

Epidural anaesthesia and analgesia

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Abstract:

Objective

Among various methods of providing analgesia during surgery for e.g., parenteral opiates and NSAIDS, epidural anaesthesia and analgesia seem to have beneficial efficacy and less side effect profiles.

Methods

This study was conducted in 153 patients coming for operation at KMCTH between August 2003 to August 2004. Patients were divided in two groups, one group were operated under sole epidural anaesthesia and the other group received a combination of either general anaesthesia or spinal anaesthesia.

Results

39 (25.5%) patients underwent sole lumbar epidurals, 36 (23.5%) patients received a combination with spinal (CSE) and 78 (51.0%) were under Combination with general anaesthesia. The patients were interviewed among whom it was found that satisfactory analgesia was reported by 75 cases and 73 cases reported excellent analgesia. Patchy anaesthesia observed in 5 cases who underwent sole epidural anaesthesia.

Discussion & Conclusion

Patients undergoing major surgery with epidural anaesthesia and analgesia had stable cardiovascular parameters, minimal neuroendocrine response, less respiratory complications including SIRS and sepsis, lower incidence of thromboembolic events, less blood loss, reduced hospital stay and better pain control.

Periodic pain is a potent trigger of neuroendocrine system, leading to activation of stress responses and autonomic nervous system and may cause various adverse effects on organ system, some of which may be detrimental to the patient. Therefore it has been proposed that effective perioperative analgesia may improve patient outcome. There are various methods of providing analgesia but various studies have proven that epidural analgesia is superior to parenteral opiates and NSAIDS.

Trauma and pain activates neuroendocrine system, thereby causing respiratory dysfunction, cardiovascular strain, hypercoagulable state, postoperative immunosuppression and ileus. Respiratory dysfunction and cardiovascular over activity may increase morbidity and mortality in compromised patients, postoperative ileus delays oral feeding and prolongs recovery, hypercoagulable condition may increase thromboembolic events and immunosuppression may increase chances of infection and flaring up of malignant cells during onco-surgery¹.

To decrease or minimize these unwanted effects, the best option we have is to provide the patient with

epidural anaesthesia and analgesia in major cardiothoracic/abdominal and orthopaedic surgeries, if not contraindicated. Various studies done in last 30 years have proved that epidural anaesthesia and analgesia reduces these unwanted pathophysiological changes along with provides best possible pain relief as well reduce morbidity and mortality in perioperative period.

Patients and methods

A study of patients coming to Kathmandu Medical College Teaching Hospital, in the year (August 2002-August 2003) was conducted. Patients underwent major and very major surgery under sole epidural anaesthesia or combination with either general anaesthesia or spinal anaesthesia. ASA status of patients was I, II or III and total number of patients were 153.

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Following observations were made:

- Types of epidurals
- Types of surgeries
- Post operative analgesic efficacy
- Complications due to epidurals

Epidural space finding is done under local anaesthesia, with the patient in either sitting or lateral decubitus position, with loss of resistance to air or saline and hanging drop method in some cervical cases. Catheter is then placed 3-5 cm into the epidural space to get best results. Test dose of 2% lignocaine with 1:200,000 adrenaline 2.0 ml is

injected into the space after confirming no blood or CSF aspiration through the catheter. We combine light General Anaesthesia with epidural analgesia in cervical, thoracic and very major abdominal surgery and sole epidural and sometimes combined with spinal in lower abdominal and lower limb surgery.

