EPIDURAL ANAESTHESIA;
COMPARISON AS AN ALTERNATIVE TO GENERAL ANAESTHESIA IN OPEN CHOLECYSTECTOMY

ORIGINAL
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ABSTRACT… Objective: To compare the, post op analgesia, vomiting, shivering, length of hospital stay, peri-operative haemodynamic changes and recovery time in patient under going open cholecystectomy under general anaesthesia versus those receiving epidural anaesthesia. **Study design:** Quasi experimental study. **Place and duration of study:** Combined Military Hospital Rawalpindi from 15 October 2007 to 15 April 2008. **Methodology:** American Society of Anaesthesiology (ASA) physical status (PS) I and II patient of either gender undergoing un-complicated open cholecystectomy were randomly divided into two groups, group A (n=30) received general anaesthesia (GA) and group B (n=29) received thoracic epidural anaesthesia (EA). Patients of both the groups were assessed for peri-operative haemodynamic changes, recovery time, post op analgesia, vomiting and length of hospital stay. Chi-square test was applied to compare the two groups and obtain P-value. P-value of less than 0.05 was considered significant. **Results:** 9 out of 30 patients (30%) of group "A" (general anaesthesia) and 4 out of 29 patients (13.79%) in group "B" (epidural anaesthesia) had vomiting. Shivering was seen in 3 out of 30 (10%) in group "A" (general anaesthesia) and 1 out of 29 (3.44%) patient in group "B" (epidural anaesthesia). Urinary retention was seen in 1 out of 30 (3.33%) in group "A" (general anaesthesia) and 8 out of 29 (27.5%) in group "B" (epidural anaesthesia). Urinary retention was relieved by psychotherapy. None of the patient required catheterization. Post operative recovery from surgery was determined by gastrointestinal motility (passage of flatus and start of oral sips). In group "A" (general anaesthesia) 6 patients (20%) started oral sips in first post operative day, 16 patients (53.33%) on second post operative day, 8 patients (26.66%) in third post operative day. In the group "B" (epidural anaesthesia) 13 patients (44.8%) started oral sips on first post operative day, 15 (51.72%) on second post operative day and one patient (3.44%) on third post operative day. Regarding the length of hospital stay 17 patient (56.66%) of group "A" (general anaesthesia) were discharge by third post operative day and 22 patient (75.77) were discharge by third post operative day in group "B" (epidural anaesthesia). **Conclusions:** The use of intra-operative epidural anaesthesia combined with postoperative epidural analgesia was found to be associated with reduction in the post operative pain and vomiting in patients under going open cholecystectomy.

Key words: Thoracic epidural anesthesia, Analgesia, Fentanyl, Hospital Stay.

INTRODUCTION

Open cholecystectomy still remains a more frequently performed procedure in the developing countries, mostly in far flung areas due to non-availability of the laproscopic equipment as well as the lack of trained hands. 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 do not return to normal until 2-3 days after surgery. The mini incision of laproscopic cholecystectomy result in far less pulmonary and diaphragmatic loss of function, as well as less ileus. 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 chance of exacerbating the lung disease due to adverse effects on pulmonary function, which may result in requirement of postoperative ventilation after general anaesthesia. Postoperative pain relief in such cases assumes paramount importance. There is also increased incidence of nausea and vomiting following cholecystectomy augmented by GA, which requires administration of post operative anti-emetics. These factors can in turn lead to a prolonged hospital stay and hence affect the cost of hospital stay. 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 and extension of its benefits in early postoperative period (like postoperative analgesia resulting in early mobilization, hence decreasing cost of hospital stay) are being increasingly realized by clinical anaesthetists. The study was conducted to compare the epidural anaesthesia as an alternative to general anaesthesia in open cholecystectomy with reference to:
perioperative haemodynamic changes, recovery time (return of bowel movements and start of oral sips), side effects, postop analgesia and hospital stay.

MATERIAL AND METHODS

This study was conducted in combined military hospital Rawalpindi from 15th October 2007 to 15th April 2008. Study was designed to compare the epidural anaesthesia and general anaesthesia for open cholecystectomy after approval from hospital ethics committee.

