ISSN: 1607-8322, e-ISSN: 2220-5799 Anaesthesia, Pain & Intensive Care
Vol 28(2); April 2024 DOI: 10.35975/apic.v28i2.2430

ORIGINAL RESEARCH REGIONAL ANESTHESIA

Evaluation of the perspective of anesthesia research assistants on the use of ultrasonography in regional anesthesia

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ABSTRACT

Background & Objective: In the recent years, the use of clinical ultrasonography (USG) has become very popular among the anesthesiologists. USG guidance plays an important role in the practice of anesthesia to help patient evaluation, improving patient safety and the effectiveness of the procedure. USG guidance in anesthesia has been shown to reduce the complication rate and the frequency of unsuccessful procedures. Although there is a significant amount of data regarding the advantages of using USG in regional anesthesia (RA), there is limited data available on anesthesia assistants' perspectives on USG. The purpose of this study was to assess the USG usage in RA in the perspective of anesthesia research assistants.

Methodology: After approval by the institutional ethics committee, a questionnaire form was sent to one hundred and eighty-four anesthesia assistants via e-mail. The attitudes of anesthesia research assistants towards USG were evaluated using a 5-point Likert scale. Only anesthesiology and reanimation department assistants were included in the study.

Results: The mean age of the participants was 28.9 ± 2.1 y (25-35 y). Most (54.9%) of the participants were female and 45.1% were male. Respective units of all participants had an USG device, but only 39% of the participants had access to an USG device specific to RA; 98.4% of the participants used USG in RA (97.8% for peripheral nerve blocks, 28.8% for neuraxial anesthesia). While most participants (99.5%) thought that the use of USG for peripheral nerve blocks was advantageous, fewer participants (54.9%) thought that it was advantageous for neuraxial anesthesia. Only 38.6% of the participants reported that their training was sufficient for USG usage. Approximately half (48.9%) of the resident physicians needed an USG course. There were differences among the hospitals in terms of USG device. USG device specific to RA was more common in city hospitals (50.9%) and university hospitals (40.3%) compared to training and research hospitals (25%).

Conclusion: Anesthesia research assistants frequently prefer USG in regional anesthesia. With the removal of barriers to the use of USG, the rate of USG utilization and the success of procedures in regional anesthesia applications can be further increased.

Abbreviations: RA - regional anesthesia; TARD - Turkish Society of Anesthesiology and Reanimation; USG – ultrasonography

Keywords: Anesthesia research assistants; Attitude; Regional anesthesia; Ultrasonography

Citation: Atasever D, Aydin EU, Akelma FK, Gulec H, But A. Evaluation of the perspective of anesthesia research assistants on the use of ultrasonography in regional anesthesia. Anaesth. pain intensive care 2024;28(2):272−277;
DOI: 10.35975/apic.v28i2.2430

Received: October 25, 2023; **Reviewed:** November 01, 2023; **Accepted:** December 13, 2023

1. INTRODUCTION

Regional anesthesia (RA) involves administering local anesthetics around one or more nerves to provide temporary loss of sensation in one area of the body. RA can be used alone or in combination with general anesthesia in both peri-operative and post-operative anesthesia.[1]

There have been major changes in the RA during the recent years, predominantly due to the use of ultrasonography (USG). There has been a noticeable increase in the frequency of RA procedures performed under USG guidance. The evidence regarding the advantages of USG guidance is steadily increasing. Compared to other nerve localization methods such as nerve stimulation or anatomical landmark techniques, USG guidance shortens the procedure time and enhances the success rate of RA.[2]

Information on the use of USG has started to be integrated into the training programs of anesthesiology and reanimation clinics, and systematic and structured training programs on the use of USG are implemented in addition to the availability of USG devices in all anesthesiology and reanimation clinics, especially in the developed countries.[3-5]

Although USG is frequently preferred in RA, particularly in peripheral nerve blocks, its usage varies among anesthesiologists. It was observed that there was a difference between anesthesiology and reanimation specialists and research assistants in terms of USG use.

