



PERINEURAL INTERCOSTAL INJECTION OF BUPIVACAINE FOR POST-OPERATIVE ANALGESIA IN THORACIC SURGERY

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ABSTRACT

Introduction: The pain that occurs following a thoracotomy procedure, which is also known as post-thoracotomy pain, is quite commonly very severe and a major source of concern in the post-operative period. The present study is done to see the response of intercostal nerve blockade with injection bupivacaine for acute post-thoracotomy pain relief. **Materials and Methods:** A total of 20 patients undergoing elective thoracotomy procedures for various conditions were studied. In all the surgeries incision was placed in the 5th intercostal space so that it overlies pulmonary hilum to have a better injection site. **Results:** Total of 20 patients undergoing thoracotomy were included in this study. 60% of patients were relieved of major pain by injection bupivacaine. 10% patients required tramadol. Rest of the patients required analgesia only for 24-48 hours. **Conclusion:** Bupivacaine is a long acting analgesic and by injection into perineural space of intercostal nerves it remains there for long time producing analgesia. This improves chest compliance, adequate oxygenation and less of oozing. So it is recommended that post operative perineural injection of bupivacaine has an additional advantage of production of post operative analgesia and reduce the demand of another analgesia.

KEYWORDS: Intercostal nerve blockade, Post-thoracotomy pain, Bupivacaine, Thoracotomy.

INTRODUCTION

Post-thoracotomy pain is very severe, probably the most severe pain experienced after surgery. Acute post-thoracotomy pain is due to skin and muscle injury, retraction, resection, or fracture of ribs, dislocation of costovertebral and costochondral joints, injury of intercostal nerves and further irritation of the pleura by chest tubes.^[1]

Treatment of acute post-thoracotomy pain is particularly important not only to keep the patient comfortable but also to minimize pulmonary complications.^[1] Suboptimal pain relief not only will lead to increased patient suffering but also to increased morbidity after operation. In particular, poor cough and clearance of secretions may lead to atelectasis and pneumonia, which additionally prolongs immobility, and may lead to complications such as deep vein thrombosis and pulmonary embolism.^[1] Poorly treated acute post-thoracotomy pain may lead to chronic postthoracotomy pain syndrome.^[2]

Many methods of acute post-thoracotomy pain management have been tried with varied success, for

example Intercostal nerve block, intrapleural analgesia, cry analgesia, lumbar epidural, thoracic epidural, paravertebral block, intravenous (IV) narcotics, intrathecal or epidural narcotics, non-steroidal anti-inflammatory drugs (NSAIDs), and transcutaneous nerve stimulation.^[3,4] In many centers, epidural anesthesia has emerged as the gold standard for pain control.

However, this method is not suitable for all patients specially in those with altered coagulation profile and may be associated with potential risks such as dural perforation, bleeding, infection, hypotension, and urinary retention.^[5-7] There are also other potential problematic issues with epidural pain control, such as delaying the start of an operative procedure, technical failures of 13-15%^[8,9] and the costs of post-operative pain management by a separate pain team. Another method of pain control, which has gained popularity in some centers, is the use of intercostal nerve blockade.^[10,11] As with epidural anesthesia, this method allows local administration of drug to the pain causing anatomic region, but potentially with lower risks and discomfort to the patient.^[14] There may also be fewer delays in surgery, and the technical

failure rate should be lower since it is placed under direct vision. Moreover, it is much more cost-effective than thoracic epidural analgesia.

The present study is done to see the response of intercostal nerve blockade with injection bupivacaine for acute post-thoracotomy pain relief.

BUPIVACAINE

Mechanism of action

Bupivacaine binds to the intracellular portion of voltage-gated sodium channels and blocks sodium influx into nerve cells, which prevents depolarization. Without depolarization, no initiation or conduction of a pain signal can occur.^[8,10]

Pharmacokinetics

The rate of systemic absorption of bupivacaine and other local anesthetics is dependent upon the dose and concentration of drug administered, the route of administration, the vascularity of the administration site, and the presence or absence of epinephrine in the preparation.^[8]

- Onset of action (route and dose-dependent): 1-17min.
- Duration of action (route and dose-dependent): 2-9hr.
- Half life: neonates, 8.1hr, adults: 2.7hr.
- Time to peak plasma concentration (for peripheral, epidural, or caudal block): 30-45min.
- Protein binding: about 95%.
- Metabolism: hepatic.
- Excretion: renal (6% unchanged).

MATERIAL AND METHODS

All thoracic cases were selected and at the time of closure all thoracic wound, two intercostal nerves above and two below were selected and injection of 1ml each of 0.5% bupivacaine was injected with syringe retropleural along the intercostal nerve at costovertebral joint towards the wound. Patients were placed in ICU for 24 hours or more as per need.

The following cases were included in this study

Solitary pleural fibroma, Pulmonary Hamartoma, Huge dermoid cyst of chest, Pneumonectomy for destroyed lung, Emphysematous bulla of lower lobe, Sequestered lung, Bronchial stones with bronchiectasis, Hydatid cyst requiring lobectomy, Decortication.

In all the surgeries incision was placed in the 5th intercostal space so that it overlies pulmonary hilum to have a better injection site.

RESULTS

Total of 20 patients undergoing thoracotomy were included in this study. 60% of patients were relieved of major pain by injection bupivacaine. 10% patients required tramadol. Rest of the patients required analgesia

only for 24-48 hours. Patient became ambulatory at the earliest in bupivacaine injection. His ventilator capacity also improved. There was no chest complication and patient could be discharged at the earliest (10 days).