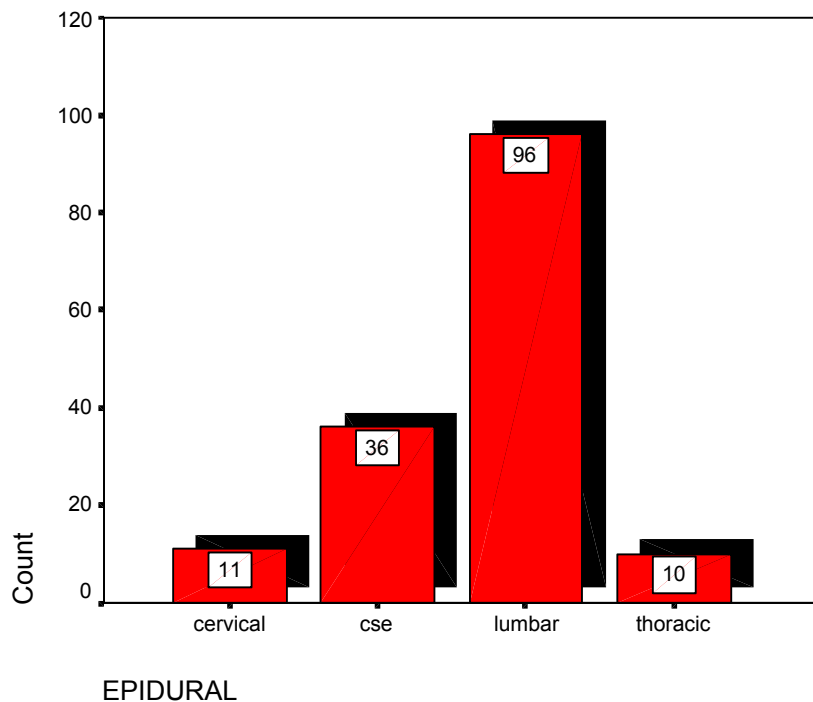


Figure no.1, bar diagram showing number/percent of epidural anaesthesia/analgesia in different vertebral levels in one year period.

Regarding the local anaesthetics and opiates, we had used 1-2% lignocaine and /or 0.25- 0.5% bupivacaine with or without pethidine for anaesthesia and 0.1% bupivacaine ± 1mg/ml pethidine for postoperative analgesia. Drug delivery was either continuous infusion of 10-20 ml/hr in lower concentration according to dermatomes to be blocked in lumbar or thoracic epidural or intermittent injection of 10-20 ml 3-4 hourly for 48 – 120 hours of post operative period. As the cervical space is comparatively narrower, we used lower volume but frequent

injection to get good analgesic effect (we inject 5-7 ml 1.5-2 hourly).

Results:

During one year period, total 153 cases were done under epidural anaesthesia, either sole or in combination. Types of epidurals according to vertebral levels and number of sole or combination epidurals are given below:

Types according to vertebral levels:

- Cervical: 11 (7.2%)
- Thoracic: 10 (6.5%)
- Lumbar: 96 (62.7%)
- CSE: 36 (23.5%)(combined spinal and epidural)

- Extended cholecystectomy: 11 (7.2%)
- Thyroidectomy: 10 (6.5%)
- Whipples surgery: 5 (3.2%)
- Total laryngectomy: 1 (0.7%)
- Miscellaneous: 14 (9.2%)

Sole or combination epidurals:

- Sole lumbar epidurals: 39 (25.5%)
- Combination with spinal (CSE): 36 (23.5%)
- Combination with general anaesthesia: 78 (51.0%)

Types of surgeries done under epidural anaesthesia:

- Orthopaedic surgery: 33 (21.6%)
- Gynaecological and obstetrics: 23 (15.0%)
- Gastric surgery: 21 (13.7%)
- Prostate surgery: 19 (12.4%)
- Colonic surgery 16 (10.5%)

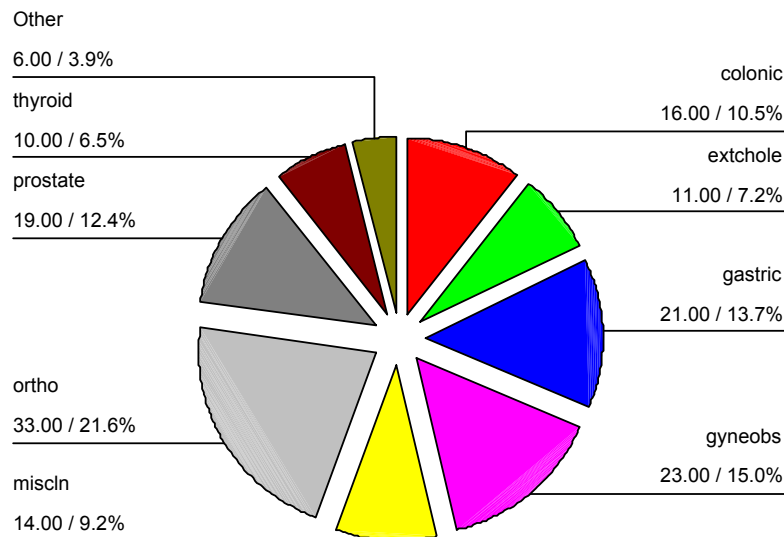


Figure no. 2, pie diagram depicting types of surgeries done under epidural anaesthesia in number and percentage.

