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PAIN ASSESSMENT IN PATIENTS UNDERGOING UPPER LIMB ORTHOPEDIC SURGERY: A RETROSPECTIVE STUDY

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ABSTRACT

In upper limb orthopedic surgeries, two main anesthetic techniques are used: regional anesthesia (RA), more precisely brachial plexus block, and general anesthesia (GA). The objective of this study was to compare the two techniques by assessing postoperative pain using the NRS (Numerical Rating Scale), opioid consumption, and antiemetic consumption, to identify the differences and advantages of each method.

This retrospective observational study was conducted in the Orthopedics and Traumatology Clinic of SCJU Constanța. 82 patients with ASA I-III classification were included in the study, of which 43 received general anesthesia (GA) and 39 regional anesthesia (RA) via brachial plexus block, axillary approach. The GA group was treated according to a uniform general anesthesia protocol, while the RA group followed the same postoperative analgesia scheme. All included patients underwent surgical interventions in the distal arm, elbow, forearm, and hand RAea.

The NRS pain scores assessed at 2, 4, 6, and 12 hours postoperatively were significantly lower in the RA group compared to the GA group. Regarding opioid use, 66% of patients in the GA group required administration, while only 2.3% of patients in the RA group required them. No patients in the RA group received antiemetics, while 30% of patients in the GA group required this type of medication.

Regional anesthesia through brachial plexus block demonstrated superior benefits compared to general anesthesia, both in terms of reducing postoperative pain scores and in reducing the need for opioids and antiemetics.

Keywords: pain score, opioids, analgesia, brachial plexus block, regional anesthesia, general anesthesia.

Introduction

Regional anesthesia performed through brachial plexus block and general anesthesia represent two of the most widely used anesthetic techniques in clinical practice, being frequently preferred for orthopedic interventions in the upper limb, due to their effectiveness and well-documented safety profile (1-4). Brachial plexus block is generally preferred as an anesthetic technique due to its multiple benefits, including superior pain control both intraoperatively and postoperatively, significant reduction in opioid requirements, decreased incidence of nausea and vomiting (5), as well as reducing the length of hospitalization (6). Aceste avantaje contribuie la o recuperare mai rapidă și la o satisfacție crescută a pacientului (3, 7-9). General anesthesia is also frequently used, especially in situations where clinical indications or patient preferences dictate this approach, providing complete control of the state of consciousness and adequate pain management for complex procedures (10, 11). The objective of this study was to compare the two anesthetic techniques by assessing postoperative pain using the NRS score, as well as by analyzing the consumption of opioids and antiemetics.

Methods

Patients included in the study were those who required orthopedic intervention of the upper limb in the Orthopedics Clinic of the Constanța County Emergency Hospital, after informed consent. They had ASA I-III risks and ages between 18 and 75 years. Each patient underwent surgery in the distal third of the arm, elbow, forearm, and hand. Exclusion criteria were: contraindications to regional anesthesia, pre-existing neuropathies, intolerance to anti-inflammatory drugs, chronic pain, and pregnancy. Data were collected between January and May 2016.

The group of patients who received general anesthesia (n=43) was brought directly to the operating room, where they were monitored (blood pressure, ECG, pulse oximetry, temperature) and peripheral venous access was administered. Patients who required anxiolysis received Midazolam at a dose of 0.3 mg/kg. After preoxygenation, Fentanyl (1-2 μg/kgc) was administered, and injected slowly, followed by Propofol (1.5-2 mg/kgc), which was administered slowly until loss of verbal contact. Then, Rocuronium (0.4-0.6 mg/kg), a neuromuscular relaxant, was administered, and after 2 minutes, intubation was performed with a probe appropriate to the patient's gender. Subsequently, the patients were ventilated with a mixture of Sevoflurane and oxygen/air in a ratio of 60:40. Upon awakening, all patients received Paracetamol 1g, Nefopam 20 mg, and Morphine 3 mg IV for postoperative pain management.

Patients who received general anesthesia were prescribed the following postoperative analgesic regimen: Paracetamol 1 g every 6 hours, Nefopam 20 mg every 8 hours, Ketoprofen 100 mg every 8 hours, Algocalmin 1 g every 8 hours, and Morphine 3 mg intravenously every 4-6 hours. Each of these analgesic drugs was administered at the patient's request, to ensure adequate postoperative pain control.

