Levobupivacaine Plus Fentanyl Versus Bupivacaine Plus Fentanyl in Epidural Anesthesia for Lumbar Disc Surgery

Lomber Disk Cerrahisinde Epidural Anestezide Kullanılan Levobupivakain-Fentanil ve Bupivakain-Fentanil Kombinasyonlarının Karşılaştırılması

Tülin AKARSU, MD[a]

[a]Clinic of Anesthesiology and Reanimation,
Kartal Koşuyolu Yüksek İhtisas Training and Research Hospital, İstanbul

Geliş Tarihi/*Received:* 05.06.2009
Kabul Tarihi/*Accepted:* 14.02.2010

This study was presented as a poster at The XXVII Annual European Society of Regional Anaesthesia Congress (ESRA 2008), 24-27 September, 2008, Genoa, Italy.

Yazışma Adresi/*Correspondence:*
Tülin AKARSU, MD
Kartal Koşuyolu Yüksek İhtisas Training and Research Hospital,
Clinic of Anesthesiology and Reanimation, İstanbul,
TÜRKİYE/TURKEY
akarsu.dr@gmail.com

ABSTRACT Objective: Epidural anesthesia can be used successfully for lumbar disc surgery. Levobupivacaine,the S(-) isomer of bupivacaine, is less cardiotoxic than racemic bupivacaine. The aim of this study was to compare the clinical efficacy and safety of epidural anesthesia with levobupivacaine + fentanyl and bupivacaine + fentanyl in equivalent concentration and doses for elective lumbar laminectomy and discectomy. **Material and Methods:** Eighty ASA I-III cases undergoing lumbar laminectomy and discectomy were randomly divided into two groups. In the first group (Grup LF n=40) epidural block was achieved with 0.5% levobupivacaine (15 mL, 75 mg) + fentanyl 100 µg + 3 ml 0.9% NaCl solution, and in the second group (Grup BF n=40) 0.5% bupivacaine (15 mL, 75 mg) + fentanyl 100 µg + 3 ml 0.9% NaCl solution was used for epidural block . Surgery was started when sensory block reached to dermatomal level of T8. The onset time, and quality of sensory and motor block were evaluated. Blood pressure, heart rate, side effects and time to need for analgesic supplement (time to reach VAS 4) were recorded. **Results:** Demographically both groups were similar. Onset of adequate sensory block (T8 dermatome) was similar in two groups (14.4 ± 5.9 min for Group LF, 11.4 ± 4.3 min for Group BF, respectively). Mean maximum block height was T5 in both groups (groupLF T2-T6 , group BF T4-T6). Complete regression of sensory block was significantly longer in group LF (296.7 ± 53.4 min) than Group BF (232.7 ± 37 min) (p<0.05). Motor block was evaluated by using modified Bromage scale. Degree of motor block in group LF was significantly lower than in group BF (p<0.05). The heart rate and mean arterial pressure values decreased in both groups but the decrease in group BF was significant between 30-60 min (p<0,05).The frequency of bradycardia and hypotension was higher in Group BF. **Conclusion:** In conclusion, 0.375% levobupivacaine with fentanyl and 0.375% bupivacaine with fentanyl are suitable anesthetics for use in lumbar spine surgery but levobupivacaine provides less motor block and beter hemodynamic stability in comparison to bupivacaine.

Key Words: Neurosurgery; discectomy; anesthesia, epidural; bupivacaine; levobupivacaine

ÖZET Amaç: Epidural anestezi, lomber disk cerrahisi sırasında başarılı bir sekilde uygulanmaktadır. Bu çalışmanın amacı, elektif lomber laminektomi ve diskektomi operasyonlarında epidural anestezide eşit doz ve konsantrasyonda kullanılan levobupivakain-fentanil ve bupivakain-fentanil kombinasyonlarını klinik etkinlik ve güvenilirlikleri açısından karşılaştırmaktır. **Gereç ve Yöntemler:** Lomber laminektomi ve diskektomi uygulanacak ASA fiziksel skoru I-III olan 80 hasta randomize olarak iki gruba ayrıldı. Epidural blok, levobupivakain grubunda (Grup LF n=40) %0.5 levobupivakain (15 mL, 75 mg) + fentanil 100 µg + 3 ml %0.9 NaCl, bupivakain grubunda (Grup BF n=40) %0.5 bupivakain (15 mL, 75 mg) + fentanil 100 µg +3 ml %0.9NaCl ile sağlandı. Duyusal blok T8 dermatomu seviyesine ulaştığında operasyona başlandı. Duyusal bloğun başlama süresi, duyusal ve motor bloğun özellikleri değerlendirildi. Kan basıncı, kalp atım hızı, yan etkiler ve ek analjezik gereksinim zamanı (VAS 4) kaydedildi. **Bulgular:** Her iki grubun demografik verileri benzer idi. Yeterli duyusal bloğun başlama zamanı (T8 dermatomu) her iki grupta benzer idi (grup LF 14.4 ± 5.9; grup BF 11.4 ± 4.3) Gruplarda en yüksek blok seviyesi ortalama olarak T5 idi (grup LF için T2-T6, grup BF için T4-T6). Duyusal bloğun sonlanma süresi levobupivakain grubunda anlamlı olarak daha uzun bulundu (Grup LF 296.7 ± 53.4 dak.; Grup BF 232.7±37 dak., p<0.05). Motor blok seviyesi anlamlı olarak grup LF'de daha düşüktü (p<0.05). Her iki grupta kalp atım hızı ve ortalama arteryel kan basıncında düşme görüldü, ancak grup BF'deki 30. dakikada başlayıp 60. dakikaya kadar devam eden düşüş anlamlı bulundu (p<0.05). Bradikardi ve hipotansiyon oluşma sıklığı grup BF'de daha yüksek bulundu (p<0.05). **Sonuç:** Sonuç olarak lomber disk cerrahisinde levobupivakain + fentanil ve bupivakain+fentanil kombinasyonları kaliteli bir epidural anestezi sağlamakla beraber, levobupivakain-fentanil kombinasyonunun daha dengeli bir hemodinamik yanıt, daha az motor blok oluşturduğu saptanmıştır.