It is noteworthy that while some anesthetists use USG in daily practice, others do not use it routinely, and some of them do not have sufficient knowledge and experience about the use of USG. Various factors, such as the fact that USG usage prolongs the procedure time in invasive interventions, affect the utilization rates of USG.[6,7]

Likert-type questions were asked in our questionnaire for USG evaluation. The questions included multiple options between two extremes to determine the level of agreement. These options are ranked in order of "highest to lowest" or "best to worst". During the analysis phase, these choices are coded by assigning numerical values according to their ranks. This process transforms qualitative data into quantitative data for analysis. Likert-type questions, originally consisting of 5 options, are used today with different number of options from 3 to 7 and various labeling systems. Such questions are coded according to the number of options used in the question, starting from 1. In this coding, the most negative response is represented with the lowest number (1), while the most positive response is represented with the highest number. Due to this sequential coding starting from 1, Likert-type questions are considered as ordinal data. In the analysis of data consisting of Likert-type questions, it is more accurate to use median and mode instead of descriptive statistics, that is, arithmetic mean, and to use range instead of standard deviation, histogram instead of graph, and to use non-parametric tests in difference and correlation calculations.

Our study aimed to evaluate the knowledge and skill levels of the assistants studying in anesthesiology and reanimation departments regarding USG, and examine the frequency of USG usage, their attitudes and behaviors towards USG usage, and the reasons for preferring or not preferring USG usage, by applying a Likert questionnaire.

2. METHODOLOGY

Our study was approved by the Clinical Research Ethics Committee of Yildirim Beyazit University by the decision number 92 on 11/11/2020. The study included physicians working as research assistants in anesthesiology and reanimation departments. The sample size of the study was composed of research assistants who were members of the Turkish Society of Anesthesiology and Reanimation (TARD) and affiliated with anesthesiology and reanimation clinics. The contact information of the research assistants was obtained from the TARD database. After providing information about the study, the questionnaire form was sent to those who voluntarily agreed to participate in the study. The study included research assistants who were members of the TARD and worked in university hospitals, training and research hospitals, and city hospitals in Türkiye. The following formula was used to demonstrate the sample size of the study at 5% significance level and 95% power. The calculation of sample size indicated that the study needed to involve at least 173 individuals. The study was conducted with 184 research assistants from all over Türkiye.

The study questionnaire consisted of 25 questions. In the first section of the questionnaire, which comprised five questions, participants were asked about their age, gender, the city and region where they worked, the year of their residency, and the type of hospital they were

employed in (university, training and research, state/city hospital). The second part of the questionnaire inquired about the particulars of USG device. Participants were first questioned about the presence of a USG device in the clinic and whether a USG device was available for RA. Subsequent questions focused on the participants' usage of the USG device, and related particulars.

Statistical analysis

Statistical analyses were performed using the software suite SPSS version 15.0 (Chicago, USA). The suitability of the variables for normal distribution was examined using visual (histogram and probability plots) and analytical methods (Kolmogrov Smirnov, Shapiro-Wilk test). Descriptive statistics were expressed as mean and standard deviation for normally distributed numerical data, and as median for non-normally distributed data, and as number and percentage for nominal data. Normally distributed numerical variables were analyzed between the two groups using the "t-test in independent groups". Non-normally distributed variables were analyzed between the two groups using the "Mann-Whitney U test". "Chi-square analysis" was used to compare the nominal data. In the statistical analysis of the study, $P < 0.05$ was considered statistically significant.

3. RESULTS

98.4% of the research assistants stated that they used USG in RA sometime. The reasons for using USG included the higher success rate, increased safety of the procedure, and for the training purposes (Table 1). The most common reasons why USG was not preferred included lack of trainers (46.5%), surgeons not requesting RA (15.5%), and the use of USG requiring more time (12.7%). 23.4% of the research assistants reported experiencing complications during the use of USG in RA. The vast majority of them (83.8%) started to use USG in the first 2 y of their training. 82.1% stated that the use of USG reduces the drug volume, and 98.4% stated that it reduces the complication rate. 78.8% of them considered USG as the gold standard for RA, while 21.2% regarded it as a standard of care.

Assistants' USG training in RA was asked. While 13.6% did find the training absolutely insufficient, while 26.6% found it sufficient. 48.9% of the assistants felt the need for a USG course in RA (Table 2). While 24.3% of those attending the USG course stated that they absolutely benefited from the course, 20.3% stated that they benefited from it (Table 2).

