

SAFETY OF REGIONAL ANESTHESIA IN UKRAINE SURVEY: ARE HOSPITALS READY FOR THE LOCAL ANESTHETIC SYSTEMIC TOXICITY (LAST)?

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Background. A survey was conducted among anesthesiologists in 38 Ukrainian hospitals to evaluate the current incidence and treatment quality of the local anesthetic systemic toxicity (LAST). With the growing preference for regional anesthetic techniques, implementation of measures for timely detection and treatment of LAST is becoming a priority for many surgical hospitals. This study aims to provide primary country-wide epidemiological data to guide further safety improvement in Ukraine.

It should be noted, that the survey was performed before the beginning of the full-scale Russian invasion of Ukraine. The resulting surge in the incidence of limb injury has resulted in an unprecedented scale of application of regional anesthesia, including out-of-hospital cases with very limited monitoring, which will no doubt generate great amount of new data on the subject. We hope that our current analysis may be used as a reference point for the future research on this subject.

Material and methods. A link to the survey was distributed via e-mail to the members of the Association of Anesthesiologists of Ukraine. Data submission was anonymous. Statistical analysis was performed using Microsoft Excel. Descriptive statistics are provided.

Results. Responses were submitted by 186 anesthesiologists from 38 Ukrainian cities. Among them, 65.9% practice in public hospitals, 25.4% - in private hospitals, 8.7% - in university hospitals. Majority of respondents (60.3%) reported performing over 100 regional anesthetic procedures per year. Peripheral nerve blocks were routinely performed in the hospitals of 76.9% of respondents. 42.4% are using peripheral nerve blocks or more times per week, 24.4% perform this amount monthly, 21.7% - yearly, with 11.5% not utilizing peripheral nerve blocks at all.

Ultrasound guidance was commonly used by 64.1% of anesthesiologists, 60.3% reported relying on landmark techniques often and 38.5% are routinely using a neuromuscular electrical stimulator.

LAST cases were previously encountered by 37.2% of respondents. However, only 37% have reported having a LAST protocol in their hospital and 42.3% did not have a lipid emulsion available. Regarding patient education, in 62.8% of cases the patients were specifically warned about the possible complications of regional anesthesia prior to procedures, where it was performed. When the local anesthetic related adverse events did occur, they were recorded in the patient's card in 27.2% of cases; the chief of anesthesiology department was informed in 36.9%, while in 35.9% the event was not reported in any way.

Conclusions. The practice of regional anesthesia is becoming more widespread in Ukraine, but the minimal measures required to provide patient safety during such procedures are still not being employed in many hospitals.

Key words: Patient safety, LAST, peripheral nerve blocks, ultrasound navigation in anesthesia.

Background. New safety measures are being introduced with every novel medical practice, particularly in the field of anesthesiology. Perioperative adverse effects in the United States are the eighth leading cause of death and their monetary costs have been estimated to range from \$54.6 billion to \$79 billion, around 6% of the total annual national healthcare funding [1].

Despite the decline of the Local Anesthetic Systemic Toxicity (LAST) incidence, its risks persist even in high-income countries, including those that have implemented the Helsinki Declaration on Patient Safety in Anesthesiology. For example, in Finland in the years 2011–2013, LAST occurrence has been estimated to be 0.7 per 10000. The potential for improvement is indicated

by the relative risk of LAST between non-academic and university hospitals – 3.3 (1.0–10.3; $p = 0.04$) [2].

The Association of Anesthesiologists of Ukraine is running several educational projects, aimed at promotion of higher quality and safety in anesthesia, but the acceptance degree of the Helsinki Declaration on Patient Safety in Anesthesiology differs between regions, resulting in a great variety in safety practices related to regional anesthesia.