Anahtar Kelimeler: Sinir cerrahisi; diskektomi; epidural anestezi; bupivakain; levobupivakain

doi:10.5336/medsci.2009-13892

Turkiye Klinikleri J Med Sci 2011;31(1):100-8

Both general and regional anesthesia can be safely applied for lower thoracic and lumbar spinal surgeries.[1-7] Despite a history of safety and efficacy, epidural anesthesia is rarely used in lumbar surgery.[3,4,6] Some institutions routinely and successfully use both epidural and spinal anesthesia for lumbar spine surgery.[8-10] Besides the general advantages of regional anesthesia, this technique allows the neurosurgeon to have verbal contact with the patient, which helps in precise localization of the nerve root compression, reduces perioperative physiologic responses in addition to providing pain relief.[11] Epidural anesthesia is a safe and efficacious procedure for lumbar disc surgery which also provides excellent and long lasting postoperative analgesia. These kind of operations are usually carried out in the prone position, the awake patients can easily self-position themselves thus preventing injuries due to compression of nerves. Patient's verbal contact with the surgeon also ensures detection of the precise localization of nerve root involvement.[4]

Some anesthesiologists prefer regional anesthesia. It is believed that regional anesthesia provides better surgical conditions by lowering peripheral venous pressure which reduces blood loss in the operative field. It addionally has a long lasting analgesic effect in the postoperative period.[11]

Levobupivacaine hydrochloride (LB) is the levostreoisomer form of the racemic form of bupivacaine hydrochloride (B), a member of the amide local anesthetics. The duration of the analgesic effect is usually longer with B and LB when compared to other local anesthetics.

All local anesthetics induce toxicity by direct and indirect mechanisms, always related to voltage-dependent ion channels inhibition.[12]

Racemic bupivacaine is widely used as a local anesthetic. It has a long-term effect and can provide effective sensory and motor block when used for epidural analgesia, but because of its high affinity for the myocardial Na^+ channel, it can be cardiotoxic.[13,14] Levobupivacaine was less cardiotoxic than bupivacaine in preclinical studies, and clinical trials demonstrated a better safety profile[15-18] Levobupivacaine is currently available for clinical use in anesthesia and postoperative pain management and has been shown less to be toxic on central nervous system; there were also less changes indicating central nervous system (CNS) depression on electroencephalography racemic bupivacaine.[14] The duration of the analgesic effect is usually longer with bupivacaine and levobupivacaine than other local anesthetics.

An ideal anesthetics agent should have a rapid onset of action, should provide most stable hemodynamic conditions intraoperatively, and should have rapid reversal effects in the recovery room. It should also minimize the common postoperative side effects such as vomiting, nausea and pain.

Based on these data, the aim of this study was to compare the clinical efficacy and safety of epidural anesthesia produced by 0.375% bupivacaine (75 mg) + fentanyl 100 μg and 0.375% levobupivacaine (75 mg) +fentanyl 100 μg in equivalent concentration and doses for patients undergoing elective lumbar disc surgery.

MATERIAL AND METHODS

After the Research Ethics Committee approval and written informed consents, eighty ASA I-III patients aged between 40-58 years undergoing either single or double level laminectomy or disc surgery were included in the study. This randomized double-blind clinical trial was carried out in the period between August 2007 and March 2008. The exclusion criteria for the patients were any contraindication for epidural block, history of sensitivity to any studied drugs, history of severe cardiac hepatic or renal disease, history of bleeding abnormalities, and severe spinal stenosis or infectious processes that would contraindicate neuroaxial anesthesia. All operations were performed by the same surgeons.

Patients were randomly allocated to the following groups immediately before the anesthetic procedure: 0.375% levobupivacaine (75 mg) and fentanyl (100 μg) (Group LF n=40); or 0.375% bupivacaine (75 mg) and fentanyl (100 μg) (Group BF n=40), both with 3 ml normal saline. Randomization was performed by an independent staff technician the in morning before surgery using cast lots.

Patients received midazolam 0.015-0.03 mg/kg intravenously (IV) prior to initiation of anesthesia.

