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# A retrospective examination of the effects of regional anesthesia methods applied for postoperative pain control on analgesic consumption after lower extremity surgery

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**Abstract**

**Objective:** If preferable, the regional anesthesia is a more preferred method than general anesthesia. The preference for regional anesthesia increases as postoperative recovery is quicker, hospitalization is less and hospital costs are low.

**Material and methods:** We retrospectively evaluated the hemodynamic findings, postoperative pain, hospital, and intensive care stay in patients aged 18-80 who underwent lower extremity surgery with regional anesthesia in the last 1 year. We divided the cases into 3 groups; Group 1 (n =114) patients with a peripheral nerve block, Group 2 (n =104) spinal anesthesia, and Group 3 (n =81) epidural anesthesia.

**Results:** The difference between group 1 and 2, age hospitalization, and time of stay in intensive care was statistically significant. (P=0.021) (P=0.000). The difference between group 1 and 3 Intensive care unit stay was statistically significant (P = 0.003). The difference between the length of stay in the intensive care unit between groups 2 and 3 was found as statistically significant (P = 0.000). There was no significant difference in terms of hospital stay. Group 1 was found to have the shortest duration of intensive care stay.

**Conclusion:** In lower extremity surgeries, peripheral nerve blocks may have provided more hemodynamic stability and longer analgesic effect compared to central blocks.

**Keywords:** Regional Anesthesia, Lumbar block, Sciatic block.

## Introduction

Nowadays, regional anesthesia is more preferred, especially because of the increase in outpatient surgeries. The preference for regional anesthesia increases as postoperative recovery is quicker, hospitalization is less and hospital costs are low (1).

In regional anesthesia compared to general anesthesia; Side effects such as hemodynamic instability, postoperative cognitive impairment, respiratory depression due to opioids, drowsiness, and nausea and vomiting are less common (1).

Regional anesthesia can be divided into three groups: central blocks in which epidural and spinal blocks are performed, peripheral nerve blocks performed by injecting an anesthetic substance into the nerves or plexuses, and area blocks where anesthetic drug injections are made into the surgical area and surrounding tissues (2).

The most important advantage of peripheral nerve blocks against general anesthesia and other regional anesthesia methods is that anesthesia is limited to the area innervated by the nerve (2).

Lower limb blocks are technically challenging for anatomical reasons and require clinical experience. Many of these blocks were traditionally performed with paresthesia, loss of resistance, or field block techniques in the past, with varying success rates. Today, there have been many developments in needles, catheters, and nerve stimulators, and ultrasound has come into use in peripheral blocks (3).

Nerve stimulator and ultrasound can be used as a complement to each other or separately. Ultrasound has gained importance in peripheral nerve and plexus blocks. It allows local anesthetic to be administered around the nerve at a lower dose by being observed. (3)

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In our study, we aimed to retrospectively evaluate the effects of regional anesthesia performed in lower extremity surgeries on hemodynamic, postoperative pain, hospital, and intensive care stay.

## Material and Method

After the approval of the Ethics Committee of Harran University Faculty of Medicine (Decision 09.03.2020 -05-06), we retrospectively evaluated the hemodynamic findings, postoperative pain, hospital, and intensive care stay in patients aged 18-80 who underwent lower extremity surgery with regional anesthesia in the last 1 year.

Those who are allergic to the drugs in the study, those with bleeding diathesis, neuromuscular and spinal deformities, infection at the application site, neurological disease, mental disorder, patients who do not accept regional anesthesia, patients under 18 and over 80 years of age, surgery duration longer than four hours were excluded.

We divided the cases into 3 groups; Group 1 (n =114) who patients with peripheral nerve block, Group 2 (n =104) spinal anesthesia, and Group 3 (n =81) epidural anesthesia.

The Visual Analogue Scale (VAS) was used to determine the need for analgesia.

After the patients were monitored, the anesthesia method was applied.

In the spinal anesthesia method, while the patient was in a sitting position, 0.5% 3.5 ml Bupivacaine was applied to the subarachnoid space under sterile conditions from the L4-L5 region.

In the epidural anesthesia method, while the patient was in a sitting position, an epidural catheter was inserted under sterile conditions, and a mixture of 0.5% 25 mg Bupivacaine , 50 mcg Fentanyl, and 50 mcg Lidocaine were applied to form a block at the T8 level.

In the lumbar plexus-sciatic nerve block, a 100 mm stimulation needle (D22G, Stimuplex, B. Braun, Germany) was used to provide 2 Hz electrical stimulation, provide 2 Hz electrical stimulation with a starting current of 1 mA and a pulse duration of 0.1 ms. The contraction of the quadriceps femoris and gastrocnemius in response to a current of <0.3 mA indicated that the injection site was reached. When no blood or cerebrospinal fluid aspiration was confirmed, 0.5% and 30 ml of bupivacaine were injected for the lumbar plexus block and the sciatic nerve block, respectively.

