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BASIC PRINCIPLES OF SURGICAL TREATMENT OF ARTIFICIAL PYOINFLAMMATORY DISEASES OF SOFT TISSUES

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ABSTRACT

Aim. To identify the peculiarities of surgical treatment of APIDST.

Material and methods. The analysis of treatment of 302 men with APIDST in the department of purulent surgery of the 301 Military Clinical Hospital of Khabarovsk from 1987 to 2013 was carried out.

Results. Surgical emergency procedures were performed in 40 (13.2%) patients with APIDST before admission to the hospital and in 262 (86.8%) patients with APIDST immediately after admission to the hospital. Necrectomy was performed in 6 (2.0%) patients with APIDST before admission to the hospital and in 118 (39.1%) patients with APIDST immediately after admission at the hospital. The signs of anaerobic infection were found during the surgical procedures in 260 (86.1%) patients. During hospitalization 2 or more surgical procedures were required in 188 (62.3%) patients with APIDST due to the progression of the disease.

Conclusions. In case of substantiated suspicion of APIDST surgical intervention should be based on the main principles of surgical treatment of anaerobic infections regardless of the duration of the disease. It is recommended to start the procedures with a small diagnostic incision through the site of introduction of the initiating substrate with a mandatory revision of the subfascial space and performing radical necrectomy.

Keywords: artificial pyoinflammatory diseases of soft tissues, treatment.

List of reductions:

APIDST – artificial pyoinflammatory disease of soft tissues.

Introduction. The choice of treatment strategy of APIDST is a very difficult problem due to insufficient knowledge of this pathology. It was established, that after deliberate introduction of non-sterile biological fluids into the soft tissues anaerobic infection develops in the majority of cases [3,16]. Various chemicals, introduced into soft tissues, cause «chemical» necrosis, progressive ischemia, creating conditions for the development of anaerobic infection [9,15]. It is well known that anaerobic infection of soft tissues holds a special place among surgical infections due to the high morbidity and mortality [4,5]. Currently, some experts are sure that the treatment strategy of APIDST, caused by non-sterile biological fluids, does not seriously differ from the conventional

approach to the treatment of surgical soft tissue infections and does not have any specific features [13]. Other authors stick to the opinion that the treatment of APIDST has some specific features, particularly in patients after introduction of a chemical initiating substrate into the soft tissues of the body [9,15,18].

The aim of this work is to identify the peculiarities of the surgical treatment of APIDST.

Material and methods of the research. The analysis of treatment of 302 men with APIDST who accounted for 6,1% of all patients with different forms of surgical infections of soft tissues and had been hospitalized to the department of purulent surgery of the 301 Military clinical hospital of Khabarovsk from 1987 to 2013, was carried out. The

most commonly used disease initiating substrates were oral fluid (36.1%), dental plaque (15.6%) and liquid hydrocarbons (6.3%).

Results and discussion. Of 302 patients with APIDST, surgical emergency procedures were performed before admission to the hospital in 40 (13.2%) patients, and immediately after admission to the hospital - in 262 (86.8%) patients (Table 1).

As is seen from the above table, radical treatment of the surgical infection focus including not only an adequate incision but also necrectomy was performed in 6 (2.0%) patients with APIDST before admission to the hospital and in 118 (39.1%) patients with APIDST immediately after admission to the hospital (Table 1).

In the course of treatment, some patients required repeated operations due to the progression of the inflammatory process (Table 2).

As is seen from the above table, 188 (62.3%) patients with APIDST required 2 or more surgical procedures (Table 2).

The distribution of patients with APIDST depending on the area of the inflammatory process is presented in Table 3. The area of the inflammatory process indirectly indicates the average length of the incision.

The area of the inflammatory process was limited and accounted for less than 500 cm² in 184 (60.9%) patients and more than 500 cm² - in 118 (39,1%) patients with APIDST (Table 3).

The signs of anaerobic infection were found during the surgical procedures in 260 (86.1%) patients.

The peculiarities of surgical procedures in patients with APIDST were as follows. Surgical intervention was started from making a small (diagnostic) incision through the point of introduction of the initiating substrate under local anesthesia, which together with the other diagnostic procedures allowed to reliably confirm APIDST.

In our opinion, an incision at some distance from the point of introduction of the initiating substrate is the most common mistake.

The information obtained during a small diagnostic incision was used to select the type of anesthesia in the main stage of the surgical procedure as well as to plan the direction of the operative access and to determine the borders of necrectomy. Besides, the material for emergency bacterioscopy and tissue biopsy was taken from the wound for microbiological investigation.

In spite of the absence of visible changes in the subcutaneous tissue and fascia in some patients, revision of the subfascial and intermuscular space was obligatorily performed.

During the main stage of surgery, the pathomorphological form, the severity of the inflammatory process as well as the particular features of the soft tissues destructive changes were clarified. The decision on whether additional incisions should be performed was taken.

The maximum possible necrectomy, debridement of the wound and its drainage were carried out if necessary.