After volume expansion with 500 mL lactated Ringer's solution, epidural puncture with 17G Tuohy needle was performed in L3-L4 or L2-L3 interspace while patients were in the sitting position.

Epidural space was identified by the loss of resistance to fluid technique. After negative blood and CSF aspiration, 2 mL 2% lidocaine solution was injected in the epidural space as a testdose. Three minutes later, in the absence of motor block, additional 20 mL LF+SF or BF+SF solution was administered in 5 minutes, and the patient was returned to the supine position.

The evolution of sensory and motor blocks on both sides were checked, adequate block was accepted when the sensory block bilaterally reached to dermatomal level of T10 as the patient was lying in the prone position.

The time to achieve this level of anesthesia was the primary efficacy measure.

Secondary measures included peak block height, time to reach the peak block, time to two segment regression, time to regression to T10 level, and total duration of sensory block.

Sensory block was measured by using the blunt end of a 27- gauge dental needle at 0, 2, 5, 7, 9, 12, 15, 20, 25 and 60 min post injection and every 30 min thereafter until complete regression of sensory block was observed. The surgical procedure did not started until 25 min after the end of epidural injection. The onset, degree, and duration of motor block were measured in both legs by using a modified Bromage scale, and scored as: 0: no paralysis, full flexion of hips, knees, and ankles; 1: inability to raise extended leg, able to move knees; 2: inability to flex knees, able to flex ankles; and 3:inability to move any portion of the lower limb. Motor block was measured at 0, 5, 10, 15, 20 and 25 min post injection (presurgery), and every 30 min postsurgery until the patient returned to a score of zero in both legs. It was planned to apply an epidural injection of 0.25% bupivacaine or 0.25% levobupivacaine 5 ml per/dose if any pain at the incision area occured.

At the end of the operation, the quality of the anesthesia, both motor and sensory blocks, was judged as either satisfactory or unsatisfactory.

Intraoperative sedation was provided with additional IV 1 mg midazolam/per dose as needed at the discretion of the anesthesiologist.

The patients who were given additional sedation were oxygenated. Routinely, they were observed while their SpO_2 and breathing number min were recorded.

The quality of the anesthesia, both motor and sensory blocks, was judged as either satisfactory or unsatisfactory.

The classification of quality: 0= ineffective, another anaesthesia technique is needed. 1= unsatisfied consequence: inadequate sensory block 3= satisfied consequence.

Electrocardiographic monitoring, noninvasive blood pressure (Lohmeier M211 Germany) and pulse oximetry were used in all patients. Heart rate and noninvasive blood pressure were recorded prior to administration of the epidural anesthesia and at 5-minute intervals thereafter for 150 minutes. Hypotension was defined as a baseline systolic blood pressure decrease equal to or more than 30%, and it was treated with hydration and ephedrine. Bradycardia was defined as a decrease of heart rate below 55 bpm. Other complications, such as pain, nausea and vomiting were also looked for and recorded.

Total anesthesia time was calculated as the time period between admission of a patient to the operating room and postanesthesia care unit (PACU) admission.

Kolmogorov Smirnov test was used for statistical analysis when the normal distribution was observed. Non parametric two independent group test (Mann Whitney U test) was used when Kolmogorov Smirnov Test was unsuitable because of a great deal of variables for statistical analysis of sensory and motor block difference between Group LF and

Group BF. The difference in heart rates and mean arterial pressures between Group LF and Group BF were analyzed with nonparametric two independent group test (Mann Whitney U test). A non-parametric Friedman's test (an alternative to the repeated measures ANOVA) was used to compare baseline differences of heart rate and mean arterial pressure variables for both Groups LF and group BF during operation and PACU time. A P value of less than 0.05 was considered as statistically significant.

The power of the tests were calculated using Gpower (Power analysis: alpha= 0.05, delta= 2.2361, effect size d= 0.5 critical t(78)= 1.6646 power= 0.7163).

RESULTS

There were no significant differences between groups with respect to age, weight, sex or ASA physical status (Table 1). Nobody was excluded from the study. All operations were performed by the same surgical team. No major surgical or anesthetic complications were observed.

Anesthesia was satisfactory in both groups. Five patients required additional 5-mL reinjection (0.25% Levobupivacaine, 3 of 40) in the group LF (7.5%), and (0.25% Bupivacaine, 2 of 40) in the group BF (5%).

The initial dose of midazolam and the sedation level did not cause SpO_2 depression (< 95%).

SENSORY ANALGESIA

Sensory block duration, the study's primary endpoint, was significantly different between LF and BF groups. The onset time and duration of segmental analgesia are shown in Table 2. The meantime to the onset of sensory block adequate for surgery (T10) was equivalent in the two groups. The onset time to T8 block was statistically significant between Group LF and Group BF (p <0.05).

The peak block height was between T2 and T6 in both treatment groups. The time to two segment regression of sensory block and time to complete regression were significantly longer group LF than group BF (p <0.05).

Time to two segment sensory block regression was significantly longer in patients who administered levobupivacaine+ fentanly (139.9 ± 41 min) than bupivacaine+fentanly (106.2 ± 33 min). A sig-

TABLE 1: Demographic data.