- Sixty patients under going elective open cholecystectomy were visited in surgical ward, one day before surgery, assessed for any comorbid conditions and were classified according to (ASA) physical status classification. Those falling in ASA I and II, either male or female, age between 25-40 years participate in study, after obtaining informed written consent, were enrolled. Patients having diabetes, hypertension, pulmonary, hepatic or renal disease were excluded from study. The participant was assigned randomly to group A (general anaesthesia) and group B (epidural anaesthesia). All patients were advised not to take any thing orally after midnight and were explained about numerical rating scale for pain relief in the pre-operative visit.

METHODOLOGY

Patient were brought to OT at 0730 hrs and after identification of the selected patient, NPO was confirmed. Monitors were applied; intravenous line was maintained with inj ringer solution. Baseline heart rate, blood pressure and oxygen saturation was recorded. Standard anesthetic techniques were used for the two groups. Both the groups received inj midazolam 0.05mg/kg body weight intravenously as pre medication within 15 – 20 min before the induction of anesthesia. In the general anaesthesia group, inj nalbuphine 0.07 mg/kg body weight given and anaesthesia was induced with inj Propofol 2mg/Kg body weight, a dose sufficient to obtund the eyelash reflux. Orotracheal intubation was facilitated by inj Atracurium 0.5mg/kg body weight intravenously. Anesthesia was maintained with 40%, oxygen 60% nitrous oxide and Isoflorane 1%- 1.2% .Inj Atracurium 1/5th of intubating dose was repeated after every 25 minutes to maintain muscle relaxation. Intermittent positive pressure ventilation was maintained through out the procedure. At the end of the surgery, the neuromuscular blockade was reversed with inj neostigmine 0.04mg/kg body weight and inj atropine 0.015mg/kg body weight I.V.

Patient in the epidural group were positioned in the lateral decubitus and whole of the back draped observing strict aseptic measures, local anaesthetic infiltrated at the site of epidural injection and Tuohy needle G16 introduced through T9-10 intervertebral space. Epidural space identified with loss of resistance technique. Test dose of local anaesthetic (2ml lignocaine) given and patient was monitored for 3 minutes for any inadvertent spinal block, intra arterial injection, haemodynamic changes or any allergic reaction. Then 20ml of local anaesthetic (10ml lignocaine with adrenaline and 10 ml bupivacaine) given. An epidural catheter was threaded 5-6 cm in the epidural space (for top ups in case surgery is prolonged and for post operative analgesia). The patient was then positioned supine and oxygen inhalation 3-4 liter / min started through facemask. Surgery was allowed only after the segmental analgesia was confirmed by pinprick method. Start of surgery was taken as the surgeon gave incision while end of surgery was taken when last stitch was given and dressing done.

Both groups received a loading dose of ringer solution 10 ml/Kg body weight over the first 10 minutes before the induction of anesthesia. Otherwise the Anesthetist, based on clinical criteria, determined fluid input during the study period. Variables were recorded before the induction of anesthesia and this was taken as zero time.

Surgery started in the two groups within 10-20 minutes of induction. Measurements were then recorded every 10 minutes interval from time zero throughout the surgery. Results of haemodynamic changes were presented up to 90 minutes. Surgery period did not last more than 90 minutes for all patients. Postoperatively patients were closely monitored in high care recovery room.

In the GA group patient received continuous infusion of inj nalbuphine I.V. at 0.15µg/kg/ hour to provide postoperative analgesia. Patients of epidural group received inj bupivacaine 0.125% (0.1-0.2mg/kg/hour) continuous infusion through the epidural catheter. A numerical rating scale with anchor words was used (worst pain imaginable 100 to no pain 0) and the level of analgesia was recorded one hourly for next 12 hours.

Recovery (functional recovery) from surgery was determined by the return of gastrointestinal motility (passage of flatus and start of oral sips), was also recorded. During the hospital stay, clinically apparent complications /side effects (urinary retention, sore throat, vomiting, shivering) were observed and recorded. In the end, period of hospital stay (from the day of operation to discharge from the hospital) was also recorded.