Alternate to general anaesthesia in cardio respiratory compromised patients:

- Hysterectomy: 5
- Caesarean section: 4
- Dynamic hip surgery: 6
- Rectal prolapse and uterine procidentia:1
- Cholecystectomy with sedation:1 (not included in study)

Post operative analgesic efficacy:

We interviewed the patients with epidural analgesia in post operative period on 1st, 2nd, 3rd and 4th post operative day about the effectiveness and satisfaction about the analgesia provided. We found that satisfactory analgesia in 75 cases and excellent analgesia in 73 cases. Visual analogue scores were not used as subjective assessment of analgesia is

what patients choose and judge and their primary concern.

Complications/ failure:

There was no total failure but patchy anaesthesia in patients who underwent sole epidural anaesthesia in 5 cases and managed with supplementation of general anaesthesia.

Inadvertent dural puncture was made in 5 cases but space was changed for epidural catheter placement and there was no post dural puncture headache when followed up for 5 days after the puncture.

Discussion:

Apart from few partial failures, we didn't encounter major complications in patients with epidural anaesthesia and analgesia but more advantages with biophysiological effects and greater patient satisfaction and better outcome. Therefore, we recommend epidural or spinal analgesic supplementation on major and prolong surgery if not contraindicated otherwise.

Use of epidural anaesthesia and analgesia may provide potential benefits but as with all other procedures and medications, it has also some complications of procedure and side effects of drugs used. Therefore we tried to review the physiological changes and complications due to epidural anaesthesia and analgesia in patients with major surgery.

In cardiovascular system, because of decreased neuro-endocrine response, there is less sympathetic response and catecholamine release leading to less cardiac work load after epidural analgesia. Myocardial oxygen supply/demand is well balanced. Thoracic epidural in ischemic heart disease patient has added benefit of coronary vasodilatation, less incidence of ST-T changes, reduction in infarct sizes if ischemia occurs and less incidence of ventricular arrhythmias^{1,7,9}.

Similarly thoracic epidural analgesia has been found to be an effective treatment for the patients with MI refractory to conventional medical therapy. Post operative ischemia occurs more commonly in 2-4 days, are more severe and prolonged than that occurring during pre and Intraoperative period. Therefore aggressive therapy to control pain in that period is mandatory with monitoring of patient, for which epidural analgesia is a good alternative^{1,3,7,9}.

The effect of epidural analgesia in high risk patients has also been studied and the greatest beneficial effect of epidural anaesthesia and analgesia has been demonstrated. Yeager et al studied patients scheduled for intra thoracic, intra abdominal and major vascular surgery with epidural analgesia and parenteral opiates. They found that CHF, MI and mortality rates were significantly lesser in epidural group of patients. Like wise Tuman et al in 1991, reported significant reduction in morbidity in epidural group of high risk patients but mortality was same. Blomberg and Ricksten in 1995 studied the haemodynamic variables in animals with MI with metoprolol and epidural analgesia. They found that there is significant reduction of cardiac workload such as decrease in MAP, CO, SV and max pressure change in left ventricle but minimal reduction in SVR^{1,2,7,8,9}.

Major surgery is associated with hypercoagulable state in postoperative period and may be associated with vasoocclusive and thromboembolic events. Etiology is unknown but it has been found that stress response leading to increased coagulation factors, decreased coagulation inhibitors, increased platelet activity and impaired fibrinolysis. GA with parenteral opioids has little effect on post operative hypercoagulability but epidural analgesia may reduce increases in postoperative coagulability and thus improve outcome^{1,2,3}.

Modig et al reported a series of studies in the effects of lumbar epidural anaesthesia on patients with hip replacement surgery. When compared with patients who received GA with IM opioids, the epidural group had 2.5- 5 fold reduction in DVT, 1.5 fold decreases in calf vein thrombosis and 3 fold decreases in pulmonary embolism. Tuman et al reported that use of epidural analgesia was associated with 9 fold decrease in incidence of vascular graft occlusion. Regional anaesthesia has been found to be associated with less blood loss in lower abdominal and lower limb surgeries, especially prostate and hip joint surgeries^{1,5,6}.

