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The impact of multimodal therapies on the comfort and safety of patients in the immediate post-anaesthetic period following gynaecological procedures — part II

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ABSTRACT

Objectives: The second part of the study was to assess the effects of the types of anaesthesia along with multimodal analgesia on the stability of vital functions at the critical moment of awakening from anaesthesia.

Materials and methods: The material comprised the medical records at the Department of Anaesthesiology and Intensive Care in Szczecin. The anaesthesia record forms and recovery room observation charts of 150 patients from the Gynaecology Clinic who had undergone category III and IV surgical procedures between October 2018 and January 2019 were selected for analysis. The patients were divided into three groups:

1. Patients given multimodal analgesia with non-opioid and opioid analgesics.
2. Patients given multimodal analgesia with non-opioid analgesics and adjuvants.
3. Patients given multimodal analgesia with non-opioid and opioid analgesics, as well as neuraxial anaesthesia.

Results: The average minimum heart rate in the operating room was 63.92 in group I, 61.48 in group II, and 62.34 in group III. The most common cause of bradycardia during surgery was insufflation. The average SBP prior to surgery was similar in groups I and II — 128.74 and 128.66, respectively. The average maximum values during surgery were 135.24 in group I, 139.34 in group II, and 142.32 in group III.

At the time of discharge from the post-anaesthetic care unit, all the patients from the study group had achieved an Aldrete score of 10. Following the anaesthesia, 24% of the patients in group I, 22% in group II, and 28% in group III required oxygen therapy.

Conclusions: When using multimodal analgesia, the time required to fully awaken even after extensive surgical procedures was no longer than two hours.

Key words: multimodal therapies; tachycardia; bradycrdia

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INTRODUCTION

The ERAS protocol, first outlined by Danish surgeon Henrik Kehlet in the 1990s, assumes that the development of postoperative complications is influenced not only by the surgical procedure and anaesthesia, but also by the perioperative management. Older age increases the likelihood of diseases requiring surgical treatment, thus the number of older patients undergoing surgeries is increasing. Old age is an additional independent risk factor for increased perioperative mortality.

Therefore, the implementation of comprehensive postoperative care increases the chance of an uncomplicated postoperative course. The elements of such care include analgesic treatment, prevention of nausea and vomiting, as well as maintenance of normothermia.

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The aim of the second part of the study was to assess the effects of the types of anaesthesia along with multimodal analgesia on the stability of vital functions at the critical moment of awakening from anaesthesia.

MATERIAL AND METHODS

The material comprised the medical records at the Department of Anaesthesiology and Intensive Care at one of the clinical hospitals in Szczecin. The anaesthesia record forms and recovery room observation charts of 150 patients from the Gynaecology Clinic who had undergone category III and IV surgical procedures between October 2018 and January 2019 were selected for analysis. The patients were divided into three groups:

1. Patients given multimodal analgesia with non-opioid and opioid analgesics.
2. Patients given multimodal analgesia with non-opioid analgesics and adjuvants.
3. Patients given multimodal analgesia with non-opioid and opioid analgesics, as well as neuraxial anaesthesia.

RESULTS

During the surgical procedures and in the post-anaesthetic care unit, all the patients were monitored for heart rate, blood pressure and oxygen saturation. These values were compared with those prior to the anaesthesia, the average values during surgery and in the post-anaesthetic care unit, and the minimum and maximum values during surgery and in the recovery room (Fig. 1–3).

The average minimum heart rate in the operating room was 63.92 in group I, 61.48 in group II, and 62.34 in group III. The most common cause of bradycardia during surgery

