

## **Optimization of surgical treatment of spleen injury in the light of long-term consequences and immunological disorders in children**

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### **Abstract**

Among the closed injuries of the abdominal cavity in children, the most common injury is the spleen, it accounts for about 50% of all parenchymal injuries. Until recently, splenectomy for spleen injury was considered the main operation [1], but most researchers adhere to the tactics of preserving the organ in childhood due to a decrease in resistance to infections [2,3,4]. In our case, we analyzed changes in the immune status in 29 children who underwent splenectomy and splenectomy with autotransplantation. The studies were carried out in the early and late postoperative period.

**Keywords:** splenectomy; damage to the spleen; autotransplantation; post-splenectomy hyposplenism; children.

### **Relevance of the work**

Splenectomy is an immunocompromising operation, since an immunocompetent cell suffers at this time, which indicates the need for organ-preserving surgery in case of damage to the spleen in children. More and more researchers are in favor of organ-preserving tactics, especially in childhood [2,3], which is due to the appearance of a large number of publications on a decrease in the body's resistance to infections and their malignant course in children who have

undergone extirpation of the spleen. Recently, information has appeared in publications about the replacement of the removed spleen with autografts of its tissue into the omental bursa, the mesentery of the intestine, into the muscles of the anterior abdominal wall and retroperitoneal space [2,4]. A systematic analysis of domestic literature over the past 10 years has shown that little attention is paid to the importance of immunological disorders in the follow-up after splenectomy in traumatic injuries of the spleen in children [5].

**The purpose of our research** - to optimize the method of surgical treatment of patients with traumatic injuries of the spleen, taking into account the long-term consequences and changes in the immunological status.

### **Research results**

The study is of a clinical nature and was based on the study of long-term results of splenectomy for traumatic injuries and the effect of autotransplantation of spleen tissue on changes in the immune status in children. This work is based on the observation of 29 children aged 9 to 14 years with a diagnosis of "closed spleen injury". There were 18 boys and 11 girls. Splenectomy was performed in 27 patients, including autotransplantation in 7, in two cases superficial spleen ruptures were sutured. Autotransplantation of spleen tissue was performed as follows: a decapsulated fragment of the spleen of a cubic shape with a side of 8 mm, treated with warm saline, was implanted into the greater omentum 2 cm in the transverse colon closer to the left corner. The patients were divided into three groups. The main group consisted of 7 who underwent splenectomy - autotransplantation of spleen tissue into the greater omentum. The comparison group consisted of 7 patients of the same age and sex who were admitted to the hospital on a planned basis for surgical treatment for inguinal hernias and 20 patients who underwent splenectomy.

The vast majority of patients (60%) were admitted within the first 2 hours after injury. In addition to generally accepted laboratory studies, the following methods were used to assess the immune reactivity: the micromethod of the reaction of blast transformation of lymphocytes (RBTL) with phytohemagglutinin (PHA), the level of immunoglobulins A, M and G in blood serum according to Manchini, the phagocytic activity of leukocytes with counting the phagocytic number (PN), phagocytic index (PI) and index of completed phagocytosis (ICP). Statistical processing of the data obtained was carried out according to the standard method. The study was conducted with the consent of patients to conduct it.

Upon admission to the clinic, damage to the spleen was recognized in 70% of patients within 5 hours, and in 30% - at a later date. 4 children were operated on with an unspecified diagnosis (intra-abdominal bleeding). On palpation of the abdomen, there was local pain in the left hypochondrium in 20, diffused in 9 patients. Tension of the muscles of the anterior abdominal wall was observed only in 5 children, bloating was observed in 60% of patients. The

Shchetkin-Blumberg symptom was positive in 30% of patients, the Kulenkampf symptom in 60%, and the "vanka-vstanka" symptom in 10% of patients.

In the dynamics of observation, the victims revealed an increase in heart rate and a decrease in blood pressure in 95% of patients, a sharp decrease in the level of hemoglobin and erythrocytes immediately in the first 2-3 hours upon admission in 45% of patients. The most informative, accessible and simple method for diagnosing laparocentesis was a closed abdominal trauma in 15 patients. The anti-shock measure began immediately after the patient was admitted to the clinic and was carried out in parallel with the surgical intervention, since the operation aimed at stopping bleeding was the most important element of anti-shock therapy.

