

USE OF EPIDURAL ANESTHESIA WITH PRESERVED SPONTANEOUS BREATHING IN HYPOSPADIAS IN CHILDREN

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Abstract. *The study included 146 children aged 4 to 12 years who underwent urethroplasty for hypospadias. The duration of the operation averaged 114+/-21 minutes. Anesthesia was started with intravenous propofol (2-4 mg/kg) or midazolam (0.5 mg/kg). Then puncture and catheterization of the epidural space was performed at the L2 - L3 level. To assess the condition of patients during surgery, along with monitoring the clinical picture of anesthesia, dynamic recording of an ECG, spirogram, determination of CBS indicators and blood gases and the concentration of certain stress hormones (cortisol, triiodothyronine, thyroxine) were carried out. The developed method is characterized by cost-effectiveness, good controllability, optimal rehabilitation of patients in the postoperative period, and the absence of the need for manipulation of the respiratory tract.*

Keywords: *epidural anesthesia, local anesthetic, hypospadias, childhood, hemodynamic parameters, cortisol*

Introduction. The choice of the most optimal method of anesthesia for a particular method of surgical intervention remains one of the pressing problems of modern anesthesia [1,2].

The trend towards a transition to laparoscopic or robotic minimally invasive methods of treating many congenital urological anomalies in children has led to a review by pediatric anesthesiologists of the choice of anesthetic management with a preference for minimally invasive techniques [3]. Today, a multimodal approach to pain management, which includes regional anesthesia, is of particular interest to pediatric anesthesiologists [4,5,6]. Thus, in particular, during surgical urological interventions in children, there is a need to choose the safest method of anesthesia for postoperative patient management, further treatment and improvement of the child's quality of life [7,8,9].

In an effort to achieve effective pain relief in the pre- and postoperative period, thereby significantly improving the patient's well-being, ensuring early resumption of motor activity, speeding up rehabilitation, reducing the risk of complications, and therefore reducing the length of the patient's hospital stay, the method of choice for surgical correction of hypospadias is epidural anesthesia [10,11].

One of the advantages of epidural anesthesia is the absence of the need for manipulation of the respiratory tract, in particular tracheal intubation, which avoids negative respiratory phenomena (associated with subglottic stenosis, laryngotracheomalacia, airway hyperresponsiveness, airway problems) [12,13].

The structure of our clinic is dominated by urological beds, and therefore the number of patients with this pathology is high. Surgical correction of hypospadias in our clinic is carried out in one stage, the duration of the surgical intervention is on average 114+/-21 minutes. With this

extracavitary urological operation, there is no need for total muscle relaxation and, therefore, artificial ventilation of the lungs, which disrupts the natural mechanisms of breathing and blood circulation, which made it possible to carry out anesthesia while maintaining spontaneous breathing.

The most acceptable method of general anesthesia for plastic surgery should be characterized by technical simplicity, good controllability, rapid post-anesthesia rehabilitation of the patient, and safety for the patient and staff [14,15].

Although, in the vast majority of cases, extracavitary operations in children are still performed under conditions of technically difficult general endotracheal anesthesia.

Purpose of the work: to evaluate the adequacy of epidural anesthesia while maintaining adequate spontaneous breathing in children undergoing plastic surgery for hypospadias.

Materials and methods

The study included 146 children aged 4 to 12 years who underwent urethroplasty for hypospadias. The duration of the operation averaged 114+/-21 minutes.

Anesthesia was started with a slow intravenous injection of propofol (2-4 mg/kg) or midazolam (0.5 mg/kg). Then, under aseptic conditions, catheterization of the epidural space was performed at the L2-L3 level. To achieve the surgical stage, a bolus of local anesthetic - levobupivacaine 0.5% (1-1.5 mg/kg) - was injected into the epidural space. In order to prevent arterial hypotension, moderate hypervolemic hemodilution was performed after epidural administration of an anesthetic drug.

To assess the adequacy of anesthesia during surgery, along with monitoring the clinical picture of anesthesia, monitoring blood pressure (BP) and heart rate (HR), dynamic cardiac monitoring was performed on a Life Scope monitor (Japan), a spirogram (Metatest), and determination of acid and acid levels were performed. basic state (BOS) and blood gases on an analyzer (AVL 995 Hb Blood, Japan) and determination of the concentration of some stress hormones (cortisol, triiodothyronine T3, thyroxine T4). Hormone concentrations were determined by radioimmunoassay. The studies were carried out at the main stages of anesthesia and surgery. The obtained data were processed by the method of mathematical statistics with the introduction of the Student's criterion.

RESULT AND DISCUSSIONS

The surgical stage began 15-20 minutes after the epidural injection of local anesthetic. During the surgical stage of epidural anesthesia, there was a slight decrease in respiratory rate (RR) by an average of 3-4 per minute and heart rate by 5-7 per minute, and a decrease in blood pressure by an average of 10-12 mm Hg. The course of anesthesia was characterized by drug-induced sleep of patients while maintaining adequate spontaneous breathing, and the absence of motor and autonomic reactions to surgical trauma.