Respiratory system is another important system affected by major thoracic/abdominal surgeries. Pulmonary dysfunction after upper abdominal surgery occurs because of pain, abnormal diaphragmatic function and increased abdominal and lower intercostals muscle tone, which remains for 7-14 days. Most important aspect is decrease in FRC, resulting in atelectasis and V/Q mismatch leading to hypoxemia and pulmonary complications^{1,6}.

Postoperative pulmonary dysfunction can be attenuated by use of epidural analgesia, there by

improving diaphragmatic and intercostals muscle function and limitation of episodes of postoperative hypoxemia and sequele. Various authors compared the type of analgesia and post operative pulmonary complications in patients undergoing major surgery. Pulmonary function was significantly better in 9 studies, equivalent in 6 studies and worse in one study (Anaesthesiology 1995)¹.

Post operative ileus is impairment of gastro intestinal motility that occurs after surgery. Epidural analgesia helps in early return of bowel function, increased blood flow and less use of opiates. It is possible to resume early enteral feeding, that is said to decrease stress response, less post operative sepsis and improved wound healing. Various authors studied and compared the epidural analgesia with parenteral opioids on return of bowel function after major abdominal surgeries. The bowel function is assessed by passage of flatus, faeces or transit of radio-opaque markers. Bowel function recovery was faster in 11 out of 13 studies and equal in 2 series of studies (Anaesthesiology 1995)^{1,3}.

Perioperative epidural analgesia also suppresses the stress response of trauma and the consequent metabolic and inflammatory response. The greatest suppression has been observed after epidural anaesthesia with local anesthetics followed by post operative epidural analgesia with local anesthetics^{1,2,3}.

Immunosuppression is the another unwanted effect after surgery, which may increase the chances of sepsis, wound infections and pneumonia and sequele, most important during onco-surgery is suppression of natural killer cells and increase growth of tumour cells and metastasis. Therefore epidural analgesia can minimize these effects by improving immune functions^{1,10}.

Systemically absorbed local anesthetics after epidural administration, has anti-inflammatory action which is beneficial in post-operative period. Local anesthetics inhibit G protein coupled receptor mediated inflammatory responses (thromboxane A₂ & hypophosphatidic acid) and inhibit macrophage and polymorphonuclear leucocyte action (release of oxidant radicals and lysosomal enzymes). Local anesthetics also inhibit M₁ receptor activity^{5,6}.

Epidural space finding and catheter placement has some complications as well, the most common is accidental dural puncture and post dural puncture headache. Recent large surveys encompassing 51,000 epidural catheter placements during last 3 decades

showed the dural puncture is 0.16-1.3%, subsequent development of PDPH is 3-16%. Other less frequent complications are paraesthesia and neurological injury (0.01-0.001%) but most are self limiting and did not require treatment. Epidural haematoma may occur with inadvertent epidural vein puncture and the incidence is also rare. Another pitiful condition is the failure (1-8%) of the procedure and backache in 2-10% of the cases. A recent survey of more than 18,000 epidural anesthetics performed at university teaching hospitals suggest that placement of epidural catheter at thoracic vertebral levels doesn't confer higher risk than placement at lumbar levels^{1,4,5}.

Local anesthetics and opiates used in epidural spaces may have some complications like accidental intravascular and intrathecal injections leading to dysrhythmias, CVS collapse or high spinal anaesthesia. CNS complications like headaches, dizziness and even convulsion and coma can occur. Itching, nausea and vomiting and delayed respiratory depression can occur with opiates. Complications due to motor blockade like urinary retention and orthostatic hypotension are there but these can be minimized by the use of low concentration of local anesthetics^{1,5,9}.

Conclusion

Patients undergoing major surgery with epidural anaesthesia and analgesia had stable cardiovascular parameters, minimal neuroendocrine response, less respiratory complications including SIRS and sepsis, lower incidence of thromboembolic events, less blood loss, reduced hospital stay and better pain control. These are the advantages in one side and cost and rare complications are disadvantages in other side. Although the cost effectiveness of the epidural anaesthesia has not been studied, the potential long term benefits from reduction in morbidity due to epidural analgesia may outweigh total cost.

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