In our materials, the main operative access was the upper median laparotomy access (25 patients), in 4 cases it was supplemented with an incision to the left. Extensive multiple ruptures of the spleen were noted in 15, deep single rupture of the spleen in the vascular pedicle in 6, crush injuries in 4 patients. All patients underwent splenectomy. Long-term results were studied in 19 children.

Among the patients of the comparison group, only two did not present any complaints in the long term after the operation. The remaining 16 children noted various complaints, which undoubtedly can be attributed to the manifestations of postsplenectomy hyposplenism, a symptom complex described by M.M. Rozhinsky.

16 examined children complained of recurrent abdominal pain. Apparently, the occurrence of abdominal pain is associated with compensatory hypertrophy of the lymphoid tissue and an increase in lymph nodes of all groups, including the mesentery of the intestine, in response to removal of the spleen.

In 6 patients, recurrent headaches were noted, which appeared in the middle of the day and intensified in the evening. They reported physical mental fatigue and declines in school performance.

Two fell ill with an acute form of pneumonia, and they are on the dispensary for chronic bronchitis. 1 patient suffered from recurrent otitis media. Within a year after splenectomy, 3 children underwent viral hepatitis, one had an autopsy of lymphadenitis of various localization. One child suffered from furunculosis. In the examined group, chronic tonsillitis was registered in 2 patients. We did not observe severe septic complications.

The obtained results of assessing infectious morbidity in children who underwent splenectomy in childhood were confirmed by the data of immunological examination. (tab. 1).

Table 1.

Indicators	Healthy children n=7	After splenectomy n=20	Spleen tissue autotransplantation after splenectomy n=7
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Ig A	1.25 ± 0.08	1.18 ± 0.11	1.23 ± 0.12
Ig M	1.08 ± 0.03	↓0.45 ± 0.02	1.00 ± 0.09
Ig G	12.1 ± 0.6	↓6.7 ± 0.37	11.09 ± 0.55
Tl	1.02 ± 0.06	1.23 ± 0.13↑	1.24 ± 0.15↑
Th	1.43 ± 0.09	1.35 ± 0.21	1.44 ± 0.17
Ts	1.67 ± 0.12	↓1.43 ± 0.15	1.65 ± 0.07
VI	2.32 ± 0.2	↓2.01 ± 0.21	2.34 ± 0.25
RBTL	4.66 ± 0.11	↓1.63 ± 0.27	4.68 ± 0.11
PN	6.75 ± 0.56	↓5.65 ± 0.12	6.80 ± 0.48
PAL	6.97 ± 0.43	↓5.01 ± 0.15	6.97 ± 0.33
PI	72.44 ± 0.4	↓47.4 ± 0.71	71.5 ± 0.71

The latter revealed a significant decrease in the concentration of serum immunoglobulins of classes A, M, G - unreliable, M, G - a decrease in both the absolute number of T- and B-lymphocytes. The indices of the reaction of blast transformation of lymphocytes (RBTL), phagocytic activity of leukocytes (PAL), phagocytic number (PN), phagocytic index (PI) are significantly reduced in comparison with healthy children.

In the experimental group, where, according to this technique, splenic tissue autotransplantation was performed in 7 cases with forced splenectomy due to organ trauma. The postoperative period was uneventful. None of them had post-splenectomy hyposplenism syndrome. In the erythrocytes of peripheral blood, Jolly's bodies were not detected, there was a normal number of platelets, which is the most important parameter of the functional state of the reimplanted spleen. Our clinical observations confirm a decrease in infectious complications. So, out of 7 victims with spleen trauma, who underwent splenectomy with splenic tissue autotransplantation, infectious morbidity took place only in one case, during the follow-up period of 3-5 years.

Summarizing the results of the study, it is possible to trace the correlation between complications in the postoperative period and the dynamics of the immune response in the main group of patients, which makes it possible to assess positively the autotransplantation of the spleen into the omentum in traumatic injuries. Thus, the greatest suppression of the immune defense was observed in patients with splenectomy, which requires restorative therapy.

