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MODERN IDEAS ABOUT THE ETIOLOGY OF INFECTIOUS-INFLAMMATORY PROCESSES OF THE MAXILLOFACIAL AREA. ANALYTICAL REVIEW OF THE LITERATURE

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СОВРЕМЕННЫЕ ПРЕДСТАВЛЕНИЯ ОБ ЭТИОЛОГИИ ИНФЕКЦИОННО-ВОСПАЛИТЕЛЬНЫХ ПРОЦЕССОВ ЧЕЛЮСТНО-ЛИЦЕВОЙ ОБЛАСТИ. АНАЛИТИЧЕСКИЙ ОБЗОР ЛИТЕРАТУРЫ

Анотація. Збудником інфекційно-запальних захворювань щелепно-лицевої ділянки та шиї є представники різноманітних видів мікроорганізмів, а одонтогенна інфекція характеризується як поліетіологічна з формуванням у вогнищі запалення мікробних асоціацій. На сучасному етапі розвитку медицини розпрацювання та практичне використання простих та доступних методів дослідження бактеріальних плівок є одним із пріоритетних напрямків сучасної медицини.

Аннотация. Возбудителем инфекционно-воспалительных заболеваний челюстно-лицевой области и шеи являются представители различных видов микроорганизмов, а одонтогенная инфекция характеризуется как полеэтиологическая с формированием в очаге воспаления микробных ассоциаций. На современном этапе развития медицины розроботка и практическое использования простых и доступных методов исследования бактериальных пленок является одним из приоритетных направлений современной медицины.

Ключові слова: інфекційно-запальні захворювання, щелепно-лицева ділянка, етіологія, біоплівка.

Ключевые слова: инфекционно-воспалительные заболевания, челюстно-лицевая область, этиология, биопленка.

Odontogenic inflammatory processes of the maxillofacial area and neck develop as a result of penetration of the infectious agent through the root canal, which is affected by caries or its complications. For a long time, it was believed that the microbiological picture of odontogenic infection is represented only by monocultures (Staphylococcus aureus, Streptococci), or in the form of their associations with gram-negative rods, diplococci. Due to the development of modern methods of identification of various microorganisms, application of diagnostic methods, other types of microbial associations were isolated and verified, the role of gram-negative conditionally pathogenic flora and anaerobes was established [3]. Today, modern and promising research methods are used to identify genetic markers of infectious microorganisms by polymerase chain reaction (PCR).

As an agent of odontogenic infection, microorganisms that vegetate in the oral cavity are most commonly detected: hemolytic and non-hemolytic streptococci (Streptococcus mutans, Streptococcus mitis), non-spore forming anaerobes (Peptostreptocpp). To date, over 700 species of microorganisms have been identified and identified in the oral cavity. The resident microflora of the oral cavity is very diverse, does not have virulence and pathogenicity [16], includes bacteria, fungi, simple, viruses [12]. The constant flora of the oral cavity is very large. Normally, it acts as a so-

called "biological barrier" that prevents the propagation of random flora, including pathogens. However, this flora is a potential "reservoir" of autoinfection, which develops when the overall resistance of the body is weakened. By reducing the body's defenses, the resident microflora acquires pathogenic properties and has the ability to initiate the development of infectious-inflammatory processes [13].

Most often from the odontogenic inflammatory lesion associations of 2-6 species of microorganisms are distinguished: aerobes (streptococci and staphylococci) and obligate anaerobes (bacterroids, fusobacteria, peptococci) [5]. The anaerobic detection rate is 52-68%, this indicator for non-odontogenic processes is 20%, for odontogenic processes it is 67.7% [14]. Infectious-inflammatory processes that occur with associations consisting of Peptococci, Peptostreptococci, gram-positive cocci are more difficult and more extensive than the lesions caused by the monoculture of aerobic gram-positive cocci. Representatives of the genus Veilonella exhibit poor autogenicity in monoculture, and the synergistic effects of concomitant aerobic microbes enhance the indicated property of these bacteria [8].