	Levobupivacaine with fentanyl (n = 40)	Bupivacaine with fentanyl (n = 40)
Sex (M/F)	29/11	30/10
Age (yrs)	48,95 ± 8,1	51 ± 7,9
Height (cm)	169,31 ± 15	171,5 ± 10
Weight (kg)	82 ± 19	83 ± 14
Midazolam(mg)	3±1	5±2
Surgery time (min)	110±15	109±12

There were no significant differences in age, sex, height and weight.

TABLE 2: Sensory block.

Variable	Treatment group	Mean±SD	Median(IQR)	Mann Whitney U	P
Time to T10 (min)	LF	9.04 ± 1.3	9 (1)	687	0,238
	BF	8.45 ± 1.4	9 (1)		
Onset time to T8 (min)	LF	14.5 ± 4.9	14(4)	403,5	0,000
	BF	11.4 ± 4.3*	12(1)		
Peak block height	LF	T5(T2-T6)			
	BF	T5 (T4-T6)			
Time to two segment sensory block regression (min)	LF	139.9 ± 41	147(5)	145,5	0,000
	BF	106.2 ± 33*	10(12)		
Time to complete sensory block regression (min)	LF	296.7± 53.4	7(25,5)	7	0,000
	BF	232.7 ± 37*	25(12,5)		

LF: Levobupivacaine +fentanly
BF:Bupivacaine +fentanly

TABLE 3: Lower extremity motor block (Bromage score).

Variable	Treatment group	Mean±SD	Median (IQR)	Mann Whitney U	sig
Time to Bromage 1 (min)	LF	9.94 ± 1.7	10,5 (3)	514	0,005*
	BF	8.75 ± 1.3	9 (2)		
Time to Bromage 2 (min)	LF	13.75 ± 5.2	14(1)	567,5	0,022*
	BF	10.9 ± 4.7*	13(2)		
Time to Bromage 3 (min)	LF		_		
	BF	18.6± 4.3	19(2,7)		

nificant difference (p= 0.00) was observed for the time to complete regression of block between the two groups, where complete regression occurred 64 min sooner with bupivacaine (232.7 ± 37 min) than with levobupivacaine (296.7 ± 53.4 min) (Table 2). Duration of anesthesia was sufficient in study groups.

MOTOR BLOCK

There was significantly less motor block in patients who were had levobupivacaine + fentanyl. Furthermore, 22 of 40 patients (55%) had no detectable motor block in the group LF ($p<0.001$). In group BF, Bromage 3 level was observed in 10% of the patients while in group LF ($p<0.001$) Bromage 3 level was not observed. The onset time of motor block was significantly different between two groups ($p <0.05$). The onset time of motor block to Bromage 1 and Bromage 2 levels were significantly longer in the group LF than the group BF (Table 3).The amount of perioperative midazolam used for sedation did not differ between two groups (Table 1).

CARDIOVASCULAR EFFECTS

There were no clinically significant electrocardiographic changes attributable to study drugs, and no patients were withdrawn because of side effects. The heart rate (HR) and mean arterial pressure (MAP) values were decreased significantly in both study groups from baseline values ($p< 0.05$) (Figure 1, 2). The frequency of bradycardia and the hypotension was higher in Group BF. Significant HR decrease was observed beginning at 35th minute of operation and lasted up to 70th minute, and significant MAP decrease was observed beginning at 30th minute until 60th minute in Group BF ($p< 0.05$).

Of the patients receiving bupivacaine with fentanyl (BF), 15% (6 of 40) became bradycardic and 20% (8 of 40) hypotensive during surgery. Ephedrine was administered to 10% (4of 40) and atropine was administered to 5% (2 of 40) of patients receiving BF.

The levels of MAP and HR were slightly decreased in Group LF, but none of the participants required a medication for hypotension nor for bradycardia.

QUALITY OF SURGICAL ANESTHESIA AND SIDE EFFECTS

No serious adverse effects were observed attributable to study medication.

Patient satisfaction and side effects were evaluated with a follow up call 24 h after the procedure.

Intraoperative sensory and motor block qualities were assessed by anesthesiologist and surgeon and, were found satisfactory in both Group LF and Group BF by both surgeons and patients. No serious adverse effects (such as pain,vomiting, nausea, pruritus) were observed and no additional treatment was needed for this purpose. Urinary retention was reported in only one patient (%2.5) in the group LF as side effect.