Postoperative analgesia was not administered in any of the groups. Hemodynamic changes were evaluated using the maximum rate of variation calculated using the following formula: maximum rate of variation = (maximum-minimum) / pre-anesthetic value.

Posteparif VAS score was checked at 2nd, 6th, and 12th hours. VAS scores range from 0 to 10, with 0 being painless and 10 being the worst pain imaginable.

**Statistical analysis**

Continuous data are presented as means and standard deviations. Categorical data were presented as percentages or frequency. Comparisons were made using one-way analysis of variance followed by posthoc analysis or chi-square test. Ordinary data compared using the Anova test. All statistical analyzes were performed using SPSS 23.0 software (SPSS, Chicago, USA). P <0.05 was considered statistically significant.

## Results

Group 1 (n= 114), Female=42 (36.8%), Male =72 (63.2%), mean age 51.6±20.97 years, hospital stay 4.94±4.05 days, and the duration of intensive care stay was 0.26±0.82 days.

Group 2 (n= 104), F = 43 (41.3%), M = 61 (58.7%), mean age 63.35±16.76 years, hospital stay 5.34±2,9 days, and the length of stay in the intensive care unit was 0.85 ±2.35days.

Group 3 (n= 81), Female= 23 (28.4%), Male= 58 (71.6%), mean age 45.83±22.5 years, hospital stay 4.85±2,81days, and the length of stay in the intensive care unit was 0.87±0.6 days.

Gender, age, and ASA characteristics of the patients were similar (Table1).(Figure 1)

The difference between groups 1 and 2, age, hospitalization and length of stay in intensive care was statistically significant. (P = 0.021) (P = 0.00).

The difference between group 1 and 3 Intensive care unit stay was statistically significant. (P = 0.003)

Group 1 was found to have the shortest duration of intensive care stay.

The difference in heart rate, mean arterial pressure, and maximum variation ratio was statistically significant between the 3 groups. (P = 0.00) Table 2

The preoperative VAS score was not different between the 3 groups.

While the 2nd-hour VAS score was similar between Group 1 and Group 3, it was significantly higher in Group 2 (P = 0.00).

While the 6th hour and 24th-hour VAS score was significantly lower in Group 1 (P = 0.00), there was no statistically significant difference between Group 2 and Group 3 (P = 0.69).

No significant difference was found in terms of other findings.

**Table 1.** General informations of patients

| | Group 1 (n=114) Mean±STD | Group 2(n=104) | Group 3(n=81) | P-Value |
|---|---|---|---|---|
| **Gender** | F = 42 (36.8%) M = 72 (63.2%) | F = 43 (41.3%) M = 61 (58.7%) | F = 23 (28.4%) M = 58 (71.6%) | P=0.62 |
| **Mean Age (year)** | 51.6 ±20.97 | 63.35 ±16.76 | 45.83 ±22.5 | Grpup1-2 P=0.021 Group 2-3 P=0.59 Group 1-3 P=0.67 |
| **Hospital Stay (day)** | 4.94 ±4.05 | 5.34±2,9 | 4.85±2,81 | Group 1-2 P=0.00 |
| **ICU Stay (day)** | 0.26±0.82 | 0.85±2.35. | 0.87±0.6. | Group 1-2 P=0.00 |