This survey was conducted before the Russian invasion of Ukraine. The resulting rise in incidence of trauma of the extremities in areas, distant from well-equipped medical facilities has resulted in a sharp increase in the amount of performed peripheral nerve blocks. Regional anesthesia has proven itself as an invaluable tool in mass casualty evacuation scenarios, allowing for transportation of the wounded for further treatment in safer locations without dispatching a dedicated anesthesiologist or risking the potentially lethal side effects of insufficiently supervised opioid drug use. Tertiary care has also benefitted from regional anesthesia methods, allowing for more efficient rehabilitation within the modern framework of multimodal analgesia, modulating the excessive use of systemic analgesics. The resulting benefits come at cost of increased doses of local anesthetics administered per patient, with exposure often lasting multiple days or weeks in settings, where best monitoring standards cannot be upheld. Systemic toxic effects of local anesthetics become more of a prominent concern in such scenarios, augmented by the variety of approaches as highlighted by other military medical services [4].

This study is a part of our effort to examine the safety of the large-scale implementation of regional anesthetic techniques in Ukraine.

MATERIALS AND METHODS

The survey was conducted from October 2021 until February 2022 by anonymously filling out a privately distributed Google form. The survey design was approved by Bogomolets National Medical University ethical committee (protocol #151 from 25 October 2021). All participants

have signed the digital informed consent form while filling out the questionnaire. The survey link was sent to each member of the Association of Anesthesiologists by email (<https://aaukr.org/opytuvannya-shhodo-vypadkiv-toksychnosti-mistsevyh-anestetykiv>)

The questionnaire consisted of 14 items and was created following the guidelines outlined in the literature that describes in detail the methods of conducting similar surveys [5, 6].

The questionnaire was designed to ensure sufficient collection of data from respondents on demographics, awareness of the LAST guidelines, the availability of ultrasound navigation and preparations of fat emulsions in their departments. Extra care was taken to include the information on safety protocol adherence and checklist usage during regional anesthesia, as well the level of communication between the medical personnel within the hospital during LAST incidents.

The structure of the questionnaire gives doctors an opportunity to fill it in a short time. It also provided respondents with an option to give more descriptive and detailed answers to some questions if they wished. Certain questions were restricted to given single- or multiple-choice options, while others had a free reply format. The language of the survey is Ukrainian. Only practicing anesthesiologists, heads of departments, practicing PhD students and professors were invited to take part in the survey.

The results of the survey were imported into Microsoft Excel for continuous analysis. Simple descriptive statistics were used.

RESULTS

Responses were submitted by 186 anesthesiologists from 38 Ukrainian cities. Among them, 65.9% practice in public hospitals, 25.4% – in private hospitals, 8.7% – in university hospitals. Majority of respondents (60.3%) reported performing over 100 regional anesthetic procedures per year. Peripheral nerve blocks were routinely performed in the hospitals of 76.9% of respondents.

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monthly, 21.7% – yearly, with 11.5% not utilizing peripheral nerve blocks at all. 15.4% have reported delivering several blocks per day – mostly those practicing in highly specialized orthopedic clinics. Spinal anesthesia was routinely performed by 94.5% of respondents, epidural – by 87.2%.

Ultrasound guidance was commonly used by 64.1% of anesthesiologists, 60.3% reported relying on landmark techniques often and 38.5% are routinely using a neuromuscular electrical stimulator. The low ultrasound use rate on sites where the ultrasound machine was present was commonly attributed by the respondents to its limited availability within the operation room (OR) and the ICU due to administrative factors.

LAST cases were previously encountered by 37.2% of respondents. However, only 37% have reported having a LAST checklist in their hospital. 39% have reported that their institutions' management is making active efforts to implement checklists in routine practice, while 20.7% described their administration as critical towards the LAST protocols.

Only in 57.7% the respondent had the lipid emulsion readily available. We consider this a critical risk to patient's safety and a basic requirement to safe administration of regional anesthesia.

