

## A case series of use of combined spinal epidural anesthesia for laparoscopic appendectomy in adults

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### **Abstract:**

**Background:** Most of the surgeries are now-a-days performed laparoscopically. Early ambulation, less infections, cosmetic effects, minimal surgical pain are some of the advantages of laparoscopic surgeries over open surgeries. General anesthesia is usually used to prevent aspiration and respiratory compromise seen secondary to pneumoperitoneum created in laparoscopic surgeries. But general anesthesia does not provide post-operative analgesia. Also, general anesthesia has disadvantage of decreasing FRC and TV. Regional anesthesia provides good postoperative analgesia, anti-emesis with minimal respiratory and cardiovascular changes. In regional anesthesia patient is awake and oriented during surgery, also problems like oral or teeth injury during laryngoscopy, sore throat and stomach inflation seen in general anesthesia can be avoided. Regional anesthesia is safe and cost effective as compared to general anesthesia.

**Methods:** Eight ASA grade I and II patients undergoing elective Laparoscopic appendectomy were performed under combined spinal epidural anesthesia. Spinal anesthesia was given at L2-L3 interspace using 3.5 ml of 0.5% (17.5 mg) hyperbaric Bupivacaine mixed with 0.5ml (25 micrograms) of Fentanyl. Epidural catheter was inserted at T10-T11 interspace for inadequate spinal anesthesia and postoperative pain relief. Perioperative events and operative difficulty event was noted. Systemic drugs were administered if patients complained of shoulder pain, abdominal discomfort, nausea or hypotension.

**Results:** Spinal anesthesia was adequate for surgery with no operative difficulty in all the patients. Intraoperatively, two patients experienced right shoulder pain and was given Fentanyl, one patient was given Midazolam for anxiety and two were given mephentermine for hypotension. The postoperative period was uneventful.

**Conclusion:** Spinal anesthesia with hyperbaric Bupivacaine and Fentanyl is adequate and safe for elective laparoscopic appendectomy in healthy patients and a better alternative to general anesthesia.

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### **I. Introduction:**

Laparoscopic surgeries are normally performed under general anesthesia to prevent aspiration and respiratory compromise secondary to induction of pneumoperitoneum.

Newer studies and case reports states that regional anesthesia has a important role in the care of patients undergoing laparoscopy. There are many published reports of laparoscopic cholecystectomy and inguinal hernia repair under segmental thoracic spinal anesthesia and epidural anesthesia., , .To support this, we performed case study of 6 patients undergoing laparoscopic appendectomy using combined spinal-epidural anesthesia.

### **II. Methods:**

After the written informed consent, ASA Grade I and II patients underwent elective laparoscopic appendectomy under combined spinal epidural anesthesia [Table1]. Exclusion criteria included patients with the presence of any condition contraindicating elective surgery or spinal anesthesia.

The patients were explained during the preoperative visit by the anesthesiologist that any anxiety, pain or discomfort occurring during surgery would be dealt with intravenous medications or if they wished, conversion to general anesthesia. During and after the procedure, the patients were encouraged to report any discomfort, abdominal or shoulder pain, nausea and vomiting. All patients received oral alprazolam 0.5 mg on the night prior to surgery. In the preoperative room an 18g IV line secured and all patients received adequate preloading with 15 ml/kg of Ringer's lactate solution over 30 min and inj. Ranitidine 150mg, inj. Ondansteron 4mg intravenously 30min before surgery. The patients were then shifted to the operation theater and all routine monitors namely, non invasive blood pressure, peripheral oxygen saturation by pulse oximetry (SpO<sub>2</sub>) and electrocardiogram were attached and after obtaining baseline vital signs, oxygen at 5L/min was commenced through a face mask.

The patients were positioned in sitting position, and under strict aseptic precautions, the epidural catheter was introduce at T10-T11 epidural space was accessed using an 18 G Tuohy needle and loss-of-resistance technique and epidural catheter was threaded cephalad and fixed at 4cm within the epidural space. Spinal aesthesia was then performed with 3.5ml that is, 17.5 mg of 0.5% heavy bupivacaine with 25 micro gm

of inj. Fentanyl injected into L2-L3 subarachnoid space through a 25G spinal needle after free flow of cerebrospinal fluid. The patients were turned to the supine position and a 10 degree Trendelenburg tilt was given to achieve the required level of block.