In the odontogenic nature of the inflammatory process, the frequency and degree of insemination is dominated by representatives of obligate anaerobic non-spore-forming anaerobes (bacterial group-25-46%, fusobacterial-24-60%), and microaerophilic streptococci (up to 96%) [13].

The microbial flora of the operative wound in inflammatory diseases of the maxillofacial area and neck is significantly different depending on the pathogen. Thus, severe purulent lesions are associated with the optional gram-negative flora (Enterobacteriaceae spp.) and Staphylococcus aureus. Patients with diabetes and the elderly are mainly dominated by Enterobacteriaceae spp. [7]. Our studies have shown that Staphylococcus spp. are sown in odontogenic inflammatory diseases. (15%), Streptococcus spp., (6%), obligate anaerobic bacteria (79%). Anaerobes are represented by gram-positive microorganisms - Bacteroides spp,. Fusobacterium spp., gram-positive cocci. Resident flora is sown in 86%, pathogenic strains in 7%.

Individual nosological forms can be caused by different microorganisms. Development of odontogenic periosteum and osteomyelitis caused by S. Aureus and Streptococcus spp., Anaerobic flora (Peptococcus niger, Peptostreptococcus spp., Bacteroides spp.) [4]. In non-odontogenic osteomyelitis, the main causative agents are methicillin-sensitive staphylococci (MSSA)-52%, coagulase-negative staphylococci (CNS)-14%, methicillin-resistant staphylococci (MRSA)-2%, and Pseudomonas [3]. Traumatic osteomyelitis is most often caused by S.aureus, Enterobacteriaceae spp., P. aeruginosa [5].

Purulent odontogenic infection of the soft tissues of the face and neck is associated with the selection of polymicrobial flora: Streptococcus spp., Staphylococcus spp., Peptostreptococcus spp., Bacteroides spp., F. nucleatum., Enterobacteriaceae spp., Veilonell spp., Veilonell spp., Veilonell spp., Veilonell spp. Anaerobic bacteria Peptostreptococcus spp., Bacteroides spp., Veilonellas spp are secreted in 50,9% of patients with phlegmon of the face and neck; Staphylococcus spp. - in 23,7% of observations, Streptococcus spp. - at 18,6% [2]. In purulent-necrotic phlegmon of the face and neck distinguish the field of microbial flora, which includes Streptococcus spp., Staphylococcus spp., Bacteroides spp., F. nucleatum, Actinomyces spp. Gram-negative and S. Aureus are sometimes identified in patients with severe disease [32].

The development and implementation of new methods and the indication of microorganisms have revealed a number of bacteria in the site of the foci of odontogenic infection, information about which was not available previously. These include representatives of the genus Atopobium (gram-positive obligate anaerobic cocci); Atopobiumparvulum and Atopobiumrimae; anaerobic gram-positive sticks Bulleidiaextructa, Creptobacteriumcurtum, Eubacteriumsulci, Mogibacteriumtimidum, Mogibacteriumvescum, Pseudoramibacteralactolyticusand Filifactoralocis, Dialisterpneumosintes, Centipedaperiodonti, Selenomonassputigena, [33].

Thus, the agents of infectious-inflammatory processes of the maxillofacial area and neck are representatives of different types of microorganisms, and odontogenic infection is characterized as polyetiological with the formation of inflammatory microbial associations in the focus.

Microbial biofilms in dentistry and maxillofacial surgery

Studies of the etiology of infectious diseases, including infectious and inflammatory processes of the maxillofacial area and neck, were conducted on the basis of the determination of pure cultures of microorganisms isolated from pathological focus. This traditional method of bacterial cultivation made it possible to investigate the bacteria and gave a clear answer to some aspects of the physiology of the microorganisms. Currently, most microbiologists have recognized that most microorganisms in natural and artificially created conditions exist in the form of structured, attached to the surface colonies - biofilms.