Regarding patient education, in 62.8% of cases the patients were specifically warned about the possible complications of regional anesthesia prior to procedures, where it was performed. When the local anesthetic related adverse events did occur, they were recorded in the patient's card in 27.2% of cases; the chief of anesthesiology department was informed in 36.9%, while in 35.9% the event was not reported in any way. Communication seems to be a great problem within the Ukrainian healthcare system, including staff and administration, doctors and patients and doctors in a team.

The sample was drawn from the members of the Association of Anesthesiologists of Ukraine, members of which may be on average more involved in implementation of modern practices in anesthesiology and do not accurately represent the situation in Ukraine.

The nature of the study, particularly the chosen method of data collection permits the distortion

of information on multiple levels. Future observational studies may provide more reliable results.

True incidence of LAST may be obfuscated by different diagnostic approaches and inflated or diminished by the adverse events presenting a similar clinical picture.

The difficulties with patient safety during regional anesthesia are a problem in both Ukraine and EU countries. The introduction of ultrasound into clinical practice has brought the solutions closer [7]. The first paper in this field was published in 1978: a Doppler ultrasound blood flow detector was used to facilitate a supraclavicular brachial plexus block [8]. The first direct use of ultrasound for a regional block was reported in 1994, again for supraclavicular brachial plexus block [9]. Recent studies have demonstrated the cost-effectiveness of ultrasound-guided regional anesthesia in daily clinical practice [10], but it's still not widely available in the operation rooms of some hospitals in Ukraine and in European countries, which was demonstrated in our previous investigation of patient safety during anesthesia in Ukraine [3].

Another serious problem is the implementation of LAST checklists in routine anesthesia practice. It is common practice for employees to view such documents as bureaucracy. Even in the case of the WHO Surgical Checklist low adherence is being justified by hierarchy, delays, increased workload, lower applicability in emergency situations, raised anxiety in awake patients, etc. [11].

Other authors also analyzed using of patient safety approaches in EU countries. It was reported that the most common barrier to checklist implementation was active resistance or passive noncompliance from individuals, most frequently from senior surgeons and/or anesthesiologists [12].

But this practice causes a lot of problems and doesn't have any advantages. For example, in a study conducted in UK clearly showed that Safe Surgical Checklists do not have any significant impact on theater start time [13].

And third, the most serious and critical problem in Ukrainian regional anesthesia is communication in hospitals and reporting about critical incidents. We are silent about possible complications and mistakes.

