TOPICAL ISSUE

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SURGICAL TREATMENT OF CHILDREN WITH LIVER TUMORS: COMPARISON OF THE RESULTS OF OPEN AND LAPAROSCOPIC OPERATIONS

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One of the main methods of treating patients with liver neoplasms is surgical. Today in medicine there is an important tendency to reduce trauma. The aim of the study was to select the optimal tactics for the surgical treatment of children with liver tumors. The analysis included the results of treatment of patients with hepatoblastomas who underwent laparoscopic liver resections. The use of laparoscopic technologies made it possible to reduce the operation time, reduce the amount of blood loss and prevent the development of complications both intraoperatively and in the postoperative period, shorten the duration of inpatient treatment, start early patient mobilization, enteral load, chemotherapy, reduce the drug load, and carry out radical surgery.

Keywords: pediatric oncology, surgery, laparoscopy, surgical oncology, hepatoblastoma, case report, liver, laparotomy

Background. Recently, thanks to the development of imaging methods and the improvement of the standards of dispensary observation, the number of patients with neoplasms of various localization and etiology has begun to increase. Liver lesions in the structure of this nosological group occupies one of the leading places, both due to the primary localization of the focus in the organ parenchyma, and due to metastatic lesions. The most optimal treatment for patients with liver tumors is their surgical removal [1].

Today in medicine there is an important tendency to reduce trauma in the treatment of many diseases, and one of the options for solving this issue is the development and implementation of minimally invasive surgical techniques that facilitate the course of the postoperative period and rehabilitation, which is not unimportant in pediatric practice. However, unfortunately, there is no reliable data on the use of laparoscopic technologies in pediatric practice in patients with tumor lesions. This article provides data on the surgical treatment of children with various oncological diseases of the liver.

Based on new data on the structure of the liver, new methods of liver resection have been developed using the principles of preliminary ligation of vascular-isolated elements of certain zones of the liver (lobe, segment), or access to them through low-vascular zones with ligation at the gate or in the planes of division of the liver tissue (fissural method), which made it possible to perform more radical operations on the liver [2, 3].

An important point in resection is the method of tissue dissection in order to isolate tubular structures before the moment of intersection, followed by precision clipping or ligation. In the last decade, ultrasonic and water-jet dissectors-aspirators have been widely used in specialized foreign and domestic clinics. The advantages of using these technologies are a decrease in the time of surgery, a decrease in intraoperative blood loss and a reduction in the time to achieve final hemo- and cholestasis in the remaining liver parenchyma [4, 5, 6]. However, to date, there is no evidence of the superiority of this or that technical means over the method of crushing the parenchyma with a clamp (clamp crushing) [7].

The first report of laparoscopic atypical liver resection for solid lesions appeared in 1991 from Reich et al. [4].

5 years later, in 1996, S. Azagara et al. published a report on the first anatomical liver resection in the volume of left-sided lateral segmentectomy for liver adenoma [5].

Laparoscopic technologies have been actively introduced into practice since the mid-90s of the last century and have not spared hepatobiliary surgery. This was primarily due to the development of efficient high-energy platforms for liver parenchyma dissection (waterjet and ultrasonic dissectors, Liga Sure, Tissue Link, etc.), which in the laparoscopic version allowed performing liver resections relatively safely [7, 8].

The lack of a large number of observations in the pediatric group of patients determines the urgency of this problem.

The authors do not aim to compare the results of open and laparoscopic operations in this article, since the group of patients is not comparable in size, which makes the use of statistical methods incorrect. The article describes the first experience of performing laparoscopic resections in patients with liver tumors. Comparison with the group of patients who underwent surgery using laparotomy is given for clarity.

Aim. Describe the first experience of performing laparoscopic resections in patients with liver tumors

Materials and methods. In the period from 2014 to 2020. 25 liver resections were performed at the Morozov Children's City Clinical Hospital, of which 5 (20%) patients underwent a laparoscopic technique (Table 1). Most (16 people) were boys. The age of the patients ranged from 1 to 17 years. The group of children operated on using the laparoscopic technique is represented by a smaller age group (from 3 to 9 years old).

In most cases (68%) we observed patients with hepatoblastoma. Hepatocellular carcinoma (HCC), embryonic sarcoma of the liver and focal nodular hyperplasia (FNH) were encountered equally (8% each), adenoma and hamartoma were less common (4% each) (Table 2).