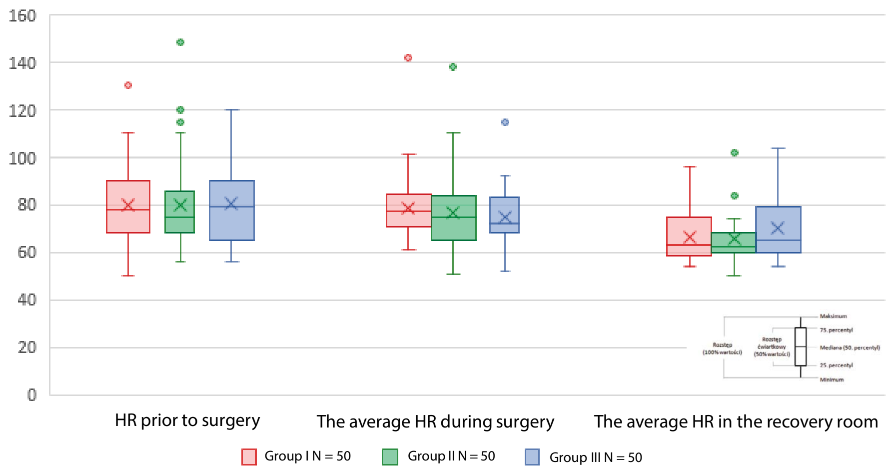

Figure 1. HR (pulse) in the perioperative period

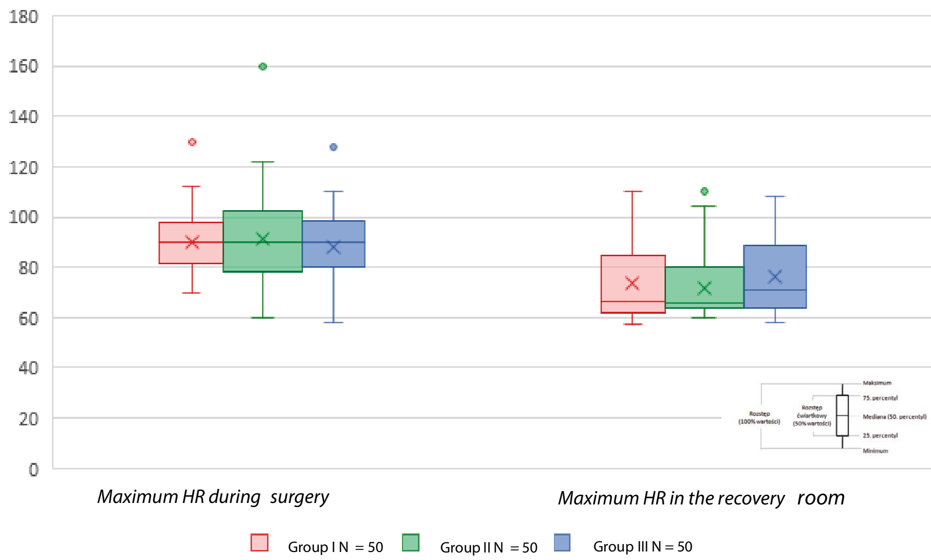

Figure 2. Maximum HR (pulse) in the perioperative period

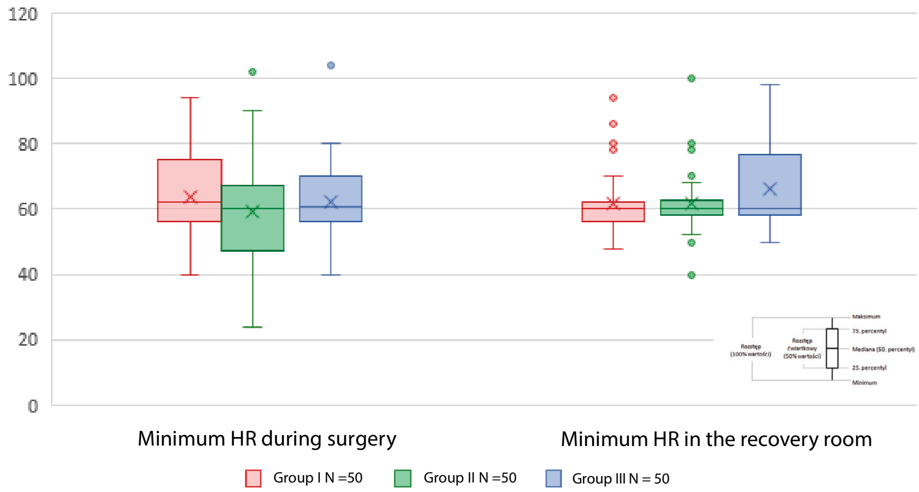

Figure 3. HR (pulse) in the perioperative period

Table 1. Causes of tachycardia in the operating room

Cause of tachycardia in the operating room	Group I N = 50	Group II N = 50	Group III N = 50
Medical History	1	1	0
Stress	10	12	15
Intubation	1	0	0
Pain	7	7	6
Haemorrhage	1	2	1
Insufflation	2	2	1
Medications (atropine)	1	1	1
Anaemia	0	0	1
Awakening	3	0	0
Total	26	25	25