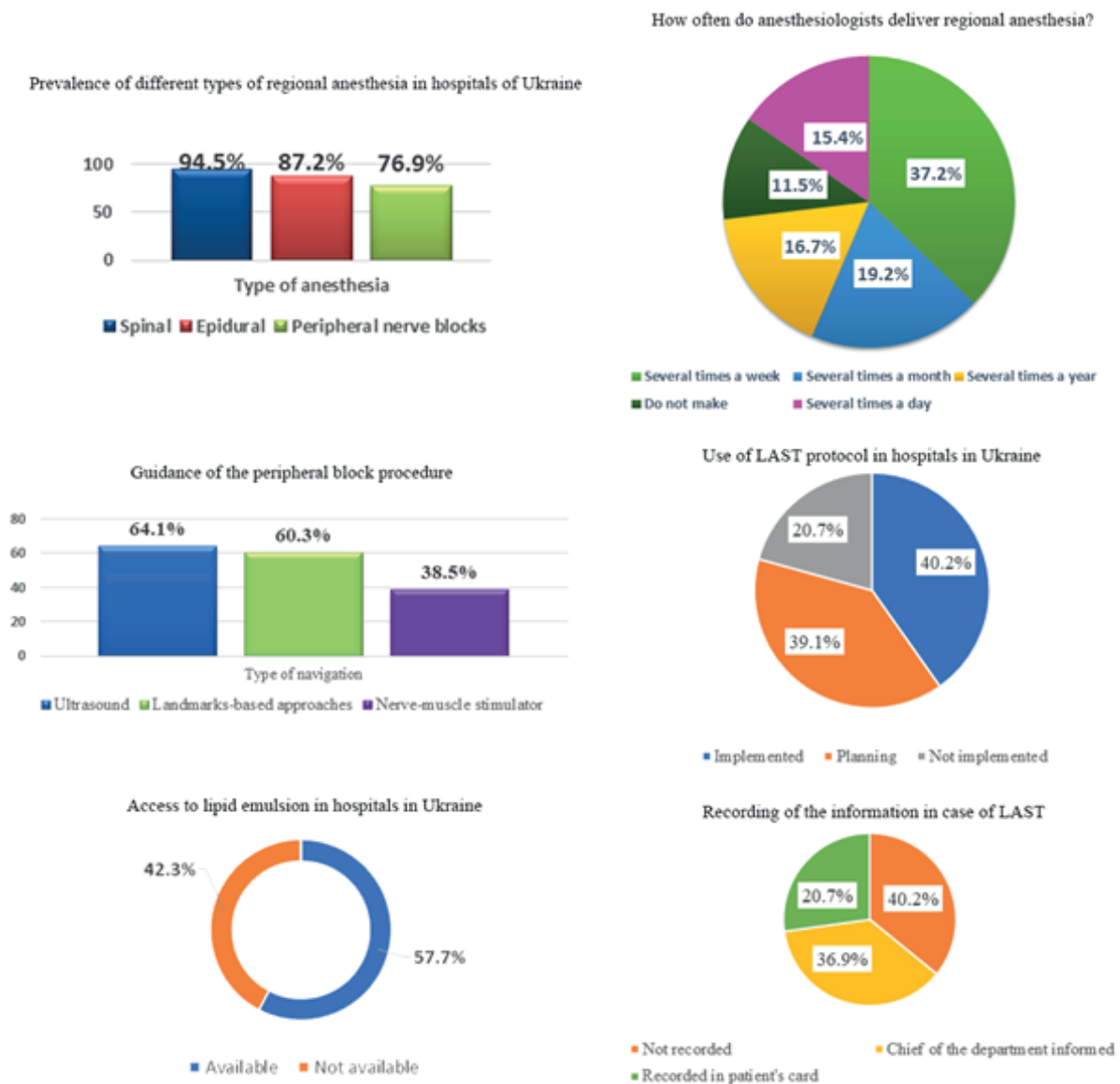


Fig. 1. Obtained results

If you are a patient, you are a hundred times more likely to die from a critical incident or error in a hospital than you are in a transport accident, for example [14]. That's why reporting if LAST or another critical mistake occurs should be immediate.

It's still common practice in Ukrainian healthcare system to hide mistakes and accidents in the OR. This may be due to fear of punishment. However, there is human factor. Everyone makes mistakes. It is part of human nature. The aerospace industry has adopted a fundamentally different approach. No one is criticized for reporting a

problem – indeed, failure to report a problem is treated very seriously, and staff has a degree of immunity from any disciplinary action if issues are reported promptly. As a result, flying in a commercial airliner is the safest way of traveling, far safer than traveling by car [15]. We suppose this approach is the most justified in medicine.

There are many ways to improve the safety of regional anesthesia. It's a good practice to implement within an institution a 'block room' where regional anesthesia nerve blocks could be provided by expert anesthetists in regular scheduled sessions [16]. Block room models have

been in use for the past decade in North America, but are only a recent introduction in the EU. A few studies have demonstrated, that instituting a block room has improved the efficiency of the theater complex, and improved the service delivered to the patients. It could likely become the best practice for Ukrainian hospitals as well.

CONCLUSIONS

A lot of problems with the safety of regional anesthesia in Ukraine. Spreading of checklists, ultrasound navigation and lipid emulsion is strongly dependent on the region of Ukraine and on the management of the hospital. But our doctors and scientists make a lot of efforts to improve routine safe practice. We can see how our hospitals become better and we hope to do this in five-ten years. This is the main theme of our future work.

