

Use of epidural analgesia for pain management after major spinal surgery

RJ Kumar, KV Menon, TC Ranjith

Division of Spine Surgery, Amritha Institute of Medical Sciences & Research Centre, India

ABSTRACT

Purpose. This is a retrospective study of the role of postoperative epidural analgesia in major spinal surgical procedures. With the number and complexity of the procedures performed on the spine ever-increasing, this method of analgesia is becoming more important.

Methods. Results of 74 consecutive cases of major spinal surgeries between January 2000 and January 2001 at the Spine Division, Amritha Institute of Medical Sciences and Research Centre, Kochi, India, were studied. 32 cases were posterior procedures and the other 42 were anterior procedures of the thoracic and lumbar regions. The use of various combinations of local anaesthetic and opioid to control postoperative pain after spinal surgery were analysed.

Results. 36 (49%) of 74 patients did not require any

parenteral supplements. Of the remaining 38 patients who required supplementary parenteral analgesia in the first 48 hours, 25 (34%) received a single dose and 13 (18%) required more than one dose. The number of patients requiring parenteral analgesia immediately after operation were 11; between 2 and 6 hours were 12; and between 6 and 24 hours were 11. Of the 74 patients, 67 had a sound sleep after epidural administration. There were 2 cases of respiratory depression and 2 of transient hypotension.

Conclusion. Most epidural analgesic regimens significantly reduced postoperative pain, and the requirement for supplementary parenteral analgesics was minimal. Adverse effects were rare, yet we recommend that patients treated with this protocol be managed in high-dependency units.

Key words: analgesia, epidural; postoperative analgesia; spine; surgery

INTRODUCTION

It has been well documented that immediate post-operative pain control can significantly affect the outcome of surgical procedures and operative morbidity.¹ After major abdominal, chest, or pelvic surgery, adequate analgesia promotes early ambulation and aggressive pulmonary rehabilitation. Cullen et al. and Benzon et al.²⁻⁴ have suggested that for these procedures, epidural analgesia is the technique of choice. Epidural analgesia is superior to parenteral analgesia in high-risk patients undergoing major surgical interventions.⁵ Similar findings have been reported by Rehtine and Love.⁶ However, little information exists regarding postoperative pain management after major spinal surgery and how it affects the final outcome.⁷ Ibrahim et al.⁸ have shown that epidural administration of morphine is superior to parenteral analgesia for laminectomies. A prospective double-blind randomised control study⁹ of intraspinal morphine found that this method of analgesia is an effective adjunct to postoperative pain management in spinal surgery. A number of small studies using continuous infusion techniques have reported the benefits of epidural analgesia, with minimum complications, for spinal procedures such as idiopathic scoliosis.^{10,11} Some centres have been reluctant to administer epidural local anaesthetics, even though they have been proven to enhance the analgesic effect of narcotics,¹²⁻¹⁴ because of the concern of late respiratory depression, particularly if supplemental systemic narcotics are used. At our institution, we use this modality as the procedure of choice for all major spinal procedures, unless contraindicated. Although patient-controlled analgesia (PCA) has been recommended as the technique of choice in many centres,^{15,16} the adoption of this technique in the developing world has not been encouraging, because of factors such as the cost of equipment and patient acceptance. Some studies have not found any advantage of epidural opioids over PCA.¹⁷

In this study, we used a local anaesthetic alone or in combination with an opioid to control pain after major spinal procedures. Early results were rewarding, complications minimum, and the recuperation from surgery and final outcome excellent.

MATERIALS AND METHODS

This study is a retrospective report of 74 consecutive cases of major spinal surgeries that were performed between January 2000 and January 2001 at the Amritha Institute of Medical Sciences and Research

Centre, Kochi, India. 32 cases were posterior procedures and the other 42 were anterior procedures of the thoracic and lumbar regions; all cases were managed with continuous postoperative epidural analgesia. Major surgery in this study refers to an operating time of more than 2 hours, blood loss of more than 500 ml, and the involvement of spinal instrumentation or bone grafting. The following operative procedures were included:

- (1) Anterior release of scoliosis;
- (2) Anterior instrumentation for scoliosis;
- (3) Posterior instrumentation for scoliosis;
- (4) Anterior corpectomy and fusion for tuberculosis, tumour, and fracture;
- (5) Posterior lumbar interbody fusion;
- (6) Reduction and fusion of spondylolysis;
- (7) Posterolateral decompression and fusion for tuberculosis;
- (8) Combined anterior and posterior vertebrectomy and fusion for tumours or fractures; and
- (9) Laminectomies or expansive laminoplasties with instrumentation and fusion.