The preoperative examination in patients included the following:

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• determination of the level of tumor markers (fcmaf-alpha-fetoprotein, human chorionic gonadotropin);
• ultrasound examination with preliminary assessment of tumor topography and angioarchitectonics;
• computed tomography with intravenous contrast enhancement;
• magnetic resonance imaging with intravenous contrast enhancement.

Results. In 16 (64%) patients, hepatoplastoma was diagnosed, and half of them are in the PRETEXT III stage. Surgical treatment of these patients was performed using a laparotomic approach. Laparoscopic operations were performed in patients with liver adenoma (1) and hamartoma (1). Patients with HCC (2), liver sarcoma (2), FNG (2) underwent open approaches.

When performing laparoscopic surgical interventions, bisegmentectomy was performed in two cases, and segmentectomy in three cases. In the case where laparotomic approach was preferred, hemihepatectomy or extended hemihepatectomy were the options of choice.

During the surgical intervention, preference was given to the use of various modern methods of achieving hemostasis - monopolar coagulation, bipolar coagulation (including measurement of tissue impedance). At the stages of accumulation of experience in this area, water-jet dissection has been repeatedly used, however, today the preference is given to ultrasound dissection.

Evaluating the results of surgical treatment of the liver (Table 3), it is worth noting that the duration of the operation in the group of patients operated on by the laparoscopic approach (30-60 minutes) is significantly shorter than in the laparotomic approach (180-270 minutes).

The volume of intraoperative blood loss in laparotomy was 50 - 70 ml / kg, which is more than 5 times higher than in laparoscopy. During open operations, intraoperative blood transfusion was required in 28% of cases, which was not required for laparoscopic resections. And only in the group of patients operated on using open access, intraoperative complications were noted in 2 (8%) cases: lethal outcome (4%) and damage to the extrahepatic biliary tract (4%).

The course of the postoperative period also differs in children operated openly and laparoscopically (Table 4)

Discussion. Performing CT and MRI allows the most accurate assessment of the boundaries of tumor invasion. These studies complement each other and, if possible, should be performed on each patient. In addition, they can be used to perform non-invasive volumetric measurements in patients with advanced neoplastic process (PRETEXT III) and to predict possible postoperative complications.

Today, the diagnosis can be made without morphological verification based on the level of tumor markers. In two patients, the diagnosis was verified by the clinical picture. In 4 cases, morphological verification of the diagnosis was required (Table 2). For this purpose, two children underwent a tru-cut percutaneous biopsy under ultrasound navigation, and two patients underwent laparoscopic biopsy.

An important advantage of the laparoscopic approach is the reduction in the trauma of the operation and the reduction of the rehabilitation period for patients, the availability and use of special equipment in order to prevent massive intraoperative bleeding, which undoubtedly meets all the requirements of modern surgery.

To date, the place and principles of laparoscopic interventions in the surgery of focal liver lesions are clearly defined:

1.To perform laparoscopic liver resections, specialized equipment is required, including one of the dissector options, as well as a device for final hemostasis;

2. The optimal volume for such oper-

Table 1

General characteristics of patients

Indicators	Total	Types of access	
		Open	Laparoscopic
Number of patients	25 (100%)	20 (80%)	5 (20%)
Female	9 (36%)	7 (28%)	2 (8%)
Male	16 (64%)	13 (52%)	3 (12%)
Age, years	1 – 17	1 – 17	3 – 9

Table 2

Morphology of tumors

Indicators	Total (%)	Types of access	
		Open (%)	Laparoscopic (%)
Total	25 (100)	20 (80)	5 (20)
Hepatoblastoma:	17 (68)	14 (56)	3 (12)
PRETEXT I	4 (16)	2 (8)	2 (8)
PRETEXT II	5 (20)	4 (16)	1 (4)
PRETEXT III	8 (32)	8 (32)	0 (0)
Adenoma	1 (4)	0 (0)	1 (4)
Hamartoma	1 (4)	0 (0)	1 (4)
Hepatocellular carcinoma	2 (8)	2 (8)	0 (0)
Liver sarcoma	2 (8)	2 (8)	0 (0)
Focal nodular hyperplasia	2 (8)	2 (8)	0 (0)

