

# Minimal invasive method of treating an acute spermatic cord cyst in children

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## Abstract

We examined 355 patients with acute spermatic cord cyst aged from 18 days to 1 year. All patients were divided into two groups according to the type of surgical treatment performed. The control group consisted of 160 children who were treated at the clinic from 1994 to 2007 and received traditional treatment. The main group consisted of 195 boys with Acute Spermatic Cord Cyst (ASCC), whose treatment was carried out according to the tactics developed in the clinic and a sparing method of treatment. When analyzing the long-term results, it was revealed that in comparison with traditional methods of treating ASCC in children, the gentle method showed advantages in the form of less invasiveness, fewer complications, and faster recovery of patients.

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**Keywords:** Acute spermatic cord cyst; Puncture-sparing method of treatment; Children.

**Abbreviations:** ASCC: Acute Spermatic Cord Cyst; CG: Control Group; MG: Main Group.

## Introduction

In relation to therapeutic tactics for Acute Spermatic Cord Cyst (ASCC) there is no consensus among pediatric surgeons among children. There are adherents of radical tactics of treatment of this pathology, at the same time there are many specialists who prefer the puncture method of treatment. Adherents of radical correction explain their choice by the fact that the operation allows you to get rid of the disease once and for all. However, at the same time there are no exact recommendations on how to deal with patients who have contraindications to the anesthetic manual [1,3,8].

Proponents of the puncture method of treatment of ASCC explain their choice by the fact that surgical intervention is advisable only if the results of the puncture method are unsatisfactory. The choice of this tactic is justified by the properties of the vaginal process of the peritoneum in young children to

obliteration. At the same time, the possibility of repeated punctures is allowed. At the same time, being a minimally invasive puncture method of treatment of ASCC SC is considered as the most attractive. With the right tactical approach, the availability of hardware visual monitoring in real time and the safest possible methods of ASCC puncture, this method, with a number of advantages, can be a full-fledged alternative to the surgical method [2,4,5,9,10].

It is important to note that surgical interventions can be accompanied by various complications that can affect the function and health of organs. Scar-adhesive processes, blood flow and patency of the vas deferens are just a few of the many factors that may be associated with surgical interventions on the testicles [1,6].

In pediatric urology and andrology, the preservation of the health and quality of life of patients, especially children, has a

high priority. At the same time, reducing the traumatic nature of procedures and operations plays an important role. The use of endovideosurgery makes it possible to achieve more accurate and less invasive intervention, which is especially important for operations on the organs of the genitourinary system of children.

The choice of approach should be based not only on the immediate results of treatment and the number of possible complications, but also on the frequency of relapses in the long term. Factors influencing the decision to conduct an open or minimally invasive intervention, a previous unsuccessful operation and the presence of functional disorders. The long-term results and the frequency of relapses of minimally invasive techniques are still poorly described in the literature [7,9,10].

The aim of the study: to improve the results of surgical treatment of acute spermatic cord cyst in infants.

### Materials and methods

This study was based on the results of treatment of 355 children with ASCC (acute spermatic cord cyst) aged 18 days to 1 year. All patients were treated at the Specialized Pediatric Surgical Clinic of SamSMU for a 28-year period from 1994 to 2021.

Depending on the tactics and method of treatment, all 355 patients with ASCC were divided into 2 groups. The Control Group (CG) consisted of 160 (45.1%) children who were treated at the clinic from 1994 to 2007 and received traditional treatment. The main group (MG) consisted of 195 (54.9%) boys with ASCC, whose treatment was carried out according to the tactics and method of treatment developed in the clinic. Patients from MG were treated at the clinic from 2008 to 2021.

(Table 1) shows the distribution of patients into groups depending on the place of residence.

**Table 1:** Distribution of patients by place of residence in groups.

Groups	Place of residence		in total
	City	Village	
CG	70(43,7%)	90(56,3%)	160(100%)
MG	60(30,8%)	135(69,2%)	195(100%)
in total	130(36,6%)	225(63,4%)	355(100%)

The data shown in (Table 1) show that rural residents predominated among patients by almost 2 times - 225(63.4%).