Regarding the regional anesthesia group, consisting of 39 patients, each patient received a premedication that included Midazolam (0.4 mg/kgb) and Fentanyl (2 μg/kgb). After skin disinfection and local anesthesia, the patient's RAm was positioned at 90 degrees of abduction from the body, and the forearm was placed at 90 degrees of flexion. The axillary brachial block was performed using a peripheral nerve stimulator (Stimuplex HNSS11, Braun Medical) and a 50 mm and 22G stimulation needle, to ensure effective brachial plexus anesthesia.

For the group of patients who received brachial block with regional anesthesia, a local anesthetic, Ropivacaine, was administered at a concentration of 0.5% (15-20 ml), following protective measures by repeated aspiration before administering the drug, to avoid accidental administration into a blood vessel or other uncontrolled RAeas. This was used to induce anesthesia in the brachial plexus arm, ensuring effective pain control during the intervention and postoperatively.

After the intervention, patients in both groups (GA and RA) continued to receive the same analgesia regimen, similar to that described previously: Paracetamol 1 g every 6 hours, Nefopam 20 mg every 8 hours, Ketoprofen 100 mg every 8 hours, Algocalmin 1 g every 8 hours and Morphine 3 mg intravenously every 4-6 hours, administered at the patient's request, depending on their needs.

To assess postoperative pain control, all patients were followed up in the postoperative ward, and pain intensity was assessed using the Numerical Rating Scale at 2, 4, 6, and 12 hours postoperatively. The NRS is a unidimensional instrument used to measure pain in adults, where the patient chooses a number from 0 to 10 to reflect the intensity of the pain, as follows:

- 0 represents no pain,
- 5 represents moderate pain,
- 10 represents the greatest possible pain.

This scoring system was explained to patients before the procedure so that they could express their pain level clearly and objectively.

In the study, the following data were recorded for each patient: age, gender, ASA classification, type of surgery (urgent or scheduled), number of days of hospitalization, and number of patients who required morphine and antiemetics.

For statistical processing, IBM SPSS

Statistics software, release 27, was used. All evaluations were performed using the mean and standard deviation (SD), except for variables such as number of patients, gender, ASA classification, and number of patients requiring morphine and antiemetic administration, for which the Chi-squared test was used. This is a statistical test used to analyze the distribution of frequencies between groups for nominal or categorical variables. To evaluate differences between groups and to validate the results obtained in the study (for example, the group that received general anesthesia and the one that received regional anesthesia), the parametric T-test, which is used to compare the means of two independent groups, was used. Results were considered statistically significant when the p-value was less than 0.05 (p<0.05).

Results

Table 1 Pre- and postoperative patient characteristics

	Group GA (n = 43)	Group RA (n = 39)	P
Age (years)	51 ± 13	55 ± 14	0.485
Gender (M/F) (n)	26/13	20/23	0.066
ASA (I/II) (n)	33/10	30/9	0.781
Type of intervention (n) (emergency/scheduled)	11/32	9/30	0.673
Number of days of hospitalization	4.0 ± 1.20	5.1± 2.0	0.367
Patients who required opioids (n)	19	9	0.02
Patients who required antiemetics	21	5	0.01

Values represent the number of patients and mean ± standard deviation (SD). GA refers to general anesthesia and RA to brachial plexus block. The ASA (American Society of Anesthesiologists) classification is used to assess the physical status of the patients. Results were considered statistically significant for p < 0.05.

The table above contains demographic and clinical data comparing two groups (GA and RA).

The two groups (GA and RA) did not show statistically significant differences in terms of age (P = 0.485), gender distribution (P = 0.066), ASA classification (P = 0.781), type of intervention (P = 0.673), or duration of hospitalization (P = 0.367). However, significant differences were observed in the number of patients requiring opioids (P = 0.02) and antiemetics (P = 0.01), with the GA group showing a higher need for both.

Table 2 NRS score

	Group GA (n = 43)	Group RA (n = 39)	P
NRS score at 2 h	4 ± 2	0 ± 1	<0.01
NRS score at 4 h	6± 2	2 ± 1	<0.01
NRS score at 6 h	7 ± 3	2 ± 3	<0.01
NRS score at 12 h	4 ± 2	4 ± 2	0.673

Values represent the number of patients and mean ± standard deviation (SD). GA refers to general anesthesia, and RA to brachial plexus block. P < 0.05 indicates statistical significance, and NRS is the scale used to assess pain intensity.