Table 1: General questions regarding USG

Questions	Response [n (%)]
Use of USG in RA (n = 184)	
Yes	181 (98.4)
No	3 (1.6)
Reason for using USG in RA (n = 184)	
Higher success rate	74 (40.2))
Increased safety	71 (38.6))
Training	39 (21.2)
Reason for not using USG in RA (n = 71)	
Lack of trainers	33 (46.5)
Surgeons not accepting RA	11 (15.5)
The use of USG requiring more time	9 (12.7)
Unavailability of USG device	7 (9.9)
Using the blinding technique	5 (7.0)
Preferring nerve stimulation	6 (8.5)
Complications in USG-guided RA (n = 178)	
Yes	43 (23.4)
No	135 (73.4)
Time range to start using USG in RA as assistant (n = 160)	
0-1 y	68 (42.5)
1-2 y	66 (41.3)
3-4 y	24 (15.0)
4-5 y	2 (1.3)
Effect of USG in RA on the drug volume (n = 184)	
Reduces	151 (82.1)
Not reduces	33 (17.9)
Effect of USG in RA on complications (n = 184)	
Reduces	181 (98.4)
Not reduces	3 (1.6)
What does USG mean in RA (n = 184)	
Gold standard	145 (78.8)
Standard of care	39 (21.2)

Assistants were asked about their neuraxial and peripheral nerve block applications. While 82.1% reported that neuraxial anesthesia was applied every day in their clinics, 14.1% reported that it was applied 2-3 times a week, and 3.8% reported that it was applied once a week or less. 28.8% of the assistants reported that they used USG in neuraxial anesthesia. 26.1% of the assistants thought that the use of USG in neuraxial anesthesia is absolutely beneficial, while 28.8% thought that it is beneficial. 67.4% of the assistants reported that

peripheral nerve block was applied every day in their clinics, 20.7% reported that it was applied 2-3 times a week, and 12% reported that it was applied once a week

Table 2: Questions regarding USG training

Questions	Response [n (%)]
Is assistant training sufficient for using USG in RA? (n = 184)	
Absolutely sufficient	22 (12.0)
Sufficient	49 (26.6)
Undecided	44 (23.9)
Insufficient	44 (23.9)
Absolutely insufficient	25 (13.6)
Need for USG course in RA (n = 184)	
Yes	90 (48.9)
No	94 (51.1)
Have you benefited from the USG course in RA? (n = 74)	
Absolutely benefited	18 (24.3)
Benefited	15 (20.3)
Undecided	37 (50.0)
Not benefited	3 (4.1)
Absolutely not benefited	1 (1.4)

or less. 88% of the assistants thought that the use of USG in peripheral nerve blocks is absolutely beneficial, while 11.4% thought that it is beneficial.

In peripheral nerve blocks, USG was most commonly preferred in upper extremity blocks (88.2%), followed by lower extremity blocks (7.3%) and trunk/plan blocks (4.5%) (Table 3).

4. DISCUSSION

With the introduction of USG technology for anesthesiologists, the limitations of traditional nerve block methods have been overcome.[8] Therefore, USG guidance is considered as the gold standard in RA and especially in peripheral nerve blocks.[9] However, the preference for using USG in clinical practice, the reasons for usage, and the frequency of usage may vary among anesthesiologists for various reasons.

While there is a wealth of data on the advantages of USG use in RA,[10-12] there is limited data available on anesthesiologists' perspectives on USG usage. Although the frequency of USG use has been reported to be lower in RA, especially in older studies,[13,14] it is noteworthy that recent studies show an increase in these rates.[6]

Erbesler and colleagues conducted a study in our country to assess the frequency of USG usage among anesthesiologists and reanimation specialists.[7] In their study, unlike our results, the usage of USG specific to RA was not queried, but USG usage in anesthesia

Table 3: Questions regarding USG in clinical use

Questions	Response [n (%)]
Frequency of neuraxial anesthesia in the clinic (n = 184)	
Once a week or less	7 (3.8)
2-3 times a week	26 (14.1)
Every day	151 (82.1)
Frequency of peripheral nerve block in the clinic (n = 184)	
Once a week or less	22 (12.0)
2-3 times a week	38 (20.7)
Every day	124 (67.4)
Use of USG in neuraxial anesthesia (n = 184)	
Yes	53 (28.8)
No	131 (71.2)
Is USG useful in neuraxial anesthesia? (n = 184)	
Absolutely useful	48 (26.1)
Useful	53 (28.8)
Undecided	66 (35.9)
Not useful	15 (8.2)
Absolutely not useful	2 (1.1)
Use of USG in peripheral nerve blocks (n = 184)	
Yes	180 (97.8)
No	4 (2.2)
Is USG useful in peripheral nerve blocks? (n = 184)	
Absolutely useful	162 (88.0)
Useful	21 (11.4)
Undecided	1 (0.5)
Not useful	0 (0)
Absolutely not useful	0 (0)
The area where USG is most preferred in peripheral nerve blocks (n = 178)	
Upper extremity blocks	157 (88.2)
Lower extremity blocks	13 (7.3)
Trunk and plan blocks	8 (4.5)

procedures was examined. The study reported that only 38.7% of the specialists used USG.