The distribution of children in the age groups was equivalent (Table 2).

As can be seen from (Table 2), pathology was more often observed in boys up to 3 months of age - 276 (77,7%), (127(79,3%) and 149(76.5%) in CG and MG, respectively). Almost half of the 173 patients (48.7%) were at 2 months of age. Older than 3 months, ASCC was recorded in 79(22.2%) children.

When studying the prescription of the disease, the following data were obtained, the majority of patients – 235(66.2%) were admitted to the clinic in the first 24 hours from the onset of the disease (Table 3).

As (Table 3) shows, the presence of anxiety in children in connection with acute spermatic cord cyst, as a rule, manifested by crying and sleep disturbance caused parents to be wary.

**Table 2:** Distribution of patients by age and group.

Age	Groups		in total
	CG	MG	
1 month	3(1,9%)	6(3,1%)	9(2,5%)
2 month	73(45,6%)	100(51,3%)	173(48,7%)
2 month 29 days	51(31,8%)	43(22,1%)	94(26,5%)
3-4 month	18(11,3%)	17(8,7%)	35(9,8%)
5-12 month	15(9,4%)	29(14,8%)	44(12,4%)
Total	160(100%)	195(100%)	355(100%)

**Table 3:** Distribution of children in groups by prescription of the disease.

Prescription of the disease (day)	Groups		in total (n=355)
	CG (n=160)	MG (n=195)	
Up to 1	103(64,4%)	132(67,6%)	235(66,2%)
From 1 to 3	45(28,1%)	43(22%)	88(24,8%)
From 4 to 5	12(7,5%)	20(10,4%)	32(9%)

I would like to note that 120(33.8%) children went to the clinic more than a day after the onset of the disease. In these cases, the later treatment was associated with less pronounced anxiety and some carelessness of the parents.

The examination complex included anamnesis collection, examination, palpation, clinical and laboratory examination, histomorphological analysis and ultrasound with Dopplerography (ultrasound).

Methods used for the treatment of ASCC: A method of surgical treatment of ASCC in newborns is known, which we have accepted as a prototype (G.A.Bairov, Y.L.Doroshevsky, T.K.Nemilova "Atlas of operations in newborns", Leningrad, "Medicine", 1984. p. 186). At the same time, under general mask anesthesia, after treatment of the surgical field with iodine and alcohol, a skin incision is made over the cyst of the spermatic cord in the inguinal region. Next, the cyst is hatched from the surrounding tissues, the spermatic cord and its elements, the base of the cyst is tied with a catgut thread, the cyst is removed. After hemostasis, the wound is sewn up in layers, tightly.

The method developed and implemented in the clinic is as follows: A newborn, after double treatment of the surgical field with iodine and alcohol, is punctured in the inguinal area with an injection needle over the cyst of a replaceable rope perpendicular to the surface. Next, the needle is carried out longitudinally in the subcutaneous tissue by 0.5 cm, injected into the lumen of the cyst of the spermatic cord in a perpendicular direction (puncture of the cyst). The Z-shaped needle stroke prevents infection of the cyst cavity in the postoperative period. With the help of a syringe, the cyst contents are aspirated - a transparent, amber-colored liquid. After complete emptying of the cyst, the needle is removed, and a pressing aseptic bandage is applied at the puncture site.

### Results and discussion

Until 2007, there was no clearly defined treatment tactics in our clinic, with ASCC. The therapeutic tactic was that we tried to adhere to a gentle method of treatment - puncture of the

cyst and evacuation of its contents. The puncture was also performed in cases where there were contraindications to the anesthetic aid due to concomitant colds. With tense cysts, with their large sizes, as well as with the ineffectiveness of punctures, radical surgery was performed.

As mentioned earlier, in the period from 1994 to 2007, we did not adhere to certain tactics in the treatment of patients with ASCC (CG).

