Original Research

The Success Rate of Radial Nerve and Ulnar Nerve Block with Ultrasound Compared To Without Ultrasound for Pain Management in Emergency

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Abstract:

Background:

One of the most important duties of an emergency medicine specialist is pain management. Patients with hand trauma come to the emergency room with severe pain. Therefore, the purpose of this study was to determine the success rate of radial, ulnar, and median nerve blocks with and without ultrasound guidance for pain management in the emergency room.

Methods: In this clinical trial study, 286 patients with isolated hand trauma were divided into two groups using a table of randomization numbers. In one group, the desired nerve block was performed under sterile conditions and with a guide probe surface ultrasound, and in the other group, the location of the nerve was determined through landmarks and under sterile conditions, the desired nerve block was performed. Data analysis was done using spss software version 21 and using descriptive and inferential statistical tests.

Result: The average age of the studied patients was 26.3 ± 3 years. The frequency distribution of successful nerve block was 85.3% in the group with ultrasound guidance and 67.8% in the group without ultrasound guidance (P=0.002). There was no significant difference in the frequency distribution of patient satisfaction in the two study groups (P=0.622). The frequency distribution of nerve block success in both sexes was not significantly different (P=0.971). The frequency distribution of nerve block success based on the blocked nerve was not significantly different (P=0.138).

Conclusion: The use of ultrasound to create a nerve block in the procedures performed on the hand in the emergency room increases the accuracy and success of the nerve block and as a result reduces the complications and dissatisfaction of the patients.

Keywords: Radial Nerve Block, Ulnar Nerve, Median Nerve, Ultrasound, Pain Management, Emergency

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Introduction

One of the most important duties of an emergency medicine specialist is pain management. Patients with hand trauma come to the emergency room with severe pain. The emergency medicine specialist must perform all the diagnostic and treatment measures in such a way that the patient does not feel pain and the doctor can perform his duty in peace. To achieve the above goal, the emergency medicine specialist must acquire the necessary knowledge and skills to perform (PSA) (procedural analgesia and sedation), one of the important methods of which is nerve block (1-2). In some patients, such as cardiac patients and unstable hemodynamics, the administration of intravenous drugs for PSA is contraindicated, and the best option is nerve block, and therefore the need to acquire knowledge and skill of nerve block by an emergency medicine specialist is clearly defined. Any peripheral nerve can be blocked along the way from the spinal cord to the target organ. If we know the anatomical path of the nerve well, we can easily perform the block in places where the nerve is superficial (3-4). Radial, ulnar and median nerve block in patients with hand trauma is one of the effective methods of pain management in the emergency room, fortunately, there are simple techniques in this field, and the doctor can easily do this by knowing the nerve path, the dose of the necessary medicine, and the use of landmarks. can perform nerve block (5). In a study conducted by Girolami and his colleagues, the success rate of wrist nerve block using anatomical landmarks is 98%-100% if performed by an experienced person (3). New technologies also help a lot to block nerves. With the guidance of ultrasound and surface probe, the path of the nerve can be easily identified and the doctor can perform the nerve block with confidence (2-6). In the study of Liebmann and his colleagues, the possibility of using ultrasound to block the nerves of the hand to perform hand procedures was investigated, but in this study, no comparison was made with other methods (1). Successful radial, ulnar and median nerve block requires accurate location of the nerve, correct needle guidance, and injection of the appropriate amount of local anesthetic, which can be achieved with ultrasound guidance (4-6). Considering that no study has been conducted on the success rate of radial, ulnar and median nerve blocks with and without ultrasound guidance in the emergency room, the necessity of conducting this study is clear.

Method

In this clinical trial study, 286 patients with isolated hand trauma were divided into two groups using a table of randomization numbers. In one group, the desired nerve block was performed under sterile conditions and with a surface ultrasound guide probe, and in the other group, the location of the nerve was determined through landmarks, and under sterile conditions, the desired nerve block was performed with 5 cc of lidocaine2%. After about 35-40 minutes, nerve numbness was evaluated using pin prick test.

Identification of landmarks

In the wrist, the median nerve is located under the palmaris longus tendon or radially between palmaris longus and flexor carpi radialis. In 20% of patients, the palmaris longus is not easily found, in which cases the nerve is located within one centimeter of the ulnar direction of the Flexor Carpi Ulnaris Tendon. The radial nerve is located in the path of the radial artery, but its sensory branches are separated proximally. The ulnar nerve is located in the path of the ulnar artery, both of which are located in the depth of the flexor carpi ulnaris tendon. This tendon is easily located proximal to the pisiform. Inclusion criteria include: patients with isolated hand trauma, absence of previous deformity in the hand area, age more

than 18 years. Exclusion criteria also include; The patient's lack of consent to participate in the study is a patient with multiple traumas, a patient who has received pain medication for any reason, and the presence of an injury in the target area for nerve block. Data analysis was done using spss software version 21 and using descriptive and inferential statistical tests (chi-square). P-value less than 0.05 was considered as significance level in all tests.

Result

In this study, 286 nerve block cases were examined. In 10 patients three median, ulnar and radial nerves were blocked simultaneously, in 5 patients radial and median nerve blocks were performed and in 25 patients ulnar and median nerve blocks were performed simultaneously. In 219 cases nerve block was successfully performed and in 67 cases it was unsuccessful. The frequency distribution of sex in the two studied groups did not differ significantly (P=0.611) (Table 1).

The average age of the studied patients was 26.3±3 years. The average age in the group with ultrasound guidance was 25.9 ± 6.1 and in the group without ultrasound was 26.8±5.9. The Mann-Whitney statistical test showed that the average age in the two studied groups had a significant difference (P=0.225).

