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Rare Systemic Complications Following Minor Dental Surgery

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Abstract: ***Oral microorganisms can enter the general circulation through oral care procedures, all kinds of minor and major oral surgical procedures, injuries and oral soft tissue infections, and they can also enter the general body system by being guided and carried by the local immune system, both in the mouth and in the intestines where they are constantly swallowed. In the literature; It has been reported that bacteremia may develop even during tooth brushing, flossing and use of pressurized irrigation devices. They can cause fatal secondary infections as a result of the spread of bacteria in the bloodstream to various vital tissues of the body. Especially for patients in the risk group, the dentist can prevent the formation of secondary infections by changing bacterial properties by minimizing or preventing prophylactic bacteremia. It is very important for the physician to take preoperative and postoperative precautions in his approach to the patient in order to prevent life-threatening situations. As I mentioned in my thesis, a careful anamnesis, consultations with relevant doctors, adequate informing and monitoring of the patient in the post-operative period, understanding the complaints of patients after surgical voiding, preventing the occurrence of many fatal infections, and making preliminary diagnoses at an early stage and referring them to relevant medical departments are sometimes of vital importance.***

Keywords: Complications, Minor Oral Surgery, Dentistry.

1. Introduction

Every surgical procedure performed on the human body may cause various complications in the post-operative period. Complications that occur especially after surgical procedures can have serious consequences that can endanger the patient's life due to the responses of the bacterial and immune system. Any surgical intervention performed in the oral region should be closely monitored in the postoperative period. Minor oral surgery is not taken into consideration by patients and sometimes by dentists. The aim of this thesis is to raise the necessary awareness in the preoperative and postoperative approaches of physicians performing procedures in the oral region by providing information about some secondary infections that may be rare as a result of minor surgical procedures in the oral region and that may endanger the patient's life. and to increase awareness about taking postoperative precautions [1-5].

2. Oral Microflora and Surgery

2.1 The structure of the oral microflora

The oral cavity, which is the body's gateway to the outside world, has a surface area of approximately 215 cm2. It is one of the richest microbial habitats of the human body, containing bacteria, archaea, fungi and viruses. Cheek epithelium, dorsum of the tongue, and supragingival environments are distinctly different ecosystems. The supragingival environment is exposed to saliva, food and drink. The subgingival environment is washed with gingival crevicular fluid. Most of the microorganisms found in the mouth are located in the biofilm layer. After determining the effect of oral microflora on systemic diseases of the body, interest in microorganisms in healthy and diseased mouths has increased. Most of the studies performed were haematological. Numerous studies have been conducted on the frequency of bacteremia and septicemia occurring after the extraction of infected, acutely infected normal teeth. Some of the studies conducted are aimed at distinguishing some bacteria found in the mouth of various oral diseases and normal individuals at the species level. There are also studies showing that the normal flora of the mouth can heal wounds in the mouth. It has been reported that not cleaning the wound surface during surgeries causes bacteria to be present in these areas, which delays healing. Some researchers have shown that washing the surgical area before, during and after the operation reduces the frequency of avleolith. There is a community of bacteria normally found in the mouth, namely oral flora. The oral flora settles and lives in the host without making any noticeable harmful changes. The microflora in the oral cavity can be divided into temporary and permanent flora. Aerobic bacteria found in normal oral flora; alpha hemolytic streptecocus, non-hemolitic streptecocus, staphyloccus albus, corynebacterium, leptothrichia, nocardia, neisseria and haemophilus bacteria. Anaerobic bacteria found in the normal flora are anaerobic streptococcus, fusiform bacteria, veilonella, lactobacillus, borrlia, leptospira, vibrio and actinomyce bacteria [3-8].

Unless the balance in the host-parasite relationship is disrupted for any reason, the pathogenic properties of normal microflora are not determined. When the balance is disrupted, the parasite acquires the ability to cause disease. Transient flora consists of microorganisms that disappear after being in the normal and diseased mouth for a short or long time. These sometimes live in the oral cavity without causing disease, and sometimes as disease agents. Beta hemolytic streptococcus, stphylococcus aureus, diplococcus pneumoniae, pseudomonas, alcaligenes, salmonella, escherichia, klebsiella, moraxella, proteus, mycobacterium and treponema are bacteria of the genus. Various factors are effective in the settlement and reproduction of microorganisms in the oral flora [5-9].