**Table 4:** Methods of treatment of ASCC in CG.

Group	Method of treatment			Total
	puncture	puncture +operation	operation	
CG (n=160)	107(66,9%)	17(10,6%)	36(22,5%)	160(100%)

(Table 4) shows that out of 160 CG children, 107(66.9%) were treated with a puncture method, 17(10.6%) due to the lack of effect from punctures, surgical excision of the cyst was performed as planned. A total of 124(77.5%) children were punctured. The reason for the use of puncture treatment was the presence of medical contraindications to the anesthetic aid in patients. Parents of 93(58.1%) children refused surgical treatment.

(Table 4) shows that 36(22.5%) patients were operated on shortly after admission, they did not use the puncture method of treatment of ASCC. Of these, 22(13.8%) children were operated on urgently. The indication for emergency intervention was the diagnosis – “strangulated hernia”. 19(11.9%) patients were admitted to the clinic from family polyclinics with a diagnosis of a strangulated hernia, and 3(1.9%) patients received this diagnosis in the clinic (it was not possible to exclude a strangulated hernia). In these patients, the diagnosis of ASCC was established intraoperatively.

ASCC puncture in CG was carried out using a disposable syringe with a needle, in compliance with all the requirements of asepsis and antiseptics, under local anesthesia. The usefulness of cyst emptying was controlled by palpation, i.e. subjectively. The anxiety and mobility of the child during the puncture created difficulties when fixing the needle in a stationary state. Given the presence of sharpened edges of a disposable metal needle, any accidental movement of the latter, especially at the end of the manipulation, when the cyst subsides, can lead to damage to blood vessels or soft tissues.

Complications were observed in 91(73.4%) out of 124 children with puncturing of ASCC. Damage to small vessels was in 13(10.5%), small hematomas were noted in 19(15.3%) children. Relapse of the disease after puncture in KG was noted in 59(47.6%) children, in these cases we performed repeated punctures, the second and third time (Table 5).

The data given in (Table 6) indicate that 72(58.1%) patients were cured after a single puncture emptying of the ASCC. In some cases, double and triple punctures were performed to achieve a positive effect from treatment (32(25.8%) and 3(2.4%), respectively). In 17(13.7%) cases, the puncture method was ineffective. Even after a double 7(5.7%) and triple 4(3.2%) puncture, a relapse of the disease was noted, which was the reason for performing surgical excision of the cyst.

Analysis of the results of treatment of ASCC in a patient of CG allowed to reveal the dependence of the puncture efficiency on the patient's age.

**Table 5:** Multiplicity and number of punctures performed to patients KG.

Quantity	Multiplicity/number of punctures			Total
	1 time	2 time	3 time	
Patients from them were cured:	78 (62,9%)	39 (31,5)	7 (5,6%)	124(100%)
-punctured	72(58,1%)	32(25,8%)	3(2,4%)	107(86,3%)
-operated	6(4,8%)	7(5,7%)	4(3,2%)	17(13,7%)
Punctures of them:	78(44,1%)	78(44,1%)	21(11,8%)	177(100%)
-effective	72(40,7%)	64(36,2%)	9(5,1%)	145(82,0%)
-ineffective	6(3,4%)	14 (7,9%)	12(6,7%)	32 (18,0%)

**Table 6:** Distribution of patients depending on the method of treatment and age.

Age	Method of treatment			Total patients
	puncture	puncture +operation	operation	
1 month	3(100%)	-	-	3(100%)
2 month	65(89%)	4(5,5%)	4(5,5%)	73(100%)
2 month 29 day	39(76,5%)	3(5,9%)	9(17,6%)	51(100%)
3-4 month	-	8(44,4%)	10(55,6%)	18(100%)
5-12 month	-	2(13,3%)	13(86,7%)	15(100%)
Total cases	107(66,9%)	17(10,6%)	36(22,5%)	160(100%)

(Table 6) shows that there was no therapeutic effect from punctures in children aged 3 months and older. Whereas the puncture method of treatment was effective in children under the age of 3 months (2 months 29 days). Of 114 children aged 2 months and 29 days who used the puncture method of treatment, only 7(6.1%) patients had punctures that were ineffective. These patients underwent surgical excision of the cyst.

