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EARLY ACTIVATION PATHWAYS IN PATIENTS UNDERGOING OPEN HEART SURGERY WITH MULTICOMPONENT GENERAL ANESTHESIA COMBINED WITH HIGH THORACIC EPIDURAL ANESTHESIA

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Abstract

Background: Early mobilization of patients in the postoperative period after open heart surgeries, significantly decreases the risk of complications, accelerates the restoration of functional capacity, shortens the length of hospital stay, and reduces treatment costs

Materials and methods: Open heart surgeries were performed on 60 patients at Ankara "Bayındır" Hospital, Central Clinical Hospital, and Baku Health Center were included in the study. Patients were divided into two groups. 30 of them underwent the procedure with the use of multi-component balanced general anesthesia and intravenous fentanyl analgesia in the postoperative period. The other group of 30 patients underwent catheterization under high thoracic epidural anesthesia, with the administration of ropivacaine prior to induction and, in the postoperative period, ropivacaine and fentanyl. We conducted a study on central hemodynamic parameters and analgesic effects.

Results: Thirty of them underwent the procedure with the use of multi-component general anesthesia and intravenous fentanyl analgesia in the postoperative period. The other group of 30 patients underwent catheterization of the high epidural space with the administration of ropivacaine before induction and, in the postoperative period, ropivacaine and fentanyl. We conducted a study on central hemodynamic parameters and analgesic effects.

Conclusion: It has been established that for patients in the second group according to the Enhanced Recovery After Surgery strategy, hemodynamic support and effective pain management can contribute to early patient mobilization after surgery. Early mobilization, in turn, can expedite recovery and reduce the length of hospital stay, ultimately leading to potential cost savings.

Жоғары кеуделік эпидуральды анестезиямен ұштасатын көпкомпонентті жалпы анестезиямен ашық жүрекке хирургиялық операцияны бастан өткеретін науқастардың ерте белсену жолдары

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Тұжырым

Өзектілігі: Ашық жүрекке жасалған операциялардан кейінгі операциядан кейінгі кезеңде науқастарды ерте мобилизациялау, асқыну қаупін айтарлықтай төмендетеді, функционалдық мүмкіндіктерінің қалпына келуін тездетеді, ауруханада болу ұзақтығын қысқартады және емдеу шығындарын азайтады.

Материал және әдістер: Анкара «Байындыр» ауруханасында, Орталық клиникалық ауруханада және Баку денсаулық орталығында 60 науқасқа ашық жүрекке операция жасалды.Пациенттер екі топқа бөлінді.Олардың 30-ы операциядан кейінгі кезеңде көпкомпонентті теңдестірілген жалпы анестезияны және көктамырішілік фентанилді анальгезияны қолдану арқылы процедурадан өтті. 30 пациенттен тұратын басқа топ индукцияға дейін ропивакаинді, ал операциядан кейінгі кезеңде ропивакаин мен фентанилді енгізе отырып, жоғары кеуде эпидуральды анестезиясы астында катетеризациядан өтті. Біз орталық гемодинамикалық параметрлерге және анальгетикалық әсерге зерттеу жүргіздік.

Нәтижелер: Операциядан кейінгі кезеңде олардың 30-ы көп компонентті жалпы жансыздандыру және көктамырішілік фентанилді анальгезия қолдану арқылы процедурадан өтті. 30 пациенттің басқа тобына индукцияға дейін ропивакаинді, ал операциядан кейінгі кезеңде ропивакаин мен фентанилді енгізу арқылы жоғары эпидуральды кеңістікті катетеризациялау жүргізілді. Біз орталық гемодинамикалық параметрлерге және анальгетикалық әсерге зерттеу жүргіздік.

Қорытынды: Операциядан кейін жақсартылған қалпына келтіру стратегиясы бойынша екінші топтағы науқастар үшін гемодинамикалық қолдау және ауырсынуды тиімді басқару операциядан кейін пациенттің ерте мобилизациясына ықпал ете алатыны анықталды. Ерте жұмылдыру, өз кезегінде, қалпына келтіруді тездетеді және ауруханада болу ұзақтығын қысқартады, сайып келгенде, әлеуетті шығындарды үнемдеуге әкеледі.