Table 3

Results of surgical treatment

Criterion	Total	Types of access	
		Open	Laparoscopic
Total	25 (100)	20 (80)	5 (20)
Duration of surgery, min		180 – 270	30 – 90
Blood loss, ml / kg		50 – 70	не более 10
Intraoperative blood transfusion	7 (28)	7 (28)	0 (0)
Intraoperative complications	2 (8)	2 (8)	0 (0)
Mortality	1 (4)	1 (4)	0 (0)
Damage to the extrahepatic biliary tract	1 (4)	1 (4)	0 (0)

ations is atypical resections of the "anterior" or "laparoscopic" liver segments (III-VI segments), as well as bisegmentectomy for relatively small focal liver lesions;

3. resection of "complex" segments (VII-VIII) is possible, however, this requires special equipment that can change the angle of bending of the working area of the instrument; here, there is also the use of "hybrid" resections.

Many authors recommend performing laparoscopic atypical resections for neoplasms less than 5 cm in diameter, hoping that operations for large tumors can be accompanied by significant technical difficulties and the risk of trauma to large vessels increases. However, at present, with the accumulation of experience in such interventions, many surgeons successfully perform anatomical resections with the removal of a significant part of the liver [9, 10].

Today, there are several ways to classify this type of surgery depending on the resection method, volume, access and degree.

Analysis of the available literature shows that wedge-shaped (segmentectomy) (45%) laparoscopic liver resection is performed more often than others. Next in frequency are followed by anatomical left lateral section (20%), right-sided hemihepatectomy (9%), left-sided hemihepatectomy (7%), 19 extended right-sided hemihepatectomies (0.7%), 3 extended left-sided hemihepatectomies (0.1%), 18 caudate lobectomies (0.6%), 8 central resections (0.3%). This statistics has been accumulated by foreign colleagues involved in the treatment of the adult population [11, 12, 13].

Contraindications to the use of the laparoscopic method are:

• heart defects associated with the risk of decompensation during surgical treatment under conditions of pneumoperitoneum;

• the presence of coagulopathies complicated by thrombosis of the visceral vessels of the abdominal organs;

• the presence of subcompensated respiratory failure;

• overweight;

• widespread adhesions in the abdominal cavity.

According to the literature, as a result of the performed liver resection by the laparoscopic method, the incidence of complications varied from 0% to 50%. Of 2804 patients, 295 (10.5%) complications were registered [14].

Of the complications presented, bile leakage, the possibility of massive intraoperative bleeding, and the risk of gas embolism are more common. In addition, it is worth noting the technical difficulty of performing various surgical maneuvers laparoscopically. Let's dwell on some of the complications in more detail.

Surgical blood loss, complications in the postoperative period, and length of hospital stay were significantly less in the laparoscopic group, even if the patients were comparable in the degree of resection and the presence of malignant neoplasms.

After open surgery, postoperative complications were observed in 17 (51.5%) cases and acquired more severe forms that required longer treatment, while after using the laparoscopic approach, a complicated course was observed in 13 (35.1%) patients [15].

The length of stay in the ICU is reduced from 3 - 5 days with open to 1 - 3 days with laparoscopic operations. Enteral loading, verticalization of the patient during laparoscopic operations are possible in the early stages (from 1 p / o day). In the postoperative period, chemotherapy was started at 8 p / o days for minimally invasive operations and at 12 for laparotomic approaches, which reduces the number of bed days before chemotherapy starts after surgery.

The treatment of children in the postoperative period was carried out using combined anesthesia in combination with prolonged epidural anesthesia. With laparoscopic liver resection, the duration of analgesia (1 - 3 days) and antibiotic therapy (7 - 10 days), which is almost half as long as with laparotomy (3 - 5 and 12 - 14 days, respectively). Drainage of the abdominal cavity and fermentemia continued for a maximum of 4 postoperative days. In the p / o period, complications occurred in 16% of cases: 3 (12%) patients with biloma and 1 (4%) with bleeding. In the group of patients operated on by the laparoscopic approach, radical surgical treatment (R0) was performed in 5 (20%) cases; in 1 (4%) child, the resection volume was R1. In children who underwent open liver resection, radical surgical treatment was performed in 9 cases (36%), and the R1 volume was

