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Original Article

Efficacy of bilateral erector spinae block for postoperative pain control in patients of lumbar spine fusion surgery

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Abstract

Background

Controlling postoperative pain after posterior lumbar spine surgeries is necessary to achieve patient satisfaction and good outcome after successful surgical intervention. Preoperative erector spinae block (ESB) technique is considered a recently evolved tool to achieve these goals.

Purpose

The aim of this study was to evaluate the efficacy of the bilateral ESB technique in pain management after lumbar spinal fusion surgery for degenerative spine diseases.

Patients and methods

Patients who underwent lumbar spinal fusion surgery for degenerative pathologies in 2019and 2020 were enrolled in the study. The patients were assessed according to pain score experienced postoperatively at different times till the end of the first postoperative day by numeric rating scale, amount of analgesics received, and drug-related complications noticed in the first postoperative day.

Results

The data of 60 patients who had lumbar spinal fusion surgery were collectively analyzed. Of these, 30 received only general anesthesia (group A), whereas the other 30 patients received the ESB in addition to general anesthesia (group B). The numeric rating scale pain scores and the amount of intravenous postoperative analgesia received were lower in group B than in group A at all the measured time points ($P < 0.05$). There was no significant difference in the incidence of complications between the two groups.

Conclusion

Bilateral ESB is an effective tool in controlling postoperative pain after posterior spinal fusion surgeries in both pain intensity and postoperative-received analgesics.

Keywords: Analgesics, erector spinae block, pain control, spine fusion

Introduction

Lumbar spine fusion procedures are a common treatment option for patients with degenerative spine diseases. These procedures usually result in considerable postoperative pain and discomfort, which, if not managed properly, can lead to more dissatisfaction and a longer recovery time. Opioids are the most commonly used drugs, although they have side effects and a risk of long-term dependence [1].

Preoperative planned regional analgesia strategies can be useful in controlling postoperative pain in multimodal manner. The ability of erector spinae block (ESB) technique to induce anesthetic effect on dorsal rami of spinal nerves, which innervate the paraspinal muscles and pain-sensitive vertebral elements, has been used to control postoperative pain by a similar hypothesis to its action on ventral rami for inducing abdominal and thoracic analgesia [2–6].

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Infiltration of anesthetic agent between the erector spinae muscle and the transverse process, in theoretical thinking, offers dorsal ramus anesthesia at the same spinal level. As the locally injected anesthetic solution can travel both caudally and cranially through the thoracolumbar fascia, it can induce anesthesia of dorsal remi below and above the level of injection helping in pain control.

Aim

The aim of this study was to evaluate the efficacy of the bilateral ESB technique in pain management after lumbar spinal fusion surgery for degenerative spine diseases.

Patients and methods

Study design

This prospective randomized double-blind study has been performed in Matarya Teaching Hospital. The study had been approved by the ethical committee.

Sixty patients scheduled for elective one or more levels of posterior lumbar spine fusion surgery by transpedicular screws with laminectomy ± discectomy for lumbar spine degenerative pathologies in the Neurosurgery Department were included in this study. All the patients involved in this study were able and accepted to give an informed consent after receiving information and discussion with a member of the Anesthesia Department.

Patients were randomly allocated to one of the two planned groups: those receiving general anesthesia alone (group A) or those receiving general anesthesia and ESB (group B) before the surgical procedure. A standard preoperative and postoperative analgesia plan is applied to all patients who undergo a regional anesthesia technique at our institute.

Age, sex, risk factors like diabetes, hypertension, and smoking, surgical indications, surgical procedure, number of levels, surgical time, patient-controlled analgesia data, use of routine and rescue analgesia, and numeric rating scale (NRS) (0 no pain, 10 worst pain) at 2nd, 4th, 8th, 12th, and 24th hours after surgery; all are data collected for all patients of the study.

Technique of erector spinae block

All patients are monitored by the standard method. Induction of anesthesia is achieved by propofol 2 mg/kg, fentanyl 1 μg/kg, and tricium 0.5 mg/kg. After a cuffed endotracheal tube is being inserted, maintenance 1 MAC of isoflurane is then supplied. The patient is placed in prone position. The levels of injection are then identified from the last rib and they are mostly between 10th and 12th thoracic transverse processes and get sterilized by chlorhexidine 2%. A 20-ml sterile syringe containing 10 ml of lidocaine and 10 ml of marcaine is used with its needle being advanced in the fascial plane between the erector spinae muscles and transverse processes of targeted levels under guidance of high-frequency ultrasonography. A 20 ml is being injected in each side in a craniocaudal direction. All patients' hemodynamics are closely monitored during the surgical procedure.

Results

There was male predominance in the two groups (18 males and 12 females) in group A, and (16 males and 14 females) in group B. Ages of the patients ranged from 33 to 62 years in the earlier group with a mean age of 47.34 years, and ranged from 31 to 59 years in the second group with mean age of 46.06 years.

Among the patients of group A, 11 patients were smokers, seven patients were diabetics, and nine patients were hypertensive, while in patients of group B, 12 patients were smokers, nine patients were diabetics, and 10 patients were hypertensive.

Surgical indications included multilevel lumbar canal stenosis (19 cases), single-level canal stenosis (eight cases), single-level spondylolithesis (17 cases), and more than one-level disc herniation (16 levels).