Source: own study

Table 2. Causes of bradycrdia in the operating room

Cause of bradycardia in the operating room	Group I N = 50	Group II N = 50	Group III N = 50
Medical History	3	2	3
Intubation/Induction of anaesthesia	1	3	5
Insufflation	2	7	0
Opioids	0	1	0
Sympathetic blockade	–	–	2
Unknown	0	0	1
Total	6	13	11

Source: own study

Table 3. Causes of tachycardia and bradycardia in the recovery room

Recovery room	Group I	Group II	Group III
Tachycardia	On entry — 2	On entry — 1	On entry — 1
			Pain — 1
			Hypovolemia – 1
			Anaemia — 1
Total	2	1	4
Bradycardia	On entry — 3	On entry — 3	0

Source: own study

was insufflation. The detailed causes of tachycardia and bradycardia are presented in Tables 1–3.

Systolic blood pressure (SBP) values prior to anaesthesia, average values during surgery and in post-anaesthetic care, as well as the minimum and maximum values during surgery and in the recovery room were compared (Fig. 4–6). The average SBP prior to surgery was similar in groups I and II — 128.74 and 128.66, respectively. The average maximum values during surgery were 135.24 in group I, 139.34 in group II, and 142.32 in group III.

In more than half of the patients from group III (64%), an SBP of 140 mmHg or higher was noted at least once during the intraoperative period.

Similarly, to tachycardia, the most common cause of a higher SBP was preoperative stress (30% of the patients in each group). The remaining causes of elevated or lowered SBP in the intraoperative period are presented in Tables 4 and 5.

In the post-anaesthetic care unit, an elevated SBP was recorded in 7 patients from groups I and II, and in 5 patients from group III immediately after awakening, at the first measurement taken after leaving the operating room. A pain-related elevated blood pressure was observed in 3 patients from group I and 2 patients from group III (Tab. 6).

In the operating room, oxygen saturation of 92–94% (Fig. 7) was noted prior to surgery in 1 patient from groups

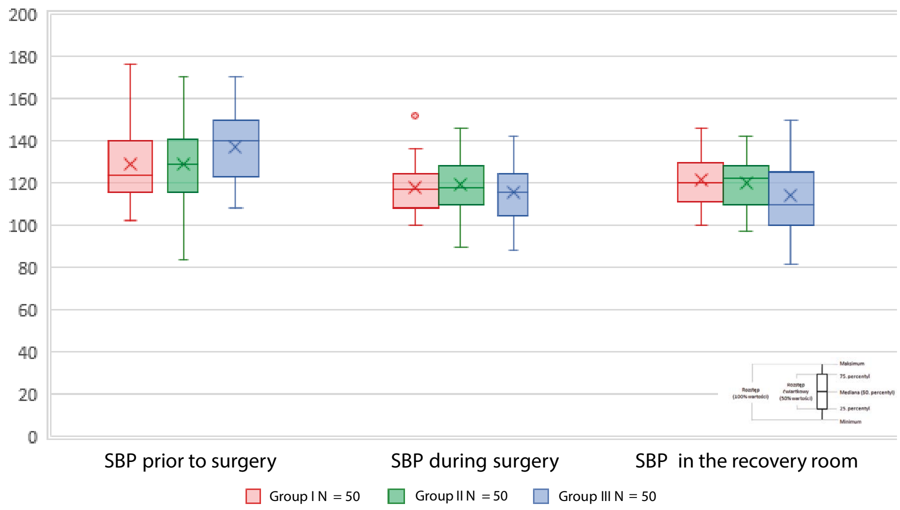

Figure 4. Systolic blood pressure in the perioperative period; SBP — systolic blood pressure

