

Abdurakhmonova D.R.

Assistant of the department of Anesthesiology-resuscitation and EMS

Andijan state medical institute,

Alijonova M.A.

5th year student of Pediatric faculty

Andijan state medical institute

POSTOPERATIVE PAIN MANAGEMENT IN NEWBORNS

Abstract. The frequency of use of analgesics, their combination, method of administration, indications for use and duration of postoperative pain relief in 325 newborns were analyzed.

An analysis of postoperative pain relief showed that a limited number of drugs are used for analgesia in newborns, mainly opioid analgesics and metamizole sodium. Every third child uses methods for pain relief that do not meet modern principles of postoperative pain relief: intramuscular injection, "according to indications," and monoanalgesia. It has been determined that one of the determining factors in the choice of postoperative pain relief is the nature of the surgical disease.

The implementation of modern principles of postoperative pain relief in newborns is possible only by selecting the optimal combination of drugs and doses, as well as routes of administration of analgesics.

Keywords: pain relief, newborns, analgesics.

Introduction: Despite the abundance of analgesic methods and analgesics, the problem of postoperative pain relief remains relevant to this day. 10-50% of adult patients report persistent pain after surgery, of which 8.4-13.4% rate the pain as very intense. Chronic pain develops in approximately 2-10% of patients [1, 3]. Because newborns are unable to report pain, an even higher incidence of postoperative pain should be expected in this age group. A

multicenter study on postoperative pain management in newborns showed that 12% of children after minor surgical interventions and 7% after major and traumatic operations do not receive pain management in the early postoperative period [4]. The main method of postoperative pain relief in newborns remains opioid analgesia, which is used in 60-84% of cases; in some children, analgesics are replaced with sedatives [2, 4].

The purpose of the study: to study the quantitative and qualitative characteristics of pain therapy in newborns after surgery.

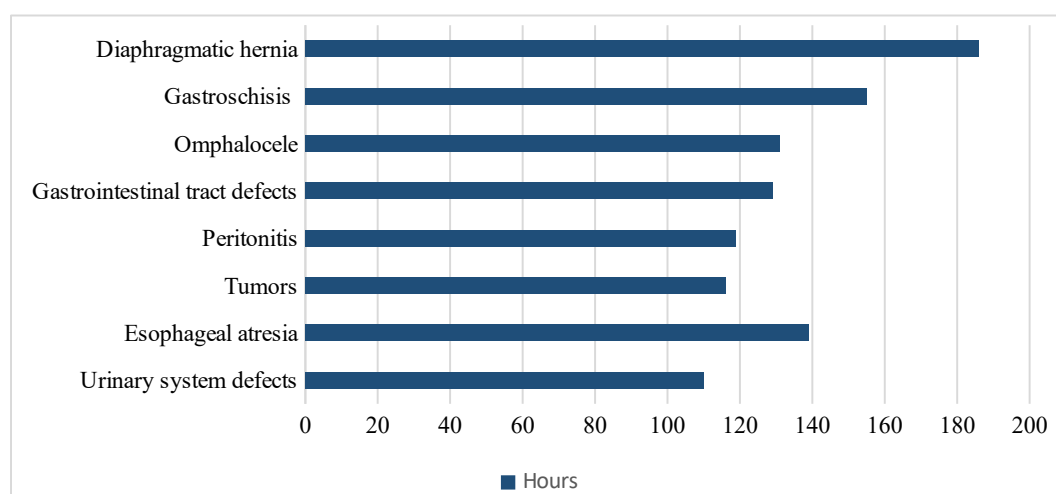


Fig. 1. Duration of postoperative pain relief depending on surgical pathology (M, h)

