

A case report of open reduction, internal fixation and plating of clavicle fracture (Allman classification Group 1) under Cervical Epidural Anaesthesia: A viable alternative to general anesthesia

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Abstract: *The technique of cervical epidural anaesthesia (CEA) was first described by Dogliotti in 1933 for upper thoracic procedures. Cervical epidural anaesthesia can be administered in surgeries of neck, upper arm and chest. It has gained popularity due to its safety, relative bloodless field, stable hemodynamic, minimal morbidity and early postoperative recovery. The technique has become popular as it avoids the potentially arrhythmogenic and myocardial depressant effects of anaesthetics and airway instrumentation during general anaesthesia (GA), specially in patients with cardio respiratory disorders. We selected this technique of CEA for open reduction and internal fixation (ORIF) of Clavicle fracture (left) in an adult patient, as the patient was unwilling for general anaesthesia, there was anticipated difficult airway (Mallampati grade- IV) For CEA, a mixture of 10ml 0.25% Bupivacaine and 1ml 50 mcg Fentanyl was administered into cervical epidural space at the level of C₇-T₁ space through 20G epidural catheter placed by 18G Tuohy needle. A top up dose of 5ml 0.25% Bupivacaine was given after 60 minutes following initial dose. The Surgery lasted for 1hour 20 minutes. The added advantage of epidural anaesthesia was that the patient was awake and comfortable, vital parameters were maintained well within normal limits during the operation without any pharmacological interventions, there was appreciably less blood loss during surgery (200ml) and postoperative pain relief was also excellent with continuous cervical epidural infusion of a mixture of 0.08% Bupivacaine and 2µg/ml Fentanyl @ 2ml.hr⁻¹.*

I. Introduction

ORIF of Clavicle fracture are conventionally performed under general anaesthesia (GA). With the rising concern for GA-related implications on cardiorespiratory, metabolic and immune status of the patient, a preference for regional anaesthetic techniques has increased worldwide. Epidural anaesthesia is a special technique in regional anaesthesia. While the earlier trials have widely focused on lumbar or thoracic epidurals, the cervical approach has been an upcoming technique since the past few years and has attracted investigators to explore its viability for various surgeries. Administration of local anaesthetic into the cervical epidural space results in anaesthesia of cervical plexus, brachial plexus and superior thoracic dermatomes. Additional advantages are lower cost, reduced intraoperative blood loss, stable cardiovascular status, reduced stress response, post-operative analgesia and early ambulation of the patient.¹ In experienced hands the sole use of CEA is well established owing to the stable cardiorespiratory status and the avoidance of airway instrumentation.^{1,2,3} The incidence of complications is quiet low. ⁴ The potential advantage of employing this technique is where GA is contraindicated, as respiratory and hemodynamic inhibition is minimal with epidural. Some studies have documented the efficacy and safety of CEA as a sole anaesthetic technique for upper extremity and thoracic wall surgeries.^{5,6} However, this technique has rarely been used for ORIF of clavicle fracture. We selected this technique of CEA for open reduction and internal fixation (ORIF) of Clavicle fracture (left) in an adult patient, as the patient was unwilling for general anaesthesia and there was anticipated difficult airway.

II. Case Report

After obtaining a written informed consent, a 30-year-old American Society of Anaesthesiologists (ASA) grade I, male patient was posted for open reduction, internal fixation and plating of left sided Clavicle fracture (Allman classification Group 1). On Pre-anaesthetic check-up (PAC), pulse rate (PR) was 86/min, blood pressure (BP) was 130/80mmHg and respiratory rate (RR) was 20/min. Systemic examination was within normal limit. Mallampati grade was IV with slight restriction of neck extension. All routine investigation results were within normal limit. He was counselled on the previous day about the merits and demerits of both general anaesthesia and regional anaesthesia techniques and gave consent for regional anaesthesia. The patient was kept nil orally after 12 midnight prior to surgery. He was given tablet Alprazolam 0.5 mg half an hour before dinner and 6am on the day of surgery to allay anxiety. On arrival to the operation theatre, an intravenous line was