Мүдделер қақтығысы:
Авторлар мүдделер қақтығысының жоқтығын мәлімдейді

Түйінді сөздер:
Кардиоанестезия, Эпидуральды Анестезия. Fast-Track, ERAS

Пути ранней активации пациентов, прошедших операцию на открытом сердце с применением многокомпонентной общей анестезии в сочетании с высокой грудной эпидуральной анестезией

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Кардиоанестезия, эпидуральная анестезия. Ускореннаяпроцедура, ERAS

Абстракт

Актуальность: Ранняя мобилизация больных в послеоперационном периоде после операций на открытом сердце существенно снижает риск осложнений, ускоряет восстановление функциональных возможностей, сокращает сроки пребывания в стационаре и снижает затраты на лечение.

Материалы и методы: В исследование были включены операции на открытом сердце 60 пациентам в больнице «Байындыр» Анкары, Центральной клинической больнице и Бакинском центре здоровья.Пациенты были разделены на 2 группы. 30 прошли процедуру с применением многокомпонентной сбалансированной общей анестезии и внутривенной анальгезии фентанилом в послеоперационном периоде. Другой группе 30 больным была проведена катетеризация при высокой торакальной эпидурального анестезии, с введением ропивакаина до индукции и, в послеоперационном периоде, ропивакаина и фентанила. Мы провели исследование показателей центральной гемодинамики и анальгетических эффектов.

Результаты: 30 из них прошли процедуру с применением многокомпонентной общей анестезии и внутривенной фентаниловой анальгезии в послеоперационном периоде. Другой группе из 30 пациентов перед индукцией проводилась катетеризация верхнего эпидурального пространства с введением ропивакаина, а в послеоперационном периоде — ропивакаина и фентанила. Мы провели исследование параметров центральной гемодинамики и анальгетического эффекта.

Заключение: Установлено, что у пациентов второй группы по стратегии Ускоренного восстановления после операциигемодинамическая поддержка и эффективное обезболивание могут способствовать ранней мобилизации пациентов после операции. Ранняя мобилизация, в свою очередь, может ускорить выздоровление и сократить продолжительность пребывания в больнице, что в конечном итоге приведет к потенциальной экономии затрат.

Introduction

Early mobilization of patients in the postoperative period after open heart surgeries (such as aortic coronary bypass grafting (CABG), aortic valve replacement or repair, mitral valve replacement or repair, closure of atrial septal defect (ASD), closure of ventricular septal defect (VSD), aortic aneurysm repair, removal of myxoma, implantation of a cardioverter-defibrillator and cardiac pacemaker, ablation procedure) performed for arrhythmias, ischemic heart disease, heart failure, valve stenosis or regurgitation, aortic aneurysm, congenital intracardiac and extracardiac defects, significantly decreases the risk of complications, accelerates the restoration of functional capacity, shortens the length of hospital stay, and reduces treatment costs.[1,2,3]

The solution to the problem of reducing hospitalization duration due to the increasing number of cardiac surgery patients has once again become one of the main issues of the modern era.[4]

At the end of the last century, the method of Enhanced Recovery After Surgery (ERAS) - accelerated rehabilitation protocol after surgery or Fast-Track, became widely spread, which is currently being widely reintroduced in surgery.[5] This strategy represents a new approach to patient management at the pre-, intra-, and postoperative stages and is aimed at reducing pain, complications, stress reactions, and organ dysfunctions in the postoperative period.[5] The ERAS program is divided into 3 stages, each of which is a multi-component system.[6]

1. Preoperative Phase: Patient education and instruction, bowel preparation, reduction of fasting period (no food intake for 6 hours and no liquids (tea, coffee, milk, juice) for 2 hours), provision of carbohydrate loading, prophylaxis against thromboembolic complications;

2.Intraoperative Phase: Antibiotic prophylaxis, use of regional (epidural) analgesia, avoidance of long-acting anesthetics, maintenance of perioperative therapy with minimal use of infection treatment, complete removal from continuous nasogastric intubation, normothermia, preservation of drainage tubes, minimal invasive surgery;

3.Postoperative Recovery: Effective wound healing, oral non-opioid analgesics, prophylaxis against vomiting and postoperative nausea, early mobilization, early enteral feeding.