Materials and methods. The study was conducted on 325 newborns in the department of surgery, resuscitation and intensive care of newborns of the Andijan regional children's multidisciplinary medical center. The gestational age of the children ranged from 26.5 to 42 weeks (average age - 37.7 ± 2.4 weeks), of which 252 were full-term and 73 were premature. Age at the time of surgery - 106 ± 98 hours. Surgical diseases of newborns were represented by congenital malformations of the urinary system (58 people), gastroschisis (40 people), omphalocele (20 people), formations of various locations (51 people), diaphragmatic hernia (25 people), esophageal atresia (21 people), malformations of the gastrointestinal tract (71 people), peritonitis (27 people) and other

diseases (12 people). The frequency of use of analgesics, their combination, method of administration, indications for use and duration of pain relief were analyzed. In addition, the factors influencing analgesic therapy in the postoperative period were assessed. Statistical processing was carried out using the "Statistica 6" software package (Stat-Soft Inc., USA) with the calculation of absolute and relative frequencies, $M \pm m$ and $Me [Q1, Q2]$ of the studied characteristics. To compare groups, we used the Kruskal-Wallis and Mann-Whitney nonparametric statistics methods.

Research results. The study showed that analgesic therapy after surgery was prescribed to 324 (99.7%) children. Analgesics were not used in only one newborn: after surgery to remove a teratoma of the tongue on a narrow base. The average duration of postoperative pain relief was 129 ± 55 hours (from 20 to 336 hours).

It was determined that the need for analgesics in the postoperative period depends on the nature of the surgical pathology (Fig. 1). Rank analysis of variations according to the Kruskal-Wallis method with further pairwise comparison using the Mann-Whitney method revealed statistically significant differences in the duration of pain relief between children with diaphragmatic hernia and other surgical diseases ($p < 0.002$), with the exception of newborns with gastroschisis ($p = 0.014$). In addition, pairwise comparisons revealed differences in the duration of postoperative analgesia in children with gastroschisis and malformations of the urinary system ($p = 0.0001$), gastroschisis and formations of various locations ($p = 0.005$).

Due to serious age restrictions, the choice of drugs for postoperative pain relief is small, and opioid analgesics occupy a leading place in postoperative pain relief in newborns. The most frequently used drugs were promedol, tramadol and metamizole sodium (Fig. 2). In the postoperative period, promedol was administered at least once to 148 (45.5%) children; metamizole sodium and tramadol were used equally often (173 (53.2%) newborns).

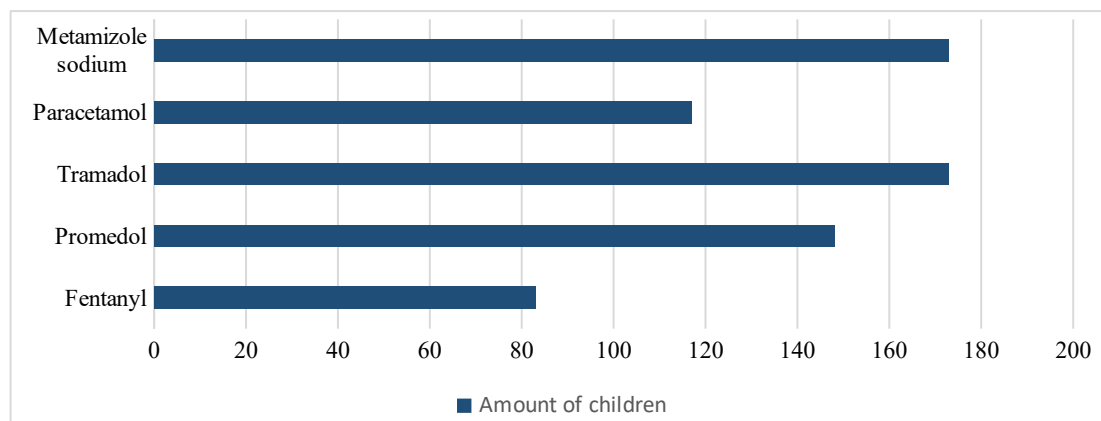


Fig. 2. Analgesics for postoperative pain relief in newborns* (absolute frequency).

Note. * – children who received the drug at least once in the postoperative period were taken into account.

When analyzing the indications for prescribing pain relief, 3 groups of children were identified. Group 1 consisted of 27 (8.3%) children who were administered analgesics “according to indications” (at the onset of pain), intravenously or intramuscularly, within 75.0 ± 28.6 hours after surgery.

Group 2 included 181 newborns (55.7%). They received routine analgesic therapy for 129.6 ± 50.3 hours after surgery. Pain management included intravenous infusion of opioid analgesics (fentanyl, promedol, or tramadol), routine intravenous bolus or intramuscular analgesics (tramadol or metamizole sodium), and rectal suppositories (paracetamol).

