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COMPLICATIONS AND REPEATED SURGICAL INTERVENTIONS AFTER SURGICAL TREATMENT OF CHILDREN WITH ACUTE SCROTUM SYNDROME

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Objective. Identify the causes of complications and repeated surgical interventions in the surgical treatment of patients with "acute scrotum syndrome" in the early and late postoperative period.

Materials and methods. The results of treatment of 3315 patients aged 0 to 18 years with acute scrotum syndrome are analyzed. 43 complications of a tactical and technical nature were stated, and surgical intervention was required in 32 cases.

Results and discussion. The most frequent complication is the incorrect determination of the vitality of the gonad when it is torsion. This is due to the fact that surgery is often accompanied by surgery. However, decision making requires no objective data to save gonad, which requires subjective character and in all cases leads to the lost gonad and need for repeated surgical intervention and does not require objective arguments. Disorders of surgical hemostasis are most often caused by defects in the surgical technique; insufficient consideration of background inflammatory changes in the scrotum organs is enhanced. Purulent complications are most often associated with acute epididymitis and are caused by the presence of an inflammatory lesion in the scrotum. Performing a broad revision of the scrotum in hydatid pathology is not justified, since the frequency of non-emergence of the second hydatid - a rare complication, the invasiveness of the intervention increases. Other complications are casuistic.

Conclusion. Surgical complications in acute scrotal diseases are different. Typical errors can be both tactical and technical. Complications are more common in the acute period (88.4%). Purulent complications are directly dependent on the duration of the disease and are aggravated by secondary changes in the scrotum organs. The low frequency of undetecting hydatid with its combination of torsions (0.03%) is not a reason for a complete revision of the scrotum, since the overall invasiveness of the operation will increase significantly. The frequency of their occurrence is reduced.

Keywords: acute scrotum syndrome, children, complications, repeated operations.

Acute scrotum diseases are a common nosological group in childhood. Operations with nosological forms, united in this syndrome, make up the second place after appendectomy in childhood [1]. A significant number of operations are performed not only by a pediatric urologist, but also by a pediatric surgeon and an urologist of an adult medical department involved in emergency care [3].

Technically, these surgical interventions are quite simple, do not require

significant surgical skills, and do not pose significant difficulties for the practitioner. The tactical component in some cases is more complicated and is discussed in the literature, first of all, this concerns the assessment of viability and tactics in testicular inversion in a state of severe ischemia [2,6].

Nevertheless, in some cases, the surgical interventions discussed lead to the development of complications, both technical and tactical in nature, and often require repeated surgical interventions [7]. A number of complications arise when performing operations for acute scrotum syndrome in the long term - with gonad fixation, prosthetics, etc. this question finds extremely poor consecration in the literature and the almost complete absence of an analysis of complications [4,9,10]. To a large extent, the small number of publications on complications is due to the high frequency of legal conflicts associated with various complications, and the corresponding social tension caused by them [5,8]. This leads to limited publications on this issue. All of the above allows us to consider such a study relevant.

Purpose: To establish the causes of complications and repeated surgical interventions in the surgical treatment of patients with acute scrotum syndrome in the early and long-term postoperative periods.

Materials and methods. We have analyzed the experience of treating children with acute scrotum syndrome over a period of 25 years. During the period under discussion, the department treated 3315 patients aged from birth to 18 years, including with testicular torsion - 299, acute epididymitis - 267, scrotal organ injury - 47, hydatid torsion - 2673, and other diseases - 29. Surgical interventions were performed in 3106 (93.7%) patients, among whom, during testicular torsion, emergency operations were performed 269, delayed and planned 218, including on the contralateral testicle, with acute epididymitis 155, with torsion of hydatides - 2431, with scrotal organ injury - 22, for other diseases Organ Precursor Cells scrotum - 11.

Complications were noted in 43 (1.38%) patients. The existing complications are divided by us conditionally into two groups - technical (n = 23) and tactical (n = 20).

Tactical complications:

1. Incorrect determination of the viability of the gonad during testicular torsion (n = 19)

2. Secondary orchoepididymitis (n = 1)

Technical complications:

1. Disorders of surgical hemostasis (n = 12)

2. Suppuration and partial failure of the wound in the postoperative period (n = 5)

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3. Failure to detect twisted hydatid due to incomplete revision of the scrotum organs (n = 1)

4. Complications of orchiectomy - ligature fistula of the scrotum (n = 1)

5. Complications of testicular prosthetics (n = 2)

6. Complications of testicular fixation during torsion (n = 2)

Selected study design does not allow statistical analysis

Results and discussion. The frequency of complications and reoperations in the conditions under discussion was analyzed, the largest number of complications, both tactical and technical, are noted in testicular torsion, acute epididymitis and scrotal organ injury, less often in hydatid torsion. The results of the analysis are shown in table 1.