All results were expressed as mean ± SD. Statistical analysis was performed using a statistical soft ware package SPSS version 10 and analyzed by computer. Chi square test of significance was applied to evaluate qualitative data. The quantitative data was tested by paired "t" test. One-way analysis of variance (ANOVA) used for inter group and intra group change. in heart rate, systolic blood pressure, diastolic blood pressure and peripheral saturation of oxygen after performing block for baseline. Sex, ASA physical status and side effects were tested by two ways Chi square test. Age, weight and duration of surgery were tested by "t" test

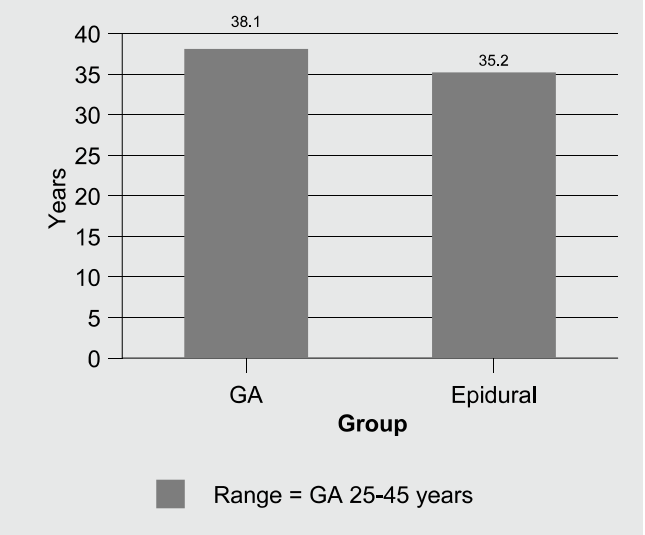
RESULTS

Although total of 60 patients were randomly allocated in to two groups designated as group A (patients given general anesthesia) and group B (patients given epidural anaesthesia). One patient in the group B was excluded from the study due to conversion of unsuccessful epidural anesthesia to general anesthesia. Therefore 59 patients comprised study population and they were included in the analysis.

Both groups were comparable in terms of age, weight, sex, ASA physical status and duration of surgery. Chi square does not show any significant difference in both groups, with respect to sex and ASA physical status. Similarly "t" test shows non significant difference in terms of age, weight and duration of surgery.

Regarding age, the two groups age range from 25-45 years. In the group A, age ranges from 25-45 years (Mean±SEM 38.10±1.26) and in the group B, it ranges from 23-45 years (Mean±SEM 35.20±1.33) (Fig.1).

Fig-1. Age (mean ± SEM)



Regarding weight, the average weight in GA group was 57.5 kg while in the epidural group it was 56.53 kg (Fig.2). In the GA group, male to female ratio was 8 males and 22 females (1:2.75), while in the epidural group, the ratio was 9 males, 20 females (1:2.22) (Fig.8). Regarding ASA status again, there was not much difference in the two groups. In the GA group 23 patients were ASA I and 7 patients were ASA II while in the epidural group 20 patients were ASA I and 9 patients of ASA II (Fig.4).

We divided the duration of surgery in three groups in both groups Group I patients in which surgery ended within 50 minutes, in group II, within 50-70 minutes and group III in which surgery ended within 70-90 minutes. There was

Fig-2. Weight (mean ± SEM)

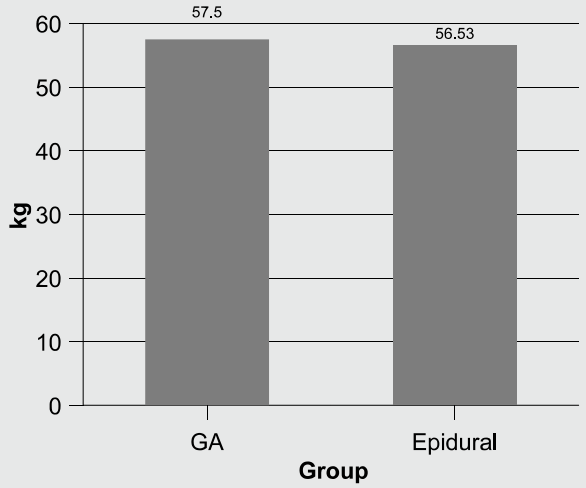


Fig-3. Sex distribution (both groups)

