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Peculiarities of surgical treatment of gastrointestinal tract combined congenital malformations in newborns

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Key words: newborn, gastroschisis, esophageal atresia, intestinal atresia, surgical procedures operative.

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Congenital gastrointestinal (GI) malformations make up 21–25 % of all congenital anomalies and require surgical correction in the neonatal period.

The aim was to analyze the methods of operative treatment of hard composite congenital gastrointestinal malformations in infants.

Materials and Methods. There were 13 newborns with gastroschisis, omphalocele and esophageal atresia combined with intestinal atresia, anal atresia and also with congenital heart defects in our study.

Results. We have designed new preoperative care strategies for the newborns. All combined GI defects were corrected in one step. In gastroschisis and omphalocele in combination with small intestine atresia we made a plastic of anterior abdominal wall, bowel segment resection and anastomosis end-to-end. In esophageal atresia and atresia of the anus direct esophago-esophagoanastomosis was applied with suturing of tracheoesophageal fistula, also in two patients proctoplasty by Pena 2 was carried out, and in one patient with high anal atresia colostomy was applied, which was closed in the age of 6 months. In case of esophageal atresia combined with small intestine atresia direct esophago-esophagoanastomosis with tracheoesophageal fistula suturing was carried out, and resection of the bowel segment with anastomosis end-to-end was applied. In a patient with a combination of esophageal atresia and duodenal obstruction esophagoplasty and closure of tracheoesophageal fistula with anastomosis by Kimur was made. Preference was given to the combined anesthesia with neuraxial blockade. Postoperative care included prolonged artificial lung ventilation, anesthesia, parenteral nutrition, antibacterial and antifungal medicines.

Conclusions. One-step correction of the congenital GI malformations in newborns is effective and it gives opportunity to achieve the best results with a single surgical intervention. Extremely important links of the combined GI defects therapy is timely and balanced preoperative preparation, anesthetic management with the advantage of neuraxial blockade usage, as well as careful postoperative management of the patient.

Ключові слова: новонароджений, гастрошизис, атрезія стравоходу, атрезія кишечника, оперативне лікування.

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Особливості хірургічного лікування комбінованих вроджених вад розвитку шлунково-кишкового тракту в новонароджених

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Вроджені вади розвитку шлунково-кишкового тракту (ШКТ) становлять 21–25 % усіх уроджених аномалій і потребують хірургічної корекції у періоді новонародженості.

Мета роботи – аналіз методів оперативного лікування тяжких комбінованих уроджених вад розвитку ШКТ у новонароджених.

Матеріали та методи. Під спостереженням перебували 13 новонароджених дітей із гастрошизисом, омфалоцеле та атрезією стравоходу в комбінації з атрезією тонкого кишечника або ануса, а також із вродженими вадами серця.

Результати. Розробили схеми передопераційної підготовки для новонароджених. Усі комбіновані вади ЖКТ скоректовані за один етап. При гастрошизисі та омфалоцеле в поєднанні з атрезією тонкої кишки проводилась пластика передньої черевної стінки, резекція ділянки кишки та накладення анастомозу кінець у кінець. При атрезії стравоходу та атрезії ануса накладався прямий езофаго-езофагоанастомоз з ушиванням трахеостравохідної нориці, а також у двох пацієнтів здійснювалась проктопластика за Пена 2, а в одного пацієнта з високою атрезією ануса була накладена колостома, що надалі була закрита у 6-місячному віці. У пацієнта з поєднанням атрезії стравоходу та дуоденальної непрохідності здійснили езофагопластику, ушивання трахеостравохідної нориці, а також накладення анастомозу Кімура. Під час анестезіологічного забезпечення перевага надавалася комбінованій анестезії з використанням центральних нейроаксіальних блокад. Післяопераційне ведення містило пролонговану штучну вентиляцію легенів, знеболювання, парентеральне харчування, антибактеріальні та антимікотичні препарати.

Висновки. Одноетапна корекція комбінованих уроджених мальформацій ШКТ у новонароджених ефективна та дає можливість досягти найкращих результатів під час єдиного хірургічного втручання. Виняткова важливими ланками терапії комбінованих вад ШКТ є своєчасна та збалансована передопераційна підготовка, анестезіологічне забезпечення з переважним використанням нейроаксіальних блокад, а також ретельне післяопераційне ведення пацієнта.

Ключевые слова: новорождённый, гастрошизис, атрезия пищевода, атрезия кишечника, оперативное лечение.

Особенности хирургического лечения комбинированных врождённых пороков развития желудочно-кишечного тракта у новорождённых

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Врождённые пороки развития желудочно-кишечного тракта (ЖКТ) составляют 21–25 % от всех врождённых аномалий и требуют хирургической коррекции в периоде новорождённости.