Early mobilization prevents muscle weakness and pulmonary embolism by improving early activity of skeletal muscles, respiratory function, and oxygenation of tissues, while reducing the risk of deep vein thrombosis.[7]

The application of new "fast-track cardiac anesthesia" methods has resulted in early extubation, reduced stay in the intensive care unit and hospital, and prevention of complications.[8]

Cardiovascular diseases first came into focus in the literature in the middle of the last century, when high thoracic epidural anesthesia (HTEA) associated with cardiovascular surgery was noted.[9] In modern times, information about the use of HTEA began to be re-described in the literature by Jakobsen CJ, leading to extensive discussions about the placement of the catheter in the thoracic epidural space, anesthesia and analgesia during and after surgery, as well as the regulation of arterial hypertension.[9]

By the end of the last century, the technique of using HTEA began to be applied to patients before surgery, after which this technique became widely used. This method provides reliable analgesia during surgery and in the postoperative period, allowing for early extubation and attracting attention with its advantages over others.[9]

It should also be noted that during open-heart surgeries, A.D. Volkovet al. conducted a comparative study between patients who underwent anesthesia using a balanced method with propofol and fentanyl via the endotracheal route and analgesia with fentanyl in the postoperative period, and patients who underwent endotracheal and high thoracic epidural anesthesia (ropivacaine 0.75% - 10-12 ml and fentanyl 2-3 mcg/kg) with ropivacaine 0.2% and fentanyl 2 mcg/ml introduced into the thoracic epidural space at a rate of 3-10 ml/hour in the postoperative period. It was found that during epidural anesthesia, arterial hypertension and myocardial depression undergo insignificant changes. With the use of HTEA with 0.75% ropivacaine, a reduction in propofol consumption was 15%, and fentanyl was 50%.[1]

E.A. Korniyenkoet al.note that after placing the catheter in the epidural space, injection of naropin in a dose of 2 mg/ml leads only to the use of a sensory block, while in a dose of 7.5 mg/ml, it leads to a motor block and intraoperative use (analgesic, high-quality analgesia) yielding more positive results. Additionally, the use of morphine by the epidural method enhances its analgesic effect. The duration of morphine action at a volume of 2-4 mg is 20 minutes, with a maximum starting from 30-60 minutes and lasting 8-12 hours, and at a volume of 5-10 mg, it lasts up to 16-30 hours.[10]

However, some authors consider the presence of analgesia in patients with a high risk of cardiovascular decompensation (injury to the left coronary artery) to be dangerous and recommend the use of general anesthesia. This type of anesthesia provides stable hemodynamics and coronary perfusion.[11]

The aim of the study is to determine the optimal anesthesia method based on central hemodynamic parameters by comparing patients who underwent open heart surgery with endotracheal balanced propofol-fentanyl anesthesia or multi-component general anesthesia (MGA) with postoperative fentanyl analgesia, to those who received MGA combined with high thoracic epidural anesthesia (ropivacaine 0.75% - 10-12 ml and fentanyl 2-3 mcg/kg) and postoperative epidural administration of ropivacaine 0.2% and fentanyl 2 mcg/ml at a rate of 3-10 ml/hour. Additionally, the study aims to implement and prepare for early activation according to the Enhanced Recovery After Surgery program in the postoperative period.

Material and Methods

A total of 60 patients (41 males, 19 females; mean age 52.18±6.38 years) who underwent open heart surgery at Ankara "Bayındır" Hospital, Central Clinical Hospital, and Baku Health Center were included in the study.

The study included patients undergoing aortic coronary bypass, aortic valve replacement or repair, mitral valve replacement or repair, closure of atrial septal defect, closure of ventricular septal defect (VSD), aortic aneurysm repair, removal of myxoma, implantation of cardioverter-defibrillator and pacemaker, and patients randomized to multi-component general anesthesia (MGA) with ablation procedure. The primary criterion for operated patients was the absence of contraindications to regional anesthesia. Additionally, patients not included in the research were those undergoing emergency surgery, those with ejection fraction below 30%, severe valve dysfunction, severe peripheral vascular injuries, decompensated stages of diseases, simultaneous interventions (carotid endarterectomy, etc.), and those connected to the artificial blood circulation device during surgery.

The initial condition of the patients was assessed through comprehensive laboratory and instrumental examinations, including Doppler echocardiography (EchoCG), ECG, X-ray, angiography. From the central hemodynamic parameters, the following parameters were determined using Doppler echocardiography: cardiac index, dPmax (maximum pressure gradient of the left ventricle), global ejection fraction (GEF), cardiac function index. Other parameters such

as heart rate (HR), maximum arterial pressure (MAP), minimum arterial pressure, mean arterial pressure (MAP), central venous pressure (CVP) were also evaluated.

Postoperative pain relief effect was assessed using the Visual Analog Scale (VAS) and the Efficacy-Safety Scale (ESS) or the Efficacy Safety Score (ESS).[12]

Central hemodynamic parameters were evaluated in 7 stages: the 1st stage before the start of anesthesia induction, the 2nd stage immediately after anesthesia, the 3rd stage during sternotomy, the 4th stage after the completion of the surgery, the 5th stage 6 hours after surgery, the 6th stage 12 hours after surgery, and the 7th stage 18 hours after surgery.