The results of the studies given above allowed us to determine that puncture treatment of ASCC is highly effective in children under the age of 3 months. At the same time, the method of puncture of ASCC in CG needed modernization. The use of a standard, disposable, injection needle with cutting edges during puncture of ASCC in CG led to complications such as damage to blood vessels, through-piercing of the cyst. The lack of hardware visual control forced the surgeon to rely only on palpatory sensations. This could not give reliable information about the complete emptying of the cyst. The reliability of palpation decreased even more with repeated punctures, due to swelling of soft tissues and contraction of the cyst walls.

For the puncture treatment of ASCC in patients with MG, a method has been proposed that is characterized by minimal trauma to soft tissues, eliminating damage to blood vessels during aspiration of the liquid contents of the cyst. Minimal traumatization of soft tissues during puncture was achieved by using a disposable angiocatheter, which has thin, elastic walls and is equipped with a needle with a special laser sharpening, which provides an atraumatic and painless introduction. Full-fledged, high-quality emptying of the cyst was monitored by ultrasound examination in real time.

As mentioned earlier in the MG, a puncture method developed in the clinic was used in the treatment of ASCC, minimiz-

ing the risk of damage to blood vessels during aspiration of the liquid contents of the cyst. At the same time, full-fledged, high-quality emptying of the cyst was controlled by ultrasound examination. To compare the traditional method of puncture treatment of ASCC in CG with the proposed method in the MG, the following criteria were determined: repeated accumulation of cyst fluid, the content of erythrocytes in aspirated cystic fluid, the appearance of swelling at the puncture site.

(Table 7) shows the criteria for evaluating the effectiveness of the puncture method of treatment according to the traditional method (CG) and according to the method developed in the clinic (MG). The parametric values of the criteria are given in relation to all only dotted patients in both groups. Children who were operated on without preliminary punctures were not included in this table. In addition, since we have proved the expediency of puncture treatment of ASCC in children under 3 months in (Tables 5), data on repeated accumulation of cyst fluid after puncture treatment are given only in relation to children under 3 months.

As a result of a comparative analysis of the traditional method of puncture treatment of ASCC in CG and the gentle method of puncture treatment in MG developed in the clinic (Table 7) it was found that the incidence of soft tissue edema, as a consequence of puncture treatment of ASCC, was reduced from 19(15.3%) in CG to 2(1.3%) in MG. Macroscopic signs of blood in the puncture fluid of CG patients were visualized in 13(10.5%)

**Table 7:** Comparison of the effectiveness of puncture treatment of ASCC in CG and MG.

№	Criteria	Groups	
		CG	MG
1	Local swelling of the soft	19(15,3%)	2(1,3%)
2	The presence of signs of blood in the punctate (macroscopically)	13(10,5%)	-
3	The average content of red blood cells in the sediment of the point, in the field of view	14,23±1,31 (n=19)	1,98±0,31 (n=32)
4	Repeated accumulation of cystic fluid	42(36,8%)*	9(6,0%)*
Total treated by puncture method		124	154
Total children treated by puncture method up to 3 months		114	149

**Note:** where \* is the percentage of complications in relation to all children treated by the puncture method in groups up to 3 months.

cases, whereas in MG this criterion was not registered in any case 0%. The level of traumaticity of the compared puncture methods can be judged by the content of red blood cells in the cyst fluid sediment. The presence of single erythrocytes in the sediment of the punctate or their complete absence indicates minimal trauma to the soft tissues during the insertion of the needle and the cyst cavity. As can be seen from the data given in Table 5.9, the average content of erythrocytes in the punctate sediment decreased from 14.23±1.31 in CG to 1.98±0.31 in MG, i.e., by 7.2 times. At the same time, thanks to the use of a gentle method of puncture treatment of ASCC, the frequency of repeated accumulation of cyst fluid from 42(36.8%) in CG decreased to 9(6.0%) in the exhaust gas, more than 6 times. These data indicate that the gentle method of puncture treatment of ASCC in the exhaust gas is 6 to 10 times less traumatic than the traditional method.