According to the results of assessing peripheral hemodynamics, the average blood pressure values did not change significantly during surgery and anesthesia. Thus, during the most traumatic period of the operation, blood pressure system. increased by 2.7%, blood pressure diast. - by 4.4%, respectively, in relation to the previous stage, and in comparison, with the initial indicators of blood pressure system. and blood pressure diast. increased by 3.6% and 8.1%. However, these changes were unreliable. Heart rate during the most traumatic stages of the operation increased slightly by 1.2% compared to the previous stage, and in comparison with the initial data it increased by 3.2%. RR during the most traumatic stage of the operation decreased by 4.8%, while

tidal volume (TV) increased by 4.7% compared to the previous stage. When compared with the original data, RR and RR increased by 2.7% and 5.5%, respectively, and were unreliable.

According to the results of the study of CBS and blood gases, spontaneous breathing of patients was adequate, pO₂ and pCO₂ of capillary blood during anesthesia and surgery did not differ significantly from the baseline.

The earliest signs of weakening neurovegetative protection were facial reactions, twitching of the eyelids, and an increase in the frequency and depth of breathing. The introduction of subsequent maintenance doses of propofol (4-8 mg/kg/h) or midazolam (0.25 mg/kg) prevented these changes. To maintain analgesia, a continuous infusion of 0.25% levobupivacaine was administered at a rate of 0.25-0.375 mg/kg/h).

According to a study of stress hormones, an increase in the content of cortisol, T3 and T4 was revealed during the most traumatic stages of the operation compared to the initial ones. However, their level was within the physiological norm, which indicated the adequacy of the proposed method of anesthesia and the preservation of the adaptive endocrine reactions of the body.

At all stages of anesthesia and surgery, all clinical signs indicated adequate protection of the patient from surgical aggression. Even during the most traumatic stages of the operation, indicators of the cardiovascular system, pulmonary function and gas exchange remained relatively stable and did not undergo any significant changes (Table 1).

Table 1

Indicators of the condition of patients during anesthesia and surgery

Indication	Outcome	Premedication	Induction of anesthesia	Injury step	Awakening stage
BP Syst. mmHg.	107,4-4,7	109,8-5,1	96,6-4,2	104,1-3,7	107,3-2,3
BP Diast. mmHg.	73,4-1,3	76,6-3,1	64,3-2,2	63,4-2,4	67,3-1,4
HR, min	91,1-1,9	98,2-5,3	93,1-4,6	94,1-4,2	96,1-4,9
pO ₂ mmHg		90,6-5,7	99,4-4,6	95,6-4,5	94,0-4,4
pCO ₂ mmHg		41,4-1,6	39,3-1,5	39,1-2,4	39,9-3,1
pH		7,38-0,01	7,36-0,05	7,36-0,02	7,37-0,3
BE		-1,5-0,03	-1,9-0,02	-2,1-0,02	-2,2-0,05
Cortisol, nmol/l	409,8-42,2	543,5-65,9	588,1-67,9	672,5-72,4	652,8-86,5
BR, min	24,1-2,4	30,4-2,2	26,1-2,7	26,8-2,4	25,2-2,3
TV, l	0,24-0,02	0,21-0,03	0,23-0,02	0,27-0,02	0,21-0,02

Recovery from anesthesia without complications. Restoration of consciousness was noted at the end or immediately after the end of the operation. The main group of patients did not require observation in the intensive care unit. At the end of the operation, the catheter was removed from the epidural space.

In the majority of patients (92.5%), epidural anesthesia was quite adequate. Inadequate anesthesia was noted in 7.5% of patients. In only one case was there a need to switch to general anesthesia due to technical errors in performing epidural anesthesia. In 5.5% of cases, arterial hypotension was observed (a decrease in blood pressure by more than 15 mm Hg).

The use of epidural anesthesia with preserved spontaneous breathing and sedation, a reduction in medications and their dosages used to achieve anesthesia, hypervolemic hemodilution significantly reduce the frequency of intra- and postoperative complications, and expand the indications for surgical treatment of hypospadias.

An equally important feature of this technique is that it allows you to reduce the financial costs of anesthesia for operations by 3-5 times.

Conclusion.

1. Epidural anesthesia using levobupivacaine and maintaining spontaneous breathing in children is the method of choice for plastic urological surgeries for hypospadias.

2. The developed method is characterized by good controllability, optimal rehabilitation of patients in the postoperative period, and the exclusion of complications. associated with the endotracheal method of anesthesia, safety for medical staff and economic benefits.

3. Epidural anesthesia does not require manipulation of the airway, which reduces and minimizes respiratory complications.

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