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Our clinical experiences in ultra-sound guided peripheral nerve blocks: a retrospective evaluation

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Abstract
Peripheral nerve blocks are commonly used in extremity surgeries for anesthetic and/or postoperative analgesic purposes with general anesthesia. Ultra-sound (US) guided peripheral nerve blocks that have been used in recent years provide many superiorities in comparison with other conventional methods. The objective of this retrospective study was to carry out a retrospective evaluation of our experiences regarding 400 patients on whom US guided peripheral nerve was applied at the Inonu University Faculty of Medicine, Department of Anesthesiology and Reanimation during June 2012-March 2016. Demographic data of the patients, block type, purpose of block (for surgical or analgesic), type and volume of the local anesthetic, type of US probe, needle length, block success, toxicity finding and complications were all recorded. Blocks were performed for analgesia in 16% of the patients and for anesthesia in 84%. Lidocaine+bupivacaine combination, bupivacaine+prilocaine combination and bupivacaine were used on 82%, 13% and 5% of the patients as local anesthetic agent, respectively. Linear US probe (6-13 MHz) was used for all patients. In conclusion, US guided peripheral nerve blocks provide adequate depth of anesthesia and analgesia. It was found to be safe and useful and may be a good alternative to general anesthesia.

Keywords: Aneshesia, nerve block, ultrasonography

Introduction

Peripheral nerve blocks are commonly used in extremity surgeries for anesthetic and/or postoperative analgesic purposes with general anesthesia [1-8]. It is important to determine nerve localization in peripheral nerve block applications. Even though anatomical landmarks, paresthesia, electrical nerve stimulation methods can be used for this purpose. Although these methods provided information about the proximity of the needle tip to the target nerve, do not provide information about the distribution of the local anesthetic injected [5].

Ultra-sound (US) guided peripheral nerve block applications that have been used in recent years provide many superiorities in comparison with other conventional methods. These advantages are that can provide direct imaging of the anatomic structures (nerve, artery, tendon) and the local anesthetic administered, prevention of complications such as intraneural or intravascular local anesthetic injection, elimination of painful contractions in nerve stimulation and decrease of local anesthetic doses [3].

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The objective of this retrospective study was to carry out a retrospective evaluation of our experiences regarding 400 patients on whom USG peripheral nerve was applied.

Material and method

This study was carried out with 400 patients at the Inonu University Faculty of Medicine, Department of Anesthesiology and Reanimation following the consent by Malatya Clinical Studies Ethical Council (2016/152) by via a retrospective scanning of the records of US (Esaote MyLab™Five, Italy) guided peripheral nerve block between June 2012-March 2016. Demographic data of the patients included age, height, weight, ASA, block type, purpose of block (for surgical or analgesic), type and volume of the local anesthetic, type of US probe, needle length, block success, toxicity finding, complications such as vomiting-nausea, hypotension, respiratory failure, methemoglobinemia, nerve puncture, pneumothorax and accompanying diseases of the patients were all recorded.

Data were presented as mean ± standard deviation or percentages.

Results

The demographic data of the patients was presented in Table 1. The block types are shown in Figure 1. Block applications were performed for analgesia in 16% of the patients and for anesthesia in 84% of the patients.

Lidocaine+bupivacaine combination, bupivacaine+prilocaine combination and bupivacaine were used on 82%, 13% and 5% of the patients as local anesthetic agent, respectively. 20 of patients (5%) applied interscalene block was used bupivacaine 20 mL. 30 mL of local anesthetic was used in 340 (%85) of patients.

Table 1. Patients' demographic data; number of patients, mean ± SS

	Mean ± SS
Age (years)	38±0.1
Height (cm)	169±6.1
Weight (kg)	71±0.4
Gender (Female/Male)	100/300
ASA I/II/III	320/60/20

ASA; American Society of Anesthesiologists

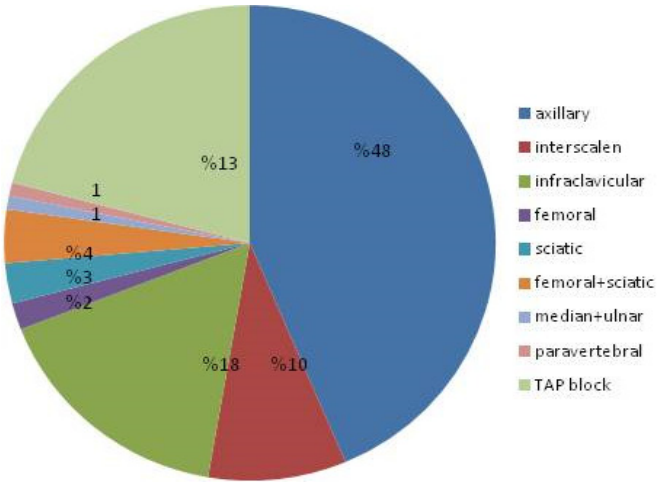

Figure 1. Block Types

40 of (10%) patients received total volume 40 mL (lokal anesthesic 30 mL dilueted with saline10 mL). Linear US probe (6-13 MHz) was used for all patients.

Needle visible with US was used with a length of 5 cm for 22% of the patients, 8 cm for 73% of the patients, and 10 cm for 5% of the patients.

The block was successful on 87% of the patients, 13% of the patients who had unsuccessful block was applied general anesthesia. The sign of toxicity, hypotension, vomiting-nausea, respiratory failure, pneumothorax, methemoglobinemia developed in none of the patients. There were hypertensions, diabetes, asthma, coronary artery disease in 4 %, 2%, 3%, 5% of the all patients, respectively. The block distribution are shown in Figure 2.

