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Original Research

Lateral Sagittal Infraclavicular Block for Orthopedic Surgery: One Year Experience

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ABSTRACT

Objective: Lateral sagittal infraclavicular block (LSIB) is commonly used as a regional anesthetic technique for below the mid-humerus region in upper-limb surgery. The primary aim of the present study was to analyze the success rate of LSIB for orthopedic surgery.

Methods: We retrospectively analyzed orthopedic surgical procedures and identified patients who were applied LSIB between January 2015 and December 2015. Patient age, gender, American Society of Anesthesiologists (ASA) classification, diagnosis, surgery time, premedication regimens, serious complications, and guidance type [ultrasound (US) or nerve stimulator (NS)] were recorded. Need for additional sedatives and analgesics, laryngeal mask airway anesthesia, and general anesthesia was documented. The successful block was defined as the block sufficient to perform the surgery without any additional anesthetic and analgesic methods.

Results: We identified 233 patients who underwent 244 orthopedic procedures. US-guided and NS-guided LSIB were applied in 170 (69.7%) and 74 (30.3%) procedures, respectively. Mean age, gender, ASA classification, surgery time, and premedication regimens were similar in both the groups. The success rates of US-guided and NS-guided LSIB were 95.3% and 83.8%, respectively, and this difference was significant as statistically.

Conclusion: US-guided LSIB had been gradually increased in our daily practice. Moreover, US-guided LSIB had a higher success rate than NS-guided LSIB.

Keywords: Infraclavicular block, ultrasound, nerve stimulator, success rate, orthopedic surgery

INTRODUCTION

Lateral sagittal infraclavicular block (LSIB), a technique for regional anesthesia developed by Klaastad et al. (1), is frequently used below the mid-humerus region in upper-limb surgery. Nerve stimulator (NS)-guided LSIB has been used for many years. Recently, ultrasound (US)-guided LSIB has been used to view the nerves and advance the needle during injections, because peripheral nerve blocks (PNBs) can be applied more easily and involves lesser risk using US than using NS (2). Thus, the aim of this retrospective study was to analyze the use of LSIB for orthopedic surgeries of the elbow, forearm, wrist, and hand for comparing the success rate of LS-guided and US-guided LSIB.

METHODS

We retrospectively analyzed orthopedic surgical procedures and identified patients who were applied LSIB between January 2015 and December 2015 at a single institution after Local Ethics Committee approval had been obtained (31.03.2016-E.4563).

We recorded patient age; gender; American Society of Anesthesiologists (ASA) Physical Status classification; diagnosis; surgery time; premedication regimens; guidance type; additional drug requirements; and serious complications, such as convulsion, local anesthetic drug toxicity, and pneumothorax. All values of patients were obtained from computers with hospital information management system and anesthetic charts.

The inclusion criterion was that the patients who underwent only unilateral LSIB had to be aged 18 years and older. The exclusion criteria were as follows: patients aged less than 18 years; those who received multiple PNBs; those who received multiple anesthetic techniques, such as LSIB and general anesthesia; those with central neuraxial blocks; those with perineural catheter placement; and those with inadequate data.

Block Techniques and Applications

All blocks were performed by anesthesiologists experienced in LSIB and residents who were trained for at least 3 years under observing of the same anesthesiologists.

Nerve stimulation guidance technique

The needle was connected to the active lead of the nerve stimulator, and 1.5-mA current impulses of 0.1-ms in duration at 1-Hz

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frequency were delivered. The needle was inserted caudally in the sagittal plane 45° from the skin on a horizontal plane at the intersection between the clavicle and the coracoid process. When the second and third finger flexion of the median nerve response was observed, 20 mL of a bupivacaine (0.25%) and lidocaine (1%) mixture was injected.

Ultrasound guidance technique

The needle was inserted in a plane with the US probe at the intersection between the clavicle and the coracoid process. The axillary artery and chords of the nerves were identified. The needle was directed posterolateral of the axillary artery, and 20 mL of a bupivacaine (0.25%) and lidocaine (1%) mixture was injected until the local anesthetic mixture surrounded the artery in a U-shaped pattern.

Statistical Analysis

All analyses were performed using the SPSS (Statistical Package for Social Sciences) for Windows version 22.0 (IBM Corp.; Armonk, NY, USA). Data were expressed as mean±standard deviation (SD), percentage, or n, as appropriate. Shapiro–Wilk tests were used for normality assumption of data. Student's t-test was used to compare numeric parameters that showed a normal distribution, and the Mann–Whitney U-test was used to compare numeric parameters that did not show a normal distribution. Categorical parameters were compared using Pearson's chi-square and Fisher's exact tests. $p<0.05$ was considered statistically significant.