In group 3, 117 (35.9%) patients were administered analgesics as planned in the next 97.6 ± 54.4 hours after surgery, and were used “according to indications” over the next 64.3 ± 40.3 hours.

Postoperative monitoring using the CRIES neonatal pain scale was performed in 211 (64.9%) children. The selection of analgesia was carried out according to the ratings of this scale: with values of 4 or more points, analgesia was enhanced. If the scores were low, the dose of the analgesic was reduced. In the remaining 114 (35.1%) newborns in whom pain monitoring was not used, the selection of analgesic therapy depended on the physician's personal beliefs

and knowledge of postoperative pain in newborns. More often, pain relief was intensified when the child showed external signs of discomfort (crying, restlessness). Analgesics were often replaced with sedatives, so therapy “according to indications” was often untimely, and pain in newborns could remain undetected.

The study determined that the most common method of postoperative pain relief in newborns is continuous intravenous administration of opioid analgesics using a syringe pump. In 261 (80.3%) children, an infusion of opioid analgesics (fentanyl 0.5-10.0 mcg/kg/h, promedol 0.01-0.2 mg/kg/h or tramadol 0.02-0.2 mg/kg/h). Of these, 28 (8.6%) children received sequential infusions of two opioid analgesics in the postoperative period.

The average duration of fentanyl infusion was 100.8 ± 61.9 hours, promedol - 76.3 ± 44.5 hours and tramadol - 55.7 ± 27.3 hours (Fig. 3).

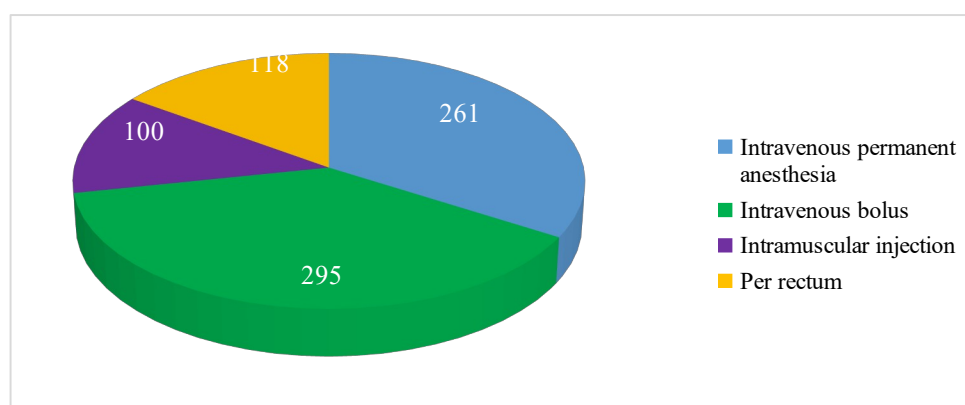


Fig.3 Routes of administration of analgesics (absolute frequency).

It should be noted that intramuscular administration of analgesics was also often used in newborns: intramuscular promedol or tramadol, at least once, was administered after surgery in 30.8% (100 children). Intramuscular injections are quite painful and should be avoided in newborns. Intravenous continuous infusion of analgesics is preferable to the intramuscular method, since this method creates a more stable level of analgesia.

Therapy with one analgesic throughout the entire postoperative period was carried out in 114 (35.1%) children. In the remaining 211 (64.9%) newborns, two or more drugs with analgesic activity were simultaneously administered (Fig. 4); a combination of several analgesics was more often used in the first 3 days after surgery. The use of multimodal postoperative pain relief allows the use of low doses of analgesics, including opioids. In addition, the combination of drugs with different application currents creates more adequate pain relief.