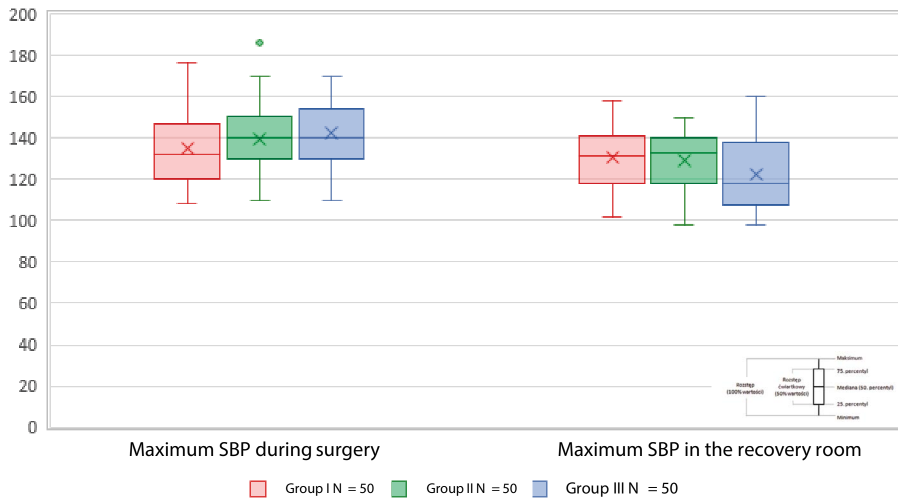

Figure 5. Maximum systolic blood pressure in the perioperative period; SBP — systolic blood pressure

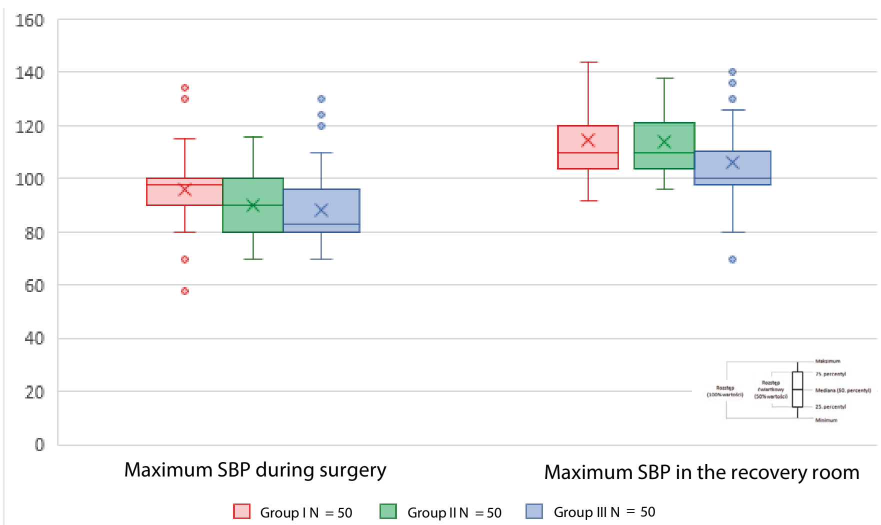

Figure 6. Minimum systolic blood pressure in the perioperative period; SBP — systolic blood pressure

Table 4. Causes of elevated SBP in the operating room

Cause of elevated SBP in the operating room	Group I N = 50	Group II N = 50	Group III N = 50
History of HA	2	2	1
Stress	17	19	19
Intubation/Induction of anaesthesia	3	2	0
Pain	9	11	7
Instability/Other causes	1	1 – before bradycardia	1
Awakening	0	1	2
Total	32	36	30

Source: own study; HA — Hypertonia arterialis

Table 5. Causes of hypotonia in the operating room

Cause of hypotonia in the operating room	Group I N = 50	Group II N = 50	Group III N = 50
Induction	3	9	2
Opioids	3	4	1
Hypovolemia	1	1	1
Insufflation	0	2	0
Awakening	1	1	0
Sympathetic blockade	–	–	25
Instability/other causes	1	2	2
Total	9	19	31