DISCUSSION

This study demonstrates that 0.375% levobupivacaine with fentanyl and 0.375% bupivacaine with fentanyl are suitable anesthetics for epidural anesthesia in lumbar spine surgery. This study also con-

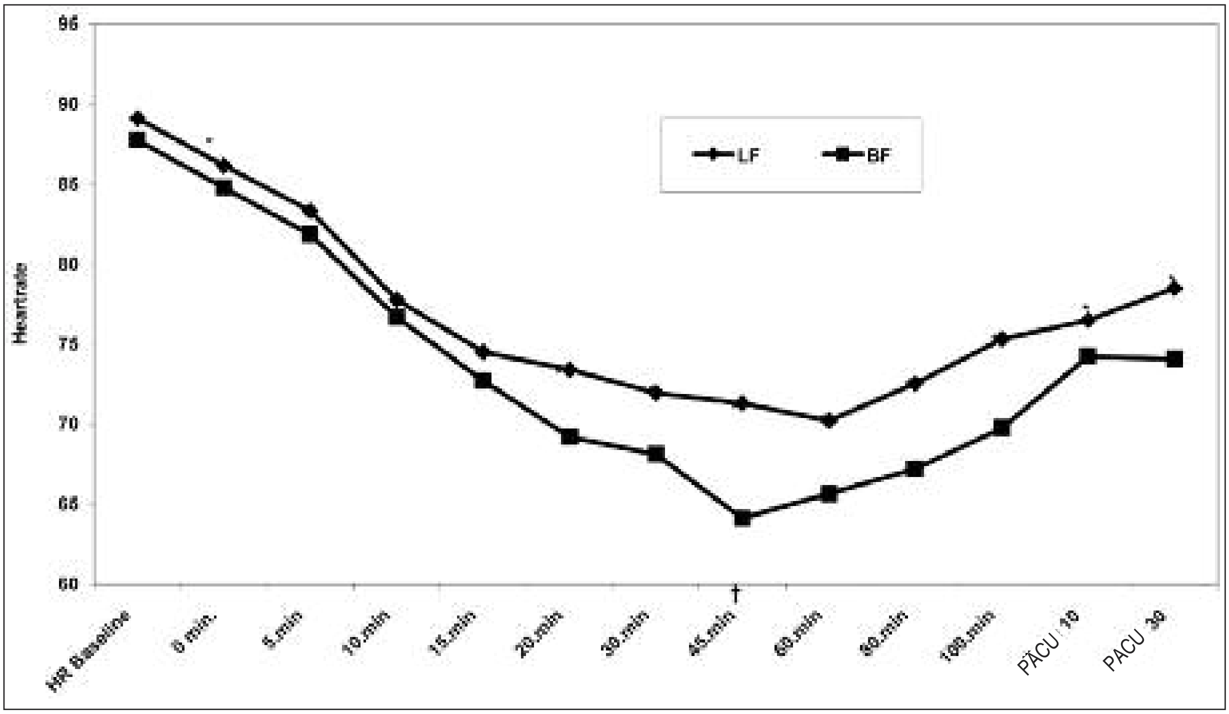

FIGURE 1: Heart rate (beat/min).
*p< 0.05. The heart rate values were significantly decreased in both study groups from baseline values.
† p< 0.05. A significant decrease of Heart Rate was seen in Group BF than Group LF.
PACU: Postanesthesia care unit.

firms that levobupivacaine has a favorable profile with regard to adverse effects. Fentanyl was added to both protocols because it tends to increase the duration of the block, reduces the resultant local anesthetic concentration, and improves intraoperative anesthetic quality.

Recently, regional anesthesia (RA) techniques such as spinal or epidural anesthesia have been increasingly applied for lumbar disc surgery.[8-10] Regional anesthesia has advantages such as significantly reduced incidence of thrombosis and thromboembolism, reduced blood loss, high quality of postoperative analgesia, low incidence of nausea and vomiting. Furthermore, patients can be discharged sooner after RA.[4,15-17] Epidural anesthesia is an effective, well tolerated technique with several potential advantages, and acceptable incidence of complications, as compared to general endotracheal anesthesia for patients undergoing decompressive lumbar spine surgery.[18] Expected disadvantages of RA for lumbar spine surgery includes the inability to immediately assess lower extremity motor function and a possible delay in bladder function.[3] However, in this study, 55% of patients did not attain any degree of motor block.

Some institutions routinely and successfully use both epidural and spinal anesthesia for lumbar spine surgery since they are safe and reliable procedures and good alternatives to general anesthesia for spinal surgery.[10]

All local anesthetics have a direct depressant effect on the cardiovascular system in a dose related fashion.[19,20] Low doses of local anesthetics may cause vasoconstriction whereas moderate or high doses result in vasodilation and decreased SVR. Local anesthetics also have a dose-dependent negative inotropic effect.

Levobupivacaine has been investigated in epidural anesthesia, brachial plexus blocks, peripheral nerve blocks, and in infiltration anesthesia. Clinical studies have shown that levobupivacaine is equipotent to bupivacaine in terms of anesthetic efficacy. The decreased cardiovascular and central nervous system toxicity make levobupivacaine an interesting alternative to racemic bupivacaine.[21-23]