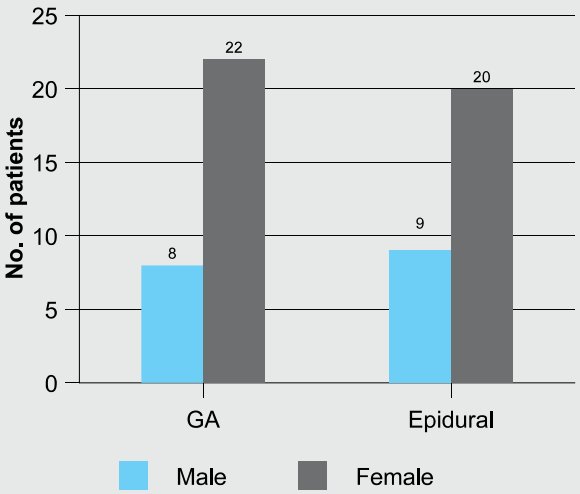


Fig-4. ASA status

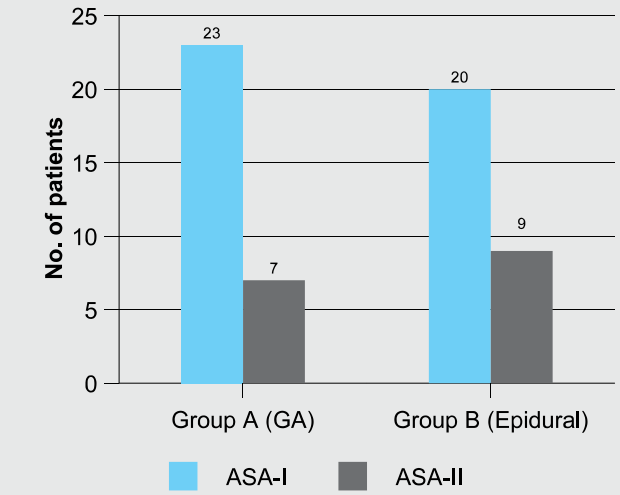
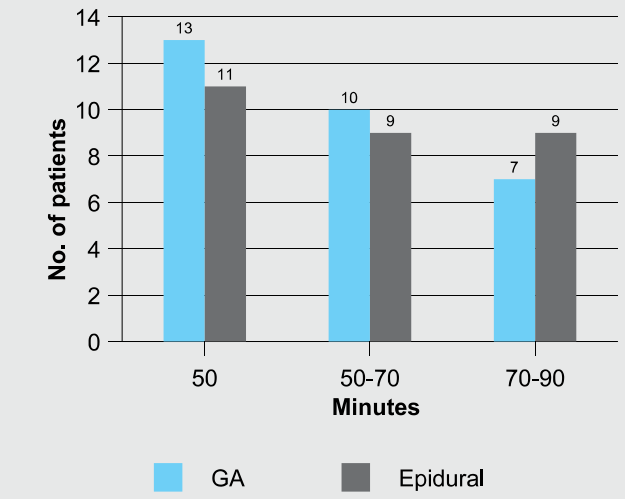


Fig-5. Duration of operation



not much difference in the two groups regarding duration of surgery. Surgery ended within 50 minutes in 13 patients in GA group and 11 patients in epidural group. Surgery ended within 50-70 minutes in 10 patients in GA group and 9 patients in epidural group and surgery ended within 70-90 minutes in 7 patients in GA group and 9 patients in epidural group (Fig.5).

The pulse in the two groups at the start of the procedure was about 96 / min. In the GA group, the mean pulse remained close to 91/min with small variation throughout the procedure. In the epidural group, the pulse dropped to 84/min in the initial 40 min, which then remained close to this value during the rest of the procedure with small variation (Fig.6).

The systolic blood pressure was about 132 mmHg at the start of the procedure in the two groups. There was a small increase in the first 20 minutes of the procedure in the GA group, which remained around 125 mmHg during the rest of the procedure. In the epidural group, there was a drop of blood pressure in the initial 20 minutes to 110 mmHg which then remained close to this value (Fig.7).