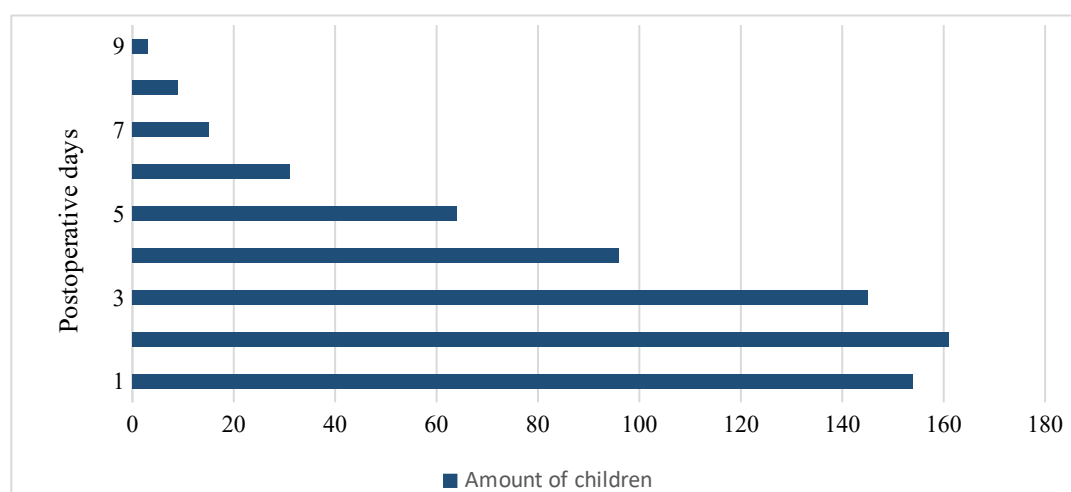


Fig. 4. Number of children in whom several analgesics were simultaneously administered (absolute frequency).

In the postoperative period, 119 (36.6%) children were administered sedatives (diazepam, midazolam, GHB, phenobarbital) together with analgesics, and in 26 (8%) newborns, muscle relaxants (atracurium) were used in the next 1-4 days after surgery).

It has been determined that the choice of an analgesic, the method and duration of its administration, and combination with other drugs depends on a number of factors. Thus, the majority of children with congenital diaphragmatic hernia (92%, 23 of 25) and esophageal atresia (61.9%, 13 of 21) received fentanyl infusion in the postoperative period. In children with gastroschisis (57.5%, 23 of 40) and peritonitis (55.6%, 15 of 27), promedol was used more

often and other analgesics were used less often. Newborns with nephro-urological diseases (81.0%, 47 of 58) and tumor formations (74.5%, 38 of 51) received tramadol by infusion or intramuscular injection for postoperative pain relief (Fig. 5).

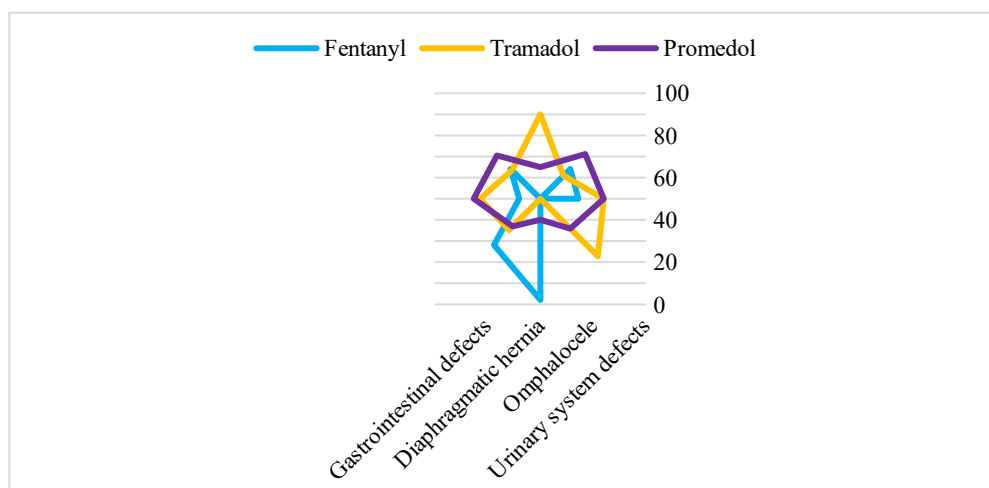


Fig. 5. Dependence of the choice of opioid analgesic on surgical pathology (relative frequency, %)

A combination of several analgesics for pain relief was more often used in children with urological diseases (50 children, 86.2%) and less often with peritonitis (7 children, 25.9%) ($p = 0.000003$, Kruskal-Wallis method). In other diseases, the simultaneous prescription of several analgesics was noted in more than half of the children: from 57.1% with esophageal atresia to 70% with omphalocele (Fig. 6).