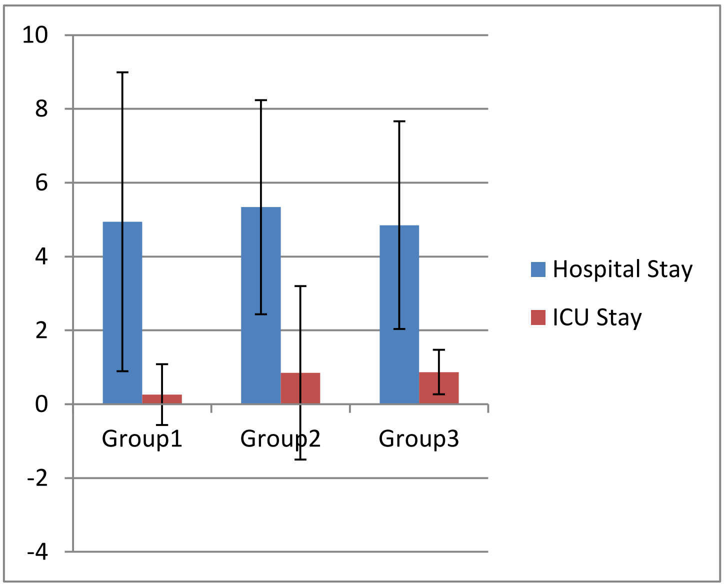


**Figure 1.**Comparison of Hospital and ICU stay (days)

**Table 2.** Maximum Variation Rate Comparison

| | Group 1 (n=114) peripheral nerve block | Group 2 (n =104) spinal anesthesia | Group 3 (n =81) epidural anesthesia | P-value |
|---|---|---|---|---|
| **Systolic Blood Pressure** | 0.27 (0.25-0.29) | 0.40 (0.35-0.45) | 0.35(0.30-0.40) | P=0.00 |
| **Diastolic Blood Pressure** | 0.21(0.19-0.23) | 0.36(0.34-0.39) | 0.30(0.29-0.32) | P=0.00 |
| **Heart Rate** | 0.23(0.20-0.26) | 0.39(0.34-0.42) | 0.32(0.29-0.33) | P=0.00 |

## Discussion

Nerves that innervate the lower limb exit from the lumbar and sacral plexuses. The lumbar plexus consists of the anterior parts of the first four lumbar nerves; often takes branches from T12 and sometimes from L5. The plexus is located in the psoas compartment between the psoas major and quadratus lumborum muscles. The lower components of the plexus L2-3 and L4 innervate the anterior and inner thigh region. The anterior parts of L2-3 and L4 form the obturator nerve, the posterior parts of the same nerves form the femoral nerve. The lateral cutaneous nerve consists of the posterior parts of L2 and L3. The posterior cutaneous nerve and the sciatic nerve of the thigh are formed by the addition of branches in the anterior parts of S1-2-3 and L4-5, respectively. These nerves pass together through the pelvis and the large sciatic foramen and are blocked using the same technique. The sciatic nerve is the combination of two major nerve trunks.

The tibial nerve (anterior branches of the anterior parts of L4-5 and S1-2-3), the main peroneal (posterior branches of the anterior parts of L4-5 and S1-2-3) are nerves. In or above the popliteal fossa, the tibial nerve splits inward and the main peroneal nerve outward. (2)Peripheral nerve blocks are used in postoperative analgesia when general anesthesia is not desired or contraindicated. Less side effects, more stable hemodynamics and longer analgesic effect than central blocks cause peripheral nerve blocks to be preferred (4).

Hemodynamic instability, such as changes in heart rate and blood pressure during intubation and extubation, may increase the risk of vascular events, especially in elderly patients. Hemodynamic instability was found the most in the spinal anesthesia group.

The difference in the maximum variation ratio was found to be the lowest in the peripheral nerve block group. This shows that the peripheral nerve block is safer in terms of hemodynamic instability (5).

VAS score was found to be lower in the peripheral nerve block group than the spinal anesthesia and epidural anesthesia group. This shows that the analgesic effect of the peripheral nerve block lasts longer than the epidural anesthesia and spinal anesthesia groups (6).

Aldahish et al. compared combined lumbar plexus plus sciatic nerve blocks with epidural anesthesia in terms of intraoperative anesthesia and postoperative analgesia. Similar to our study, the results showed effective anesthesia in both groups and the analgesic duration was longer in the peripheral nerve block (7).

Davies et al. compared epidural anesthesia with femoral block anesthesia. Similar to our study, the duration of analgesic was found to be longer in the peripheral block (8).

Greengrass et al. Compared peripheral nerve block with epidural anesthesia in their study. Similar to our study, they showed that there was a longer analgesic effect in the peripheral nerve block group (9).

In a similar study conducted by Horasanlı et al., patients who underwent peripheral nerve block showed more hemodynamic stability, less side effects and a longer analgesic effect time compared to patients undergoing epidural anesthesia. This shows similar results to our study (10).

One of the limitations of our study is that it is retrospective and that data was searched from files.

## Conclusion

In lower extremity surgeries, peripheral nerve blocks may have provided more hemodynamic stability and longer analgesic effect compared to central blocks.

In addition, although no significant difference was found in terms of length of hospital stay, the duration of intensive care stay was found to be shorter in the peripheral nerve block group. This may indicate that peripheral nerve blocks may be more preferable in lower extremity surgeries. More studies are needed in this area.

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**Author Contributions: MKE:** Project design, Patient examinations, Review of the literature, data collection and analyzes **MKE;** Writing and Revisions

**Ethical issues:** All authors declare originality and ethical approval of research. Responsibilities of research, responsibilities against local ethics commission are under the authors responsibilities. The study was conducted under defined rules by the local ethics commission guidelines and audits.

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