The recurrence rate usually correlates with the incidence of complications. Most complications relate to the acute period of the disease. Repeated operations for complications were performed in 32 (74.4%) patients.

The most common complication is an incorrect determination of gonad viability during testicular torsion (n = 19). This error was found in patients with critical ischemia, when, against the background of detorsion, it was difficult to assess the viability of the gonad with available clinical and radiation methods. The testicle was left to assess its perfusion over time. In all cases, a follow-up audit was performed after 1-2 days, in which the gonad, erroneously defined as viable, was removed in 16 (84.2%) cases, in three (15.8%) the testis was regarded as viable and preserved, however, with an assessment after a year noted atrophy with a loss of 65-92% of the volume and performed secondary orchiectomy. This position may be controversial from the point of view of interpreting it as a complication, the chosen tactics are often dictated by the surgeon's desire to leave the organ-bearing operation, in some cases, the decision to perform an orchiectomy is made against the background of errors in the prehospital

phase, exacerbates social stress and entails potentially judicial collisions. Note that such a decision is made without objective data for the possibility of maintaining the gonad, is exclusively subjective. Such tactics in all cases leads to loss of gonad during repeated revision or delayed against testicular atrophy, causes the need for repeated surgical intervention and cannot be justified. The above allows us to regard it as a tactical error that has no clinical background

Disorders of surgical hemostasis are the second most common group of complications (n = 12). The reason for the development of complications of this group is due directly to defects in surgical technique, as well as insufficient consideration of background inflammatory changes in the scrotum, leading to impaired hemostasis. So, out of 12 complications, 9 developed with a disease duration of more than 3 days against the background of pronounced inflammatory changes in the soft tissues of the scrotum.

In 9 cases, the source of bleeding was the vessels of the membranes of the scrotum. The reason was insufficient hemostasis of the membranes against the background of their secondary inflammatory changes. These complications were noted in all forms of acute scrotum syndrome - testicular inversion (n = 4), torsion of hydatides (n = 2), scrotal organ injury (n = 1), orchoepididymitis (n = 2). The volume of hematomas ranged from 12 to 250 ml (35.8 ± 11.9 ml). Their evacuation and drainage were performed in five patients, the volume was estimated as 57.2 ± 8.1 ml, with a smaller volume of hematoma, patients received conservative therapy and was accompanied by a gradual lysis followed by puncture.

One patient had scrotum hematoma due to bleeding from the hydatid pedicle during coagulation. A complication arose against the background of secondary orchoepididymitis, the operation was performed on the 6th day of the disease.

The accumulation of the hematoma was detected 2 hours after the operation, with a repeated audit performed urgently, its volume was 40 ml, and the coagulation of the hydatid pedicle was repeated

In one case, insolvency of the ligature was noted during ligation of the spermatic cord in a patient with testicular torsion. The latter was carried out in a single side without separation of the elements and their flashing. A scrotum hematoma with a volume of 300 ml was ascertained, which required repeated revision, flashing of elements and drainage. Subsequently, all orchectomies were performed only with stitching of the elements and, with severe edema, with separate dressing, which avoided such complications.

In one case, the scrotum hematoma was caused by incisions on the testicle's white membrane, an assessment to assess its viability during inversion. A small volume of hematoma (20 ml according to ultrasound) allowed for conservative treatment. In the described observation, the gonad was saved in an acute situation; when assessed after 1 year, atrophy was found with a loss of 85% of the volume.

Prevention of this complication is considered to be the most careful observance of hemostasis during wound closure, mandatory control of the hydatid pedicle and double suturing of spermatic cord elements during orchiectomy. Subject to the above precautions, only two cases of bleeding from the scrotum membranes have been noted over the past 10 years.

Purulent complications were noted in five patients - 1.15% of the total number of operations performed. Their relative rarity is due to the good vascularization of the organs of the scrotum and its membranes. It is characteristic that three of them were noted in acute epididymitis and are probably associated with an inflammatory focus in the scrotum cavity. A partial discrepancy of sutures of the postoperative wound, which required local treatment, was noted. In all cases, the intervention was carried

The frequency of complications and reoperations depending on the form "Acute scrotum syndrome."