Depending on the type of anesthesia administered, the patients were divided into two groups.

The first group consisted of patients(n=30) who received endotracheal balanced propofol-fentanyl anesthesia or multi-component general anesthesia with postoperative intravenous fentanyl analgesia at a concentration of 10 mcg/ml at a rate of 1-5 ml/hour. The second group included patients (n=30) who underwent high epidural catheterization at the Th1-Th4 level together with MGA before induction (with ropivacaine 0.75% - 10-12 ml and fentanyl 2-3 mcg/kg) and received postoperative epidural ropivacaine 0.2% and fentanyl 2 mcg/ml at a rate of 3-10 ml/hour.

Premedication and general anesthesia were conducted according to general principles in both groups.

In the postoperative period, pain relief efforts were assessed using the Visual Analog Scale (VAS), where a score of <3 indicated mild pain at rest and <4 during coughing, while a score of 4 and above indicated inadequate pain control. According to this scale, pain levels were categorized as follows: 0-1 no pain, 1-3 mild pain, 3-5 occasional mild pain, 5-7 persistent mild pain, 7-9 severe pain, and 10 unbearable pain. According to the Efficacy-Safety Scale (ESS), agitation was noted in patients with scores of 10 and above.

Two methods were used during open heart surgeries: "Pump" method, where an artificial blood circulation device is connected to the heart to maintain cardiac and pulmonary function for a certain period. The other method is without artificial blood circulation, where the heart maintains its activity, which can only be achieved during coronary-artery-bypass.

During emergency and elective open heart surgeries, consent for the procedure was personally obtained from the patients themselves.

Statistical analysis was performed using non-parametric Mann-Whitney U test and Kruskal-Wallis test.

This study was a retrospective and observational single-center study. It was approved by the local institutional ethics committee. From January 1, 2019, to November 31, 2023, 60 open-heart surgeries using artificial circulation were performed at the "Bayındır" Clinic in Ankara, the Central Clinical Hospital, and the Health Center in Baku. Before the examination, each patient provided written informed consent, and contact was maintained after the operation. Patients came for routine check-ups to our department. All patients provided written informed consent to participate in the study.

Results

The results of the hemodynamic parameters measurements from the study are reflected in Table 1.

In both groups, bradycardia, a decrease in cardiac index, cardiac function index, and dPmax were noted before the start of the operation reflecting the dysfunction of the left ventricle function, along with an increase in CVP during intraoperative period. After performing sternotomy and openheart surgery, a slight increase was observed in MAP, CVP, CFI, and MVT. Similar changes have been reported by other authors as well. The explanation for this phenomenon is the compensatory elimination of peripheral vasospasm as a response to myocardial dysfunction, consequently, after resolving the defects, stability in central hemodynamic parameters is achieved.

Table 1.
Central hemodynamic parameters during the conducted research

Parameters	Groups	Hemodynamic parameters in different stages						
		Intraopertive phase				Postoperative phase		
		Induction	After Anesthesia	Sternotomy	Postoperative	6 hours	12 hours	18 hours
MAPmmHg	MGA	79.9±13.5	76.9±15.6	81.6±12.2	80.2±10.4	82.5±14.8	80.1±13.1	80.3±1.9
	MGA with HTEA	72.8±8.37*	67.8±13.5*	73.4±9.5*	74.2±12.6*	72.0±12.4*	76.1±12.4*	76.2±12.6*
HR min¹	MGA	50.0 (42.3-59.8)	59.5 (51.3-64.8)	62.5 (50.5-70.5)	61.0 (55.3-74.5)	87.0 (80.3-99.0)	82.5 (75.0-96.6)	81.2 (74.0-95.5)
	MGA with HTEA	52.0 (43.3-59.8)*	51.5 (44.3-63.8)*	54.5 (48.3-62.8)*	56.0 (48.3-66.0)*	79.5 (75.3-92.0)*	81.0 (73.0-89.8)*	81.0 (73.0-89.8)*
CVPmmHg	MGA	11.3±3.6	14.0±4.0	11.8±3.7	12.7±3.5	5.0±4.0	5.8±4.6	5.9±4.7
	MGA with HTEA	12.5±3.1*	11.8±3.2*	9.4±2.5*	11.9±2.3*	6.3±4.2*	4.9±3.3*	5.1±3.1*
CI l/min/m²	MGA	2.20±0.42	2.43±0.59	2.96±1.23	2.70±0.80	3.69±0.78	3.39±0.38	3.46±0.42
	MGA with HTEA	2.20±0.44*	1.97±0.51*	2.55±0.33*	2.57±0.55*	3.39±0.38*	3.34±0.50*	3.32±0.44*
dP_{max}mmHg/s	MGA	697±116	537±169	567±142	565±145	770±255	744±412	915±339
	MGA with HTEA	542±136*	479±150*	552±141	567±201	880±293	1015±421	997±353
GEF %	MGA	24.6±6.1	21.0±6.6	22.2±7.0	22.0±5.6	24.0±6.3	22.0±5.4	21.7±5.3
	MGA with HTEA	26.2±7.30*	23.5±5.4*	26.1±6.3*	26.0±7.0*	24.2±6.1*	24.0±5.7*	22.9±5.5*
CFI	MGA	3.47±1.18	3.14±1.04	3.88±1.42	3.79±1.24	5.56±1.92	4.96±1.19	4.98±1.11
	MGA with HTEA	3.42±0.77*	3.03±0.65*	3.69±0.69*	3.65±0.87*	5.23±1.22*	5.13±1.14*	4.95±1.29*