Table 4

The course of the postoperative period

Criterion	Total	Types of access	
		Open	Laparoscopic
Length of stay in the intensive care unit, days	1 – 3	3 – 5	1 – 3
Timing of patient activation (beginning of enteral load, verticalization)		с 3 п/о сут	с 1 п/о сут
Length of hospital stay, days	5 – 14	12 – 14	5 – 8
Number of bed-days before starting chemotherapy after surgery, days	8 – 12	12	8
Duration of drainage of the abdominal cavity, days	до 3 – 4	до 3 – 4	до 3 – 4
Duration of antibiotic therapy, days	7 – 14	12 – 14	7 – 10
Duration of analgesia, days	1 – 5	3 – 5	1 – 3
Duration of fermentemia, days	до 4	до 4	до 4
Complications in the postoperative period:	4 (16)	4 (16)	0 (0)
bile leak	3 (12)	3 (12)	0 (0)
bleeding	1 (4)	1 (4)	0 (0)
Radicality:	–	–	–
-R0	14 (56)	9 (36)	5 (20)
-R1	12 (48)	11 (44)	1 (4)
Total	25 (100)	20 (80)	5 (20)

performed in 11 patients (44%). Patients were discharged from the hospital twice as fast with endoscopic liver resections (5-8 days).

Potential disadvantages and limitations in the use of endoscopic technologies for liver resection are significant laboriousness and labor input, high cost of education and training of a specialist, difficulty in controlling bleeding in comparison with open surgery, and an increased risk of gas embolism. Large tumor volumes and tumors with extensive vascular invasion can also impede laparoscopic access [16].

No deaths were observed in any of the clinical cases after laparoscopic surgery, no repeated surgery or blood transfusions were required. In the structure of postoperative complications, the main share was made up of fluid accumulations in the area of surgical intervention, which developed in 8 (47.1%) patients. Five patients were cured using conservative therapy, three received aspiration treatment. In 6 (35.3%) patients, hydrothorax developed in the postoperative period. This complication was arrested by a single pleural puncture. Lower lobe pneumonia on the side of the intervention developed in 1 (5.9%) patient, suppuration of postoperative wounds in 1 (5.9%) [17].

The main part of the complications after using the laparotomic approach during surgical interventions - in 13 (31.7%) patients, also consisted of fluid accumulations in the area of surgical intervention. In this case, seven patients required 3-4 punctures. Hydrothorax was detected in 12 (29.3%) cases, of which pleural puncture was performed in 4 cases. Seven (17.1%) patients had local complications in the form of seroma and suppuration of postoperative wounds. In 2 (4.9%) patients, pneumonia developed in the postoperative period, which resolved after prolonged conservative therapy. Intra-abdominal bleeding was noted among severe complications in 3 (7.3%) people in the early postoperative period [18].

Bile leakage in the postoperative period occurred in 1.5% of the total number of cases. This group of patients was usually treated conservatively with percutaneous drains and / or endobiliary stents. The incidence of this complication in laparoscopic cases does not differ from most open series of liver resections [18].

The duration of inpatient treatment ranged from 1.2 to 15.3 days and varied both from access (by the laparotomic method for about 5 days, laparoscopic - about a day in the p / o period) and from the patient's place of residence (in the USA (1.9– 2.9 days), in Europe (3.5–8.3 days), in Asia (4.0–14.9 days)). The average hospitalization time was 4 days, which is on average 2 days less than in the case of open surgery. It should be noted that there is no data on the relationship between the volume of resection and the duration of hospitalization in the world literature [17, 18].

According to the literature we analyzed, the average time of surgery was 360 minutes. In the postoperative period, observation in the intensive care unit was required in 12% of cases, and one patient died from concomitant pathology. The initiation of oral analgesic therapy and physical activity is earlier when using a minimally invasive technique [17, 18].

In the pediatric group of patients, indications for liver resection are the presence of liver neoplasms, metastatic lesions, liver trauma, cystic lesions.

Among the children's contingent, the following cases of complications are described: seroma formation (2.8%), hypertrophic scar formation (2.8%). Infectious complications occurred in 5.6% [17, 18].

The development of technologies and the improvement of techniques have made it possible to apply robotic-assisted technologies in pediatric surgery. According to Reich H., blood loss, complications and mortality in the postoperative period after the operation using robotic-assisted technologies do not differ from the laparoscopic method. The disadvantages of using robotic-assisted technologies are the long duration of the operation and the high cost of equipment [15].