Ultrasound after autotransplantation of spleen tissue in 2 patients showed an increase in the autograft in the amount of 3x4 cm in the period after surgery 2 years later; in one patient, during

relaparotomy for late adhesive intestinal obstruction, a transplanted spleen in the size of 3x3.5 cm was revealed in the omental bursa.

Based on the analysis of the data after the splenectomy operation, it can be said that the infectious morbidity is higher than in healthy children. The method of autotransplantation of spleen tissue into the greater omentum is technically simple and applicable in an urgent surgical department.

### **Result and discussion**

In the research group, in 7 patients who underwent autotransplantation of spleen tissue, the postoperative period passed without complications.

\*The syndrome of postsplenectomy hyposplenism was not registered in any child.

\*In splenectomy performed in connection with trauma of the spleen after autotransplantation of spleen tissue, an infectious disease was noted only in one case, this examination takes a period of 3-5 years.

\*Based on the analysis of the data after the splenectomy operation, it can be said that the incidence of infectious diseases in patients of this group is higher than in healthy children. Autotransplantation of spleen tissue into the greater omentum after splenectomy for its injury has shown high efficiency in the prevention of post-splenectomy hyposplenism and disorders of immunological reactivity.

### **Conclusion**

1. The incidence of post-splenectomy hyposplenism syndrome after splenectomy due to spleen injury is 51.0%.

2. Carrying out a duplicate with autotransplantation of spleen tissue into the greater omentum after splenectomy gives good results in the postoperative period in the prevention of infectious diseases, post-splenectomy hyposplenism and helps to restore laboratory parameters and immunoglobulins in the peripheral blood.

3. All children who have undergone splenectomy for damage to the spleen need constant monitoring by an immunologist, regular debridement of chronic foci of infections and immunocorrection. Also, they must be constantly monitored by a pediatrician to prevent infectious complications.

### **References**

1. Averin V.I., Katko V.A. Autotransplantation of spleen tissue in traumatic injuries in children // Healthcare of Belarus – 1998. – P 49-51
2. Afendulov S.A. Lando M.N. Borisov A.I. METHOD FOR AUTO TRANSPLANTATION OF SPLEEN TISSUE// 10.02.2001.

3. Bastrygin A.V. Traumatic injuries of the abdominal organs in children // Far-Eastern medical journal– 1998 - №3 (add) – P 76.
4. V. V. Maslyakov, V. F. Kirichuk, V. G. Barsukov, A. Yu. Chumanov Effect of preserving fragments of spleen tissue during splenectomy on changes in the immune status in children with spleen injury // PEDIATRIC SURGERY - №3 – 2012 - P 15-20.
5. Karaulov A.V. (ed) Clinical immunology and allergology // M.2002, 651 P.
6. Komissarov I.A., Filippov D.V., Yalimov A.N. and others. // Child. surg. – 2009. – № 6. – P. 7–13.
7. Matveev O. L., Babich I. I., Chepurnoy G. I. // Child. surg – 2007. – № 6. – P. 27–29.
8. Podkamenev V.V., Ivanov V.O., Yurkov P.S. and others. // Child. surg – 2009. – № 4. – P. 10–12. 5.
9. Useinov E.B., Isaev A.F., Kiselevsky M.V. et al. // Surgery. – 2006. – № 2. – P. 69–73. 6.
10. Shapkin V. V. Shapkina A. N., // Treatment of children with closed spleen injury: 18 years of experience. Child. surg – 2009. – № 6. – P. 4–6
11. Apartsin K.A. Surgical prophylaxis and pathogenetic substantiated methods of correction of post-splenectomy hyposplenism. // Bulletin SB RAMS2001; 2: 63-66.
12. Akilov Kh.A, F.Sh. Prim. The expediency of performing heterotopic autotransplantation of spleen tissue after splenectomy. // Emergency Medicine Bulletin, 2015, №4.
13. Chambon JP, Vallet B, Caiazzo R, Zerbib P. Management of splenectomized patients Presse Med. 2003 Sep 6; 32(28 Suppl): P 20-3
14. Gorg C, Colle J, Gorg K, Prinz H, Zugmaier G Spontaneous rupture of the spleen: ultrasound patterns, diagnosis and follow-up. Br J Radiol. 2003 Oct; 76(910): 704-11