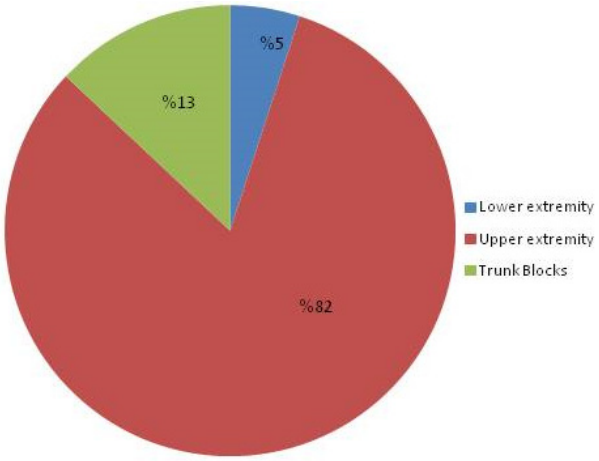

Figure 2. Distribution of Blocks

Discussion

Previous studies have showed the ultrasound guided was superior to the conventional method of nerve stimulation; additionally it was reported higher success rates and qualitative block outcomes when ultrasound was used in peripheral nerve blocks [9,10]. Ultrasound can provide direct image of the target nerve, surrounding tissues, and local anesthetic spread. It was reported, US guided peripheral nerve block lead to improvements in patient safety in the form of decreased nerve injury, local anesthetic systemic toxicity, or other complications[10].

Regional anesthesia is a more reliable method in comparison with general anesthesia. The patients received regional anesthesia are conscious, cooperated, intact of airway reflexes, additionaly detection of complications can be more earlier [6,7]. Hence, it is commonly used for anesthesia and analgesia in upper and lower extremity surgeries [2,3]. It is frequently used transversus abdominis plane block (TAP) and paravertebral blocks for postoperative analgesia after abdominal surgery [11-14]. In the current study, peripheral nerve block was applied to 80% of the patients for anesthesia and others for analgesia.

Brachial plexus blocks included interscalene block, infraclavicular block and axillary block can be performed for upper extremity surgery [1,3,5,15]. We administered all these block types on the patients. A successful plexus nerve block depends on the perineural spread of injected local anesthetic solution. Brachial plexus is divided into three terminal nerves of median, radial and ulnar nerves at the axillary region. However, the fact that anatomical landmarks vary from person to person makes it difficult to guide the needle and to peripheral nerve block applications via neurostimulation. Nerve blocks used US guided can be easily performed and detected more accurately the needle location. It is reported that in cases such as amputee extremity for which motor response cannot be received nerve stimulation US guided block applications was more

useful (5). The axillary block was the most prefer on the upper extremity in the study.

Sertöz et.al. reported that methemoglobinemia developed in two patients in their study used bupivacaine+prilocaine combination for axillary blocks [3]. Combination of bupivacaine+prilocaine was used in 52 (13%) of the patients and methemoglobinemia developed in no patients in the current study. It may be explane with that our prilocaine volumes was lower the other study. Bupivacaine+lidocaine combination was preferred for 324 (82%) of patients. Altay et.al. emphasized that bupivacaine and levobupivacaine have similar properties in axillary blocks with regard to clinical effect and reliability [16]. However, we could not used levobupivacaine in our interventions due to we did not obtain it.

The infraclavicular block is superior than axillary block because it can better block the axillary nerve and musculocutaneous nerve [4]. We preferred infraclavicular block depending on the surgical type in our patients. In infraclavicular block, the vein puncture occur more than other upper extremity blocks due to the close neighborhood between artery and vein. Koltka et.al. reported that vein puncture was occurred in two cases in infraclavicular block with a nerve stimulator [4]. They thought that the application was performed without US guided. We observed no complication such as vein puncture and pneumothorax since we performed all blocks with US guided.

In principle, interscalene block provides anesthesia and analgesia in shoulder and upper arm surgery [6]. Hence, we preferred interscalene block for patients who scheduled undergo shoulder surgery. Hypotension and bradycardia may develop during these operations because of the operations generally carry out in sitting position. However hypotension and bradycardia were not developed our patients applied interscalene block.

Lower extremity blocks frequently are used in knee and below-knee surgeries. Femoral, sciatic, combined femoral+sciatic blocks can be applied for this purpose [2,7,17-20]. The comfort of patient is provided without general anesthesia used and complications are reduced patients with high risk for general anesthesia [8]. US provided block success ratios, decreased local anesthetic amounts used and local anesthetic systemic toxicity. Local anesthetic systemic toxicity was observed in none of our patients.

Şahin et.al. reported that effective analgesia can be provided for up to post-operative 48 hours following the femoral block with a single dose injection by US guided on patients underwent knee arthroplasty [17]. Similarly, we performed US guided femoral block for analgesia on patients underwent knee arthroplasty.

Kaygusuz et.al. have carried out the combined sciatic-femoral nerve block with nerve stimulatory in patients with high risk [18]. Similarly, we also preferred the combined sciatic-femoral nerve block for patients with high risk, differently we used US guided.

It has been reported that TAP block provided more effective postoperative analgesia, significantly reduced consumption of postoperative opioids and the side effects associated with opioids (21). McDonnell et.al. (11) and Carney et.al. (12) were demonstrated that TAP block increased postoperative analgesia quality after abdominal surgeries, total abdominal hysterectomy, respectively. TAP block can perform either preoperatively (11,12) or postoperatively (21). We performed TAP block to our patients at the end of the surgery.

Side effects such as nausea, vomiting are frequently observed in the post-operative period in peripheral blocks [2]. Nausea and vomiting developed in none of our patients.

In conclusion, US guided peripheral nerve blocks provide adequate depth of anesthesia and analgesia. It was found to be safe and useful and may be a good alternative to general anesthesia.

Disclosure

The authors of this manuscript have no conflicts of interest.

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