Comparative Study between Thoracic Epidural Anaesthesia and General Anaesthesia in Open Cholecystectomy

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Abstract

Objective: *To compare the quality of anaesthesia heamodynamic stability, postoperative pain relief and vomiting and the length of hospital stay in patients undergoing open cholecystectomy under general anaesthesia versus those receiving thoracic epidural anaesthesia.*

Study Design: *Quasi experimental study.*

Place and Duration of Study*-Agartala medical college and GBP hospital.Study duration july1016 to june 2017.*

Methodology*: One hundred* ***of*** *American Society of Anaesthesiology (ASA) physical status (PS) I and II patients of either gender undergoing un-complicated open cholecystectomy were randomly divided into two groups, group 1 (n=50) received general anaesthesia (GA) and group 2 (n=50) received thoracic epidural anaesthesia (EA). Patients of both the groups were assessed for quality of anaesthesia, postoperative pain, vomiting and length of hospital stay. Chi-square test was applied to compare the two groups and obtain the p-value. P-value of less than 0.05 was considered significant.*

Results: *Quality of anaesthesia in both group are good. Heamodynamic sability was better maintain with epidural group****.*** *Thirty five patients of GA group did not require additional analgesics for postoperative pain relief; however, injection paracetamol 15mg/kg had to be administered to 15 patients (30%) for pain relief in the postoperative period. Two patients (4%) in the EA group required additional analgesic during that period. Eleven patients (22%) in the GA group had post-operative vomiting. In the EA group only 1 patient (2%) had postoperative vomiting. Patients in EA group had better post-operative pain relief (p = 0.001) and remained free from vomiting than the GA group (p = 0.003). Thirty five patients (70%) of the GA group and 35 patients (70%) in the EA group were discharged within 36 hours postoperatively (p = 0.896).*

Conclusion: *The use of intra-operative epidural anaesthesia combined with postoperative epidural analgesia was found to be associated with better ynmic stability, reduction in the postoperative pain and vomiting in patients undergoing open cholecystectomy.*

Keywords*:* *Epidural anaesthesia, epidural anaesthesia, PONV, heamodynamic data, open cholecystectomy.*

I. INTRODUCTION

Open cholecystectomy still remains a more frequently performed procedure in the developing countries, One of the major side effects of open cholecystectomy is substantial impairment of pulmonary function after a large sub-costal upper abdominal incision. Marked diaphragmatic dysfunction occurs postoperatively, caused by both reflex diaphragmatic changes and incisional pain. Vital capacity and functional residual capacity (FRC) may be reduced by 20-40% of pre-operative values, and they may not return to normal until 2-3 days after surgery.[1] General anaesthesia (GA) is almost always administered for this procedure, however, it has its own complications especially in patients with pulmonary disease. If a patient is already suffering from moderate to severe chronic pulmonary disease, procedures like open cholecystectomy can become a major undertaking as its incisional pain will significantly increase the chances of exacerbating the lung disease due to its adverse effects on pulmonary function, which may result in requirement of postoperative ventilation after general anaesthesia.[3] Postoperative pain relief in such cases assumes paramount importance.[4] There is also increased incidence of nausea and vomiting following cholecystectomy augmented by GA, which requires administration of postoperative anti-emetics. These factors can in turn lead to a prolonged hospital stay and hence affect the cost of hospital stay.[5] Thoracic epidural anaesthesia was not usually preferred technique of anaesthesia for this particular procedure until recent past, but slowly with practice and better understanding its efficacy in providing adequate operating conditions with better heamodynamic

stability and extension of its benefits in early postoperative procedure (like postoperative analgesia resulting in early mobilization, hence decreasing cost of hospital stay) are being increasingly realized by clinical anaesthetists. This study was conducted to determine if thoracic epidural can be effective enough to replace GA for open cholecystectomy particularly in patients where GA can become cumbersome.

II. METHODOLOGY

The study was conducted in the Agartala medical college an GBP hospitalCombined, after approval from the Hospital Ethics Committee from july 2016 to june 2017. All patients who were planned for cholecystectomy were selected during the study period. Patients were visited in the surgical ward, one day before surgery, assessed for any co-morbid conditions and were classified according to the American Society of Anaesthesiology (ASA) physical status (PS) classification. Those falling in ASA (PS) - I and II, either male or female and having BMI of less than 30, agreeing to participate in the study after written informed consent were enrolled. Patients having Diabetes, hypertension, pulmonary, hepatic or renal disease were excluded from the study. The willing participants were assigned randomly to group 1 (GA) and group 2 (EA).