The Mann-Whitney statistical test showed that the mean pain in the ultrasound-guided group was significantly lower (P=0.001) (Table 2).

The Mann-Whitney statistical test showed that the average duration of anesthesia was significantly lower in the ultrasound-guided group (P=0.001). The Mann-Whitney statistical test showed that the average number of blocked nerves in the two studied groups was not significantly different (P=0.799).

The chi-square test showed that the distribution of the frequency of the blocked nerve in the two studied groups was not significantly different. (P=0.378). (Table 3).

There was no significant difference in the frequency distribution of patient cooperation in the two study groups (P=0.494). Chi-square statistical test showed that the frequency distribution of failed nerve block was significantly higher in the group without ultrasound guidance (P=0.001). (Table 4).

The regression analysis of the factors involved in the success of the nerve block in all patients showed that the number of blocked nerves and the time required to create anesthesia are the factors involved in the success of the nerve block. This means that reducing the number of nerves will improve the probability of success. And increasing the time interval from the injection will increase the probability of success. Various variables such as age, sex, etc. do not play a role in the success of nerve block in the method without ultrasound guidance.

Discussion

Brachial plexus block for the upper limb is one of the valuable methods in creating regional anesthesia. The key to success in this depends on the accuracy of needle placement, focusing on the nerve and injection of local anesthesia. In recent years, ultrasound guidance has rapidly become a standard in regional anesthesia. Therefore, reviewing the different aspects of needle guidance for regional anesthesia of the brachial network using this method seems necessary. In the present study, the success of the nerve block increased significantly in the cases of using ultrasound.

In Liebmann et al.'s study, the use of ultrasound to block the nerves of the hand to perform hand procedures has been investigated, but it has not been done with other methods (1), considering that the present study was designed as a clinical trial and compared with unguided cases. Ultrasound is superior to this study.

In a study conducted by Girolami et al., the success rate of wrist nerve block using anatomical landmarks, if performed by an experienced person, is 98-100% (3). In the

present study, 85.3% of ultrasound-guided nerve block cases were successful, which is almost similar to previous studies. Peripheral nerve block under ultrasound guidance leads to better localization of the nerve and, as a result, less time to perform the block, less volume of local anesthetic, visualization of the way and place of release and lower risk of drug toxicity, faster onset and more complete nerve block, longer block duration. Sensory and motor nerves. On the other hand, ultrasound methods, in addition to being cheap and available, provide the possibility of guiding the needle under ultrasound in regional anesthesia and reduce pain, quick discharge of the patient, low complications and high patient satisfaction (6). The study on the block of other nerves using ultrasound guide also confirms that the use of ultrasound increases the accuracy of the operation by making it possible to see the path of the needle and the way the drug is released (8). Ultrasound guided needle guidance for femoral nerve block is associated with a higher rate of nerve block success, faster onset of action, and longer duration of analgesia (9). Also, if nerve blocks are performed under ultrasound guidance by skilled people, it can be a valuable alternative to other guided imaging methods in diagnosing patients with sacroiliac joint pain (10). Considering the availability and easy use of ultrasound, it seems appropriate to use this method in regional anesthesia in emergency patients to reduce complications and increase success. But on the other hand, due to the need to perform ultrasound by a skilled person, the necessary training in the emergency department should be considered.

Limitations and weaknesses and strengths

Due to the need of some patients to block several nerves, in some cases only one nerve may be blocked, and as a result, the patients experience more pain, and despite the successful block of one nerve, the lack of block of other nerves leads to patient dissatisfaction and lack of Consider the success of the procedure.

Conclusion

The use of ultrasound to create a nerve block in the procedures performed on the hand in the emergency room increases the accuracy and success of the nerve block and as a result reduces the complications and dissatisfaction of the patients.

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Tables

Table 1: Frequency distribution of gender in the two study groups

Gender	Guided by ultrasound	Without ultrasound	P-Value
Male	96(49%)	100(51%)	0.611
Female	47(52.2%)	43(47.8%)	

Table 2: Average pain in the two study groups

Average pain	Guided by ultrasound	Without ultrasound	P-Value
Pain (VAS)	8±2/2	4/1±7/2	0.001

Table 3: Frequency distribution of nerve blocked in two study groups

Frequency of nerve blocked	Without ultrasound	Guided by ultrasound
Ulnar, radial and median	5(50)	5(50)
Radial and median	3(37.2)	5(62.5)
Ulnar and median	13(59.1)	9(40.9)
Ulnar	31(52.5)	28(47.5)
Radial	52(43.3)	68(56.7)
median	39(58.2)	28(41.8)

Table 4: Frequency distribution of failed nerve block in two study groups

Frequency of failed nerve block	Guided by ultrasound	Without ultrasound	P-Value
Successful	122(85.3)	97(68.7)	0.001
Failed	21(14.7)	46(32.2)	

Table 5: Regression analysis of factors involved in nerve block success in all patients

Factors involved in the success of the nerve block	B	SE	β	P-Value
Patient group	0.155	0.065	0.183	0.019
Age	0.000	0.004	- 0.004	0.940
Sex	- 0.031	0.048	- 0.034	0.514
Number of blocked nerves	0.309	0.086	- 0.338	0.001
Nerve Blocked	- 0.409	0.032	- 0.138	0.132
Patient cooperation	0.059	0.047	0.065	0.209
Pain intensity	0.018	0.020	0.050	0.383
Time after injection	0.008	0.003	0.165	0.002