

Original Article

Frostbite in hot climates of Central Asia: retrospective analysis of the microflora of wound and antibiotic therapy

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Abstract: The problem of deep frostbites belongs to one of the most complex in surgery. Treatment of such victims is very prolonged, expensive, requiring crippling operations resulting in disability. The purpose of this present study is of etiological structure of the wound microflora and its tolerance to antibacterial preparations in patients with cold injury in the regions with warm climate of severe degree. 57 microbiological investigations of wound secretions in 38 patients with severe cold injury treated in our Burn Department of RSCUMA, Samarkand, Uzbekistan had been carried out. Microflora of wounds in patients who suffered from cold injury is characterized by polyetiology and is presented by gramnegative (49.5%) and grampositive (50.5%) microorganisms. There are *Pseudomonas aeruginosa* (17.9%). Among gramnegative microorganisms. In this context sensitivity to preparations owing activity to *Pseudomonas aeruginosa*-Ceftazidim, Ceferin and Amycacin makes 48.8%, 54.5% and 81.3% accordingly. Prevailing flora of grampositive is *Staphylococcus aureus* (26.3% of agents), of which 60% makes MRSA. High resistance to Ciprofloxacin (66.6%), Erythromycin (52.5%) and Lincomycin (44.4%) is noted. The investigations give evidence that ABT in patient with severe frostbites is a serious problem and needs well-ground approach in prescribing antibacterial preparations.

Keywords: Frostbite, wound, microflora, antibacterial preparations

Introduction

The problem of local trauma belongs to one of the most complex in surgery [1]. Frostbites most often affect asocial persons without definite place of residence, having heavy background status [2-4].

Treatment of such victims is very prolonged, expensive, requiring crippling operations resulting in disability. These patients often stay for a long time at the in - patient department, because they need constant care and it is impossible to discharge them as they do not have place of residence [5, 6]. Frostbite injuries are more often observed in northern sub-arctic regions.

However frosting injuries are also observed in the regions with warm climate particularly in Central Asia, sometimes in winter months when the air temperature is below zero and

humidity is increased. In Uzbekistan able - bodied men suffer most often, 85-90% of them are admitted in the condition of alcohol intoxication [7]. It is necessary to note that in the reactive period of severe cold trauma at the stage formation of soft tissues necrosis, after necrectomy and amputation, the problems of antibacterial therapy acquire cardinal significance in the programme of intensive therapy [8, 9, 17]. Antibiotic therapy efficacy is only possible in carrying out microbiological control and identification of sensitivity to antibiotics. Analysis of available literature revealed several papers concerning the research of etiological structure of microflora of injuries in cases of frostbites in conditions of climate but there was nothing about microflora of injuries due to frostbites in places with warm climate.

In this study we aimed to investigate the study of etiological structure of the wound microflora

Microflora wound of frostbite

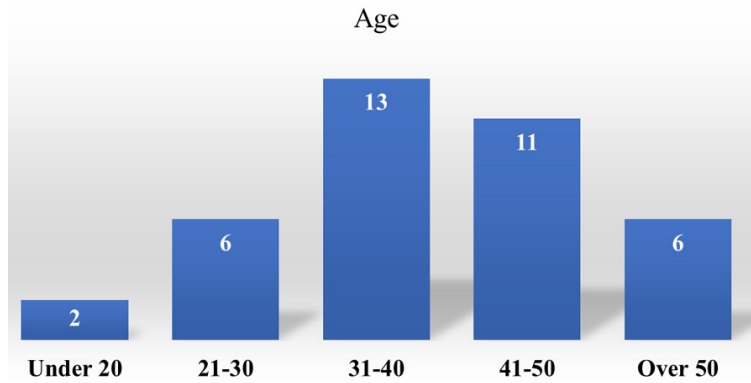


Figure 1. Age distribution of patients.

and its tolerance to antibacterial preparations in patients with cold injury in Uzbekistan with its warm climate.

Material

57 microbiological investigations of wound secretions in 38 patients with severe cold injury treated in our Burn Department of RSCUMA, Samarkand, Uzbekistan had been carried out (**Figure 1**).

22 (57.9%) hospitalized patients had been in early reactive period and 16 (42.1%) - in the late period, more than 5 days after getting cold injury.

Injuries of both lower extremities were in - 24 (63.2%), both upper and lower extremities in - 11 (28.9%) patients. Isolated injuries of only upper or lower extremity had 3 (7.9%) victims.

The character and volume of primary therapeutic measures carried out depending on the results of initial examination, clearing up the anamnesis, circumstances of getting trauma were of particular specific nature.