The patients of GA group were passed intravenous cannula after arrival in operation room (OR). All patients then received 8 mg of injection Ondansetron and inj pantoprazole 40 mg. GA was administered with 10 mg Nalbuphine followed by 2 mg/kg Propofol and 0.5 mg/kg Atracurium for induction and intubation respectively. After intubation, anaesthesia was maintained with 60% Nitrous oxide, 40% Oxygen and .6 -1% sevoflurane. Injection Atracurium 1/5th of induction dose was repeated every 25 minutes to maintain muscle relaxation. Patients were reversed with injection. Neostigmine 0.04 mg/kg and 0.05 mg/kg Glycopyrolate were administered after completion of the surgery. Patients were extubated and shifted to postoperative ward. In the ward, patients were given Nalbuphine 5 mg every 4 hourly and were observed for complaints of pain and vomiting. Patients complaining of pain were assessed on visual analogue scale and those having a score of 4 or more were given rescue analgesic in the form of injection Ketorolac 30 mg slow intravenous infusion to a maximum of 3 doses in 24 hours with an interval of at least 6 hours. Patients who had vomiting were given injection Ondansetron 4 mg slow intra-venously stat on symptoms (SOS). Patients were assessed for discharge from hospital after 24 hours on the basis of symptoms of pain, vomiting, ability to micturate and level of ambulation. Those not discharged were then assessed every 6 hourly.

The patients in EA group were also passed intravenous cannula after arrival in OR. All patients received 8 mg of Ondansetron followed by injection pantoprazole 40 mg. They were then pre-loaded with 10 ml/kg of Hartman's solution. Epidural anaesthesia was administered either at T7 – T8 level in sitting position and epidural catheter was left 3-4 cm in the epidural space. Patients were then placed in supine position. After test dose of (lignocaine2% and adrenalin) 3 ml, Injection Levo-bupivacaine 0.5% approximately 15 ml (1-1.5 ml per segment to be blocked) with 10 mg nulbhuphine was administered in epidural space. Anaesthesia was confirmed after 15 min of administration of the local anaesthetic and a minimum of T4 level was attained. The patients who either had a patchy block or in which T4 level could not be attained were excluded from the study. Seven ml of .5% S- Bupivacaine was administered 1 hour after the start of the surgery.

After surgery, patients were shifted to postoperative ward while epidural catheter still . Patients were given Ropivacaine 0.2% 7 ml every 4 hours in supine position after a bolus of 250 ml of Hartman's solution. They were also assessed for pain and vomiting. Those complaining of pain were given rescue analgesia on the same protocol as in the first group. Similarly, those with vomiting were given Ondansetron 4 mg slow intravenously. Discharge from hospital was on same criteria as in GA group.
All the peri- and postoperative data collected was entered on pre-formatted data collection forms along with the demographic data of the patients. Patients of both the groups were assessed for quality of anaesthesia including heamodynamic data, occurrence of post-operative vomiting (POV), experience of postoperative pain and their length of hospital stay (LOS). Collected data included all these variables and was then subjected to statistical analysis.

All the data collected was fed into Statistical Package for Social Sciences (SPSS version 17). Age was compared by using the t-test. Gender and length of hospital stay were compared by using the chi-square test. Postoperative pain and vomiting were assessed by using the Fisher's exact test. P-value of < 0.05 was considered as significant.

III. RESULTS

A total of 112 patients were included in the study but 12 patients had to be excluded from the study as either necessary dermatomal level could not

be achieved or patients had a delayed hospital stay due to a surgical reason. Fifty patients were included in GA group and fifty patients constituted EA group. The mean age of patients in GA group was 41.1 ± 6.34 years and 40.64 ± 7.29 years in the EA group. In the GA group, 13 were males (26%) and 37 were females (74%). In the EA group, 14 were males (28%) and 36 were females (72%).In GA group heamodynamic data (SBP,DBP,HR,) are fluctuating so much throughout the perioperative period. In EA group heamodyamic data almost stable during the period. (Shown by graphical presentation.)

In case of GA group, 35 patients remained pain-free in the postoperative period while 15 patients (30%) had to be given injection paracetamol 15 mg/kg for pain relief. In the case of EA group, only 2 patients (4%) complained of pain and had to be given rescue analgesic in the form of inj.Ropivacaine 0.2%, 7ml 6 hrly; however, the rest remained pain-free (Table I). The difference in this group was significant, as the EA group showed less use of rescue analgesia ($p < 0.001$).