We avoided to perform additional incisions, particularly located close to each other. We think, that one or two adequate incisions are sufficient for the revision of the surgical infection focus.

It should be noted that, in our opinion, the practice of making short incisions

Table 1
Surgical emergency procedures, performed in patients with APIDST before and after admission to the hospital

Surgical procedures	Before admission		After admission	
	n	%	n	%
The number of patients to have been operated on	40	13.2	262	86.8
Cases of radical necrectomy performed	6	2.0	118	39.1

Table 2
Number of surgical procedures in patients with APIDST

The number of performed surgical procedures per a patient	APIDST (n=302)	
	n	%
1 surgical procedure	114	37.7
2 surgical procedures	95	31.5
3-5 surgical procedures	72	23.8
6-9 surgical procedures	15	5
10 or more surgical procedures	6	2

located close to each other is wrong, because such incisions do not allow to perform an adequate revision and necrectomy, creating conditions for the progress of the purulent and destructive process. In addition, several small incisions often lead to the necrosis of the tissues between them.

During necrectomy, the wound was carefully cleaned with antiseptic solutions. Hemostasis was performed using diathermocoagulation, as the ligation of vessels often promotes the development of ischemia and increases the contamination of viable tissues with anaerobic microorganisms.

After completing the surgical procedures, the resulting wound was loosely packed with napkins soaked with anti-anaerobic activity ointments.

The wound tamponade was performed in such a way that there were no empty pockets and cavities left. The need for repeated necrectomy and application of bandages was determined based on the monitoring of the patients' condition and the development of the wound process. There was no mortality in this group of patients.

Currently, the active treatment strategy of anaerobic soft tissue infection is accepted. It includes the early surgical procedures, the removal of all necrotic tissues, active drainage and aeration of the wound [5,13,7]. Such strategy allows to reduce mortality from 40-67% [2, 4, 6] to 13-29.7% [8,7,17].

Considering that anaerobic microorganisms are involved in the majority of APIDST cases, the surgical procedures must be performed in all patients according with fundamental principles of surgical treatment of anaerobic infection of soft tissues.

We deem it appropriate to resort

Table 3
The area of the inflammatory process in patients with APIDST

The area of the inflammatory process in patients	APIDST (n=302)	
	n	%
Less than 500 cm ² (3% of the area of the person's skin)	184	60.9
From 500 to 1000 cm ² (3-6% of the area of the person's skin)	88	29.1
From 1000 to 1500 cm ² (6-9% of the area of the person's skin)	21	7
More than 1500 cm ² (>9% of the area of the person's skin)	9	3

to surgical intervention in all cases irrespective of the duration of the disease if there is a substantiated suspicion of APIDST.

We share the opinion of M. J. DiNubile [8], that in case of a suspected anaerobic infection of soft tissues, "an early or a too extensive surgical procedure would be a much safer option".

Considering that it is not possible to diagnose anaerobic infection with a high degree of probability before the surgical procedure, the intraoperative assessment of tissues is needed [1,6,8], which according to our observations allows to establish the anaerobic nature of the disease in 86.1% of patients. The above mentioned changes of tissues include such well-known signs of anaerobic infection as the stinking smell of gray-green or brown exudate, a specific type of diseased tissues of gray, gray-green or black color, liquid pus, often diffusely saturating the inflamed tissues, the presence of gas and the presence of wound anaerobic microorganisms in the smears [1,4,6].

The early diagnosis of anaerobic infection of soft tissues is extremely important; therefore, we share the opinion of some authors who insist that the diagnosis of anaerobic infection must not be questioned when we can find at least one of the above-mentioned signs. In such a case, the isolation of the causative agent to prove the participation of anaerobes in the infectious process is not of paramount importance [1].

As far as the chemical substances are concerned, many authors agree

that the first step in the treatment of APIDST caused by chemicals, for example, by liquid hydrocarbons, is the urgent hospitalization of patients to the hospital for observation and prevention of systemic complications [9,15,18].

At the same time, the analysis of modern publications on APIDST reveals the lack of a common approach. A number of researchers support the conservative approach consisting in the forming of the elevated position and immobilization of the affected limb, dynamic observation and symptomatic therapy without denying surgery in case of the negative dynamics of disease and the development of local complications [15,18].

At the same time, other authors point out the need for emergency surgery, regardless of the patient's condition, local status and the time elapsed since the introduction of the chemical. Surgery in these cases usually is based on the extensive access, adequate necrectomy, possible fasciotomy and wound drainage. Subsequently, in some cases repeated surgical treatment of the wound is performed [11, 12].

In the review of Kennedy J. R. et al. (2010) [10], which analyzes the treatment of APIDST caused by chemicals, the authors insist on emergency surgical treatment of the wound in order to prevent tissue necrosis by removing toxic exudate from the wound, and to prevent the compartment syndrome and to stop the resorption of chemicals.

Our experience of the treatment of patients with APIDST caused by chemicals confirms the feasibility of active surgical treatment of them, based on principles of treatment of anaerobic infection.

