Pain Control Following Lumbar Laminectomy: Comparison of Epidural Morphine and Morphine Plus Bupivacaine

Lomber Laminektomi Sonrası Ağrı Kontrolü: Epidural Morfin ve Morfin Artı Bupivakainin Karşılaştırılması

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Abstract: A comparison of the effects of epidural morphine and epidural morphine + bupivacaine on postoperative pain following lumbar laminectomy and discectomy. Thirty American Society of Anesthesiolgists (ASA) I patients undergoing lumbar laminectomy and discectomy were randomly assigned to two groups (n = 15/group). In each case, after removing the herniated disc, the surgeon placed an epidural catheter. Then, while in the recovery room, patients were asked to assess their pain according to a 10 cm Visual Analogue Scale (VAS). Following this, group I received an epidural injection of 2-mg morphine + 10 ml normal saline, and group II received 2 mg morphine + 2 ml bupivacaine 0.5% + 8-ml normal saline by the same route. Postoperative analgesia was achieved in most patients, and alternative parenteral analgesic drugs were used in those who found the epidural treatment insufficient. Side effects were encountered in three group I patients, the problems being globe vesicale, wound infection, and difficult micturition. We achieved satisfactory postoperative analgesia with epidural morphine or epidural morphine + bupivacaine in 24 of 30 patients who underwent lumbar laminectomy and discectomy. Adding bupivacaine to morphine does not enhance the analgesic effect, and there were no significant difference in quality and duration of analgesia between the morphine and morphine + bupivacaine groups.

Key Words: Bupivacaine, epidural, laminectomy, lumbar, morphine, postoperative analgesia

Özet: Lomber laminektomi ve diskektomiyi takiben oluşan postoperatif ağrı üzerine epidural morfin ve morfin + bupivakainin etkileri karşılaştırıldı. Amerikan Anestezi Birliği (ASA) I grubuna uyan, lomber laminektomi ve diskektomi operasyonu geçirecek olan 30 hasta rasgele seçimle iki gruba (n=15/grup) ayrıldılar. Hernie olan disk çıkartıldıktan sonra, hastalara cerrah tarafından direkt görüş altında epidural kateter yerleştirildi. Derlenme odasında hastalardan ağrılarını 10 cm'lik Visual Analogue Scale (VAS) skalasına göre değerlendirmeleri istendi. Grup I hastalara epidural kateterden 2 mg morfin +10 ml serum fizyolojik verilirken Grup II hastalara 2 mg morfin + 2 ml %0.5 bupivakain + 8 ml serum fizyolojik verildi. Tedavinin yetersiz kaldığı düşünülen hastalarda postoperatif analjezi alternatif parenteral analjeziklerle sağlandı. Grup I' de üç hastada yan etki gözlendi (glob vezikale, yara enfeksiyonu ve idrar yapmada zorluk). Sonuç olarak lomber laminektomi ve diskektomi operasyonu geçiren 30 hastanın 24'ünde epidural yoldan verilen morfin veya morfin + bupivakainle yeterli postoperatif analjezi sağlandı. Morfine eklenen bupivakain analjezik etkide bir artış sağlamadı ve morfin ile morfin + bupivakain grupları arasında analjezi kalitesi ve süresi açısından belirgin bir farklılık saptanmadı.

Anahtar Kelimeler: Bupivakain, epidural,laminektomi, lomber,morfin, postoperatif analjezi

INTRODUCTION

Uncontrolled postoperative pain decreases wound healing and increases postoperative morbidity. Patients who are in pain may experience delayed recovery of pulmonary function and are at greater risk of developing thromboembolism due to immobility. As well, these patients tend to suffer from nausea and vomiting. It is also known that systemic vascular resistance, cardiac workload, and myocardial oxygen consumption all increase due to cathecholamine discharge (3).

Postoperative analgesia has been extensively researched and various methods have been used to prevent such complications and achieve patient comfort. some of this work has shown that epidural administration of corticosteroids after laminectomy does not produce effective postoperative analgesia, nor does it decrease postoperative morbidity or accelerate functional recovery (5). In contrast to these poor results, another study revealed that infiltrating a wound with bupivacaine diminishes postoperative pain and analgesic needs (6). Although dissatisfaction is often expressed, the most common method of providing pain relief after laminectomy has been parenteral administration of narcotic and nonnarcotic analgesics.