Fig-6. Pulse of both groups

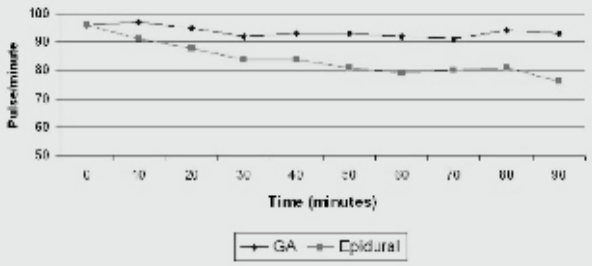


Fig-7. Systolic blood pressure of both groups

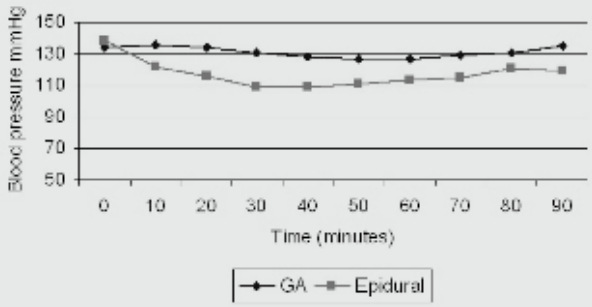


Fig-8. Diastolic blood pressure of both groups

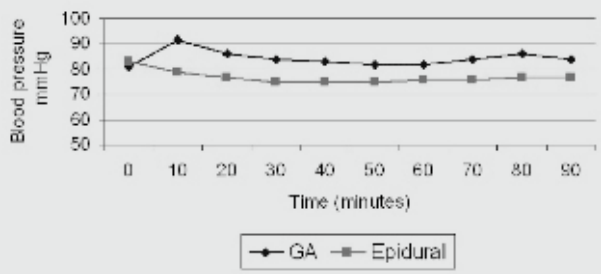
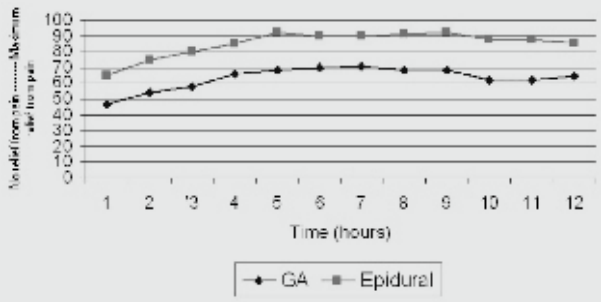


Fig-9. Analgesia of both groups



The diastolic pressure at the start of the procedure in the two groups was about 84 mmHg. In the GA group, there was a sudden increase in the initial 20 minutes to 93 mmHg, which then dropped to 83 mmHg and remained close to this value in the rest of the procedure. The mean diastolic pressure in the epidural group however dropped to 75 mmHg in the initial 30 minute and then remained close to this value in the rest of the procedure (Fig.8).

Regarding analgesia, a numerical pain score with anchor words was used (no relief from pain was taken as 0 to maximum relief from pain as 100). The pain score was about 45 in first hour as the patient fully recovered from GA and gradually improved close to 60 in next 02 hours and then close to 70 in next 4 hours. It then remained close to this value with small variations. The mean pain score in the epidural group was about 75 in first hour at the end of the procedure (surgery), which improved to 90 in next 03 hours and remained close to this value with small fluctuations (Fig.9).

Regarding complications, vomiting was seen in 9 patients in GA group and 4 patients in the epidural group, shivering in 3 patients in GA and one patient in the epidural group, urinary retention was seen in 1 patient in GA group and 8 patients in the epidural group (which was relieved by psychotherapy). No patient was required to be catheterized. 3 patients in the GA group complained sore throat, which was relieved by hot water gargles (Fig.10).

Postoperative recovery (functional recovery) from surgery was determined by the gastrointestinal motility (passage of flatus and start of oral sips). In the GA group, six patients started oral sips on the 1st post operative day, 16 started on the 2nd, and 8 on the 3rd post operative day. In the epidural group, 13 patients started oral sips on the 1st post operative day, 15 on the 2nd post operative day and 1 on the 3rd post operative day (Fig.11).

Regarding hospital stay, in the GA group, 3 patients were discharged on 2nd post operative day, 14 on the 3rd, 8 on 4th postoperative day, 4 on 5th post operative day and 1 on the 6th post operative day. In the epidural group, 6 patients were discharged on 2nd post operative day, 16 on the 3rd post operative day, 6 on the 4th and 1 on the