Conclusions

1. Diagnosis of anaerobic infection in cases of APIDST should be based primarily on the detection in the course of a small diagnostic incision of signs indicating the anaerobic nature of the disease.

2. Surgical intervention in case of the reasonable suspicion of APIDST must be performed taking into account the main principles of treatment of anaerobic infections, regardless of the stage of the disease.

3. Surgical intervention should begin with a small diagnostic incision through the site of introduction of the initiating substrate with a mandatory revision of the subfascial space and performing a radical necrectomy.

4. In surgical treatment of patients with APIDST induced by chemicals one should resort to active surgical treatment with consideration for the basic principles

of treatment of anaerobic infection.

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POSTLINGUAL DEAFNESS IN EVENO-BYTANTAYSKY NATIONAL DISTRICT OF THE SAKHA REPUBLIC (YAKUTIA): AUDIOLOGICAL AND CLINICAL-GENEALOGICAL ANALYSIS

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ABSTRACT

In this paper we present for the first time the results of the audiological and clinical-genealogical research of the population of settlements Batagai-Alyta and Kustur of the Eveno-Bytantaisky National District (ulus) of the Sakha Republic (Yakutia) for studying the postlingual form of deafness of unknown etiology, which we for the first time have identified earlier in 3 Evens. As a result of an audiological examination of 72 people, 10 patients from 6 nuclear families who met the criteria of postlingual form of hearing loss were found. The segregation analysis carried out in these families confirmed the autosomal recessive type of inheritance of this form of postlingual hearing loss. The distant relationship of the examined patients with postlingual hearing loss living in two villages of the Eveno-Bytantaisky National District of the Sakha Republic can indicate to the role of the founder effect in the local prevalence of this pathology. The results of present study and obtained expedition material will be the basis for further research of the molecular genetic etiology of this form of deafness and the discovering of mechanisms of its accumulation in this region of Yakutia.

Keywords: postlingual deafness, audiological analysis, clinical-genealogical analysis, segregation analysis, Eveno-Bytantaisky National District, Sakha Republic (Yakutia).

Introduction. Mutations of the *GJB2* gene are the main reasons of congenital and prelingual nonsyndromic hearing loss (HL) in many countries [5, 10]. Currently the territory of Eastern Siberia (the Sakha (Yakutia) Republic) is characterized by the spectrum and frequency of mutations of the *GJB2* (Cx26) gene on the large cohort of patients (n=393) with congenital hearing impairments and individuals with normal hearing (n=187) from Yakut and Russian populations [1, 9]. Recently it was shown that the pathogenic contribution of biallelic *GJB2* gene mutation to the etiology of HL in Yakutia was equal to 49%; and this rate was the largest in comparison with the earlier studied regions of Asia (10213 probands from 23 countries) [4]. In the spectrum of identified *GJB2* mutations, three mutations: c.-23+1G>A, c.35delG and c.109G>A were the most common. These mutations account for 98% out of all pathogenic *GJB2* alleles. The major *GJB2* mutations specific for the main ethnic populations of Sakha (Yakutia) Republic were identified:

for the Yakuts - c.-23+1G>A and for the Russians - c.35delG. Nevertheless, the biallelic *GJB2* mutations were not detected in 51% of examined deaf patients (*GJB2*-negative patients), and the reason of their HL remained unknown. Considering the genetic diversity of known hereditary forms of deafness, there is a high probability that HL of some patients may be due to the mutations in other genes since about 100 genes are known in association with non-syndromic hearing impairments (Hereditary Hearing loss Homepage - <http://hereditaryhearingloss.org>).

Our detailed clinical-genealogical analysis of the sample of *GJB2*-negative patients from different districts of the Republic of Sakha (Yakutia) revealed 3 Evens with late onset HL from the village Batagai-Alyta (Eveno-Bytantaisky National District): 2 sibs (proband A and sibs A) whose HL became noticeable at 7 years in proband A and at 4 years in sibs A, and also one patient (proband B) with the same onset of HL (at 4 yrs).

All collected data (medical history, the results of molecular-genetic and audio-

logical analysis) for these 3 patients from the Eveno-Bytantaisky National District of the Sakha Republic allowed us to suggest the hereditary cause of this postlingual form of deafness.

The **objective** of this study is to conduct audiological and clinical-genealogical analysis of the families with postlingual form of deafness of unknown etiology from Eveno-Bytantaisky National District for the further confirmation of hereditary nature of this disease and clarification of its inheritance type.

Materials and methods of the research. During the field work in the Eveno-Bytantaisky National District of the Sakha (Yakutia) Republic (April, 2018) the staff of the Yakut Science Center of Complex Medical Problems (Yakutsk) examined 106 inhabitants of the villages Batagai-Alyta and Kustur. Among them, 72 individuals were selected for the study of the etiology of the postlingual form of deafness - 65 from Batagai-Alyta, 4 from Kustur, and also 3 previously examined *GJB2*-negative patients (proband A, sibs A, proband B) from Batagai-Alyta were taken for further examination. Among

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