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Original Article

Comparison between continuous thoracic epidural block and continuous thoracic paravertebral block in the management of thoracic trauma

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ABSTRACT

Background: Postoperative pain is thought to be the single most important factor leading to ineffective ventilation and impaired secretion clearance after thoracic trauma. Effective pain relief can be provided by thoracic epidural analgesia but may have side effects or contra-indications. Paravertebral block is an effective alternative method without the side effects of a thoracic epidural. We did this study to compare efficacy of thoracic epidural and paravertebral block in providing analgesia to thoracic trauma patients.

Methods: After ethical clearance, 50 patients who had thoracic trauma were randomized into two groups. One was a thoracic epidural group (25), and second was a paravertebral group (25). Both groups received 10 ml of bolus of plain 0.125% bupivacaine and a continuous infusion of 0.25% bupivacaine at the rate of 0.1 ml/kg/h for 24 h. Assessment of pain, hemodynamic parameters, and spirometric measurements of pulmonary function were done before and after procedure. Visual analog scale (VAS) scores were accepted as main outcome of the study and taken for power analysis.

Results: There was significant decrease in postoperative pain in both the groups as measured by VAS score. However, the degree of pain relief between the groups was comparable. There was a significant improvement in pulmonary function tests in both the groups post-procedure. The change in amount of inflammatory markers between both the groups was not significantly different.

Conclusion: Paravertebral block for analgesia is comparable to thoracic epidural in thoracic trauma patients and is associated with fewer side effects.

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Introduction

Thoracic trauma causes significant pain and mortality in the perioperative period.[1] Postoperative pain after thoracic trauma contributes to atelectasis, pneumonia, pulmonary embolism, and increased intensive care admissions. Poor pain management leads to delayed mobilization, which is associated with increased pooling of secretions in the lungs and impaired ventilation.[2] Patients undergoing thoracic procedure may suffer from severe postoperative pain, if analgesia is not managed appropriately. Conversion to chronic pain and post-surgical fatigue after thoracotomy is more, if acute pain is not treated adequately at presentation. There is a significant improvement in pulmonary function and reduced risk for infection and complication in cases of thoracic trauma treated with appropriate analgesia and physiotherapy.[2] Hence it is only imperative to consider pain management early in the course of management of thoracic trauma to improve outcomes and speedup recovery.[3–5]

Trauma, surgery or any infection in ICU is associated with release of cytokines, which contribute to the development of hemodynamic instability and metabolic derangement, which can worsen prognosis.[6] Interleukin (IL)-6 is the most common cytokine shown to be associated with degree of tissue insult and hence can act as surrogate for intensity of tissue damage following trauma.[7] The efficacy of utilizing different modalities for analgesia in controlling extent of tissue damage can be compared by measuring these cytokines levels.

The ''gold standard'' for treatment of postoperative pain following thoracotomy is thoracic epidural. However, in certain situations, there is a need for an alternate mode of analgesia. The other techniques available for pain management post-thoracotomy include paravertebral block, intercostals nerve block, subarachnoid administration of opioids and intrapleural analgesia.[2,5,6,8–10] However, the single best method for pain relief has not been established and these techniques have shown to provide good analgesia and are still under research. A systemic review, the Procedure-Specific Postoperative Pain Management task force, has been formed with aim to develop recommendation for management of postoperative pain following surgery.[11,12] This task force will guide clinicians in selecting appropriate pain management strategies for chest trauma and encourage more studies and trial in pursuit of the best analgesic modality.

The present study was conducted to assess the quality of pain relief and quantity of improvement of pulmonary functioning in patients of thoracic trauma receiving either continuous thoracic epidural analgesia (CTEA) or thoracic paravertebral block (TP). The primary objective was to compare pain scores at 24 h. The secondary objectives were to assess the improvement in pulmonary function tests, the level of inflammatory mediators between the groups. The hypothesis of this study could be termed as there will be improvement of pain scores, pulmonary functions in both the groups equally.

Material and methods

Population

The study was initiated after obtaining ethical clearance from institutional ethics committee. Previous studies on comparison of pain relief between both the methods showed a mean visual analog scale (VAS) score of 3.6 ± 1.44 in paravertebral group and 3.5 ± 2.75 in thoracic epidural group.[13] The sample size was calculated as 19 in each group keeping the power of the study as 80% and level of significance at 0.05 and acceptable difference in mean scores as 2 using OpenEpi (www.OpenEpi.com).[14]

Inclusion criteria

All patients admitted to trauma center or intensive care unit with thoracic trauma who received epidural or paravertebral block for pain relief. The following traumas were considered

i. Patients with multiple rib fractures.
ii. Patients with flail chest and paradoxical respiration.
iii. Patients with contusion of lung.

Exclusion criteria

Patients with bilateral chest trauma, injuries to peripheries, unstable hemodynamics, sensitivity to local anesthetic drugs, infection at the operation site, cardiac dysfunction, renal dysfunction, coagulation abnormalities and patients on opioids were excluded from the study. Patients having psychosocial problem or not cooperative in between the study were also excluded.

Methodology

Advanced Trauma Life Support (ATLS) protocol was followed for initial assessment and resuscitation.

Study population

A total of 188 patients were admitted during 22 months study period and were screened to be part of the study. A total of 50 patients of either sex in American Society of Anesthesia (ASA) grade I and II, aged 15–60 years suffering from thoracic trauma and received either a thoracic epidural or paravertebral block for pain relief were part of this study (Fig. 1). A written informed consent was obtained before including the patients in to the study. The study protocol was explained to all patients along with VAS after enrollment in to the study.

Epidural group (Group 1; n = 25)

Under strict aseptic precautions with patient in sitting or lateral position, skin was infiltrated with local anesthesia, and 18 G Tuohy's needle was introduced at T5–T7 level. After

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