Fig-10. Complications

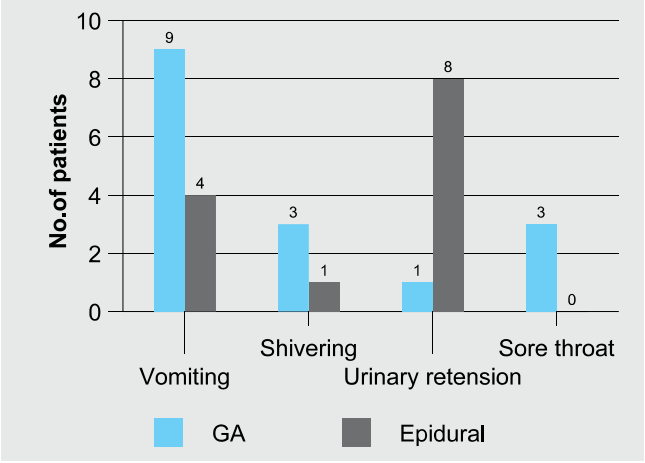
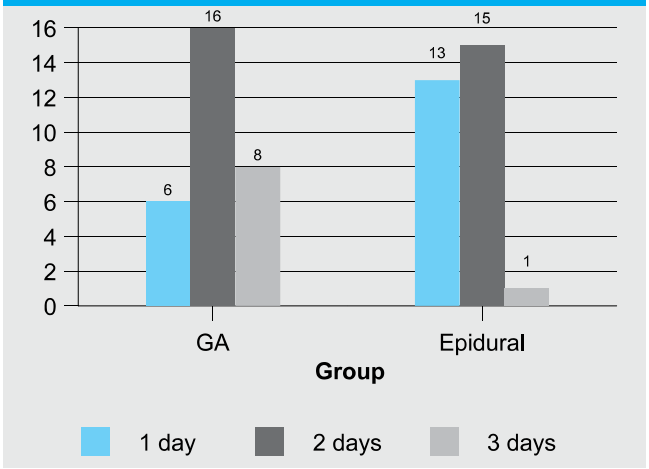
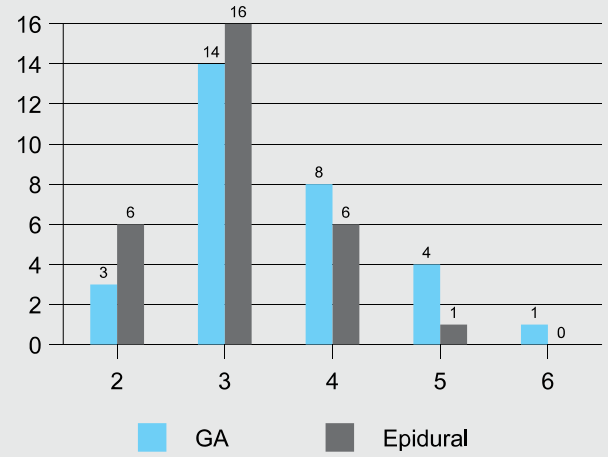


Fig-11. Oral sips (both group)



5th post operative day (Fig.12).

Fig-12. Hospital stay



DISCUSSION

Cholecystectomy is among the commonest surgical procedures in general surgery. The patients are generally middle aged or older. A proportion of these patients have comorbid conditions like chronic obstructive pulmonary disease or ischaemic heart disease, which makes general anaesthesia, a high-risk maneuver. Because of the high risks associated with the induction of anaesthesia in patients whose pulmonary and cardiac status is compromised, surgery is sometimes delayed or avoided. In such patients regional anaesthesia is a useful tool in the armamentarium of the anesthetist. Cholecystectomy under epidural anaesthesia is a safe and effective alternative procedure for high risk patients with serious cardiopulmonary or endocrine disorders developing biliary stones. Being technically difficult, the lack of expertise and awareness available in epidural anaesthesia, make general anaesthesia the only practice in these types of procedures in most of the centers in Pakistan.

This study was carried out in combined military hospital Rawalpindi to compare the epidural anaesthesia and general anaesthesia for open cholecystectomy. The aim of the study was to find out if thoracic epidural anaesthesia can be effective enough to provide better pain relief in the post operative period absence or reduced incidence of vomiting and decreased hospital stay after surgery.

The sympathetic nervous system is supplied from T1-L2. Therefore blockade at this level can block the sympathetic outflow from the level causing a decreased in the blood pressure, heart rate and cardiac output. This was studied by the Moore et al[1] in his study "thoracic epidural analgesia with bupivacaine compared to general anaesthesia. He studied that TEA produces small reductions, in cardiac output, heart rate and blood pressure. Catecholamine and cortisol secretion decreased in the thoracic epidural analgesia group than those with intravenous opioids.