DISCUSSION

It was noted that while doing thoracotomy there is extensive opening of the chest wall to permit comfortable operative procedure. In doing so ribs are spread and in this procedure intercostal muscles are sharply cut and the muscles at costochondral junction are forcibly retracted and at times they may be torn. There is also excessive movement of costochondral and costovertebral junction which could be a major cause of post thoracotomy pain.^[12]

It is further observed that there are multiple sites of pain in the post operative phase—costochondral and costovertebral junction, accidentally broken rib, fluid infusion sites, venesection sites, thrombosed vein and incision site sepsis.

In this study it was noted that if you take care of one, another site still remains producing pain. So post operative analgesia to be taken care of is a difficult job. Attempt was done to nullify the operative site pain with injection of intercostal perineural bupivacaine.

Patients in addition were iso-supported by injection of tramadol and thoracic epidural if needed.

CONCLUSION

Bupivacaine is a long acting analgesic and by injection into perineural space of intercostal nerves it remains there for long time producing analgesia. This improves chest compliance, adequate oxygenation and less of oozing.

So it is recommended that post-operative perineural injection of bupivacaine has an additional advantage of production of post-operative analgesia and reduce the demand of another analgesia.

Recommended dose-0.5mg (1cc) diluted in 10cc of saline, injected 1cc per intercostal nerve.

Caution – Direct injection into the vein can have serious complication and should be avoided. Once the needle pricks aspiration should be done to ensure that it has not entered the vessel.

NOTE

Study has been done to have a supplementary/major role in production of analgesia in post thoracotomy pain.

REFERENCES

1. Craig DB. Post-operative recovery of pulmonary function. *Anesth Analg*, 1981; 60: 46-52.
2. Joseph RA, Puttappa A, Harney D. Post-thoracotomy pain syndrome, topics In: Cardoso P,

- editor. Thoracic Surgery. InTech; 2012. Available from: [http:// www.intechopen.com/books/topics-in-thoracic surgery/postthoracotomy-pain- syndrome-2](http://www.intechopen.com/books/topics-in-thoracic-surgery/postthoracotomy-pain-syndrome-2). [Last accessed 2016 Jan 10].
3. Luketich JD, Schauer P, Landreneau R, Nguyen N, Urso K, Ferson P, *et al.* Minimally invasive surgical staging is superior to endoscopic ultrasound in detecting lymph node metastases in esophageal cancer. *J Thorac Cardiovasc Surg*, 1997; 114: 817-21.
 4. Nomori H, Horio H, Naruke T, Suemasu K. What is the advantage of a thoracoscopic lobectomy over a limited thoracotomy procedure for lung cancer surgery? *Ann Thorac Surg*, 2001; 72: 879-84.
 5. Liu S, Carpenter RL, Neal JM. Epidural anesthesia and analgesia. Their role in postoperative outcome. *Anesthesiology*, 1995; 82: 1474-506.
 6. Li WW, Lee RL, Lee TW, Ng CS, Sihoe AD, Wan IY, *et al.* The impact of thoracic surgical access on early shoulder function: Video-assisted thoracic surgery versus posterolateral thoracotomy. *Eur J Cardiothorac Surg*, 2003; 23: 390-6.
 7. Landreneau RJ, Pigula F, Luketich JD, Keenan RJ, Bartley S, Fetterman LS, *et al.* Acute and chronic morbidity differences between muscle-sparing and differences between muscle-sparing and standard lateral thoracotomies. *J Thorac Cardiovasc Surg*, 1996; 112: 1346-50.
 8. McLeod G, Davies H, Munnoch N, Bannister J, MacRae W. Postoperative pain relief using thoracic epidural analgesia: Outstanding success and disappointing failures. *Anaesthesia*, 2001; 56: 75-81.
 9. Davies RG, Myles PS, Graham JM. A comparison of the analgesic efficacy and side-effects of paravertebral vs epidural blockade for thoracotomy – A systematic review and meta-analysis of randomized trials. *Br J Anaesth*, 2006; 96: 418-26.
 10. Dahl JB, Kehlet H. Non-steroidal anti-inflammatory drugs: Rationale for use in severe postoperative pain. *Br J Anaesth*, 1991; 66: 703-12.
 11. James EC, Kolberg HL, Iwen GW, Gellatly TA. Epidural analgesia for post-thoracotomy patients. *J Thorac Cardiovasc Surg*, 1981; 82: 898-903.
 12. Kuthiala G, Chaudhary G. Ropivacaine: A review of its pharmacology and clinical use. *Indian J Anaesth*, 2011; 55: 104-10.
 13. Meister GC, D'Angelo R, Owen M, Nelson KE, Gaver R. A comparison of epidural analgesia with 0.125% ropivacaine with fentanyl versus 0.125% bupivacaine with fentanyl during labor. *Anesth Analg*, 2000; 90: 632-7.
 14. Cekmen N, Arslan M. Comparison of effect of single dose epidural ropivacaine and bupivacaine in arthroscopic operations. *Res J Med Sci*, 2008; 2: 109-15.
 15. Brown DL. *Atlas of Regional Anaesthesia*. 4th ed. Philadelphia, PA: Saunders-Elsevier, 2010; 286.