Цель работы – анализ способов оперативного лечения тяжёлых комбинированных врождённых пороков развития ЖКТ у новорождённых.

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Материалы и методы. Под нашим наблюдением находилось 13 новорождённых с гастрошизисом, омфалоцеле и атрезией пищевода в сочетании с атрезией тонкого кишечника или ануса, а также с врождёнными пороками сердца.

Результаты. Нами разработаны схемы предоперационной подготовки для новорождённых. Все комбинированные пороки ЖКТ нами были скорректированы в один этап. При гастрошизисе и омфалоцеле в сочетании с атрезией тонкой кишки производилась пластика передней брюшной стенки, резекция участка кишки и наложение анастомоза конец в конец. При атрезии пищевода и атрезии ануса накладывался прямой эзофаго-эзофагоанастомоз с ушиванием трахеопищеводного свища, также у двух пациентов проводилась проктопластика по Пена 2, а у одного пациента с высокой атрезией ануса была наложена колостома, которая в последующем была закрыта в возрасте 6 месяцев. У пациента с сочетанием атрезии пищевода и дуоденальной непроходимости произвели эзофагопластику, ушивание трахеопищеводного свища, а также наложение анастомоза Кимура. При проведении анестезиологического обеспечения преимущество отдавалось комбинированной анестезии с использованием нейроаксиальных блокад. Послеоперационное ведение включало в себя пролонгированную искусственную вентиляцию лёгких, обезболивание, парентеральное питание, антибактериальные и антимикотические препараты.

Выводы. Одноэтапная коррекция комбинированных мальформаций ЖКТ у новорождённых эффективна и позволяет добиться наилучших результатов при единственном хирургическом вмешательстве. Исключительно важными звеньями терапии комбинированных пороков ЖКТ является своевременная и сбалансированная предоперационная подготовка, анестезиологическое обеспечение с преимуществом использования нейроаксиальных блокад, а также тщательное послеоперационное ведение пациента.

The prevalence of congenital abnormalities doesn't tend to decrease recent years; on the contrary there are some data about the increasing of their frequency. The prevalence of congenital malformations in neonates is from 2.5 to 4.5 %. In the structure of congenital malformations gastrointestinal (GI) tract anomalies occupy a leading position, accounting for 21.7–25 % of all defects [1]. A common type of GI malformation is an atresia, in which a segment of the GI tract fails to form or develop normally. The most common type is esophageal atresia, followed by atresia in the jejunoileal region and in the duodenum [2]. Intestinal atresia is a congenital complete interruption of the intestinal lumen, which leads to intestinal obstruction. 50 % of all cases of the small intestine atresia occur in the duodenum, 36 % in the jejunum and 14 % in the ileum. Colon atresia is less common and account for about 10 % of the total intestinal atresia. The frequency of intestinal atresia varies from 1 in 330 to 1 in 1500 live births. Patients with bowel atresia often have other malformations such as an annular pancreas, intestinal malrotation, ectopic anus, gastroschisis, omphalocele etc [3].

Omphalocele is a protrusion of abdominal viscera from a midline defect at the base of the umbilicus. In omphalocele, the herniated viscera are covered by a thin membrane and may be small (only a few loops of intestine) or may contain most of the abdominal viscera (intestine, stomach, liver). Immediate dangers are desiccation of the viscera, hypothermia and dehydration due to evaporation of water from the exposed viscera, and infection of the peritoneal surfaces. The estimated incidence is 1 in 3000 live births. Omphalocele can be detected by prenatal ultrasonography. At delivery, the exposed viscera should be immediately covered with a sterile, moist, nonadherent dressing (e. g., medicated petrolatum gauze) to maintain sterility and prevent evaporation [2].

Gastroschisis is a protrusion of the abdominal viscera through a full-thickness abdominal wall defect, usually to the right of the umbilical cord insertion. The estimated incidence is 1 in 2500 live births (more common than omphalocele) [2]. According to other sources the prevalence of this malformation is 1 case per 10.000 births in general, but can be up to 7 or more cases per 10.000 newborns of mothers younger than 20 years [3]. Several communications have reported a significant increase in the prevalence of gastroschisis at birth in the last three decades. It is referred to as "a pandemic strongly associated to low maternal age" in many countries [4]. In gastroschisis, unlike omphalocele, there is no membranous covering over the intestine, which is markedly edematous and erythematous and is often enclosed in a fibrin mat. These findings indicate long-standing inflammation due to the intestine being directly exposed to amniotic fluid. As in omphalocele, gastroschisis can be detected by prenatal ultrasonography, and delivery should take place at a tertiary care center [2]. Some authors even propose to provide planned elective cesarean delivery from 35 to 37 gestational weeks to minimize the risks of mortality [5,6]. Surgery is similar to that for omphalocele. It often takes several weeks before GI function recovers and oral feedings can be given [2].