A biofilm is a microbial colony characterized by cells that are attached to the surface or to each other enclosed in a matrix sensed by extracellular polymeric substances, exhibiting a change in phenotype, which is manifested in various variations of growth parameters and expression of specific genes [26]. Microbial biofilms have been found to be the etiological factor of many acute and chronic bacterial infections in humans [18]. Pathology, the etiological agents of which are biofilms, is extremely diverse and includes: caries and its complications, periodontal disease, otitis media, cystic fibrosis, bacterial prostatitis, infectious endocarditis [31]. In addition to the tissues of the human body, microbial biofilms have been found on the surface of implanting devices: orthopedic structures, catheters, mechanical prosthetic heart valves, "rhythm drivers" [17].

A distinctive feature of microbial biofilms is their high resistance to various factors. Resistance to environmental agents is due to the peculiarities of the structure and operation of this multilevel system. Biofilms are multicellular clusters that are immersed in an exopolysaccharide matrix that supports and protects cells of microorganisms [15]. The matrix is penetrated by pores and channels that provide a uniform distribution of nutrients and metabolism of the metabolism with the surrounding biological fluid [19]. The outer layers of cells are more aerosolized relative to the inner parts, which provides favorable conditions for the activity of anaerobic microorganisms in the center of the biofilm [27]. The matrix of the biofilm in its composition differs in different types of microorganisms. It consists of 90% of polysaccharides, proteins, lipids, nucleic acids [29]. The activity of bacteria in a biofilm is ensured by intercellular interaction, which is carried out by signaling molecules, called Quorum-sensing (QS) [24]. In dentistry and maxillofacial surgery, microbial films that are "responsible" for the etiology of the carious process, diseases of the tissues surrounding the tooth, inflammatory processes of the maxillofacial area play an important role [32].

Studies have shown that pure cultures of E.faecalis, introduced into the root canal of the tooth, can form a biofilm on its walls. It has been established that even after endodontic treatment, microbial units were detected in the canals [25]. In periodontal diseases, microbial biofilms are found in the area of periapical abscesses, granulomas, and cysts in 83%, 69.5%, and 95%, respectively. The ability to form microbial cells was not detected in isolates isolated from the subperiosteal abscess [21].

The material described above confirms that microbial biofilms are a multilevel system that significantly influences the pathogenesis of many diseases, including the pathology of the maxillofacial area and neck. However, to date, only specific data on the structure of the specialized literature are found. In this connection, the study of microbial cells, which are formed by infectious-inflammatory diseases of the maxillofacial area and neck, is at the peak of the bough. tion of world science, to determine innovative ways to approach treatment and prevention of complications of this disease.

Investigation of microbial biofilms at the present stage

The discovery of biofilms is one of the greatest achievements of medicine in the last years of the twentieth century [9]. To date, microbial biofilm research has developed models that can be divided into several groups. Statistical - have a limited supply of nutrients and aeration, include options for forming biofilms in the wells of the tablet and allow for quantitative measurements. Dynamic models are constantly updated due to the continuous supply of fresh nutrient media, allowing them to be used for the study of the physical and chemical stability of biofilms. [23].

A more sophisticated model of biofilm research has been called microcosm. It may include different types of microorganisms and materials of the environment under study [20].

Microbial film studies can be performed with the aid of laboratory animals, which is the most appropriate and close to real-world model of microbial cell data observation [28]. Modern studies of biofilms using microscopy are aimed at identifying the extracellular matrix formed by groups of microorganisms, studying its physical, biochemical and topographic properties [6]. Methods that allow the visualization of microbial cell ultrastructure can be attributed to electron microscopy, confocal mass scanning microscopy. The second group of research methods is based on the sorption of dye molecules on the structure of the biofilm, followed by desorption in organic solvents [15]. Bioluminescence measurement is a new method of biofilm research and detection that can be used both in vitro and in vivo [30]. The method of fluorescence in situ hybridization has been used relatively recently for biofuel research in medicine [7,30].

The presented material shows that the research of bacterial biofilms is constantly being improved. Often time-consuming and high-tech techniques are used that require expensive equipment that sometimes makes it difficult to put into practice. At the present stage of the development of medicine, the development and practical use of simple and accessible methods of research on bacterial films is one of the priority areas of modern medicine.

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