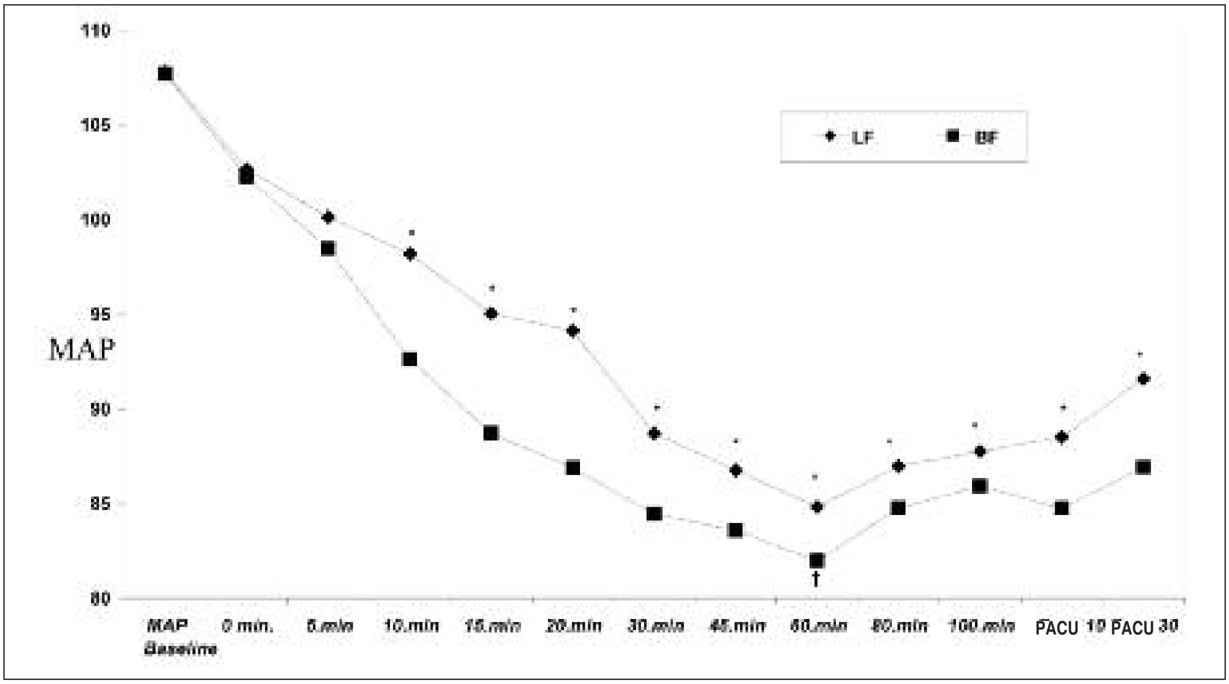

FIGURE 2: Mean arterial blood pressure (MAP).

* $p< 0.05$. Mean arterial pressure values were significantly decreased in both study groups from baseline values .

† $p< 0.05$ A significant MAP decrease was observed in Group BF than in group LF.

Our study has shown similar onset time, longer duration of sensory block and less intense motor block with levobupivacaine when compared to bupivacaine. This result was previously reported by other studies. De Negri et al.[24] found that there has been less intense motor block after epidural levobupivacaine and ropivacaine when compared to bupivacaine. Kopacz et al.[25] compared 0.75% levobupivacaine and bupivacaine for epidural anesthesia in lower abdominal surgery and observed similar onset times, but a significantly longer duration of sensory blockade when levobupivacaine was used. Cox et al.[26] reported that 0.5% levobupivacaine compared with bupivacaine for supraclavicular plexus blocks generally resulted in longer-lasting sensory (1039 versus 896 minutes) and motor (1050 versus 933 minutes) blocks and similar analgesic potencies. As opposed, some studies have shown similar characteristics of sensory and motor blocks with levobupivacaine and bupivacaine. Faccenda et.al[27] compared 0.5% levobupivacaine with 0.5% racemic bupivacaine for extradural anesthesia in patients undergoing Caeserean sections and observed similar block time, segmental spread, and duration of sensory block while lower-limb motor block was significantly longer and less intense in the levobupivacaine group. Casimiro et al.[28] showed similar anesthetic effects with Levobupivacaine plus fentanyl versus racemic bupivacaine plus fentanyl in epidural anaesthesia for lower limb surgery. In a study, Bader et al.[29] compared epidural 0.5% bupivacaine 30 ml with 0.5% levobupivacaine 30 ml for elective Caesarean section in 60 women, and they found no differences between treatment groups in the time to onset after injection and fade-out of sensory block and onset of motor block. All patients experienced motor block (Bromage 2 or 3) within 30 min. Depth of epidural anesthesia and motor block level are associated with amount and concentration of anesthetic agent and appropriate placement of epidural catheter. We used smaller concentrations and amounts of drugs when compared to Bader et al., and this is the most possible explanation why we obtained a lower level of motor block.

Our data showed that 20 ml of 0.375% (75 mg) levobupivacaine or 0.375% (75 mg) bupivacaine with 100 μg fentanyl was adequate for epidural anesthesia. This dose was equipotent and could equally offer an epidural anesthesia of good quality for elective lumbar laminectomy and discectomy. All patients had a cephalic spread to T2 or T6. Five patients required the additional 5-mL reinjection [(0.25% Plain Levobupivacaine, 3 of 40, (7.5%), 0.25% Plain Bupivacaine, 2 of 40 (% 5)].