*-p<0,05 compared with MGA group

Discussion

It should be noted that during sternotomy and open-heart surgery, patients who underwent MGA in combination with HTEA exhibited a 10% ($p<0.05$) decrease in MAP and a 11% decrease in HR compared to patients who received MGA alone. During the examination, it has been determined that the application of HTEA initially results in a decrease in MAP and HR, this is associated with sympathetic and motor blockade (due to vasodilation of arteries resulting in an increase in vascular volume). Also, a 25% ($p<0.001$) decrease in CVP was observed compared to initial measurements. During epidural anesthesia, the Bainbridge reflex is noted due to sympathetic blockage in the spinal cord, and this reflex is formed due to the superior and inferior venae cava and pulmonary veins. The stimulation is transmitted to the central sympathetic nucleus of the brainstem, resulting in an activation of the sympathetic autonomic nervous system, leading to tachycardia.[13]

Looking at the postoperative period, it can also be observed that arterial hypertension and tachycardia are less prominent in patients who received MGA in combination with HTEA. In fact, when comparing preoperative indicators to the first 24 hours postoperatively, no significant difference is observed. Additionally, after the operation, patients receiving ropivacaine and fentanyl epidurally showed an increase in dPmax, indicating an improvement in the function of the left ventricle. The stability of indicators such as CI, GEF and CFI during epidural analgesia has also been confirmed by other authors.[14]

Vasodilation effect of ropivacaine-induced epidural analgesia also improve the pulmonary system and systemic circulations. Additionally, HTEA exerts a positive effect on the respiratory system, further enhancing the quality of postoperative pain relief and preventing atelectasis.[15]

In general, HTEA results in pulmonary vasodilation, thereby preventing the accumulation of fluid in the lungs and improving respiratory mechanics and oxygenation.

None of the patients examined in the study experienced epidural hematoma related to perioperative hypocoagulation or other complications. Although literature reports mention arrhythmias associated with sympatholytic effects during epidural anesthesia, such cases were not observed in our study.[16]

In the postoperative period of cardiac surgery, the main etiopathogenesis of pain syndrome consists of the activation of dermal receptors and pleural nociceptors due to the effect of drainage tubes resulting from sternotomy, chondropathic pain in the joints of the sternum and rib-chest area,[17] as well as the formation of chronic neuropathic syndrome due to damage to the intercostal nerves from the thoracotomy retractor.[18] In such pains, simultaneous application of 5% medical lidocaine plaster and epidural analgesia significantly reduces postoperative pain.[18]

Epidural anesthesia is considered the "gold standard" of regional anesthesia, blocking the transmission of nociceptive impulses by afferent fibers, which can also be applicable to cardiac surgery. Additionally, it should be noted that epidural anesthesia at the Th_1-Th_4 level creates a sympathetic block in the heart and also has an additional cardioprotective effect.[19]

In foreign countries, "fast-track cardiac surgery" (perioperative anesthetic management aimed at facilitating extubation of patients from mechanical ventilation within 1-6 hours after cardiac surgery with the goal of reducing length of stay in the hospital, conducting intensive therapy, and reducing treatment costs) is based on the strategy of rapid discharge of patients from the intensive care unit after cardiopulmonary bypass and extubation, which is associated with restoring physical activity in the postoperative period.[20] The concept of "fast-track cardiac surgery," proposed by Lloyd-Donald P. and colleagues, showed that 4 out of 16 patients undergoing surgery according to the protocol were successfully extubated in less than 4 hours and transferred to the intensive care unit.[21]

