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Critical overview

Reducing the incidence of adverse events in anesthesia practice

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Abstract

Background and purpose: *adverse event during anesthesia is defined as an event that may result in the development of complications and is caused by human error, failure of the apparatus, the selected anesthetic techniques and individual reaction of the patient. Timely detection of adverse events prevents complications and their analysis through the register of the same to the adoption of preventive and remedial measures.*

Materials and methods:*The Department of Anesthesiology in General Hospital Karlovac, in accordance with the accreditation standards of the Republic of Croatia monitors adverse events during anesthesia, the waking up period and the stay on the ward during the first 24 hours, and the type of anesthesia techniques applied.*

Results: *During the 2012, a total of 4244 anesthesia with a 1.25% complications was done. We have been monitoring the number of anesthesia since 2011. when the percentage of complications was 5.4%. This is the basis to conclude that there is a tendency to reduce the number of complications. Anesthesia was classified as general and regional. The use of ultrasound contributes to safety of regional anesthesia, especially nerve conduction anesthesia of extremities and thus reducing the volume of local anesthetic administered and its toxicity. The incidence of complications of regional anesthesia among all regional anesthesias done during the 2012 was 0,31%.*

Conclusion: *Keeping the register of complications during anesthesia has led to increased awareness of the need to record them and analyze the causes and consequences of complications at the department meetings. There is a trend of increased use of regional anesthesia techniques as indicated.*

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INTRODUCTION

Adverse event during anesthesia is defined as an event that may result in the emergence of complications, and occurs due to human error, failure of the apparatus, the selected anesthetic techniques and the individual reaction of the patient (*1*). Weaknesses and shortcomings of the anesthetic procedures and the work of anesthesiologists are monitored by recording and analyzing the occurrence of adverse events and the consequent complications of anesthesia. By timely detection of unwanted events, we have tried to prevent the occurrence of complications, and increase the safety of anesthesia procedures. As a part of quality assurance and accreditation in our institution, we followed the number of anesthesia, the type of anesthesia techniques and complications of anesthesia during one-year period.

MATERIALS AND METHODS

We noted the complications of anesthesia, the type of anesthesia during which the complications occurred, and the time of the unwanted occurrence in the hospital 'Quality' programme. That meant: an introduction to anesthesia, maintenance of anesthesia or awakening from anesthesia, and the first 24 hours postoperatively (room awakening, department or ICU). The total number of anesthesia and type of administered anesthetic techniques in one-year interval was noted as well. We divided the type of anesthesia techniques on general anesthesia and regional anesthesia techniques (Fig. 1).

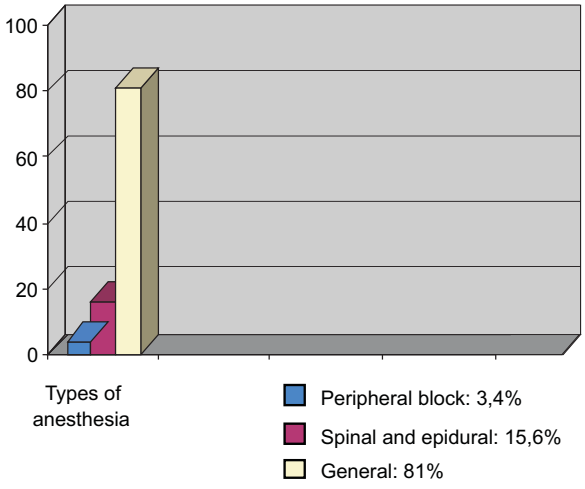

Figure 1. *The division of anesthesia according to its type.*

Regional techniques were divided on central blocks (spinal and epidural) and peripheral blocks of nerves. The number of complications for each type of anesthesia was expressed as a percentage of the total number of incurred anesthesia (Table 2), and complications of regional and their percentage in the total number of regional anesthesia (Table 3).

Every specific complication according to the type of regional anesthesia was described and compared to complications described in foreign literature.

RESULTS

During 2012, a total number of 4244 anesthesias were done at Karlovac General Hospital. This number includes 3438 general anesthesia, 663 central blocks and 143 peripheral blocks (Table 1). A total of 53 complications were recorded, i.e. 1.25% out of total anesthesia (Fig. 2). The percentage of complication rate according to the type of anesthesia compared to the total number of incurred anesthesia makes 0.94% in general, 0.26% in the central blocks and 0.05% for peripheral blocks (table 2). The number of complications of regional anesthesia compared to the total number of 806 regional anesthesia in 2012 was 11 complications in the central blocks and

TABLE 1

Anesthesia type division in 2012.