Heart rate, blood pressure, and SpO2 were recorded every minute for 10 min and every 5 min thereafter. The level of sensory (pinprick) block was assessed and recorded every minute until the start of surgery and every 15 min thereafter. Once the block was considered adequate (minimum block T5 – as assessed by pinprick), surgery was started using carbon dioxide (CO2) insufflation at a maximum pressure limit of 12 mm Hg and a minimal tilt of the table.

Pain was treated with inj. Fentanyl 50 micro.gm, anxiety with inj. Midazolam 2mg and hypotension with inj. Mephentamine (upto 20mg), all as IV boluses as and when required during the intra operative period. The epidural injections were to be administered only if systemic analgesic drugs were ineffective in controlling pain. Anaesthetist should be prepared for general anesthesia if surgeon felt that the anesthetic technique was adding to technical difficulty for the surgical procedure. An orogastric tube was inserted to decompress the stomach only if the surgeon demanded for it.

The surgical procedure of laparoscopic appendectomy was carried out according to standard protocol. Operative time as well as any intraoperative events was recorded.

### III. Results:

The combined spinal epidural technique was successful in all the 6 patients at the first attempt. No patient experienced problems during injection of the anesthetic solution or insertion of the epidural catheter.

Adequate sensory block upto T5 (range T4 – T6) achieved within 10 min in all patients. Surgical conditions were excellent in 5 and good in 1 patients, took an average of 49 min and were completed 60 min after spinal injection. The cardiovascular changes were minimal, 2 patients requiring mephentrine, although a mean of 1300 ml of crystalloid was infused Intraoperatively [Table 1].

The first indication of regression of sensory block was observed in 75 min after intrathecal injection with the median upper level decreasing by 2 segments at 90 min [Table 2]. One patients described right shoulder pain, and one patient abdominal discomfort late in the procedure, all responding to moderate doses of Fentanyl. One patient received Midazolam 2 mg for anxiety. Two patient experience nausea and vomiting. Epidural drug injection was not required in any of the patients. The procedure was successfully performed by laparoscopy under spinal anesthesia in all the patients. No signs of respiratory depression were noticed, oxygen saturation being more than 95% throughout the intraoperative period [Table 3].

Postoperatively all patients received epidural infusion of 0.125% bupivacaine with Fentanyl 2 micro gm. / ml for pain relief. One patient experienced mild nausea and some degree of shoulder pain persisted for up to 2 hours, which was mild and did not require any medication.

**Table 1: Patient characteristics and outcome indicators**

Sex: M: F (n)	4:2
Age (in years)	33.5 (22-45)
Weight (kg)	57.5 (50-65)
ASA grade (I: II) (n)	5:1
Duration of surgery (min)	49 (35-63)
Intraoperative fluid volume (ml)	1300 (1100-1500)
Surgical conditions: Excellent: Good: Poor (n)	5:1:0

Data expressed in mean, range and number of patients (n); ASA= American Society of Anesthesiologists

**Table 2: Anesthetic outcome**

Duration (min)	Dermatoma level of sensory blockade
15	T5 (T4-T6)
30	T5 (T4-T6)
60	T5 (T5-T7)
75	T6(T6-T8)
90	T7 (T7-T10)

Data expressed in mean and range

**Table 3: Perioperative side effects and medication**

Shoulder pain (n)	1
Abdominal pain (n)	1
Nausea/vomiting (n)	2
Respiratory depression RR< 10	0
Midazolam 2 mg (n)	1
Fentanyl (0:50:100 mg)	4:2:0

Data expressed as number of patients (n)

#### **IV. Discussion:**

General anesthesia is usually used to prevent aspiration and respiratory compromise seen secondary to pneumoperitoneum created in laparoscopic surgeries. But general anesthesia does not provide post-operative analgesia. The goal of anesthetic management in these patients includes management of pneumoperitoneum, achieving adequate level of sensory blockade, management of shoulder tip pain, provision of postoperative pain relief adequate to prevent deterioration of respiratory mechanics, and ambulation as early as possible. Spinal-epidural anesthesia fulfills all the above criteria and results in the quick and uneventful postoperative recovery and thus has been suggested to be a suitable alternative anesthetic method for laparoscopic surgeries.

This case series provides an evidence regarding safety and adequacy of lumbar spinal anesthesia with hyperbaric bupivacaine with postoperative epidural analgesia in patients undergoing laparoscopic appendectomy.

The epidural technique was performed at the lower thoracic level, the T10- T11 space was chosen as it was at the centre of the surgical field and was to be activated in case of unsuccessful spinal anesthesia or prolonged surgery and also for postoperative pain control. To avoid any accidental damage to the spinal cord we performed spinal anesthesia at lumbar level (L2- L3) and the patient was kept in Trendelenburg position for a few minutes to achieve adequate extent of blockade required for the surgery.