Because about one third of infants with a GI malformation have another congenital anomalies, they must be evaluated for malformations of other organs and systems, especially of the CNS, heart, and kidneys [2,3].

The purpose was to analyze the methods of hard composite congenital GI malformations operative treatment in infants.

Materials and Methods

There were 13 infants being treated in Anesthesiology and Intensive Care Neonatal Department of Zaporizhzhia City Multidiscipline Pediatric Hospital #5 under our supervision. All newborns had been transported from a maternity hospital on the first day after birth. Three patients had gastroschisis in combination with atresia of the small intestine, one – omphalocele and ileal atresia. 9 patients had esophageal atresia combined with anal atresia – in three cases, in combination with small intestine atresia – in one case, with annular pancreatic and duodenal obstruction – in one case, and with a bilateral megaureter and congenital amputation of both forearms – in 1 case. In another three patients esophageal atresia was combined with congenital heart disease: tetralogy of Fallot – 1 infant, septal defect and pulmonary stenosis – 2 infants.

Results and Discussion

Preoperative preparation of patients with gastroschisis and in case of high intestinal obstruction presence was carried out for 2–3 hours, while in case of the other combined malformations of the digestive tract – for 24–48 hours. It included crystalloid infusion at a rate of 10 to 20 ml/kg/hour, by indications – colloids and fresh frozen plasma, and antibacterial therapy. As criteria of newborns readiness for surgery we considered: absence of clinical signs of dehydration, the oxygen saturation of 94–99 %, a mean blood pressure of 40 mm Hg, central venous pressure of 20 to 60 mm water column, cardiac index of 3,5–4.5 l/min/m^2 and a diuresis over 1 ml/kg/hr.

The operation was done under general anesthesia with tracheal intubation (in the case of esophageal atresia with tracheoesophageal fistula, tracheal intubation was performed immediately after diagnosis) and mechanical lungs ventilation. Besides, neuraxial blockade was provided in 10 patients – spinal and/or sacral epidural anesthesia. The methodology of neuraxial blockade in newborns is rather simple to use, it is safe if preoperative preparation was effective, and it provides significantly better antinociceptive protection in comparison with traditional total intravenous }anesthesia.

All combined GI defects were corrected in one step. In gastroschisis and omphalocele in combination with atresia of the small intestine we made a plastic of anterior abdominal wall, bowel segment resection and anastomosis end-to-end. In esophageal atresia and atresia of the anus direct esophago-esophagoanastomosis was performed with suturing of tracheoesophageal fistula, also in two patients proctoplasty by Pena 2 was carried out, and in one patient with high anal atresia colostomy was applied, which was subsequently closed in the age of 6 months. In esophageal atresia combined with atresia of a small intestine direct esophago-esophagoanastomosis with tracheoesophageal fistula suturing was performed, and resection of the bowel segment with anastomosis end-to-end was applied. In a patient with a combination of esophageal atresia and duodenal obstruction esophagoplasty with closure of tracheoesophageal fistula was made and anastomosis by Kimur was done.

Postoperative treatment included prolonged mechanical ventilation (1 to 5 days), thorough anesthesia, infusion therapy, broad-spectrum antibiotics (with essential usage of the drug with activity against anaerobic bacteria), antifungal drugs from the 3–4th day, parenteral nutrition from the first day after surgery, correction of water and electrolyte imbalance and acid-base status. Enteral nutrition was started at the 2–5th day after surgery. The criteria for enteral nutrition starting were the absence of the stomach contents stagnation and stool appearance.

Postoperative analgesia was conducted by continuous intravenous infusion of fentanyl during 2–5 days, and additionally epidural anesthesia by bupivacaine or ropivacaine through the sacral canal. Epidural blockade not only helps to achieve better analgesia, but also improves abdominal blood circulation and intestinal peristalsis recovery.

In patients with concomitant congenital heart defects surgical correction was performed in 2–3 months after birth at the Kyiv Institute of Cardiology.

Conclusions

1. One-stage correction of the congenital GI malformations in newborns is effective and it gives an opportunity to achieve the best results by a single surgical intervention.

2. It is extremely important to combine GI defects surgical therapy with balanced preoperative preparation in proper time, as well as anesthetic management using advantageous neuraxial blockade and thorough postoperative management of the patient.

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