Source: own study

Table 6. Causes of elevated and lowered SBP in the recovery room

Recovery room	Group I	Group II	Group III
Elevated SBP	On entry — 7	On entry — 7	On entry — 5
	Pain — 3		Pain — 2
	Nausea — 1		Nausea — 1
	Total — 11		Total — 8
Lowered SBP	0	0	Hypovolemia — 1 Blockade — 1

Source: own study; SBP — systolic blood pressure

I and II, and in 2 patients from group III, and was caused by stress-induced vasoconstriction (Tab. 7).

In the recovery room, low oxygen saturation was recorded in all the patients immediately after leaving the operating room due to the residual effects of the anaesthetics.

Hypothermia prevention methods included: fluid warming, passive warming and a convective warm-air system. Passive warming is a standard method applied in every patient. Fluid warming with flow-through heaters was used for 60% of the patients in group I, 92% in group II, and 82% in group III. The convective warming system was used for 60% of the patients from group III, where the longest and extensive surgeries were recorded. Warm air was used for 12% of the patients from group I and 8% from group II. A detailed distribution of hypothermia prevention methods is presented in Figure 8.

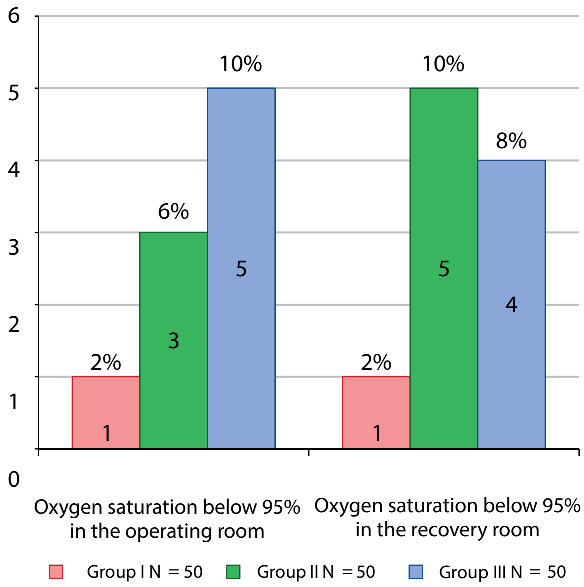

Figure 7. Oxygen saturation in the perioperative period

Table 7. Causes of low oxygen saturation in the perioperative period

	Grupa I N = 50	Grupa II N = 50	Grupa III N = 50
Causes of oxygen saturation below 95% in the operating room	Prior to surgery — cold hands — 1	Prior to surgery — cold hands — 1	Prior to surgery — cold hands — 2
		Haemorrhagic shock — 1	During intubation — 1
		Bronchospasm during desflurane anaesthesia — 1	Anaesthetics in spontaneously breathing patients — 2
Causes of oxygen saturation below 95% in the recovery room	After awakening	After awakening	After awakening

Source: own study

The Aldrete scoring system is an important measurement of recovery after anaesthesia. In group II, 1 patient achieved a score of 7 points — she was drowsy, with poor activity, and required oxygen therapy. Eight patients (16%) from group III and 4 patients (8%) from groups I and II achieved a score of 8 points. 20% of the patients from group II and 18% (9) from group I achieved a maximum score of 10 (Fig. 9).