Form of acute scrotum syndrome and surgery	Number of operated patients	Number of complications	% complications	Number of operations for complications	% operations for complications
Testicular inversion (detorsion, orchiectomy, prosthetics, fixation)	487	27	5.54	26	96.29
Acute epididymitis	155	5	3.22	2	40
Hydatid torsion	2431	4	0.16	3	75
Scrotal organ injury	22	2	9.09	1	50

out against the background of secondary inflammatory changes in the membranes of the scrotum and its organs. Prevention is the appointment of antibiotic therapy for signs of inflammatory changes in the scrotum.

Secondary epididymitis was detected in one patient with scrotal organ trauma (2.12%). A patient with a 20 ml intravaginal hematoma who arrived 12 hours after the injury was given conservative treatment. Perforated hematoma with almost complete emptying. Against the background of therapy, by the third day of treatment, acute orchioepididymitis with impaired perfusion in the lesion zone was detected. The patient was operated on, a rupture of the albuminous membrane was found without significant damage to the parenchyma in the lower pole of the testis, scrotum sanitation and drainage were performed. Suturing of the protein coat is considered impractical due to inflammation and compression of the parenchyma. By the 9th day, the subsidence of the inflammatory process was ascertained.

Non-detection of twisted hydatide due to incomplete revision of the scrotum organs occurred in one observation for 2431 surgical interventions (0.04%) - during an emergency operation by access from mini-access, the inflamed hydatide was detected at the upper pole of the testis and removed. A complete audit of the scrotum was not carried out in connection with the discovery of the source of the disease. In the postoperative period, persistent pronounced edema of the scrotum and hyperemia was noted, with repeated ultrasound in order to identify possible complications on the 3rd day after the operation, an altered hydatide was detected with ultrasound. In an emergency reoperation, the diagnosis is confirmed, an altered hydatide with torsion of the pedicle below the first is detected (Fig. 1). Hydatide removed. In this case, it was possible that there was a torsion of a previously unchanged hydatide after surgery, and a primary torsion of both hydatides, not detected during the primary operation. Performing a wide audit of the scrotum is not considered appropriate, because the frequency of such a complication is very small, and the invasiveness of the intervention is substantially obtained. It should be noted that the detected unchanged hydatides during any operations on the scrotum organs are considered necessary to be removed simultaneously.

Complications of orchiectomy are quite rare. We noted such a complication



Fig. 1. The second hydatide, which was not removed during the initial audit, went unnoticed.

in one case, performing 96 orchectomies (1.04%). A ligature fistula of the scrotum was noted 6 months after performing an orchectomy (Fig. 2). We consider the reason for the complication to bandage the elements without separation by coarse silk thread. Subsequently, the removal of this ligature through the fistula was required, because its presence and infection prevented prosthetics.

Complications of testicular prosthetics are also not frequent - two cases were noted in 98 operations of implant implantation (2.04%). In one case, a bed sore of the scrotum membranes was associated with a relative discrepancy between the size of the implant and the volume of the scrotum cavity. This discrepancy is due to the desire to install an implant of the appropriate age and size of the testicle in the cavity, which subsided after an orchectomy performed three years before the intervention (Fig. 3). The second case is represented by the migration of the implant to the scrotum root and its wrinkling and is due to both the mismatch of the volume of the cavity and the implant, and probably the structural characteristics of the material of the implant (Fig. 4). Prevention of these complications is considered an adequate selection of the implant size with prosthetics without significant tension of the scrotum tissue and the use of modern synthetic implants.

Complications of the fixation of ischemic and contralateral gonad after testicular torsion were noted in two patients with 218 operations performed - only 0.92%. In one case, a ligature fistula was detected in the fixation zone associated with the reaction of tissues to suture material. In another observation, 1 year after the operation, an asymptomatic granuloma was detected at the lower pole of the testis, probably caused by the same reaction to the surgical thread. Both complications



Fig. 2. Ligature fistula of the scrotum. 6 months after performing an orchectomy.



Fig. 3. Pressure ulcer of the scrotum. 7th day after prosthetics.

were noted until 2010 among the first 98 operations. In both cases, silk 3/0 was used as a suture material. Subsequently, in connection with the transition from 2010 to the PDS 6/0 thread on an atraumatic needle when performing testicular fixation in 120 patients, no complications were noted.