Various researchers have found that metabolic response

to surgery is characterized by an increased secretion of catabolically acting hormone (cortisol, glucagon and catecholamine) where as the anabolically acting hormone (insulin, testesterone, growth hormone) mainly are inhibited. Therefore the rise in heart rate and blood pressure in the general anaesthesia group is due to release of catecholamine due to surgery and stress response of the intubation[2-5].

Bythell, Kehlet and Stevenson, in their studies confirmed that secretion of cortisol, aldosteron, renin and epinephrine nor epinephrine are all decreased in epidural/spinal anaesthesia (effect of epidural/spinal anaesthesia with local anaesthetics on endocrine and metabolic responses to surgery)[6-7].

Scott[8] and Schwieger, Gamolin and Suter[9] found that there is a reduction of blood loss about 30% during surgery in the epidural group as compared to general anaesthesia group. They concluded that the explanation for the reduced intraoperative blood loss is probably a combination of decreased mean arterial pressure, pulmonary arterial pressure, right arterial pressure and peripheral venous pressure leading to diminished intravenous oozing

The basic mechanism of the blocking effect in epidural or intrathecal local anaesthesia on the surgical stress response is inhibition of the nociceptive signal from the surgical site area to the CNS. In addition, blockade of reflexes involving efferent autonomic and somatic pathways may be effective. This is exactly the same which we found in our study. In the epidural group, there was a fall of blood pressure (both systolic and diastolic) and heart rate, while on the other hand, in the GA group initially is an increase in the heart rate and blood pressure.

Postoperative pain relief if not adequately treated may have adverse effects by enhancing the stress response. Reflex response may be initiated and adversely effect respiratory function, increased cardiac demand, increased intestinal motility and initiated skeletal muscle spasm. An improved understanding of acute pain physiology has led the use of various drugs intravenously and in the epidural space for post operative pain relief.

Pain relief by epidural opioids or clonidine and local anaesthetics seems less effective but is probably better than pain relief by systemic opioids whether given by intermittent doses or patient controlled analgesia[2,17].

Yeager[11] et al reported 53 patients who were undergoing major thoracic or vascular surgery, part of analgesia consisted of epidural opioids in patients with epidural catheter or intravenous opioids in GA group. They found a lower incidence of myocardial infarction and congestive cardiac failure in epidural group. This was attributable to inhibited stress response to better analgesia. Hurrahing et al[12], conducted a prospective study to compare the effects of epidural fentanyl, epidural lidocaine and intravenous fentanyl on intavenous and hormonal responses to surgery and postoperative analgesia requirements in upper abdominal surgery (gastrectomy). They found out that there was a drop of blood pressure and heart rate in epidural lidocaine group and a raise in heart rate in intravenous fentanyl group. Analgesia used during the first 48 hours was less in epidural fentanyl group followed by epidural lidocaine and intravenous fentanyl. In our study we also observed that the analgesia was significantly better in the epidural group than in the GA group in which the intravenous opioid nalbuphine was used in the first 12 hour of surgery.

Various studies have also confirmed that use of regional anaesthesia also decreases the complication during the surgery and postoperatively. Seven controled studies in lower body procedure have shown postoperative thromboembolic complication are decreased by approximately 50% in patients receiving regional anaesthesia compared with general anaesthesia without thromboembolic prophylaxis. It is because of an increased blood flow in the lower extremity,[13-15] decreased thrombocyte aggregate[2,16] and coagulation and increased fibnolysis[2,16] in the cases where epidural local anaesthetis were used.

Thirteen controlled studies have compared postoperative mental dysfunction in patients receiving regional or GA[8,9]. They found out that the choice of anaesthesia and the altered endocrine milieu do not appear to have a major effect on the postoperative

mental changes. However a small trend exists toward a favourable effect of regional anaesthesia.

Postoperative pulmonary infection complications may be related to preoperative and postoperative lung function. Schulze, Moller[17] et al have shown the anaesthesia and surgery related factors contributing to this deterioration include pain, bronchospasm, muscle paralysis, microthromboembolism, blood transfusion, site of surgical incision, GA and distorted sleep pattern. Several studies have reported the incidence of postoperative pulmonary atelectasis to be reduced with regional anaesthesia[8,9]. Nevertheless, the available data are more positive toward regional anaesthesia compared with GA techniques to reduce postoperative pulmonary complications.