As to the occurrence of postoperative vomiting, 11 patients (22%) in GA group had vomiting, whereas only one patient (2%) in the EA group had vomiting **(Table I).** The difference was yet again significant ($p = 0.003$).

In terms of the length of hospital stay, there was no significant difference between the groups ($p = 0.896$).

(Table I).Chart No-1- Heamodynamic Data Changes In Ga Group.

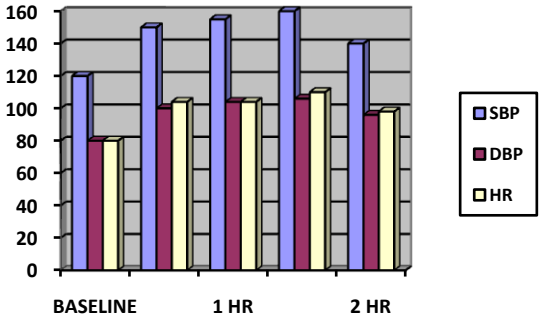

Chart No-2 –Heamodynamic Data Changes In Ea Group.

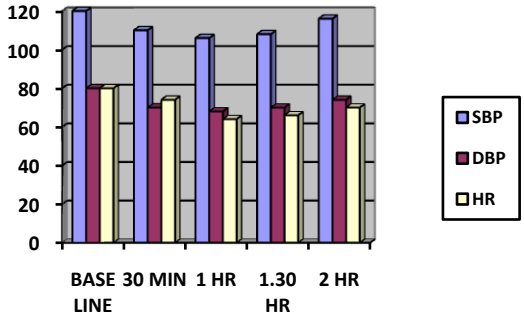

Table I: Table Showing Number of Patients in Both Groups in Terms of Postoperative Pain, Postoperative Vomiting and Length of Hospital Stay Along with Their P-Values.

	GA group	EA group	p-value
Postoperative pain			
Remained pain-free		48	< 0.001
Required rescue medication	35 15	 2	
Postoperative vomiting			
Remained vomiting-free	39	49	
Required antiemetic	11	1	0.003
Length of hospital stay			
Less than 36 hours	35	35	
More than 36 hours	15	15	0.896

IV. DISCUSSION

GA is usually employed for open cholecystectomy as it provides adequate surgical relaxation for the surgery and usually more acceptable to the surgical colleagues by convention. However, it can lead to a number of complications especially if the patient is suffering from any co-morbid condition. Tracheal intubation and laryngoscopy stimulate sympathetic nervous system resulting increase in HR, BP which may cause arrthythmia, and ishcaemia, may trigger life threatening spasms in patients of bronchial asthma. GA may result in need of postoperative ventilation considerably increasing LOS hence the cost of hospital stay. Inadequate post-operative pain relief after GA can lead to abdominal muscle splinting and basal atelectasis complicating any concurrent lung disease while on the other hand it also delays out of bed mobilization, thereby resulting in prolonged postoperative ileus which can cause POV. POV is a significant cause of patient distress requiring treatment and can result in prolonged LOS and adversely affect the economy of the surgical procedure.

Many retrospective, prospective, and meta-analysis studies have demonstrated an improvement in surgical outcome of EA through beneficial effects on peri-operative pulmonary function, blunting the surgical stress response and improved analgesia.

In particular, significant reduction in perioperative cardiac morbidity (~30%), pulmonary infections (~40%), pulmonary embolism (~50%), ileus (~2 days), acute renal failure (~30%), and blood loss (~30%) as well as beneficial effects on immune system, cognition and prevention of peri and postoperative stress have been widely highlighted in the review of the literature carried out by us.[5-14] Despite all these above mentioned advantages, regional anaesthesia in abdominal surgeries, especially upper abdominal surgeries, is usually not preferred by most of the surgical colleagues because first they are not accustomed to operate under this type of anaesthesia and second because of the delay associated with institution of this technique, hence an aspiring anaesthetist fails to establish these techniques into his/her practice as routine.[15]

Part of the problem lies with the anaesthetist, because physicians who desire to add regional anaesthesia techniques to their own practice are most successful if they are fundamentally truly outstanding physicians and, as a result, excellent peri-operative physicians. They must be able to understand patient medical problems, surgeon's operative requirements, and regional anaesthesia techniques, as well as recovery pattern, nursing requirements, rehabilitation and potential complications from the surgical procedure performed.[16] Only if all of these are incorporated into decisions about regional anaesthesia will the patient, surgeon, anaesthesiologist, and nursing staff be co-advocates of the proposed new technique. This technique is successfully incorporated in the authors routine general surgical practice as well and it is usually demanded by the surgical colleague if an option. The perioperative period should be designed so that regional anaesthesia does not delay or slow down a surgical day. Surgical delay is one of the most important items to avoid if one desires to successfully add regional anaesthetic techniques to practice.