Conclusion. The complications of surgical treatment of acute scrotal organ diseases are diverse. The nature of the errors can be either tactical - most often the complexity of assessing the viability of the gonad during inversion, and technical - primarily defects in surgical hemostasis. Complications are noted more often in the acute period (88.4%), less often with staged treatment in the

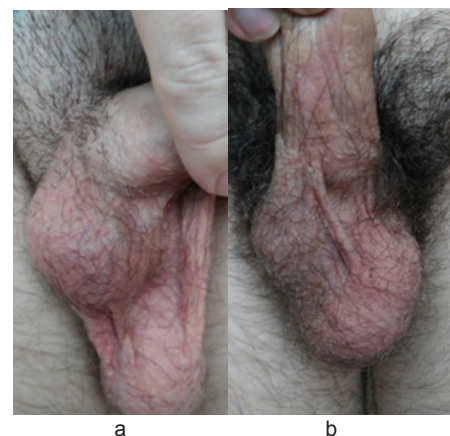


Fig. 4. Migration of the implant to the scrotum root and its wrinkling. A. - 1 month after surgery, B - 1 year after surgery.

long-term period (11.6%). Purulent complications in most cases are directly dependent on the duration of the disease before surgery and are aggravated by secondary inflammatory changes in the membranes and organs of the scrotum. The low frequency of not detecting hydatide with its combined torsion (0.03%) is not, in our opinion, a reason for a complete revision of the scrotum with this pathology, because significantly increases the overall invasiveness of the operation. In most cases, subject to a number of measures, it is possible to significantly reduce the frequency of complications.

Rational tactics of patient management, compliance with preventive measures of a technical nature will help to avoid most of the possible complications, or minimize their number.

References

1. Григорьева М.В., Гасанова Э.Н., Саруханян О.О. и др. Дифференцированный подход в лечении острых заболеваний и травм яичка у детей. VI всероссийская конференция «Неотложная детская хирургия и травматология»: Сборник материалов. Москва. 2018: 36. [Grigor'eva M.V., Gasanova E.N., Saruhanjan O.O. et al. Differentiated approach in the treatment of acute diseases and injuries of the testis in children. VI vserossijskaja konferencija «Neotlozhnaja detskaja hirurgija i travmatologija». Sbornik materialov. Moscow. 2018: 36. (In Russ)].
2. Шорманов И.С., Щедров Д.Н., Куликов С.В., и др. «Опыт протезирования яичка в детском и подростковом возрасте: результаты мультицентрового исследования» Экспериментальная и клиническая урология. 2018; 3: 84-90. [Shormanov I.S., Shedrov D.N., Kulikov S.V. et al. «Experience of testicular prosthetics in children and adolescents: the results of a multicenter study. *Experimental and clinical urology*. 2018; 3: 84-90. (In Russ)].
3. Саруханян О.О., Григорьева М.В., Хорчинова Э.Э. Современный взгляд на травмы и острые заболевания яичка у детей. Сборник материалов III съезда детских хирургов. Москва. Журнал Российский Вестник детской хирургии, анестезиологии и реаниматологии. Приложение. 2017: 151-152. [Saruhanjan O.O., Grigor'eva M.V., Horchinova E.E. A modern view of injuries and acute testicular diseases in children. *Sbornik materialov III s'ezda detskih hirurogov. Zhurnal Rossijskij Vestnik detskoj hirurgii, anesteziologii i reanimatologii. Prilozhenie*. Moscow. 2017: 151-152. (In Russ.)].
4. Шилл В-Б, Комхайра Ф., Харгрива Е. Клиническая андрология: монография. Москва. ГЭОТАР-Медиа, 2011: 800. [Schill WB. Komhaira F., Hargreva E. Clinical andrology: monograph. Moscow. GEOTAR-Media, 2011: 800. (In Russ.)].
5. Anthony S. Scrotal confusion: focus on diagnosis. *Med. Protect. Soc. Casebook*. 2002; 17: 5 - 11.
6. Candocia F.J. An infant with testicular torsion in the inguinal canal. *Sack-Solomon Pediatr. Radiol.* 2003; 33: 722-724. DOI: 10.1007/s00247-003-0984-8
7. Donati-Bourne D., Deb A., Mathias S.J. et al. Complete Expulsion of Testicular Prosthesis via the Scrotum: A Case-Based Review of the Preventive Surgical Strategies. *Case Rep Urol.* 2015; 43: 49-51. DOI: 10.1155/2015/434951
8. Gearhart J., Rink R., Mourigand P. Pediatric urology second edition. Philadelphia: Elsevier, 2010: 855.
9. Lucas J.W. Lester K.M. Chen A. et al. Scrotal reconstruction and testicular prosthetic. *Trans Androl Urol.* 2017; 6 (4): 710-721. DOI: 10.21037/tau.2017.07.06
10. Mor Y., Pinthus J.H., Nadu A. Testicular fixation following torsion of the spermatic cord: does it guarantee prevention of recurrent torsion events. *J. Urol.* 2006; 175:171 – 173. DOI: 10.1016/S0022-5347(05)00060-1