Hemodynamic effects of epidurally administered local anesthetics are complex, because the volume, type, and concentration of local anesthetic, the extent of sympathetic blockade, the side of the block, the addition of vasoconstrictors or narcotics and physical status of the patient- related factors are all contributories.[30.] The most frequently occurring adverse effects in this study were hypotension and bradicardia. As expected, a decrease in systolic blood pressure, attributable to sympathetic block accompanying the epidural anesthesia, was the most common.[31,32] The rate of hypotension in a previous study was 84.4% in levobupivacaine group compared with 100% in bupivacaine group and there were no significant differences in potency and side effects.[29] The heart rate and mean arterial pressure values decreased significantly in the study groups from baseline values as it expected, due to extensive sympathetic block. The frequency of bradycardia and the occurrence of hypotension was higher in the bupivacaine group during surgery. Ephedrine was administered to 10% (4 of 40) and atropine 8% (2 of 40) of the patients in the bupivacaine group. Severe hypotension and bradycardia were not seen in patients who had levobupivacaine. The lower rate of hypotension in this study might be due to smaller volume and dose of local anesthetics that we used. The development of bradycardia after lumbar epidural analgesia extending to low thoracic levels may be the result of decreased cardiac sympathetic tone, decreased venous tone, reflex decrease in heart rate resulting from a decreased degree of pacemaker stretch, or reflex decrease in heart rate mediated via ventricular mechanoreceptors.[33] In this study, arrythmia or other severe cardiovascular effects were not observed.

Previous studies have demonstrated that several essential toxic effects could be encountered with local anesthetics such as allergy, cardiotoxicity and neurotoxicity.[34] Several experimental studies showed that lower bupivacaine doses as compared to levobupivacaine may induce toxic manifestations, such as seizures, hypotension, apnea and circulatory collapse.[35] In a study on 14 volunteers [intentional intravascular administration (10 mg/min) until mild CNS symptoms developed] levobupivacaine produced significantly less effects on myocardial function than racemic bupivacaine.[22.] In this study no cases of cardiac depression or central nervous system toxicity occurred caused by vascular absorption or direct intravascular injection of local anesthetics.

In conclusion, 0.375% levobupivacaine with fentanyl and 0.375% bupivacaine with fentanyl, are suitable anesthetics for use in lumbar spine surgery. Levobupivacaine provides less motor block and better hemodynamic stability, and also longer duration of sensory block time when compared to to bupivacaine.

REFERENCES

1. Jellish WS, Thalji Z, Stevenson K, Shea J. A prospective randomized study comparing short- and intermediate-term perioperative outcome variables after spinal or general anesthesia for lumbar disk and laminectomy surgery . Anesth Analg 1996;83(3):559-64.
2. Rung GW, Williams D, Gelb DE, Grubb M. Isobaric spinal anesthesia for lumbar disk surgery. Anesth Analg 1997;84(5):1165-6.
3. Kopacz D, Helman JD, Nussbaum CE, Hsiang JNK, Nora PC, et al. A Comparison of epidural levobupivacaine 0.5% with or without epinephrine for lumbar spine surgery. Anesth Analg 2001;93(3):755-60.
4. Greenbarg PE , Brown MD , Pallares VS , Tompkins JS, Mann NH. Epidural anesthesia for lumbar spine surgery. J Spinal Disord 1988;1(2):139-43.
5. Hassi N, Badaoui R, Cagny-Bellet A, Sifeddine S, Ossart M. Spinal anesthesia for disk herniation and lumbar laminectomy. Apropos of 77 cases. Cah Anesthesiol 1995;43(1):21-5.
6. Akarsu T,Altas M, Karakaya N. [Cauda equina syndrome caused by lumbar disc herniation during pregnancy and epidural anesthesia]. Turkiye Klinikleri J Anest Reanim 2009;7(2):110-2.
7. Tetzlaff JE, O'Hara J, Bell G, Grimm K, Yoon HJ. Influence of baricity on the outcome of spinal anesthesia with bupivacaine for lumbar spine surgery. Reg Anesth 1995;20(6):533-7.
8. MClain RF, Kalfas L, Bel GR, Tetzlaff JE, YoonHJ, et al. Comparison of spinal and general anesthesia in lumbar laminectomy surgery: a case controlled analysis of 400 patients. Neurosurg Spine 2005;2(1):17-22.

9. McLain RF, Tetzlaff JE, Bell GR, Lewandrowski UK, Yoon HJ, et al. Microdiscectomy: spinal anesthesia offers optimal results in general patient population. J Surg Orthop Adv 2007;16(1):5-11.

10. Smrčka M, Baudyšová O, Juráň V, Vidlák M, Gál R, V. Smrčka. Lumbar disc surgery in regional anaesthesia-40 years of experience. Acta Neurochirurgica (Wien) 2001;143(4):377-81.

11. Modig J. Benefical effects on intraoperative and postoperative blood loss in total hip replacement when performed under lumbar epidural anesthesia. An explanatory study. Acta Chir Scand Suppl 1989;550:95-103.

12. Mather LE, Chang DH. Cardiotoxicity with modern local anaesthetics: is there a safer choice? Drugs 2001;61(3):333-42.

13. Clarkson CW, Hondeghem LM. Mechanism for bupivacaine depression of cardiac conduction: fast block of sodium channels during the action potential with slow recovery from block during diastole. Anesthesiology 1985;62(4):396-405.