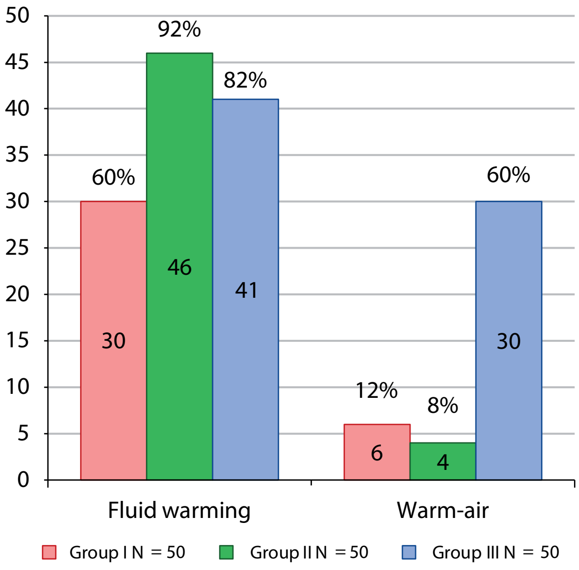

Figure 8. Warming during surgery

At the time of discharge from the post-anaesthetic care unit, all the patients from the study group had achieved an Aldrete score of 10. Following the anaesthesia, 24% of the patients in group I, 22% in group II, and 28% in group III required oxygen therapy.

DISCUSSION

Preventing hypothermia is one element in providing the best perioperative care possible, in compliance with the ERAS protocol. Analysis of the medical charts showed that fluid warming as a method to prevent unintended hypothermia was used in 60% of the patients from group I, 92% from group II, and 82% from group III. The temperature in the operating room was centrally controlled and oscillated around 23–25°C, which is within the limits recommended for the operating room. Bernthal showed that if the temperature in the operating room is less than 21°C, heat loss in the patient increases significantly in the first hour of the surgery, and up to 90% of patients will have hypothermia unless they are protected [1]. All the patients were warmed, either by passive methods or by means of a convective warming system. Warm air was used for 60% of the patients from group III (with the longest surgeries and the oldest patients with a higher surgical risk), 12% from group I, and 8% from group II. After surgery, warm air was used for all the patients. Unfortunately, the temperature was not monitored after surgery, so assessment of its effectiveness was not possible. Studies [2] show that active intraoperative warming methods are most effective at preventing intraoperative hypothermia. The effectiveness of the convective warming system at preventing unintended intraoperative hypothermia has been proven in numerous clinical studies among adults and children, and only when the warmed body surface area was not too limited.

Monitoring during anaesthesia aims at early detection of hazards, identification of the adverse effects of anaesthesia, early corrective actions, and provision of safe anaesthesia.

The most common cause of tachycardia and an elevated SBP noted in the anaesthesia record forms was emotional arousal prior to the induction of anaesthesia. Anxiety can have a negative impact on physiological parameters prior to and during anaesthesia, and patients with high levels of preoperative anxiety have problems with the induction of general anaesthesia and conduction anaesthesia [3]. Besides, patients with high stress levels are more difficult to undergo anaesthesia [4].

Emotional arousal, which is a derivative of the activity of the central nervous, endocrine and sympathetic system, increases the perception of pain [5]. Preoperative tachycardia was observed in 20% of the patients in group I, 24% in group II, and 38% in group III. An elevated SBP was noted in 34% of the women from group I, and 38% from groups II and III. We examined whether preoperative stress impacted