The following situations were considered as contraindications for epidural cannulation:

- (1) Acute pyogenic infections;
- (2) Tuberculosis with abscess formation;
- (3) Antituberculous treatment of less than 6 weeks' duration;
- (4) Localised malignant tumour; and
- (5) Situations in which dural tears (traumatic or iatrogenic) were encountered.

Surgical technique

On completion of the surgical procedure, a 16-gauge Portex catheter was placed in the epidural space through a separate skin puncture. The skin puncture was made about 2.5 cm away from the main surgical incision with the Touhey's needle, and the epidural catheter was threaded through it into the surgical wound. The catheter tip was placed in the epidural space under direct vision. The catheter was inserted 5 cm cephalad in the case of the lower thoracic spine, and 5 cm caudad in the case of the upper thoracic spine.

All patients in this study were nursed in a high-dependency intensive care facility and received analgesics according to the protocol shown in Table 1. Different combinations of analgesics were administered according to the treating anaesthetists' preference. Continuous drug flow was maintained with an infusion pump.

Table 1
The combination of drugs used

Drug	No. of patient
0.125% Bupivacaine HCl @ 4–5 ml/h	13
0.125% Bupivacaine HCl + morphine sulphate 3 mg @ 3–5 ml/h	33
0.125% Bupivacaine HCl + fentanyl 100 µg @ 3–5 ml/h	21
0.125% Bupivacaine HCl + buprenorphine 150 µg @ 3–5 ml/h	3
Fentanyl 200 µg in 50 ml normal saline @ 4 ml/h	2
0.5% Lignocaine HCl + morphine sulphate 3 mg @ 4 ml/h	1
Buprenorphine 150 µg @ 4 ml/h	1

Table 2
Observations to determine efficacy of analgesia

Parameter	Description
Vital parameters*	<ul style="list-style-type: none"> Pulse rate, respiration rate, blood pressure, and temperature Recorded every 4 hours Tachycardia, hypertension, and tachypnoea, in the absence of other obvious causes, were considered as being due to pain
General comfort level	<ul style="list-style-type: none"> Categorised as comfortable, restless, or frankly in pain Patients were assessed every 4 hours and mean comfort values were calculated every 24 hours
Sleep	<ul style="list-style-type: none"> Categorised as sound, disturbed, and sleepless Observed every 2 hours of normal sleeping hours. Mean 24-hour values were calculated
Request for the first dose of supplementary analgesia*	<ul style="list-style-type: none"> In terms of time after reversal Recorded as <2 hours, 2–6 hours, 6–24 hours, and >24 hours
Total parenteral and oral analgesic requirement*	<ul style="list-style-type: none"> Total in the first 2 postoperative days

* Qualitative measure

The epidural cannula was left in place for 2 days in all cases. All patients received dexamethasone 8 mg intravenously at de-induction and 2 additional 8-hourly doses with ranitidine 50 mg. Cefuroxime 1.5 g was given intravenously at induction of anaesthesia and 2 additional 750-mg doses at 8-hourly intervals. The patients were nursed in the surgical intensive care facility and closely monitored for respiratory depression.

All patients had the option of receiving additional parenteral analgesia on request. Tramadol HCl 50–100 mg or Ketorolac tromethamine 30 mg is routinely used at our centre. We did not prescribe morphine, pethidine, or pentazocine in cases in our study. Most of the patients were given a course of oral analgesics (nonsteroidal anti-inflammatory drugs, usually ibuprofen or paracetamol alone or in combination) after 48 hours, which corresponded to the time when bowel stasis usually resolved.

Observations were recorded with regard to the efficacy of analgesia (Table 2).

This system was not a totally numerical scoring one, and some items were qualitative measures. However, this did not seem to affect the overall efficacy of the scale, and it seemed to be a far more objective evaluation system than the visual analogue scale and it also considered the affective component of pain.

Waddel et al.¹⁸ have suggested that pain scales and ratings, while easy to implement, are difficult to measure objectively. They have no relation to physiology or pathology, and can be significantly overshadowed by distress or illness. We did not use the visual analogue scale for pain evaluation because, in our experience, it is proven too subjective and has not produced reliable, reproducible, and objective results.

RESULTS

Supplementary analgesia

36 (49%) of 74 patients did not require any parenteral supplements. Of the remaining 38 patients who required supplementary parenteral analgesia in the first 48 hours, 25 (34%) received a single dose and 13 (18%) required more than one dose.

Timing to supplementary analgesia

11 of the 38 patients requiring supplementary analgesia demanded their parenteral dose in the immediate post-operative period, possibly because of the failure to initiate epidural analgesia before recovery from general anaesthetic. Nine of these patients settled down after the initial dose and did not require any further supplementation. Two of them required another dose on the second postoperative day.