This table presents the pain scores NRS recorded at different postoperative time intervals for the two groups (GA and RA).

NRS scores demonstrated significantly lower pain levels in the RA group compared to the GA group at 2, 4, and 6 hours postoperatively (P < 0.01), while at 12 hours, pain intensity was similar between groups (P = 0.673), indicating no statistically significant difference.

Discussions

There is no statistically significant difference between the two groups in terms of age. (12). This finding is essential for the validity of comparisons of other variables between groups. Age differences may influence the results directly or indirectly through confounding factors, such as RA, increased risk of comorbidities, or sensitivity to treatments (13).

The male/female distribution between groups is almost statistically significant (P = 0.066). Although the difference is not considered statistically significant according to the usual p-value of 0.05 (12), This suggests that the gender ratio of RA patients may have influenced the results and deserves further analysis. Gender is an important factor in the medical context, influencing response to treatments, pain perception, or incidence of adverse reactions (14).

The distribution of patients according to ASA score (I/II) is comparable between groups. The high P value (0.781) confirms the lack of a statistically significant difference, suggesting that the overall severity of health status is similar between the two groups (15, 16).

Emergency anesthesia involves high and specific requirements, determined by the severity of conditions, the need for rapid interventions, and the fluctuating volume of cases (17). The lack of a statistically significant difference supports the hypothesis that the type of intervention does not influence outcomes differently between the two groups (18).

The length of hospital stay between the two groups was not statistically significantly different. This suggests that length of stay is influenced by individual or procedural factors rather than group membership (19).

The percentage of patients who required opioids was significantly higher in the GA group (20). This difference may indicate less effective pain management in the GA group or greater perceived pain severity (21).

A significantly higher number of patients in the GA group required antiemetics (22). This observation may reflect differences in the adverse effects of the medication used in each group or the anesthetic techniques applied (22, 23).

A statistically significant difference was observed between the groups, with pain being much lower in the RA group at 2 hours postoperatively. Significant pain reduction at this interval is critical, as acute immediate postoperative pain significantly influences patient recovery and the risk of subsequent complications, including the development of chronic pain (24, 25).

A statistically significant difference, with the RA group having a considerable reduction in pain compared to the GA group at 4 hours (26).

There is a significant difference between regional and general anesthesia with much better pain control in the regional anesthesia group at 6 hours (26). The major difference at this interval may be associated with differences in the metabolism and duration of action of the administered analgesics, as well as with the administration techniques (27).

For the NRS score at 12 hours between the GA and RA groups, the P value indicates that at 12 hours postoperatively, the perceived pain is similar between the two groups, without a statistically significant difference (24).

Conclusions

The results obtained from the RA group show that the use of regional anesthesia, especially brachial plexus block, brings the greatest benefit to the patient by reducing postoperative pain, as observed by monitoring pain using the NRS score. Patients who received general anesthesia had higher NRS scores compared to those in the RA group. However, this benefit disappears as the effect of the anesthetic used in the brachial plexus block fades, and at 10-12 hours the NRS scores equalize.

Significant differences in opioid, antiemetic, and pain scores indicate an advantage of the approach used in the RA group for the management of postoperative pain and symptoms.

Brachial plexus block offers significant postoperative benefits, such as RA reduction in pain, opioid and antiemetic drug consumption, and decreased length of hospital stay. Both anesthetic techniques, brachial plexus block, and general anesthesia, are successfully used in orthopedic surgery of the upper limb. The choice of one of them depends on the particularities of each case.

Postoperative pain and adverse reaction control are essential aspects of postoperative patient care. The brachial plexus block technique has demonstrated significant advantages over general anesthesia, with fewer patients requiring antiemetic and opioid drugs. Regional anesthesia also contributed to reducing hospital stay days, with an average of 1-1.5 days less than patients who received general anesthesia, making it superior in upper limb orthopedic interventions.

Future Regional anesthesia studies should explore the factors contributing to the observed differences and identify ways to optimize analgesic protocols, given that acute pain management directly influences clinical outcomes and patient satisfaction.

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