The study of Erbesler et al.[7] unlike our results, evaluated anesthesiology and reanimation specialists, not resident physicians. Another difference of our study was the evaluation of the use of USG only in RA in the field of anesthesia. In our study, it was observed that USG devices are available in all hospitals and physicians use USG at a much higher rate. However, it was previously stated that there is a difference between specialist physicians and resident physicians in terms of USG usage. A recent study conducted by Akelma et al.[6] in our country evaluated the perspectives of anesthesiology and reanimation assistants and specialists towards USG. In the study that evaluated 41 assistants and 105 specialists, all of the resident physicians stated that they had USG in their unit, while 79% of the specialists reported that they had USG. USG usage was reported as 95.1% among resident physicians and 72.4% among specialist physicians. Most of the resident and specialist physicians who used USG reported that its primary application was in clinical anesthesia and RA; 95.1% and 74.3%, respectively. The study indicated that resident physicians preferred using USG more. The results of Akelma et al.,[6] especially regarding resident physicians, are consistent with our results. In our study, the majority of resident physicians reported having access to USG devices and using them in RA. While the study of Akelma et al. evaluated 41 resident physicians, our study included 184 resident physicians from across the country. Therefore, it can be said that our results are more generalizable and cross-sectional.

Two studies, by Fusco and colleagues in Italy and by Chui et al. in Canada evaluated the use of USG by anesthesiologists and the obstacles to the use of USG.[14,15] The later study was conducted with 66 anesthesiologists reached online from 40 hospitals. The study reported that 67% of the participants used USG in RA, and 57% reported that they could access a USG device when needed. In our study, we observed that factors such as a lack of trainer/training in RA, the use of USG requiring more time, the surgeon's preference against RA, and accessibility to USG devices reduces the use of USG.

The study by Margarido et al. suggests that the 45-minute theoretical and 30-minute practical training, given in addition to the 20-session supervised practice for anesthesiologists, is not sufficient for lumbar spine sonography.[16] Another noteworthy result in our study is that approximately half of the physicians expressed the need for USG training, and those with less than two years of residency experience did not find USG training sufficient. Our results suggest that resident physicians require training for the use of USG in RA, and the provided USG training should be intensified within the first two years of their residency.

Our study shows that, although physicians routinely apply neuraxial and peripheral nerve blocks in their clinics, USG guidance is frequently preferred in peripheral nerve blocks (97.8%), while the usage of USG in neuraxial anesthesia is much lower (28.8%). The neuraxial range is deep in terms of imaging and difficult to reach due to the short interlaminar distance. Therefore, the area where the ultrasound probe and needle can be localized together is narrow. Techniques in which the patient is in the prone position have been defined to overcome this limitation.[17]

5. CONCLUSION

In conclusion, USG is increasingly preferred in regional anesthesia procedures. Our study shows that almost all of the resident physicians in the anesthesiology and reanimation departments use USG in regional anesthesia. However, most of the resident physicians stated that there is no USG device specific to regional anesthesia available in their units. While USG guidance is frequently preferred in peripheral nerve blocks, it is less frequently used in neuraxial anesthesia. Our study revealed that most resident physicians are aware of the advantages of USG guidance, but significant barriers to its use include the lack of training/trainers, the use of USG requiring a lot of time, and the use of conventional methods for nerve localization. We are of the opinion that the success of regional anesthesia applications can be increased by revising the current courses within the training programs of anesthesiology and reanimation departments considering the advantages reported for USG guidance, as well as developing USG-based systematic training courses, and supporting technical features such as devices and equipment.

6. Data availability

The numerical data generated during this research is available with the authors.

7. Acknowledgement

We gratefully thank Faculty of Medicine

8. Conflict of interest

The study utilized the hospital resources only, and no external or industry funding was involved.

9. Authors' contribution

All authors took part in the concept, conduct of the study and data analysis. All authors approve the manuscript for publishing,

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