In former Soviet Union countries, such an approach was called early mobilization and was associated with discharging patients from the intensive care unit, extubation, and restoration of postoperative physical activity.[22]

Maintaining the function of the cardiopulmonary apparatus for a prolonged period in patients with artificial circulation was considered the "gold standard" in previous years. However, modern research shows that using a low-opioid anesthesia protocol reduces the increase in IL-6 levels and brings the volume of the heart closer to normal.[23]

Starting from the 2000s, many countries began to advocate for early mobilization. Numerous authors have noted that the use of such strategy leads to significant reductions in complications of both blood circulation and respiratory systems, as well as inflammation-associated problems. In this regard, according to modern concepts, skeletal muscles are immunocompetent endocrine organs. During increased muscle activity, specific anti-inflammatory cytokines (myokines) are actively produced. Myokines participate in various clinical conditions, including the modulation of the inflammatory response in postoperative complications, systemic inflammatory reactions, endothelial dysfunction, and other pathophysiological mechanisms.[24]

Certainly, as HTEA has the analgesic effect within the first 6 hours after weaning off the mechanical ventilation, it contributes to cut down the expenses incurred in patients undergoing open-heart surgery until discharge from the hospital.[25]

The main components of early mobilization of patients undergoing open-heart surgery are as follows:

1. Patient admission to the hospital one day before or on the day of surgery;
2. Use of short-acting hypnotics or inhalation anesthetics, small doses of opioids, or ultra-short-acting drugs for anesthesia, with the use of HTEA;
3. Early separation of the patient from the mechanical ventilation, and use of HTEA after tracheal extubation;
4. Avoidance of high doses of opioids in the postoperative period, and use of HTEA;
5. Accelerated rehabilitation - early mobilization and feeding;
6. Stay in the intensive care unit for up to 6 hours and discharge from the stationary ward within 1-4 days;
7. Outpatient follow-up for 30 days.

Such accelerated early activation is referred to as "early extubation" or "early tracheal extubation" in English literature, which constitutes a fundamental stage in the patient's mobilization.[26]

In American sources, the term "fast track" is sometimes expressed with another specific term, such as "early discharge" or "ultra-fast track hospital discharge," which primarily entails the monitoring of patients in the hospital for 1-4 days after surgery.[16]

Literature refers to extubation within 30-40 minutes as "ultra-early extubation",[27] and extubation within 1 hour is termed as "ultra-early activation".[28]

During the postoperative period, among patients who received MGA in combination with HTEA, one patient had a score of 4 or higher on the Visual Analog Scale, whereas in the group of patients who underwent MGA alone, two patients had a VAS score of 4 or higher. Regarding to the efficacy-safety scale, among patients who received MGA in combination with HTEA, one patient had a score of 10 or higher, the same result also observed in patients who received only MGA.

Limitations During the research, no limitations arose (in collecting data on patients and refusals, financial problems, etc.).

What's known? According to the concept of the ERAS strategy, patients who underwent open-heart surgery, should be mobilized early, monitored in the intensive care unit for up to 6 hours, and after 1-4 days, can be discharged from the hospital under outpatient follow-up

The application of "fast-track cardiac anesthesia" methods in cardio-anesthesia has resulted in early extubation, decreased duration of stay in the intensive care unit and hospital, prevention of complications, accelerated the treatment process, and significantly reduced treatment costs.

What's new? VAS and ESS scales play an effective role in predicting the intensity of pain syndrome in the early postoperative period of patients undergoing open-heart surgery regardless of the type anesthesia administered. However, the advantage of efficacy-safety scale is that, apart from VAS, this scale predicts the negative course of the postoperative phase and the development of postoperative complications

Conclusion When comparing patients who underwent open heart surgery with endotracheal balanced propofol-fentanyl anesthesia or MGA with postoperative fentanyl analgesia, to those who received MGA combined with HTEA (ropivacaine 0.75% - 10-12 ml and fentanyl 2-3 mcg/kg) and postoperative epidural administration of ropivacaine 0.2% and fentanyl 2 mcg/ml at a rate of 3-10 ml/hour, it is observed that administration of the latter results in hypodynamic hemodynamic changes, making it an optimal anesthesia method for patients undergoing open-heart surgery.

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