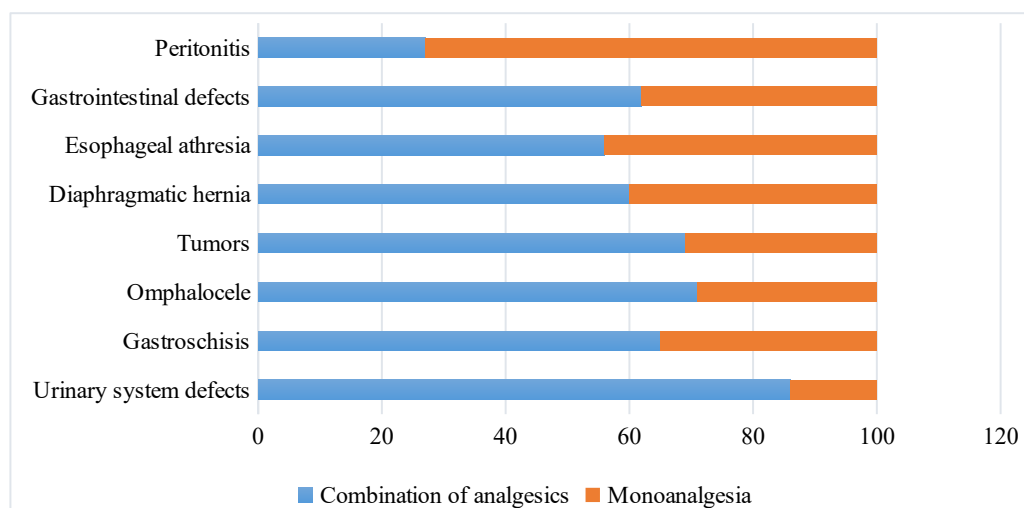


Fig. 6. Frequency of combination of analgesics depending on surgical pathology (relative frequency, %)

Conclusion:

Postoperative pain relief is an important component of intensive care for newborns with surgical diseases, determining the course of the postoperative period and its complications, as well as the comfort of the child's stay in the hospital. The severity of postoperative pain syndrome is determined by a number of factors, primarily the area and nature of the operation, as well as the individual characteristics of the child. An analysis of postoperative pain relief in newborns showed that a limited number of drugs are used for analgesia, mainly sensations and reliable blockade of the somatic and vegetovisceral components of pain, was continuous, did not have adverse effects on the main vital functions of the body, did not give adverse reactions, opioid analgesics and Metamizole sodium. Every third child uses methods that do not meet modern principles of postoperative pain relief: intramuscular injection, analgesia "according to indications" and monoanalgesia. In neonatal practice, doctors often do not differentiate the individual characteristics of patients, are late in prescribing pain medications or prescribe ineffective dosages, wanting to avoid side effects, which in most cases leads to inadequate analgesia, aggravates the patient's condition and complicates the course of the postoperative period.

It is obvious that modern medicine has not yet developed an ideal method of postoperative pain relief and has not created an ideal analgesic, therefore postoperative pain relief remains one of the most pressing problems of modern anesthesiology and intensive care. The ideal method of postoperative pain relief should be considered one that would ensure the absence of severe pain and is easy to use. Despite the fairly diverse range of methods and drugs used, to date no method has been found that would meet all the requirements for postoperative pain relief and would be free of side effects and negative effects on the state of vital functions of the body. Currently, the solution to the problem of

postoperative pain relief is based on preventive measures regarding the development and perception of acute pain, the fundamental direction of which is the multimodal principle [1, 4]. Due to the characteristics of the neonatal period, many methods of pain relief cannot be implemented in this age group; the range of drugs that can be used in newborns is significantly limited. Therefore, the implementation of modern principles of postoperative pain relief is possible only by selecting the optimal combination of drugs, doses and routes of administration of analgesics.

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