyperbaric plain bupivacaine 0.5% was injected intrathecaly, after confirming free flow of CSF. Patients were turned into supine position and the table was tilted into Trendelenburg position till the sensory block up to T_5level was achieved.

The surgical technique was modified using lower levels of intra-abdominal pressure, with minimal operating table tilt, modified trocar sites if needed, and minimal surgical manipulation. The CO_2 pneumoperitoneum was maintained at an intra-abdominal pressure of less than 10 mm Hg. The flow rate of CO_2 administration was maintained at the rate of 1liter/minute. Head up and left lateral tilts of operation table were made to minimal possible position. Surgeons were explained that if they need GA, conversion of anaesthesia was possible without hampering surgical work. The nasogastric tube was inserted to decompress the stomach only on surgeon’s demand.

Intraoperative parameters, operative difficulty and recovery in general, as well as postoperative pain, hospitals stay and patient satisfaction at follow-up were prospectively recorded. Patients were encouraged to report any discomfort like abdominal or shoulder pain, nausea and vomiting as well as headache. Every event was recorded. Oxygen was administered by mask at the flow rate of 5 liter/minute. Any conversion in anaesthetic or surgical technique was noted with its reason. Anxiety of patient was treated with Midazolam 2mg as intravenous bolus when required.

At the end of surgery, abdomen was deflated completely. Postoperatively RR, HR, BP, pulse oximetry values, pain assessment by VAS and nausea vomiting were recorded. Oxygen via nasal prong was administered at the rate of 3 liter/minute. Intravenous fluid was infused in first 24hours of surgery. If the VAS was more than three, injection Diclofenac sodium and if more than 5, injection Tramadol intravenously was advised. At the time of discharge every patient was asked to rate their satisfaction level with regard to anaesthetic procedure by using simple centimeter scales ranging from 0 to 10.

OBSERVATION

The patients who appeared in surgical OPD of our institution for laparoscopic cholecystectomy, during January 2008 to June 2009 and those who were fulfilling our criteria were included in our study. 100 consecutive selected patients were alternately divided into two groups. Intraoperatively nine patients (18%) experienced right shoulder pain and only 4 of them required injection Tramadol. In our study 4 (8%) patients had transient hypotension which was managed by infusion of crystalloid intra operatively. Bradycardia was encountered in 8(16%) patients of spinal group and was managed with Atropine injection. Abdominal pain or discomfort was encountered in 3 patients (6%) who were managed by Entonox (Table-1). During surgery 4 (8%) patients had some difficulty in surgery, out of which 2 patients were converted to GA due to severe shoulder pain. In rest two patients there were minimal technical difficulty for the laparoscopic surgeon and average time of total procedure was 40.25 minutes.

Figure 1

TABLE-1

INTRA-OPERATIVE EVENTS (n=50)	NUMBER OF PATIENTS	PERCENTAGES
SHOULDER PAIN	9	18%
HYPOTENSION	4	08%
HYPERTENSION	0	0%
BRADYCARDIA	8	16%
ABDOMINAL PAIN	3	06%
CONVERSION TO GA	2	04%
OPERATIVE DIFFICULTY	2	04%

Post operative surgical or anaesthetic events were not alarming. Nausea and vomiting as well as complain of right shoulder pain percentages were almost similar in both groups and these patients were managed by injection Ondensetrone 4mg and injection Diclofenac through intravenous route respectively. Statistically there was no significance. Two patients in spinal group had post operatively urinary retention, which was managed by Foley’s catheterization. One patient had post operative headache, probably PDPH and was managed by analgesics and I.V. fluids. None of the patients had respiratory depression (Table-2).

Figure 2

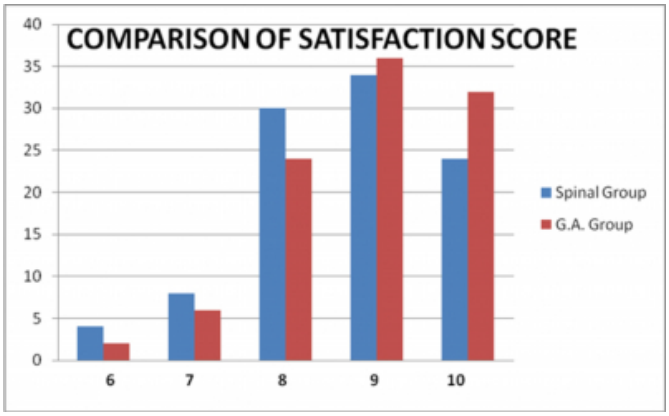
TABLE-2

POST-OPERATIVE EVENTS	SPINAL ANAESTHESIA(n=50)	GENERAL ANAESTHESIA(n=50)
NAUSEA/VOMITING	5(10%)	4(08%)
RT.SHOULDER PAIN	4(08%)	3(06%)
URINARY RETENTION	2(04%)	0(0%)
POST SPINAL HEADACHE	1(02%)	0(0%)
RESPIRATORY DEPRESSION	0(0%)	0(0%)

All the patients were discharged in between 48 to 72 hours after surgery. There was no mortality or morbidity in any patients. The satisfaction score of above 8 were reported in 88 % of patients in spinal group as compared to 92% in general anaesthesia group (Graph-1).