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Authors' contributions

IK carried out the statistical analysis. NS designed the study, carried out the acquisition and interpretation of data. KB, VP, VL critically revised the manuscript. VS and MF were involved in drafting and revising the manuscript. All authors read and approved the final manuscript.

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Availability of data and materials

The datasets used and/or analyzed during the current study available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

This study was approved by the Ethical Committee of Bogomolets National Medical University. All participants gave their written, informed consent to participate in the study. all methods were performed in accordance with the relevant guidelines and regulations. All participants were above 18 years old.

Consent for publication

Not Applicable.

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ДОСЛІДЖЕННЯ БЕЗПЕКИ РЕГІОНАЛЬНОЇ АНЕСТЕЗІЇ В УКРАЇНІ: ЧИ ГОТОВІ ЛІКАРНІ ДО ТОКСИЧНОСТІ МІСЦЕВОЇ АНЕСТЕЗІЇ (LAST)?

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Актуальність. Було проведено опитування серед анестезіологів 38 лікарень України з метою оцінки поточної інцидентності та якості лікування системної токсичності місцевих анестетиків (LAST). Зі зростанням переваги регіональних методів анестезії впровадження заходів щодо своєчасного виявлення та лікування LAST стає пріоритетом для багатьох хірургічних стаціонарів. Це дослідження має на меті надати первинні епідеміологічні дані по всій країні для подальшого підвищення безпеки в Україні.

Опитування проводилося до початку повномасштабного російського вторгнення в Україну. Сплеск частоти травм кінцівок призвів до безпрецедентного масштабу застосування регіонарної анестезії, включаючи позалікарняні випадки з дуже обмеженим моніторингом, що, безсумнівно, створить велику кількість нових даних. Ми сподіваємося, що наш поточний аналіз може бути використаний як орієнтир для майбутніх досліджень.

Матеріали і методи. Посилання на опитування було розіслано електронною поштою членам Асоціації анестезіологів України. Подання даних було анонімним. Статистичний аналіз проводили за допомогою Microsoft Excel методом описової статистики.

Результати. Відповіді надіслали 186 анестезіологів із 38 міст України. Серед них 65,9% практикують у державних лікарнях, 25,4% – у приватних лікарнях, 8,7% – в університетських лікарнях. Більшість респондентів (60,3%) повідомили про виконання понад 100 регіональних анестезіологічних процедур на рік. Блокади периферичних нервів регулярно проводили в лікарнях 76,9% респондентів. 42,4% використовують блокади периферичних нервів або більше разів на тиждень, 24,4% роблять цю кількість щомісяця, 21,7% – щорічно, 11,5% взагалі не використовують блокади периферичних нервів.

64,1% анестезіологів зазвичай використовували ультразвуковий контроль, 60,3% повідомили, що часто покладаються на орієнтири, а 38,5% регулярно використовують нервово-м'язовий електростимулятор.

З випадками LAST раніше стикалися 37,2% респондентів. Однак лише 37% повідомили, що у їхній лікарні застосовували LAST протокол, а 42,3% не мали ліпідної емульсії. Щодо навчання пацієнтів, то в 62,8% випадків пацієнти були спеціально попереджені про можливі ускладнення регіонарної анестезії перед процедурами, де вона проводилася. Коли побічні явища, пов'язані з місцевою анестезією, все-таки виникали, вони реєструвалися в картці пацієнта у 27,2% випадків; завідувач відділенням анестезіології був поінформований у 36,9%, а у 35,9% жодним чином не повідомлено про подію.

Висновки. Практика регіонарної анестезії набуває все більшого поширення в Україні, але мінімальні заходи, необхідні для забезпечення безпеки пацієнта під час таких процедур, у багатьох лікарнях досі не застосовуються.

Ключові слова: безпека пацієнта, LAST, блокади периферичних нервів, ультразвукова навігація.