With the discovery of opiate receptors in the brain and substantia gelatinosa of the spinal cord, new methods of pain prevention and treatment were developed. We known that very small doses of opiates placed in the extradural space are able to cross the meninges and produce analgesia by acting on the spinal cord (7). Since the extradural space is easily accessible during laminectomy, the extradural route has been used to provide more effective analgesia following this procedure. This method has yielded better results without any serious side effects.

Recent reports have indicated that a combination of low-dose opioid and local anesthetic produces a stronger analgesic effect than opioid alone. Hemodynamic stability, rare side effects and rapid recovery are some of the benefits of combined therapy (3). In this study, we aimed to compare epidural administration of morphine and morphine + bupivacaine, focusing on analgesic effectiveness and side effects.

MATERIAL and METHOD

After we received approval of the protocol from the Gülhane Military Medical Academy Ethics Committee, 30 American Society of Anesthesiologists (ASA) I patients, aged 21 to 62 years, who were scheduled for elective lumbar laminectomy and discectomy consented to participate in the study. ASA II and higher-risk groups, atopic patients, and those who did not wish to participate in the study were excluded.

During the preoperative preview, the patients were informed as to how to use a 10 cm VAS, on which 0 was designated as no pain and 10 as the worst pain imaginable. We premedicated all patients with 10-mg oral diazepam and 0.5-mg intramuscular atropine 1 hour before surgery. Anesthesia was induced with sodium pentothal (3-5 mg/kg) plus fentanyl (2 mg/kg), and was maintained with isoflurane in a 50/50 oxygen/nitrous oxide mixture. Muscle relaxation was achieved with vecuronium bromide (0.1mg/kg). SpO_2, noninvasive arterial blood pressure, and ECG were monitored and recorded during the surgery and for 48 hours postoperatively.

Before wound closure, we inserted a Tuohy epidural cannula through the skin approximately 4 cm lateral to the wound, and directed it deeply through the muscles to within the wound site. Next, we inserted an epidural catheter through the cannula under direct vision, and passed it into the epidural space until the tip lay about 5 cm caudally above the upper margin of the laminectomy. We then placed a suction drain in the opposite side of the wound. Once the wound was closed, the epidural catheter line was draped over the patient's shoulder and taped securely to the skin along its entire length. A bacteriostatic micropore filter filled with sterile normal saline was attached to the free end of the line. Extradural catheters were not inserted in patients who were suspected of having developed cerebrospinal fluid (CSF) leaks through dural defects that were produced intraoperatively.

After full recovery in the recovery room [(Somnolence score=1) (2)] (Table I), each patient was asked to indicate the severity of his or her pain based on a 10-cm VAS scoring system. Then group I patients received 2 mg morphine sulfate in 10 ml normal saline, and group II patients received 2 mg morphine sulfate + 10 mg bupivacaine 0.5% in 8 ml normal saline all by epidural route. Further assessments of pain severity were made at 30 minutes and 60 minutes postinjection.

Table I. Somnolence score description:

Score	Description
1	Full orientation and cooperation
2	Reactive to verbal and pain stimuli, tendency for somnolence
3	Reactive to verbal and pain stimuli, speech and orientation deficiency
4	Reactive to pain, nonreactive to verbal stimulus (no verbal reaction)
5	Nonreactive to verbal and pain stimuli.

The analgesic method was considered ineffective when the first dose failed (i.e. the patient's VAS score did not decrease). In such cases, the catheter was removed and parenteral analgesic administration was started immediately. Later, in the ward, VAS scoring was repeated at every hour and the first dose was repeated if the VAS score was greater than or equal to 4. Timing for further doses and the number of repeated doses were recorded over 48 hours postoperatively. At 6 hours following their operation, the patients were mobilized. The incidences of complications including respiratory depression, itching, nausea, vomiting, hypertension, difficult micturition, catheter blockage, and catheter displacement were recorded. All patients' catheters were removed at 48 hours postsurgery, and catheter tips were sent to the microbiology department for culture. Results were compared using the Student's t-test, and $p<0.05$ was accepted as confirmation of statistical significance.