12 of the 38 patients demanded parenteral analgesia between 2 and 6 hours after starting the epidural infusion. Eight of these patients did not require an additional dose, whereas 2 required an additional dose on postoperative day 2, and 2 required multiple doses. The latter 2 patients were unaffected by the epidural regimen, perhaps because of cannula dislodgement.

Another 11 of the 38 patients demanded supplementary analgesia between 6 and 24 hours after starting the epidural drug. The remaining 4 patients requested supplementary analgesia after 24 hours of starting the epidural infusion. Seven of these patients required more than one dose.

67 of the total 74 patients had a sound sleep. Sleep was disturbed in 70 patients, but no patients were sleepless. 70 patients said that they were comfortable, 2 were restless, and 2 were frankly in pain. Patients who had anterior spinal procedures requiring thoracotomy and who received epidural analgesia were better able to cooperate with the postoperative chest rehabilitation programme owing to reduced pain on chest expansion.

There were 2 cases of respiratory depression and 2 of transient hypotension in this series. Both cases of respiratory depression occurred with continuous infusion of fentanyl alone and were successfully reversed by immediate intubation and ventilation. The 2 cases of transient hypotension were managed with fluid therapy alone. All patients in this surgical category were usually electively catheterized and therefore urinary retention (one of the adverse effects of epidural opioids) was not evaluated. No case of itching was reported.

DISCUSSION

Sources of pain after spinal surgery include the skin incision, healing muscle tissue with reactive spasm, dural and nerve root inflammation, the site of bony excision at the vertebra and the graft donor site, and internal fixation devices reacting with overlying tissue.¹⁹ In cases of anterior spinal procedures involving thoracotomy, the added pain of the cut ribs moving with each breath has to be reckoned with. Bonica²⁰ has recorded that in laminectomy patient, moderate-to-severe pain can be expected for 5 to 9 days after surgery. This, then, is the period when parenteral or epidural analgesia is required.

Some studies have reported the undertreatment of patients in the postoperative period for pain because of concerns about drug safety and potential complications.³ Other studies have demonstrated that postoperative pain is inadequately managed in more than half of the patients.^{6,21,22} The reluctance to administer potent analgesics by the physician and nursing staff, and the reluctance of many patients to receive parenteral analgesia (especially children), are possible reasons. Besides personal distress, detrimental effects on morbidity and mortality have been recorded.²³ Moreover, tangible parameters such as hospital stay and cost of therapy would also increase considerably. Ready et al.²⁴ have reported that concerns about respiratory depression after epidural analgesia may be exaggerated and the use of such techniques in the wards is safe. Our study shows that, while the incidence of respiratory depression is minimal, it is still possible and therefore we recommend to give such analgesics in high-dependency hospital units with emergency intubation and ventilation facilities at hand. Both instances of respiratory depression in our series were due to continuous infusion of fentanyl 200 µg in 50 ml normal saline at the rate of 4 ml per hour. When used in combination, the dose of fentanyl was 100 µg to obtain adequate analgesia, and at that dose, no respiratory depression was encountered.

Peak levels of intramuscular narcotic analgesics may vary; and so does the time taken to achieve this peak.²⁵ On the other hand, epidural analgesics work by selective action on the dorsal horn nociceptors.²⁶ Epidurally administered narcotics produce better analgesia compared with an identical dose of parenterally administered drug, possibly as a result of the presence of opioid receptors on the dura.^{16,27}

In many centres in the developed world, PCA has been used as the technique of choice for analgesia after spinal operations. This method can accommodate the wide individual variation in pain perception. In this respect, it is superior to the continuous intravenous

infusion of analgesic. Bolus, on-demand regimens, have the disadvantage of not addressing the issue of pre-emptive management of pain. Overall patient satisfaction with PCA has been significant,²⁸ yet Benzon et al.⁴ have shown that epidural analgesia is far more potent and safe than PCA.

The drug combinations used in this study have been documented to have excellent analgesic properties. The incidence of adverse effects with this regimen seems to be minimal. However, since there is always a possibility of late respiratory depression, vigilant monitoring of the patient in the surgical intensive care unit is mandatory. Urinary retention—one of the frequent problems with this route of analgesia—was not looked at in our series because all

patients were electively catheterized for monitoring and because the incidence of such retention is high after major spinal procedures. We did not record any cases of pruritis with buprenorphine.

CONCLUSIONS

Epidural analgesia is a safe and extremely useful modality in spinal surgery. All the drug combinations used in this study seemed to be equally effective in controlling postoperative pain. Epidural analgesic should optimally start before de-induction from anaesthesia, and all such patients should preferably be nursed in a high-dependency unit.

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