14. Foster RH, Markham A. Levobupivacaine: a review of its pharmacology and use as a local anaesthetic. Drugs 2000;59(3):551-79.

15. Parnass SM, McCarthy RJ, Bach BR Jr, Corey ER, Hasson S, Werling MA, et al. Beneficial impact of epidural anesthesia on recovery after outpatient arthroscopy. Artroscopy 1993;9(1):91-5.

16. Dahl V, Gierløff C, Omland E, Raeder JC.Spinal, epidural or propofol anesthesia for outpatient knee arthroscopy. Acta Anaesthesiol Scand 1997;41(10):1341-5.

17. Kopacz D, Mulroy MF. Chloroprocaine and lidocaine decrease hospital stay and admission rate after outpatient epidural anaesthesia. Reg Anesth 1990;15(1):19-25.

18. Greenbarg PE, Brown MD, Pallares VS, Tompkins JS, Mann NH. Epidural anesthesia for lumbar spine surgery. J Spinal Disord 1988;1(2):139-43.

19. Morrison SG, Dominguez JJ, Frascarolo P, Reiz S. A comparison of theelectrocardiographic cardiotoxic effects of racemic bupivacaine, levobupivacaine, and ropivacaine in anesthetized swine. Anesth Analg 2000;90(6):1308-14.

20. Tetzlaff JE. The Pharmacology of local anesthetics. Anesthesiol Clin of North America 2000;18(2):217-33.

21. Huang Y, Pryor M, Mather L, Veering B. Cardiovascular and central nervous system effects of intravenous levobupivacaine and bupivacaine in sheep. Anesth Analg 1998;86(4):797-804.

22. Bardsley H, Gristwood R, Baker H, Watson N, Nimmo W. A comparison of the cardiovascular effects of levobupivacaine and rac-bupivacaine following intravenous administration to healthy volunteers. Br J Clin Pharmacol 1998;46(3):245-9.

23. Valenzuela C, Delpon E, Tamkun MM, Tamargo J, Snyders DJ. Stereoselective block of a human cardiac potassium channel (Kv 1.5) by bupivacaine enantiomers. Biophys J 1995;69(2):418-27

24. De Negri P, Ivani G, Tirri T, Modano P, Reato C, Eksborg S, et al. A comparison of epidural bupivacaine, levobupivacaine, and ropivacaine on postoperative analgesia and motor blockage. Anesth Analg 2004;99(1):45-8.

25. Kopacz DJ, Allen HW, Thompson GE. A comparison of epidural levobupivacaine 0.75% with racemic bupivacaine for lower abdominal surgery. Anesth Analg 2000;90(3):642-8.

26. Cox CR, Checketts MR, Mackenzie N, Scott NB, Bannister J. Comparison of S(-)- bupivacaine with racemic (RS)-bupivacaine in supraclavicular brachial plexus block. Br J Anaesth 1998;80:594-8.

27. Faccenda KA, Simpson AM, Henderson DJ, Smith D, McGrady EM, Morrison LM. A comparison of levobupivacaine 0.5% and racemic bupivacaine 0.5% for extradural anesthesia for caesarean section. Reg Anesth Pain Med 2003;28(5):394-400.

28. Casimiro C, Rodrigo J, Mendiola MA, Rey F, Barrios A, Gilsanz F. Levobupivacaine plus fentanyl versus racemic bupivacaine plus fentanyl in epidural anaesthesia for lower limb surgery. Minerva Anesthesiologica 2008;74(7-8):381-91.

29. Bader AM, Tsen LC, Camann WR, Nephew E, Datta S. Clinical effects and maternal and fetal plasma concentration of 0.5% epidural levobupivacaine versus bupivacaine for cesarean delivery. Anesthesiology 1999;90(6):1596-601.

30. Visser WA, Lee RA, Hons BE , Gielen MJM .Factors affecting the distribution of neural blockade by local anesthetics in epidural anesthesia and a comparison of lumbar versus thoracic epidural anesthesia. Anesth Analg 2008;107(2):708-21.

31. Twomey C, Tsui BCH. Complications of Epidural Blockade. In: Finucane BT,ed. Complications of Regional Anesthesia. Chapter 10. New York: Springer-Verlag; 2007. p.181-2.

32. Nam SH, Kim JR, Park KW, Yoon DM. A clinical evaluation of epidural anethesia-An analysis of 1,168 cases. Korean J Anesthesiol 1984;17(1):66-72.

33. Albright GA. Cardiac arrest following regional anesthesia with etidocaine or bupivacaine. Anesthesiology 1979;51(4):285-7.

34. Santos AC, DeArmas PI. Systemic toxicity of levobupivacaine, bupivacaine, and ropivacaine during continuous intravenous infusion to nonpregnant and pregnant ewes. Anesthesiology 2001;95(5):1256-64.

35. Morrison SG, Dominguez JJ, Frascarolo P A. Comparison of the eletrocardiographic cardiotoxic effects of racemic bupivacaine, levobupivacaine, and levobupivacaine in anesthetized swine. Anesth Analg. 2000;90(6):1308-14.