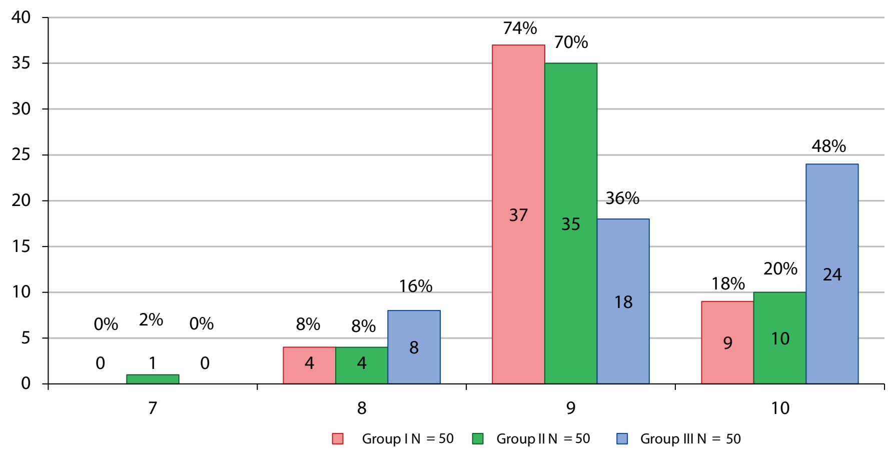

Figure 9. Evaluation of patients immediately after surgery, aldrete score

on the pain qualified as severe (above 5 points according to the NRS scale) in the recovery room, yet the analysis did not show any statistically significant differences between the groups. A similar study was carried out by Sioma-Markowska U et al. [6]. This prospective study included 184 women aged 18–80 years undergoing surgeries for gynaecological diseases. The average postoperative pain value assessed using the Visual Analog Scale (VAS) was significantly higher in the group of patients with general anaesthesia than in the group with epidural anaesthesia [6]. Studies [7–11] show that intense anxiety can have a negative influence on physiological parameters in the early postoperative period, which results in more complications, intensified postoperative pain and extended length of hospital stay. Due to the highly diversified groups and the short time spent in the post-anaesthetic care unit, it was difficult to form any conclusions as to whether multimodal analgesia had an impact on a lack of association between preoperative anxiety and postoperative pain intensity. This is certainly an issue worth further research in this area.

Other causes affecting the cardiovascular system in the study group included factors connected with anaesthesia and surgery.

The anaesthetic-related factors include the type of anaesthetic, its concentration and duration of action. Halogen-containing anaesthetics can cause cardiac depression and even cardiac arrest. At the time of maintenance of the anaesthesia and the lack of surgical stimulation, desflurane and sevoflurane lower the blood pressure [12]. Deep and long anaesthesia can cause tachycardia. Sympathetic blockades result in hypotonia. Surgical stimuli increase the blood pressure and heart rate in the case of all volatile halogen-containing anaesthetics [13]. Conscious responses to pain are not present under general anaesthesia, yet the activation of sympathetic neural and autonomic humoral pathways results in a range of physiological (*e.g.*, haemodynamic) changes that can indirectly indicate intensified surgical stress and inappropriate analgesia [14].

Intubation is also a very strong stimulus that can cause bradycardia, tachycardia, disturbed heart rate, and an elevated blood pressure [15].

Surgery-related factors affecting the cardiovascular system include haemorrhage, insufflation in the case of laparoscopic surgeries, and surgical stimulation of the cranial nerve [15].

In our own study, in the intraoperative period, patients had cardiovascular disorders due to both anaesthetic and surgical reasons, causing instability of vital parameters. In the recovery room, a much higher stability of the cardiovascular system was observed. The average maximum SBP values were significantly lower, particularly in group III — by 20 mmHg, by 10 mmHg in group II, and by 7 mmHg in group I. The average minimum SBP values also were more stable in the recovery room — the average minimum SBP increased by 18 mmHg in groups I and III, and by 23 mmHg in group II. The average maximum heart rate values in the recovery room decreased by 20 beats per minute in groups I and II, and by 12 in group III.

In the post-anaesthetic care unit, a lot of stimuli ceased upon completion of the surgery, yet the moment of awakening is still critical and requires a lot of attention and observation on the part of the nurse, as disorders of the cardiovascular and respiratory systems can appear.

Delayed awakening from anaesthesia is most often associated with the overall bad condition of the patient in the preoperative period, extensive and long surgery accompanied by a lot of anaesthetics, opioids and neuromuscular blockers, as well as the traumatic course of the surgery resulting in a haemorrhage or damage to important organs. In our own study, most patients were discharged from the post-anaesthetic care unit within two hours, *i.e.*, 92% in group I, 88% in group II, and 84% in group III. The causes of lengthened stay in the post-anaesthetic care unit, for more than two hours, were analysed and only in two cases were connected with the patient's condition. Based on the conducted analysis, it can be stated that anaesthesia adjusted to the patient as well as to the extent and technique of the surgery largely contributes to a safe perioperative period and patient comfort.

CONCLUSIONS

Preoperative stress causing an elevated blood pressure and accelerated heart rate did not result in a higher level of pain in the post-anaesthetic care unit.

When using multimodal analgesia, the time required to fully awaken even after extensive surgical procedures was no longer than two hours.

Haemodynamic disorders during surgery do not have to occur in the recovery room.

Temperature control in the perioperative period should be a standard.

Conflict of interest

None.

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