At the in - patient department all patients underwent general warming in order to relieve spasm of peripheric vessels and improve microcirculation and during 2-3 days after hospitalization they were also given therapeutic preventive intravenous infections of medicines together with subcutaneous introduction of heparine at the dose of 1500 units three times a day.

In patients admitted in late reactive period with clearly marked signs of frostbite of III-IV degree

the initial tactics of local treatment depended on the condition of necrotic tissues. If it was impossible to prevent necrosis of some layers of tissues in early reactive period in some patients as well as in those who were admitted with formed necrosis, surgical treatment was performed to fight against intoxication and infection and also in order to prepare the injuries to restorative plastic surgery. The most typical operations in patients with frostbite of III-IV degree were necrotomy, necrectomy, autodermoplasty and amputation of damaged extremity segments.

The criteria for studying this work were included the patients with frostbites of extremities of III-IV degree with development of soft tissues necrosis and necrectomy on different levels of extremities was performed. In addition to general clinical studies the programme of the investigation included microbiological studies of abrasion from the wound surface. Taking of biomaterial was performed during wound bandaging in every 4-5 days. Elimination of cultures was carried out according to common rules, identification - to classical methods [10], and also applying test API (bioMerieux, France). Sensitivity to antibiotics is determined by disco-diffusion method on Muller - Hinton agar with use of set of standardized discs with antimicrobial preparations according to National Committee on Clinical Laboratory Standards.

Methods and results

95 strains of infectious agents were eliminated from patients wound. In 27 (47.4%) microbiological studies monoculture was eliminated and in 30 (52.6%) - microbic association.

The study of infections agents structure showed that in 47 (49.5%) investigations gramnegative and in 48 (50.5%) - grampositive microorganism were revealed.

Most often gramnegative flora infections agent was that of hospital infection - *Pseudomonas aeruginosa*, eliminated in 17 tests that is in - 17.9% of the studied biological material. Spe-

Number of patients (gramnegative flora)

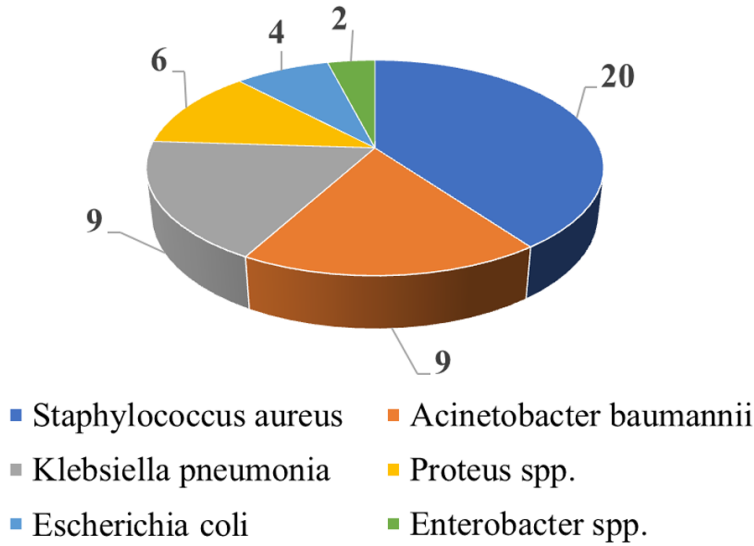


Figure 2. Number of patients (gramnegative flora).

Number of patients (grampositive flora)

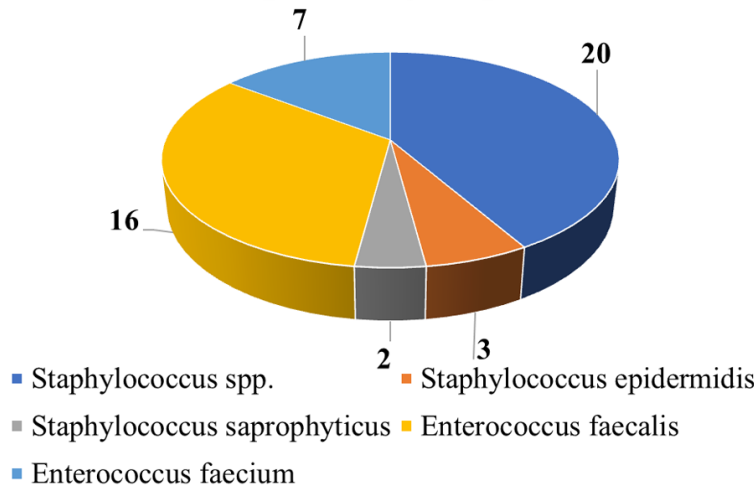


Figure 3. Number of patients (grampositive flora).

cific gravity of the other gramnegative microorganism - Acinetobacter baumannii made 9.5% (9 cases). Some other gramnegative agents in patients' wound were revealed in 21 (22.1%) investigations and were presented as microorganism spectrum: Enterobacter spp. - 2 (2.1%), Klebsiella pneumonia - 9 (9.5%), Proteus spp. - 6 (6.3%), Escherichiacoli - 4 (4.2%) (Figure 2).