The average duration of surgery was 160.14 min in patients receiving general anesthesia alone, and 165.32 min in patients receiving general anesthesia and ESB.

The NRS pain scores in group B were lower at 2nd, 4th, 8th, 12th, and 24th hours after surgery, and morning of postoperative day 2, as compared with those in group A (comparisons at all measured time points were statistically significant; $P < 0.05$) (Fig. 1).

Discussion

Posterior spinal fusion interventions rank among the most painful surgical procedures and can be challenging to treat. High doses of postoperative intravenous analgesics are often prescribed [7,8].

Postoperative intravenous opioid analgesics prescribed after spinal fusion surgeries may not induce significant control of

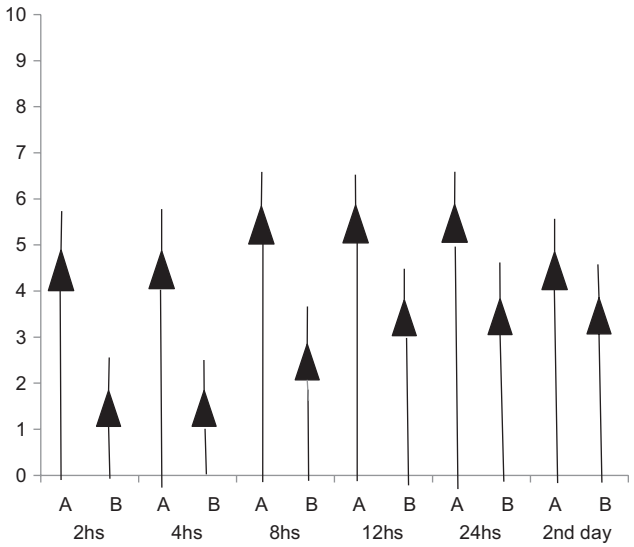

Figure 1: NRS score on the vertical arm, and both groups assessed at 2, 4, 8, 12, and 24 h postoperatively, and morning of second day postoperatively on the horizontal arm (its location is just before the discussion). NRS, numeric rating scale.

pain, except in higher doses that carry high risk of developing drug-related side effects such as cognitive dysfunction, high sedating effect, bowel disorders, or long-term dependence [1].

Postoperative pain after posterior lumbar spine fusion procedures mostly arises from surgery-related mechanical injury, prolonged tissue retraction, partial devascularization, and denervation of musculoskeletal elements, discs, and apophyseal joints that are innervated by dorsal rami of spinal nerves [9,10].

The ESB works by spreading of local anesthetic agents deep into the musculofascial plane, acting on the dorsal rami of spinal nerves at numerous levels. To date, evidences suggest that when injecting about 20 ml of anesthetic agent, it spreads three to four levels or more in a caudal spinal direction from the injection site [3,11,12]. Also, physical distribution of anesthetic agent to the lumbar paraspinal regions from distinct dorsal injection site has also been evident, indicating the existence of a distinct anatomical channel [3].

In this study, we noticed that the NRS pain scores of patients who received general anesthesia with ESB were lower than those of patients who received general anesthesia alone before surgical intervention at all measured time points with a statistically significant difference ($P < 0.05$).

Cesur *et al.* [13] found in their case series that during the first 24 h after surgery, the ESB provided significant analgesic effects and minimized opioid usage in five patients who had single or multilevel lumbar spine operations.

In the retrospective study of Ueshima *et al.* [14], NRS pain scores among the 18 patients who received ESB with general anesthesia were lower than those among the 23 patients who received general anesthesia alone in all examined time schedules during the 48 h postoperatively ($P < 0.05$).

ESB has been approved by several researchers simply on the basis of empirical evidence of effective pain control. Other experts, on the other hand, are skeptical of the ESB's effectiveness because its method of pain alleviation is not well understood [15].

Qiu *et al*. [16] in his systematic review for 171 participants from 11 publications discussing the effectiveness of ESB techniques with general anesthesia in spine fusion surgeries concluded that ESB had a significant role in reducing postoperative pain and analgesic agent consumption.

Also, Melvin *et al*. [17] in their case-series study of six patients of lumbosacral spine surgery (three lumbar-decompression surgeries, two sacral laminoplasty techniques, and one coccygectomy) found that erector spinae plane significantly improves the outcome after lumbosacral spine surgery regarding pain control and less use of postoperative analgesics.

The significant craniocaudal dispersion is a unique feature of ESB permitting its performance in a distance away from the site of surgical intervention, thus reducing the potential risk of surgical-site iatrogenic infection [6,18].

There were no significant complications among patients of both groups, apart from mild postoperative nausea in two patients of group A requiring no treatments, and fade away within 3 h from complete recovery. None of the patients had surgical procedure-related major complications. There were two cases of superficial wound infection requiring local wound care and resolved shortly, three patients had dural tears that were repaired intraoperative and caused no subsequent sequelae.

One of the limitations of this study is that it only focused on the first 48 h postoperatively. However, the effectiveness of the erector spinae plane block in relieving chronic pain is unknown.

Another limitation is that the extent of desired nerve block could not be assessed accurately; therefore, the extent of analgesia obtained postoperatively was not completely declared.

Conclusion

Bilateral ESB is an effective tool in controlling postoperative pain after posterior spinal fusion surgeries in both pain intensity and postoperative-received analgesics.

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Nil.

Conflicts of interest

None declared.

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