Type of anesthesia	Number	% of total
General	3438	81%
Central block	663	15,62%
Regional anesthesia	143	3,37%

TABLE 2

Per operative complications.

Type of anesthesia	Number of complications	% of total number
General	40	0,94%
Central block	11	0,26%
Regional anesthesia	2	0,05%

TABLE 3

Type of complication: central block, regional anesthesia.

Type of block	Number of complications	% of total number of blocks
Spinal	8	0,99%
Epidural	3	0,37%
Deep cervical block	–	–
Axillar block	–	–
Supraclavicular block	1	0,12%
Femoral block	1	0,12%
Popliteal block	1	0,12%

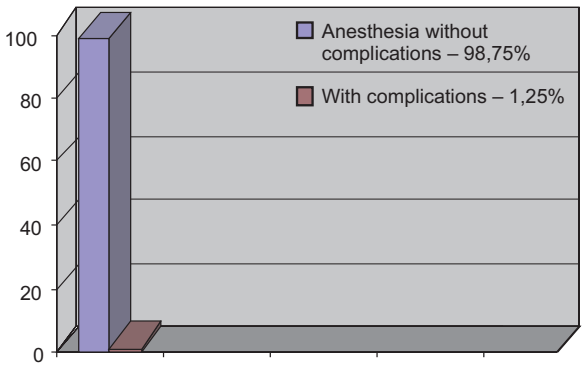

Figure 2. *Complication rate compared to the total number of performed anesthesia 2012.*

two complications of peripheral blocks (Fig. 3). The types of complications depending on the type of regional anesthesia were as following:

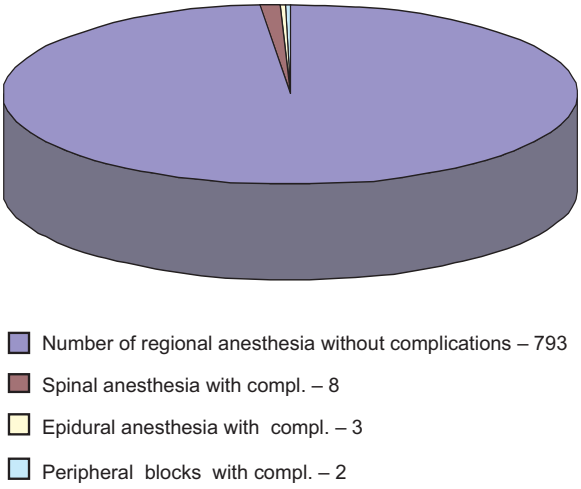

Figure 3. *The number of complications by type of regional anesthesia in relation to the total number of regional anesthesia.*

a) with spinal anesthesia – an anaphylactic reaction to antibiotic, inadequate block meaning inadequate analgesia in two cases, the occurrence of paresthesia para gluteal right 6 hours after the spinal anesthesia, post puncture headache, the insufficient amount of spinal block, redness of the skin and flushed face after syntocinon injection, bradyarrhythmia slower than 30/min. which recovers after the administration of ephedrine. b) in epidural anesthesia – the inability to set the catheter, the occurrence of motor weakness of one foot which recovers after removing the continuous infusion of local anesthetic and the emergence of hypotension after a bolus of local anesthetic in anesthesia concentration for a Caesarean section

c) in peripheral regional blocks we had inadequate analgesia in supraclavicular block and prolonged lack of motor skills and sensibility for more than 24 hours at femoropopliteal block followed by the complete recovery