secured with 18G cannula and Lactated Ringer's solution was started. All anaesthetic equipment were checked and monitors attached to the patient. Electrocardiogram (ECG), Oxygen Saturation (SpO₂), Noninvasive Blood Pressure (NIBP), and Heart Rate (HR) were monitored continuously throughout the intraoperative period. The patient was given Inj. Ondansetron 4mg IV and Inj. Midazolam 1mg IV and was properly briefed prior to the procedure. Under all aseptic precautions the neck was prepared and draped in sitting position. CEA was performed with the patient in a sitting position and neck flexed to make the cervical vertebrae prominent. The C7-T1 space was identified and infiltrated with 3 ml of 2% lignocaine to provide local anaesthesia. A Tuohy epidural needle of 18G (Perifix[®] 400 Filter set, B-Braun Medical (I) Pvt. Ltd) was introduced in C7-T1 space. Cervical epidural space was identified (at a depth of 4cm from skin) with loss of resistance technique. A 20G epidural catheter was then inserted 4 cm into the space (total 8cm from skin). The catheter was fixed in position with the help of Tegaderm[®]. Correct placement of the catheter was verified by negative aspiration for blood and CSF, followed by administration of a test dose of 3 ml of 2% lignocaine with adrenaline (1:200000). The patient was positioned supine on the operating table, one head ring is placed under the head, Oxygen was given by nasal cannula at the rate of 3 L/min and monitored with 5-lead ECG, SPO₂, NIBP, and HR for about 5 minutes. A bolus dose of mixture of 10ml 0.25% Bupivacaine and 1ml 50 µg Fentanyl was injected via epidural catheter. Onset of action was noted within 10 minutes of injection. The level of sensory block was tested bilaterally (defined as loss of sensation to pinprick) in an ascending fashion starting from the T12 dermatome. A sensory block from C2 to T6 is obtained after 20 minutes. 30 min post-CEA, drapes were applied and surgery was started. Monitoring was done throughout the operation and vitals were recorded on monitors every 5 min. The patients were kept in a state of conscious sedation with midazolam 2mg IV throughout the surgery. Vocal cord functions were monitored intermittently by verbal contact with the patient. The Surgery lasted for 1hour 20 minutes. A top up dose of 5ml 0.25% Bupivacaine was given after 60 minutes following initial dose. No significant decrease was observed in systolic and diastolic blood pressure from the baseline values. Although there was a slight decrease in systolic blood pressure, diastolic blood pressure, and heart rate, the patient required no therapeutic intervention. The lowest mean blood pressure was 82 mm Hg at 5 minutes and the lowest heart was 62/min at 60 minutes, which was acceptable. Oxygen saturation remained in the range of 95-99%. Postoperative analgesia was provided with continuous cervical epidural infusion of a mixture of 0.08% Bupivacaine and 2µg/ml Fentanyl @ 2ml.hr⁻¹. Vitals were monitored 2 hourly on day 1 and 4 hourly or SOS (when ever needed) from next day. Pain on rest and on movement was assessed by VAS (visual analogue scale) every hour on first day and 4 hourly next day onwards. If VAS was 3 or more, and or patient demanded, 2-4 ml bolus of epidural injection of same solution being infused was given as rescue analgesic. Patient had good postoperative pain relief. Patient did not have any complication either during surgery or in postoperative period.

III. Discussion

Cervical epidural anaesthesia (CEA) was first described Dogliotti in 1933 for thoracic procedures using a single shot technique by local anaesthetic lignocaine.⁷ CEA can be used for neck (carotid artery surgery or thyroid/ parathyroid surgeries) mastectomy and upper limb surgeries.³ Administration of local anesthetic (with/without an opioid) into the cervical epidural space, via an epidural catheter, results in anesthesia of the cervical plexus, brachial plexus, and upper thoracic dermatomes.⁸ The upper margin of CEA sensory block is assessed at C2 dermatome, and the lower margin of sensory block is assessed at T3 in all patients (minimal extent C2-T1; maximal extent C2-T10).³ CEA provides high-quality anesthesia and excellent postoperative analgesia of the above mentioned dermatomes and has a favorable effect on hemodynamic parameters due to cardiac sympathetic blockade resulting in a prolonged coronary perfusion time and reduced left-heart afterload.^{6,9} Usually Bupivacaine 0.25% or Ropivacaine 0.5% are used as the local anaesthetic.