Conclusion. Preference for liver resection in patients with benign formations and hepatoblastoma PRETEXT I-II should be given to the laparoscopic method. When performing liver resection with this method, special attention should be paid to the following aspects:

• use of 10 mm optics for adequate visualization;

• preliminary volumetric marking of the resection boundaries;

• predominant use of monopolar dissection in coagulation mode for parenchymal dissection;

• safe ligation of vascular structures using impedance methods of bipolar coagulation;

• constant smoke evacuation with an aspirator or through a slightly opened trocar valve;

• the use of various methods of intraoperative hemostasis, taking into account the nature and intensity of bleeding;

• extraction of the resectate in the endomesch without fragmentation through the minilaparotomic approach.

Children with hepatoblastoma PRETEXT III can potentially be operated on using minimally invasive technologies, however, further accumulation of experience in this area and a comparative analysis of treatment results are needed.

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COMPARATIVE ANALYSIS OF THE DURATION OF SPORADIC FORMS OF MOTOR NEURON DISEASE IN THE REPUBLIC OF SAKHA (YAKUTIA)

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The article describes a study of the duration of the disease in patients with different forms of motor neuron disease (MND) in the Republic of Sakha (Yakutia). Motor neuron disease is a group of neurodegenerative diseases of unknown etiology and pathogenesis, accompanied by the death of central and / or peripheral motor neurons, steady progression and inevitable death. The results obtained correlate with the data of researchers in the world and depend on the combined or isolated damage to the motor neuron (p = 0.00001).

Aim: to study the duration of the cases of illness in different forms of motor neuron disease in the RS (Y), depending on ethnicity, age and gender.

Keywords: motor neuron diseases, amyotrophic lateral sclerosis, progressive muscle atrophy, primary lateral sclerosis.

Introduction. Motor neuron disease (MND) is a group of neurodegenerative diseases of unclear etiology, characterized by selective damage to central and / or peripheral motor neurons with an invariable lethal outcome.

MND classification

Currently, there is no uniform accepted international classification of MND

In the most common North American [16] and British [27] classifications of MND, in addition to the division into sporadic and familial forms of MND, its varieties are indicated, depending on the isolated peripheral lesion (progressive bulbar palsy, progressive muscle atrophy) of the central (primary lateral sclerosis) or mixed motor neuron lesion (amyotrophic lateral sclerosis). In the Russian modified classification of ALS (MND) by G. Levitsky and V. Skvortsova (2006), progressive bulbar palsy, progressive muscle atrophy, primary lateral sclerosis are also separated from ALS, in which there is a combined lesion of the motor neuron [2]. In the classification of O.A. Hondkarian ALS is not differentiated from the degree of motor neuron involvement, but its forms have been described, depending on the onset of the disease [4]. Many researchers adhere to the principle of separation in which MND is divided into a disease with a "pure" lesion of the lower motor neuron - progressive muscle atrophy (PMA), with a "pure" lesion of the upper motor neuron - primary lateral sclerosis (PLS) and a combined lesion of the lower and upper motor neurons, amyotrophic lateral sclerosis (ALS) [6, 7, 19, 20, 21, 24, 25]. Some authors consider PMA and PLS to be atypical forms of ALS or its variants of the course, believing that a single molecular mechanism may be compatible with clinical heterogeneity. [6, 10, 24].

Epidemiology of ALS.

Since ALS is the most common motor neuron disease in comparison with PMA and PLS, we present data on its prevalence. PMA and PLS are rare forms of MND and we have not found data on their prevalence in the available literature. According to researchers and co-authors from the Institute of Neuroepidemiology and Tropical Neurology (France), who published in 2017 a comparative meta-analysis on the prevalence of MND in the world, the total cumulative incidence of ALS in the world was 1.68 (1.50-1.85) per 100,000 population after standardization. Heterogeneity was found in the standardized incidence of ALS between Northern Europe 1.89 (1.46–2.32) per 100,000 population and East Asia (China, Japan) 0.83 (0.42–1.24) per 100,000 population (p = 0.00) and South Asia (Iran) 0.73 (0.58-0.89) / 100,000 population (p = 0.02). In contrast, homogeneous rates were reported in populations from Europe, North America and New Zealand: pooled standardized ALS incidence 1.81 (1.66–1.97) / 100,000 population for these regions [18]. In Yakutia, the incidence as of 2018. was 0.5 cases per 100,000 population. Taking into account the severity of the patient's condition and the absence of biomarkers for early detection of MND, specific treatment, a group of these diseases is a medical and social problem for public health authorities and social protection of the population and requires the organization of a multidisciplinary approach in the management of such patients.

Materials and methods. Materials: We retrospectively analyzed the hospital register of patients with MND, as well

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