Despite the evidence from physiologic assessments that regional anaesthesia may be advantageous in surgical patients, very few well designed sufficiently large studies have investigated the effect of regional versus GA in cardiac complications. One study involved a very high risk group of 45 patients within 3 months of MI who underwent major vascular abdominal surgery. Epidural anaesthesia resulted in improved intraoperative stability and also significantly reduced reinforcing rate compared with GA (1 of 23 versus 5 of 22 p >0.2)[18]. Postoperative death from MI occurred in 1 of 23 patients in the regional A group and 3 of 22 patients in the GA group.

Another study compared combined GA and epidural analgesia (intraoperative LA, postoperative opioids) versus GA and systemic opioids in high risk patients undergoing thoracic abdominal or vascular procedures. The incidence of postoperative cardiovascular failure was significantly reduced by the epidural regimen[19]. Furthermore cumulative data from studies showed that a preoperative electrocardiography changes only showed an insignificantly reduced incidence of ischemic changes in the regional anaesthesia group. Despite well documented physiologic advantages, the few studies that have evaluated clinically important cardiac complications only show an insignificant trend toward a beneficial effect in patients receiving regional a versus GA. Thus it is not possible to make firm conclusions and specific indications. However the available data should serve as a stimulus for further studies on this topic. In our study we also found decreased complication in epidural group in terms of vomiting, shivering and sore throat. However urinary retention was more in the epidural than in the GA group which was resolved either by giving intravenous fluids or by psychological motivation. Since in our study only ASA I and ASA II groups were included therefore grave complication were not seen.

Postoperative gastrointestinal paralysis continues to be a clinical problem with relatively few improvements in the understanding of its pathogenesis and therapy. Although probably multifactorial, the most important factor leading to postoperative ileus is activation of sympathetic inhibitory reflexes[9,20]. Regional anaesthesia is therefore expected to have a beneficial effect on postoperative GI paralysis.

In six of seven studies[5,21,26] continuous epidural bupicaine has been demonstrated to improve postoperative gastrointestinal motility compared with postoperative pain relief with systemic opioids or epidural opioids. Therefore continuous epidural bupicaine appears to be the most effective measures to improve postoperative GI ileus[24,27-31].

However intraluminal pressure undoutably are increased by epidural analgesia causing potential risk of anastomotic dehiscence. On the other hand epidural analgesia increases colonic blood flow, which is advantageous for a GI anastomosis.

In our study we studied postoperative recovery (functional recovery) in terms of return of bowel movements (passage of flatus and start of oral sips). We observed that start of oral sips is decreased in epidural group as compare to GA groups. In GA group, 6 patients started the oral sips on 1st postoperative day, 18 on the 2nd and 6 on the 3rd postoperative day compared to 13, 15 and 1 on 1st, 2nd and 3rd postoperative day in the epidural group.

The time until the patient can ambulate after hip surgery performed with the patient under regional anaesthesia has been reported to be reduced in two of three

studies.27 However no conclusive data exist in convalescence parameters such as postoperative fatigue, muscle performance and return to work. The relatively few data available suggest that hospital stay may be reduced during lower body procedures performed with the patient under regional A. although the effect was only significant in one of six studies. In our study, the hospital stay was reduced in epidural group, however the effect is not significant enough as seen in previous studies. 75.86% patient were discharged on the 3rd postoperative in epidural group compared to 56.6 in GA group and 96.5% were discharged by 4th day in epidural group compared to 83.3% in GA group.

CONCLUSIONS

Epidural anaesthesia is a useful tool in the armamentarium of the anesthetist for patients undergoing upper abdominal surgery. It provides excellent perioperative and postoperative analgesia, hemodynamic stability, early return of bowel movements, less complications and shorter stay of the patient in the hospital. For certain types of surgery, regional anesthesia may actually reduce perioperative morbidity and mortality and, therefore, is an attractive alternative to general anesthesia. However, the anesthesiologist must be skilled, the block must work, and the postoperative caregiver must be educated in providing the care these extended blocks necessitate.

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"Wrong is wrong even if everyone is doing it.
Right is right even if only you are doing it."

Unknown