This study was directed to find out if thoracic EA can be effective enough to provide good surgical conditions, heamodynamic stability and better pain relief in the post-operative period, absence or reduced incidence of vomiting and decreased hospital stay after surgery. These factors can be beneficial in preventing complications like Deep Vein Thrombosis (DVT) and pulmonary atelectasis. Furthermore, this can help limit the use of opoids, NSAIDS or anti-emetics in the post-operative period. Studies of high risk surgical patients randomized to EA plus GA or EA alone have demonstrated fewer cardiac complications than in patients provided GA.[7,17] These studies suggest that there is approximately a 4-fold reduction in the incidences of postoperative congestive heart failure, myocardial infarction, and death in patients treated with epidural local anaesthetics compared with those treated with balanced general anaesthetics.[18] The study proved that not only patients who were given EA mobilized early due to better postoperative pain relief but also they experienced less vomiting, providing greater patient satisfaction. Nevertheless, in spite of these favourable results no substantial difference was found among groups in the terms of LOS. Still, epidural anaesthesia/ analgesia results in improved postoperative mortality and decreased cost of care during the hospital stay of the patients.[15,19-23] Although this study has proven otherwise, retrospective studies have concluded that effective epidural analgesia does affect length of stay.[15] A large retrospective study of 462 consecutive cancer patients undergoing surgery reported that both ICU days (1.3 days versus 2.8 days, $p < 0.05$) and hospital length of stay (11 days versus 17 days, $P < 0.05$) were decreased in patients treated with perioperative epidural anaesthesia/analgesia compared with those treated with general anaesthesia/intravenous (patient control anaesthesia).[23]

No other study could be found in literature which has studied the effects of GA and EA on patients undergoing open cholecystectomy. Only one study could be found which has compared both forms of anaesthesia on patients undergoing laparoscopic cholecystectomy and having restrictive lung disease and found EA more favourable.[24] In the postoperative period epidural top ups gave superior pain relief than the opoids or NSAIDs. This leads to a less use of opoids and thus also prevented their potential side effects like nausea, vomiting and pruritis. Vomiting was also well controlled due to early out of bed mobilization limiting the need of anti-emetic. However, in terms of the LOS, no significant difference could be detected.

The overriding benefit of regional anaesthesia technique is that they do not need to end as the patient leaves the operating room at the end of the intra-operative period and can be extended into post-operative period to provide effective and economical pain relief. In many cases, the surgical outcome of the patient can be improved by implementing thoracic epidural anaesthesia/analgesia in perioperative period and then extending it to the postoperative period for 48 to 72 hours. The combination of epidural opoids and local anaesthetics provides superior analgesia than when these drugs are

used separately. The combination delivers superior analgesia on ambulation with added advantage of reduced toxicity than either class of drug alone. The epidural anaesthesia and analgesia reduces morbidity due to thrombotic complications in complex vascular operations. A major advantage of this technique is shortened duration of postoperative ileus after abdominal operations reducing the risk of POV, decreasing length of hospital stay and increased patient gratification.[25.]

V. CONCLUSION

Epidural anaesthesia is reasonabaly safe and more economical option for the patients undergoing upper abdiminal surgery like cholecystectomy. It provided good surgical condition, better heamodynamic stability throughout perioperative period, provide best postoperative analgesia, without any compline of PONV. Its help in early ambulation, without hampering lung and GIT functions with increase patients satisfaction compared to GA.

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ACKNOWLEDGEMENT

As a principal author of this study, I Dr.Tushar H. Majumder very greatful to hospital ethical committee, all patients who participate in my study, All my teachers specialy Dr. Biswajit sutradhar sir ,Asst.Prof, Dr.H.Shanti singh sir Prof. and HOD, all my staffs for their help guidance.