RESULTS

There were no statistically significant differences between the two groups with regard to demographic data ($p>0.05$) (Table II). No significant changes were detected in peripheral O_2 saturation and hemodynamic parameters throughout the study ($p>0.05$). When the therapy failed in two patients in group I and in 4 individuals in group II, parenteral analgesic drugs were administered immediately. Pain relief was achieved in all six of these patients. In the other patients, sufficient levels of analgesia were achieved. There were no significant differences between the two groups with regard to VAS scores, total dose per group, and number of requests for additional analgesics ($p>0.05$) (Table III-IV).

Table II. Patient demographic data.

Group I (n=15)	Group II (n=15)	
Age (years)	32.20±12.50	32.20±12.92
Weight (kg)	76.13±6.8	76.33±9.15
Gender (F/M)	2/13	3/12

Table III. Number of total doses and additional dose requirement intervals.

	Group I	Group II	p value
Number of doses	2.40±1.35	2.53±1.19	0.792
Additional dose requirement interval (hours)	5.15±1.86	5.27±2.10	0.852

Table IV. VAS scoring results.

	Group I	Group II	p value
Postoperative pain	7.53±0.92	7.47±1.06	0.843
30 min. after epidural injection	2.67±2.16	3.27±2.96	0.525
60 min. after epidural injection	1.23±0.44	1.36±0.50	0.343

Side effects were encountered in three group I patients. Globe vesicale developed in one individual; however, after urinary catheterization, and since the patient needed no additional analgesic, the problem resolved completely. Another patient experienced difficulty with micturition. The third patient had developed signs of inflammation at the catheter placement site by 24 hours postsurgery. The catheter was removed immediately and sent for microbiological culture; however, the culture was negative.

DISCUSSION

Ideal postoperative analgesia should provide pain relief, but also allow the patient to be alert and mobile. With these needs, the complications due to pain and immobility can be prevented. Effective analgesic doses of parenteral opioids do not leave patients alert or mobile, even if the staff in the recovery room are allowed to give the drugs in fractionated, small doses. Instead, large doses are usually given with relatively large time lapses, so that patients fluctuate between drowsy analgesic mobility and painful immobility. Epidural opioids might allow us to get closer to achieving ideal postoperative analgesia after laminectomy and discectomy, since many reports in recent years have cited their use in the relief of trunk and lower limb pain(9).

This technique is particularly appropriate following lumbar laminectomy because the surgeon can place the epidural catheter precisely, under direct vision and with little risk of dural puncture and infection (9). In our study, no microorganisms were isolated from any of the catheter tips, though one patient showed signs of inflammation. It has been suggested that catheter blockage by blood and serous fluid is the most important problem with the epidural technique, and that this could be minimized by flushing the catheter with normal saline immediately upon insertion (9). Even though we did not flush the catheters, we encountered no blockage difficulties in our series.

Epidural administration of low-dose local anesthetic agents in combination with opioids has been shown to produce a greater and longer-lasting antinociceptive effect. It has been proposed that opioids may bind better to spinal opioid receptors in the presence of local anesthetics (4,7,8). One report suggests that this, in turn, leads to reduction in drug dosages required, and a lower incidence of side effects from opioids or local anesthetic agents. In addition, there are the proposed benefits of more stable hemodynamics and improved functional ability (2). In our series we encountered only two negative side effects, namely globe vesicale and difficult micturition. We observed no respiratory depression, itching, urinary retention, nausea-vomiting, hypotension, or tachyphylaxis.

There were no significant differences between the two groups with regard to 30-minute postinjection VAS scores, intervals between first and second dose injections, and number of doses administered within 48 hours ($p>0.05$). Thus, our results do not support the suggestion that epidural administration of a combination of local anesthetic agents and opioids is more effective than epidural morphine alone (1). In conclusion, the addition of bupivacaine does not improve the analgesic effect of epidurally administered morphine. Epidural morphine, with or without bupivacaine, provides sufficient postoperative analgesia levels in lumbar laminectomy and diskectomy patients.

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