DISCUSSION

Timely detection of adverse events prevents complications and their analysis using the register enables the adoption of preventive and remedial measures, emphasizing patient safety and improving the work quality of anesthesiologists. Collecting data on anesthetic complications in different hospitals throughout the country creates the possibility of drawing a national database. Anesthetic complications database makes information more available to other anesthesiologists who can on time recognize and avoid the repetition of such complications. Anesthetic complications database also creates the possibility of education for young anesthesiologists as well as data comparison between countries thus creating access to information from other countries and creating international database. In this way, the level of quality and safety of anesthesia is raised, and the same model has been applied in aviation, nuclear power plants and oil-rigs. According to the accreditation standards in the Republic of Croatia, the Regulations on the accreditation standards for hospital health institutions (Official announcement publications 31/11) and the Regulations on the quality standards of health care and the way they application (Official announcement publications 79/11) and all within the system to ensure and improve the quality of health care (SOPK), following the protocol of application of all forms of anesthesia PSOPK. 7-06, our Department of Anesthesiology, Intensive Medicine and Pain Treatment in Karlovac General Hospital monitors adverse events, i.e. complications during anesthesia, the waking up period and the stay on the ward in the first 24 hours, as well as the number and type of anesthetic techniques during the six-month period. The Department has to perform an internal review every 6 months, then make a report for the six-month period. Each six--month period report has to be submitted for the Administration Management review. The individual register of anesthetic complications depends on the anesthesiologists themselves. The lack of complication reports is due to fear or guilt and condemnation of others colleagues or a sense of their own infallibility and lack of recognition for their mistakes[1]. Hospital policies which exclude the feeling of quilt, check-lists with adverse events filled in by the physicians and technicians, mutual encouragement from the superior physicians and the discussion about the reported complications at professional meetings of the Department which have the goal to improve the anesthesia techniques and prevent the repetition of such mistakes all contribute to the report of complications. Anesthesia complications are followed through the organ systems and may include cardiovascular (hypotension, arrhythmia, cardiac arrest), respiratory (bronchospasm, laryngospasm, aspiration pneumonitis, acute respiratory failure), thromboembolic incidents, bleeding (if it is larger and requires compensation of blood products), renal (acute renal failure with oliguria or anuria), acute liver failure, metabolic (hypoglycemia, thyrotoxicosis, neurological (central event or nerve palsy due to a bad position on the table or after peripheral blocks), complications of regional anesthesia, technical

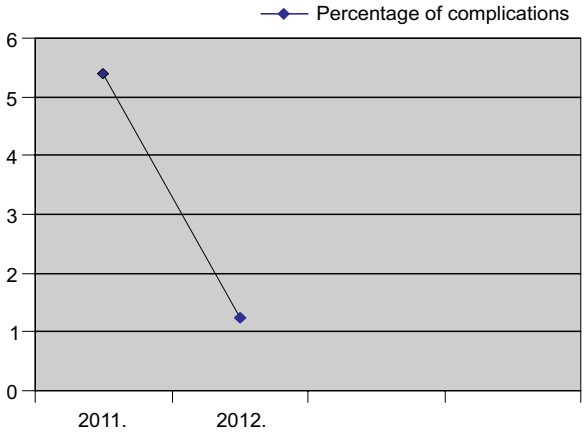

Figure 4. *The display of anesthesia complications decrease trend.*

complications (human factor, failure of the apparatus or equipment in the surgery). The number of anesthesia, type of anesthetic techniques and anesthetic complications have been followed since 2011. The incidence rate of complications in 2011 was 5.4% and in 2012 it decreased to 1.25%. There is therefore a reduction tendency of the total number of complications in anesthesia as well as regional anesthesia complications (Fig. 4). Some of anesthetic complications are rare in practice, but can be life threatening (anaphylactic reaction, high spinal block, spinal or epidural hematoma, intravascular injection of local anesthetic with an arrhythmia, cardiac arrest or convulsions). The most common complications of spinal anesthesia are hypotension and post puncture headache (*2*). Anaphylactic reaction after cefazolin prophylaxis and bradyarrhythmia slower than 30/min which recovered after the use of ephedrine were life threatening complications we encountered during spinal anesthesia. Hypotension occurred with epidural anesthesia after anesthetic concentration of levobupivacaine, accompanied by motor weakness of the extremities after continuous infusion of local anesthetic, which recovered by discontinuing the usage of analgesia. Rare complications such as neurological disturbances due to occurrence of epidural hematoma[3] with the need of urgent surgery were not recorded. However, it should be noted that such patients, especially parturient women postpartum after removing peridural catheter, should be monitored afterwards in order to exclude unwanted neurological signs.

The safety of regional anesthesia and nerve conduction anesthesia in extremities is increased by the application of the ultrasound, thereby reducing the volume of local anesthetic administered and its toxicity. In our papers, we had one case of a prolonged outage of sensibility and motor skills after the femoropoliteal block, which lasted more than 24 hours. Spontaneous recovery of neurological functions occurred on the second postoperative day. The incidence of our complications related to peripheral blocks is not higher than the incidence of the ones published in foreign literature (4). The study by German authors shows that permanent neurological damage after peripheral block is rare (5). High injection pressures at the onset of injection may indicate an intraneural needle placement and lead to severe fascicular injury and persistent neurological deficits. If these results are applicable to clinical practice, avoiding excessive injection pressure during nerve block administration may help to reduce the risk of neurological injury (6).

CONCLUSION

Keeping the register of complications during anesthesia has led to increased awareness of need to record them by the anesthesiologists and to analyze the causes and consequences at the department meetings. A trend of increased use of regional anesthesia techniques as indicated has been noticed as well as the decreasing trend of anesthetic complications.

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