Among grampositive flora Staphylococcus spp. - 25 (26.3%) tests of which in 20 (21.1%) Staphylococcus aureus was eliminated, in 3 (3.2%) - Staphylococcus epidermidis and in 2 tests (2.1%) - Staphylococcus saprophyticus.

Enterococci were revealed in 23 (24.2%) studies presented by two types - Enterococcus faecalis 16 (16.8%) and Enterococcus faecium 7 (7.4%) (Figure 3).

Analysis of sensitivity

Pseudomonas aeruginosa is resistant to Cefaperazon/sulbactam (71.4%), Ciprofloxacin (68.7%). The study of sensitivity to preparations possessing activity with regard to Pseudomonas aeruginosa, showed the following: sensitivity to Ceftazimid was revealed in 48.8%, Cefepin - in 54.5%, and Amycacin - in 81.3% of microorganisms. In this context β -lactamase producing strains 43.6%. In evaluation of antibiotic sensitivity to Staphylococcus aureustheir high resistance to Penicillin is noted MRSA makes 60%, Ciprofloxacin - (66.6%), Erythromycin - (52.5%) and Lincomycin - (44.4%). Their high sensitivity to Rifampicin - (92.4%) is kept and no strains resistant to Linezolid and Vancomycin were revealed.

Analysis of Acinetobacterbaumannii sensitivity to antibiotics showed high resistance to eliminated strains to Ampicillin and Ceftazidim (100%), Amicacin (66.6%) and Cefepim (62.5%) and sufficient to Ciprofloxacin (7.4%), Cefoperazon/sulbactam (75%) are kept. The study of Klebsiella pneumoniae sensitivity to antibiotics revealed the following: resistance of eliminated strains to Cefotaxim and Ceftriaxon (100%), Ceftazidim (85.7%), Amoxicillinclavulant and Ciprofloxacin (71.4%) is noted and Amicacin (78%). Strains, producing β -lactamas of the dilated spectrum made 85.7%.

Discussion

In the condition of peaceful life frostbiting is more often observed in northern subpolar re-

gions, where they make 0.8-1.2% of the number of all traumas. Lethality from cold trauma makes 3.6-5%, disability in deep frostbites makes from 3.6-5%, disability in deep frostbites makes from 15 до 80% of patients [10].

Wound infection in patients with cold injury is explained by disturbance of blood supply of tissue, necrosis of soft tissues and impairment of the skin barrier and it begins from the first days of stationary treatment [11, 12]. The presented microbic spectrum is the evidence of wound infection introduced by the agents of intrahospital infection.

In early reactive period the measures on circulation improvement and prevention of thrombosis continue [13, 14]. According to indices, antibacterial therapy begins. Local treatment includes application of moist drying, ointment bandages, wound coverings, performance of necrotic incisions to decrease the compression, acceleration, surgical necrectomy and early amputation (in 4-5 days).

Early surgical tactics in deep particularly poly-segmental frostbites makes it possible to decrease considerably the risk of following infections complications and to begin reconstructive - restoring treatment the earliest [15, 16].

In the late reactive period when there are already signs of infection, intoxications conservative and operative measures are directed to fight against infection, removal of unviable tissues. Antibacterial therapy last in accordance with microbiological studies, desintoxication, and symptomatic treatment. Amputations are performed within limits of healthy tissues with primary and secondary stitching, guillotine amputation with simultaneous or delayed free autodermoplasty using dermal - fatty grafts both local and from distant areas [17].

It ought to be remarked that in early terms tissue impairments are reversible. Well - timed beginning of treatment makes it possible to decrease and sometimes to prevent their development. Late applying for medical aid due to the low awareness of the population, insufficient qualification of general practice surgeons concerning treatment of local cold injury result in late beginning or complete absence of early starting therapy which influences the final result of treatment, its duration and economic

effect. Staying of such patients on burn hospital beds, having no indications but needing care only because they have no place to go is too expensive.

The work on drawing up of documents, official registration onto hostel houses must be carried out by social defense staff but not by medical staff of high qualification.

Conclusions

Frostbite is a form of cold injury in which tissue fluids crystallize after exposure to freezing temperatures. Its health effects are associated with the immediate functional disadvantages that it causes and its various sequelae. Treatment of these patients is very prolonged, expensive, frequently requiring crippling operations, resulting in disability.

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Disclosure of conflict of interest

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