**Table 8:** Methods of treatment of ASCC in the compared groups.

Method of treatment	Age of patients in groups			
	CG		MG	
	Up to 3 months	Older 3 months	Up to 3 months	Older 3 months
Puncture	107(66,9%)	-	148(76%)	-
Puncture+surgery	7(4,4%)	10(6,3%)	1(0,5%)	5(2,6%)
Operation	13(8,1%)	23(14,4%)	-	41(21%)
Total	127(79,4%)	33(20,6%)	149(76,4%)	46(23,6%)
	160(100%)		195(100%)	

The methods of treatment of ASCC in the compared groups are shown in (Table 8). For the convenience of comparative analysis, the data in the groups are given separately for children under 3 months and older than 3 months. As can be seen from (Table 8), 107(66.9%) children under 3 months of age in CG were cured by traditional puncture, 7(4.4%) patients at this age underwent surgery after ineffective puncture, and 13(8.1%) due to the difficulty of differential diagnosis with a strangulated hernia, lack of methodology ultrasound diagnostics of ASCC immediately performed the operation. In contrast to CG in MG, 148(76.0%) children under the age of 3 months had a gentle method of puncture treatment of ASCC. In 1(0.5%) case, due to the refusal of the parents, the second puncture was not performed on the child, and at the insistence of the parents, surgical excision of the cyst was performed. It should be noted that 5 children in the MG, whose age was older than 3 months, were punctured before surgical excision of the cyst. In these 5 cases, the puncture was performed as a palliative method, because the children had temporary contraindications to general anesthesia. It can be concluded that 13 CG children under the age of 3 months (is 8.1% in relation to the total number of CG patients or 10.2% in relation to children under the age of 3 months of this group) ASCC could be cured by the puncture method and thereby avoid "vain" surgical intervention. As can be seen from Table 8, in children under 3 months of age, "futile" operations decreased from 10.2% to 0.5%.

To achieve a therapeutic effect, in some cases, repeated punctures were also performed in children with ASCC in the MG.

(Table 9) shows that in CG, the number of patients who recovered only from the puncture method was 107 children, and in MG - 148. The data given in (Table 5) show that in CG, to achieve a therapeutic effect, 32(29.9%) patients underwent double punctures, and 3(2.8%) punctures completed 3 times. As a result of the use of a new gentle method of puncture treatment, the effectiveness of a single puncture increased from 67.3% in CG to 94.6% in MG. The number of patients who underwent double puncture decreased from 29.9% in CG to 5.4% in MG. The number of patients with triple puncture decreased from 2.8% in CG to 0% in MG. Simple calculations show that in order to improve the health of children in CG, 107 children underwent 145 punctures by the traditional method, i.e. in a ratio of 1:1.35. In MG, 148 children underwent a total of 156 punctures by the new gentle method (ratio 1:1.04). In conclusion of the analysis of Table 5.11, it should be noted that the number of punctures necessary for the recovery of children from ASCC in the MG was reduced by 1.3 times, i.e. by 30.0%, compared with CG.

**Table 9:** The multiplicity of punctures in the compared groups performed to patients who recovered only from the puncture method of treatment.

The multiplicity of puncture	CG n=107	MG n=148	About n= 278
1 time	72(67,3%)	140(94,6%)	218(85,5%)
2 time	32(29,9%)	8(5,4%)	40(15,7%)
3 time	3(2,8%)	-	3(1,2%)
in total	107(100%)	148(100%)	255(100%)

### Conclusion

The developed protocol of gentle treatment of ASCC, including ultrasound monitoring in real time and the use of atraumatic needles, is safe at any age and does not require long-term skills from the surgeon.

In comparison with traditional methods of treatment of ASCC in children, the gentle method showed advantages in the form of less invasiveness, fewer complications, faster recovery of patients.

The study showed the safety of the developed method, minimal side effects, no negative consequences were registered in the long term.

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