Figure 3

Graph-1



DISCUSSION

Laparoscopic cholecystectomy is usually performed under general anaesthesia, only sporadic report of regional anaesthesia being used in this surgery is documented in the literature.[1-5]The main step of every laparoscopic surgery is creation of pneumoperitoneum, which is generally made by carbon dioxide gas. The major problems during laparoscopic surgery are mechanical effect of pneumoperitoneum affecting cardiopulmonary function, systemic carbon dioxide absorption and patient positioning.[6-9] The mechanical effect of pneumoperitoneum is mainly due to tenting of diaphragm and pressure on great vessels of the abdomen. The tenting effects of diaphragm are generally compensated by increasing the minute volume ventilation, when the surgery is done under general anaesthesia. These effects can be minimized to some extent if some modification of technique was considered while doing this surgery in spinal anaesthesia. These modifications are minimum tilt of operating table and low intra abdominal pressure employed during this procedure. Creation of pneumoperitoneum also stimulates vagus nerve, which can be minimized if carbon dioxide insufflations rate is below 2 L/minute.[10]It has been observed in different studies that if intra abdominal pressure is below 10 mmHg, it minimizes diaphragmatic irritation as well as abdominal and respiratory discomforts.[11,12]The use of low pressure pneumoperitoneum does not peril the adequacy of surgical space and vision, subsequently not hampering surgical work. In case of obese patients where BMI>30, a potentially higher intra abdominal pressure is required, this being the reason; we had not included these patients in our study. Pneumoperitoneum causes cephalad displacement of diaphragm, which increases pressure on diaphragm. This leads to reduction in lung volume, decreased pulmonary compliance and restriction in diaphragmatic mobility, ultimately resulting in ventilation perfusion mismatch and hypercarbia. These effects are managed when patient is under GA by tracheal intubation and IPPV and hyperventilation to prevent hypercarbia. Some anaesthesiologist use large tidal volume of 12-15 ml/kg to prevent progressive alveolar atelectasis and hypoxaemia for achieving more effective alveolar ventilation and carbon dioxide elimination.[13] In case of spinal anaesthesia, if the lungs have either obstructive or constrictive pathology; these consequences will be augmented without controlled ventilation. So when laparoscopic cholecystectomy is planned under SA, the cardio pulmonary status of the patient should not be compromised. Pulmonary function is better preserved following laparoscopic surgery due to small incision; forced vital capacity is reduced by 27% after laparoscopic surgery and by 48% after open surgery.[14]Nausea and vomiting are particularly troublesome after laparoscopic surgery; over 50% of patients require antiemetics, so prophylactic antiemetics has been given routinely. In addition, the use of non-steroidal anti-inflammatory drugs for postoperative analgesia has been described to minimize emesis after laparoscopic cholecystectomy.[15]

The criteria for inclusion and exclusion, in our study, were based on the above facts. In this study among the 50 cases who were subjected to spinal anaesthesia, we encountered difficulty in only 4 cases. Out of them 2 cases were converted into general anaesthesia and was due to complain of intense shoulder pain. The rest of complains during surgery were of minimal intensity and were treated accordingly. The comparisons of post operative problems were not much significant in both groups, although the higher degree of satisfaction scores were recorded in patients under GA group.

CONCLUSION

This study has shown that spinal anaesthesia can be an alternative to GA in healthy patients undergoing laparoscopic cholecystectomy. Considering the benefits of regional anaesthesia especially its cost effectiveness, better post operative pain relief, minimal haemodynamic instability and relatively good patient satisfaction, we believe that spinal anaesthesia has a place in laparoscopic procedures and could evolve as a routine method of anaesthesia in ASA I & II grade patients.

Our study concludes that laparoscopic cholecystectomy can be performed under spinal anaesthesia with patients breathing spontaneously under oxygen mask support provided stringent patient's selection, gentleness and readiness to supplement intravenous adjuncts if needed and conversion to general anaesthesia are followed. With proper application and suitable improvements, spinal anaesthesia has the potential to emerge as the gold standard technique for elective laparoscopic cholecystectomy.

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