Another major concern was the consequence of paralyzing the primary expiratory muscles, those of the anterior abdominal wall. However, our study included ASA grade I and II patients without respiratory disease, and thus this effect would have little consequence; therefore, there were no concerns about respiratory status at any time. In particular no patient experienced dyspnea during abdominal insufflation perhaps because of the use of minimal tilt of the operating table and the use of low intra-abdominal gas pressure (maintained at 10 mmHg).

Under regional anesthesia the respiratory mechanism remains intact, and diaphragm the main inspiratory muscle is unaffected allowing the patient to adjust minute ventilation without any significant changes in ventilator parameters or CO<sub>2</sub> levels. In a study conducted by Ciofalo *et al.*, the ventilator measurements and arterial blood gases were maintained within normal limits at different stages during laparoscopy under epidural anesthesia.

Cardiovascular changes were also minimal even through the spinal hyperbaric bupivacaine spread to affect most of the spinal cord segments responsible for sympathetic outflow. With adequate IV fluids, the patients who all were ASA grade I and II remained conscious, thus avoiding significant central depression of circulation or respiration and the differential blocking effects of bupivacaine may have prevented any significant cardiovascular changes.

Other side effects were both infrequent and easily managed, especially shoulder tip pain, a common problem after laparoscopic surgery which occurred in 1 of our patients. Avoidance of extreme degree of head-down tilt, so that blood and other irritant fluids did not run onto the diaphragm may have been the reason for the low incidence of side effects in our patients. The continuous epidural analgesia started in the postoperative period also led to a smooth and uneventful recovery.

To conclude, laparoscopic appendectomy was successfully performed using combined spinal epidural anesthesia without any significant complications and thus can be an effective and cost-effective anesthetic technique for laparoscopic surgeries.

#### **References:**

- [1]. Hajong R, Khariang PD et al. Laparoscopic cholecystectomy under epidural anesthesia: a feasibility study. N Am J Med Sci. 2014 Nov; 6(11):566-9
- [2]. V K Pujari et al. Laparoscopic Cholecystectomy Under Spinal Anaesthesia vs. General Anaesthesia: A Prospective Randomised Study. J Clin Diagn Res. 2014 Aug; 8(8):NC01-4
- [3]. Vretzakis G et al. Regional anesthesia for laparoscopic surgery: a narrative review. J Anesth. 2014 Jun; 28(3):429-46
- [4]. Luchette FA. Commentary on "Spinal versus general anesthesia for day-case laparoscopic cholecystectomy: a prospective randomized study". J Laparosc Adv Surg Tech A. 2012 Jul-Aug; 22(6):556
- [5]. Chowbey PK et al. Extraperitoneal endoscopic groin hernia repair under epidural anesthesia. Surg Laparosc Endosc Percutan Tech 2003; 13:185-90.

- [6]. Morera Ocon FJ et al. Feasibility of spinal anesthesia in laparoscopic ventral hernia repair: is it worth it? *Am J Surg.* 2009 Aug; 198(2):299-300
- [7]. Bessa SS et al. Spinal versus general anesthesia for day-case laparoscopic cholecystectomy: a prospective randomized study. *J Laparoendosc Adv Surg Tech A.* 2012 Jul-Aug; 22(6):550-5
- [8]. Ciofolo MJ et al. Ventilatory effects of laparoscopy under epidural anesthesia. *Anesth Analg* 1990;70:357-61.
- [9]. Sun P et al. Comments on "Laparoscopic cholecystectomy under spinal versus general anesthesia: a prospective, randomized study"--can you really have the conclusion? *J Laparoendosc Adv Surg Tech A.* 2011 Apr; 21(3):259
- [10]. Imbelloni LE et al. General anesthesia versus spinal anesthesia for laparoscopic cholecystectomy. *Rev Bras Anesthesiol.* 2010 May-Jun; 60(3):217-27
- [11]. Tzouvaras G et al. Spinal vs general anesthesia for laparoscopic cholecystectomy: interim analysis of a controlled randomized trial. *Arch Surg.* 2008 May; 143(5):497-501
- [12]. Mehta PJ et al. Comparative analysis of spinal versus general anesthesia for laparoscopic cholecystectomy: A controlled, prospective, randomized trial. *Anesth Essays Res.* 2010 Jul-Dec; 4(2):91-5.