ORIF of Clavicle fracture are conventionally performed under general anaesthesia (GA). However, there has been increasing interest in the use of cervical or high thoracic epidural anaesthesia due to economic reasons, less postoperative morbidity and excellent postoperative analgesia.^{12,13} Contrary to previous belief regarding propensity of complications with CEA (cervical epidural anaesthesia), it is now suggested equally safe alternative in surgery of breast, neck and upper extremity.³ In our case, CEA provided excellent surgical conditions and there was appreciably less blood loss during surgery (200ml). Postoperative pain relief was also excellent (VAS remains 3 or less with 1 to 2 additional boluses within 24 hrs, and patient had satisfactory sleep during hospital stay. Refusal to GA and presence of anticipated difficult intubation (MPS-IV) justify the use of CEA in our case. **Bonnet et al**² noted, in a study incidence of complications such as dural puncture in 2 (0.5%), epidural venipuncture in 6 (1.5%) and respiratory muscle paralysis in 3 patients (0.8%) cases. **Hakl et al**¹⁰ noted the incidence of reported migration of local anesthetic solution into subarachnoid space in 6 (2.8%), failed epidural puncture in 3 (1.4%), and blood observed in the epidural catheter in 4 (1.8%) patients. Other possible complication of CEA include bilateral phrenic nerve palsy and **Capdevilla et al**¹¹ reported a reduction in FVC by 21.1%, increase in PaCO₂ by 11.6% and decrease in PIP in patients receiving CEA but these changes are

insignificant in patients without lung disease. So in the hands of an experienced anesthesiologist, CEA may be a suitable choice and an alternative to general anesthesia. ORIF of Clavicle fracture are conventionally performed under general anaesthesia (GA).

References

- [1] Khanna R, Singh DK. Cervical epidural anaesthesia for thyroid surgery. *Kathmandu Univ Med J* 2009;7:242-5.
- [2] Bonnet F, Derosier JP, Pluskwa F, Abhay K, Gaillard A. Cervical epidural anaesthesia for carotid artery surgery. *Can J Anaesth* 1990;37:353-8.
- [3] Michalek P, David I, Adamec M, Janousek L. Cervical epidural anaesthesia for combined neck and upper limb procedures. *Anesth Analg* 2004;99:1833-6.
- [4] Asano Y, Hasuo M, Shimomura S et al. Carotid endarterectomy under cervical epidural anesthesia. *No. Shinkei Geka*. 1993;21:787-91
- [5] Guevara-López U, Bárcenas-Olivares J, Gutiérrez-Sougarret B, Aldrete JA, Olascoaga-Ortega G. Cervical epidural anesthesia for upper extremity surgery using three different formulations of local anesthetics. *Cir Cir* 2005;73:273-81.
- [6] Biboulet P, Deschodt J, Capdevilla X, Landreau L, Aulas P, Du Cailar J, et al. Hemodynamic effects of 0.375% bupivacaine versus 0.25% bupivacaine during cervical epidural anesthesia for hand surgery. *Reg Anesth* 1995;20:33-40.
- [7]. Dogliotti AM. A new method of block anesthesia: segmental peridural spinal anesthesia. *Am J Surg* 1933;20:107-18.
- [8]. Waldman SD. Cervical epidural nerve block. In: Waldman SD, ed. *Interventional pain management*. Philadelphia: WB Saunders, 2001:373-81.
- [9]. Simon MJG, Veering BT, Stienstra R, et al. The effects of age on neural blockage and hemodynamic changes after epidural anesthesia with ropivacaine. *Anesth Analg* 2002;94:1325-30.
- [10]. Hakl M, Sevcik P, Pavlikova J, Kraus R. Cervical epidural anaesthesia for carotid artery surgery: new experience. *Int Monitor Reg Anaesth* 1998;10:79.
- [11]. Capdevilla X, Biboulet P, Rubenovitch J, et al. The effects of cervical epidural anesthesia with bupivacaine on pulmonary function in conscious patients. *Anesth Analg* 1998;86:1033-8.
- [12] Stevens RA, Stevens MM. Cervical and high thoracic epidural anesthesia as the sole anesthetic for breast surgery. *Techniques in Regional Anaesthesia & Pain Management*. 1998;2:13-18.
- [13] Singh AP, Tewari M, Singh DK, Shukla HS. Cervical epidural anesthesia: A safe alternative to general anesthesia for patients undergoing cancer breast surgery. *World J Surg*. 2006;30:2043-2047.