RESULTS

We identified 233 patients who underwent 244 orthopedic procedures. Of them, nine patients were operated two times and one patient was operated three times. US- and NS-guided LSIB were applied in 170 (69.7%) and 74 (30.3%) procedures, respectively. LSIB was applied for distal humerus or olecranon surgeries, ulna or radius surgeries, hand or wrist surgeries, and implant removals and revisions in 27 (11.1%), 69 (28.3%), 137 (56.1%), and 11 (4.5%) patients, respectively.

Demographic and clinical data of the patients are shown in Table 1.Mean ages, genders, ASA classifications, surgery times, and premedication regimens were similar in both the groups ($p>0.05$). In total, 45 patients had no premedication (18.4%); 130 (53.3%) patients used midazolam, 40 (16.4%) patients used midazolam and fentanyl, and 29 (11.9%) patients used midazolam and ketamine.

The success rate of US-guided LSIB (95.3%) was higher than that NS-guided LSIB (83.8%). General anesthesia was applied in 3 (1.8%) and 4 (5.4%) patients, laryngeal mask airway (LMA) anesthesia was applied in 1 (0.6%) and 5 (6.8%) patients and additional sedatives and analgesics were applied in 4 (2.3%) and 3 (4.0%) patients under US-guided and NS-guided LSIB, respectively. No convulsion, local anesthetic drug toxicity, or pneumothorax was associated with inadvertent intravascular injection in either group.

Table 1. Demographic and clinical data to guidance type

	US-guided LSIB (n=170)	NS-guided LSIB (n=74)	p
Age	38.22±19.1	42.84±17.9	0.079
Surgery time	76.48±44.7	80.19±45.3	0.554
Gender (male/female)	120/50	50/24	0.637
ASA class (I/II/III/IV)	82/68/18/2	26/39/9/0	0.181
Patients with premedication	141	58	0.398
Success rate (%)	162 (95.3)	62 (83.8)	0.020*

Data are presented as mean±SD, n, or percentage. ASA: American Society of Anesthesiologists; SD: standard deviation; n: number of cases; %: percentage; p: statistically significant

DISCUSSION

Lateral sagittal infraclavicular block is a safe and effective technique for forearm surgery that can be easily applied with low risk of complications (3). LSIB can be NS guided or US-guided. The success rate of NS-guided LSIB is variable (73%–92.5%) (4, 5). Using a multiple-injection technique allows for increased success rates (6, 7). It is well known that US-guided LSIB provides increased success rates and decreased complications. The success rate of US-guided LSIB is variable (83%–100%) (5, 8).

In a prospective, randomized, single-blinded study, Dhir et al. (8) reported the success rates of US-guided and NS-guided infraclavicular catheter placement to be 83.2% and 81.4%, respectively. Another study comparing US-guided and NS-guided LSIB reported higher success rates at 95% and 92.5%, respectively (4). Sauter et al. (9) reported that the success rates of US-guided and NS-guided LSIB to be 95% and 85%, respectively. Further, Brull et al. (10), consistent with the former studies, reported the success rate of US-guided and NS-guided LSIB to be 92% and 80%, respectively. As indicated by these studies, the differences in the success rates are not significant (4, 8-10). Contrary to the results of previous studies, in our study, US-guided LSIB had a significantly higher success rate than NS-guided LSIB. However, this may be because our study retrospective in nature.

Vascular punctures and pneumothorax are serious complications that can result from LSIB (11-13). Vascular punctures were reported in 2%–33% LSIB procedures (9, 11), and this number increases in NS-guided LSIB (4, 9). In the present study, we could not measure the incidence of vascular punctures that accidentally occurred because they were not recorded; nevertheless, no convulsion or local anesthetic drug toxicity related to accidental intravascular injection was reported. Further, pneumothorax is rarely observed (14-16); in our study, pneumothorax was not observed in either group.

The major limitation of this study is that the data were collected retrospectively. Another limitation is that we did not use a standardized premedication protocol because PNBs were applied by different anesthesiologists.

CONCLUSION

US-guided LSIB was gradually applied in our practice without serious complication. In addition, the success rate of US-guided LSIB was significantly higher than that of NS-guided LSIB. However, to add value to these findings, prospective and randomized large-scale studies are required.

Ethics Committee Approval: Ethics committee approval was received for this study from the Sakarya University School Of Medicine Local Ethics Committee (Approval Date: 31.03.2016; Approval Number: E.4563).

Informed Consent: Since this was a retrospective study, informed consent could not be taken from the patients.

Peer-review: Externally peer-reviewed.

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