Oral microorganisms can even affect systemic health. To date, approximately 400 bacterial species have been identified in subgingival plaque. In addition, the presence of approximately

300 different bacterial species has been detected in other parts of the mouth. Someone who does not have good oral care has 100 million-1 billion bacteria in just one tooth. As can be seen, working in a place where there is such a wide bacterial flora in minor surgical procedures involving the oral region brings a very high risk of developing systemic infections. Before and after all surgical interventions involving the oral region, the physician should take into account the general condition of the patient and perform all necessary disinfection, sterilization, asepsis and antisepsis procedures, and also take a very sound anamnesis of the patient who will undergo surgical intervention to prevent local and systemic infections that may occur in the post-operative period. . Common infections caused by dental abscess: Fusobecterium, parvimonas, prevotella, porphyromonas, dialister, streptococcus and treponema species are found. Species richness and interactions between species can determine pathogenicity and influence the development of acute infections [1-3,8-12].

In addition to microbiological factors, host-related factors can also change the severity of the infection. Diabetes, herpes virus infection, stress, corticosteroid use, autoimmune and immune system may affect the progression of the infection. It may induce a chronic or acute inflammatory response after surgical procedures. Before surgical interventions, it is very important that the infection in the relevant area is diagnosed accurately by the physician, whether it is acute or chronic. In acute infection, the patient has symptoms of systemic involvement such as pain and swelling of varying severity, fever, trismus, lymphadenopathy, malaise, headache and nausea. In these cases, antibiotics should be prescribed in addition to general disinfection and sterilization measures. Most of the bacterial species associated with infection in the oral area are sensitive to penicillin. In this case, Amoxicillin is the first choice if the patient is not allergic to penicillin. In the presence of serious infection, including life-threatening conditions, it may be necessary to combine amoxicillin with clavulanic acid or metronidazole to achieve the optimal antimicrobial effect against penicillin-sensitive species. These measures, which are not taken at an early stage, can spread to soft tissues, affect facial areas, and progress to life-affecting situations. Fascial area infections have the possibility of changing and potentially serious. For this reason, physicians must be very careful during preoperative and postoperative surgery against the risk of infection [1-4,12-16].

2.2 The Relationship Between General Health and Oral Health

The phenomenon of health and disease is closely related to the socio-economic structure of society, as we mentioned in the social model of health. The measures to be taken and the studies to be carried out to improve public health will only be possible by understanding these socio-economic factors that affect health. These factors are called “social determinants of health.” Social determinants of health affect health directly or indirectly. In addition, these factors not only affect health, but sometimes they can also affect each other. In other words, a negativity experienced in the social sphere triggers another negativity and leads to the deepening of existing health problems. Social determinants of health are the conditions in which people are born, grow up, live, work and age. These conditions are shaped by economic and social policies and political facts. These determinants can be redesigned or new ones can be created in line with the decisions of policy makers in order to create a healthier society. Social policies are of great importance for the sustainability of a healthy social life. According to the World Health Organization, the factors that negatively affect health and the uneven distribution of access to health are not the result of a “natural” process but the result of a combination of bad social policies and unfair economic regulations. Today, even in countries with a high level of prosperity, individuals in the low-income segments of the society are more exposed to diseases and their life expectancy is shorter than the rich segments of the society. This proposition draws attention to social differences and social inequalities in terms of benefiting from the right to health [1-5,1-20].

Oral bacteria, especially Streptococcus Mutans, A.actinomycetemcomitans, T.denticola and P.gingivalis, have been implicated in atherosclerotic plaques, heart valves, aortic aneurysms, brain abscesses and joints. Although the main concern about bacteremia is related to dental procedures, bacteremia during daily events such as chewing and brushing teeth should be taken into consideration, especially in terms of atherosclerosis. According to the World Health Organization, economic and social policies determine whether a child will survive, grow up well, live a good life, or end his life early. The development of a society with a high or poor level of prosperity is evaluated in terms of the quality of health of its population, how equitably social health services are distributed, and the assurances provided to individuals regarding health. These criteria are related to macro policies. It is also concerned with the social determinants of health, starting from the early lives of individuals and covering their entire lives. Health is not only the absence of disease but a state of complete physical, mental and social well-being. Oral and dental health is also included in the state of well-being. However, the most common sources of infection in the world are infections occurring in the mouth and surrounding tissues. This shows that oral diseases and related conditions are not taken seriously. In the history of oral and dental health being related to general health, there is the Focal Infection theory, which was put forward by Huntur in England in the 1900s and led to dentists becoming a profession. The exaggerated attention paid to this theory has left people toothless; The science of endodontics has been prevented from developing in other dental treatments and preventive approaches. Scientific examination of this theory over time has shown that very few of the previous studies were controlled studies and were mostly based on hearsay [1-3,20-23].

3. Infective Endocarditis and Dentistry

3.1 What is Infective Endocarditis?

Infective endocarditis is an endocardial or endothelial infection caused by bacterial, viral or fungal agents. It is also known as an infection of the innermost layer of the heart and valves that develops after bacteria in the bloodstream reach the heart. Despite advances in diagnosis, treatment, surgical techniques and complication management, it can still cause significant death and disease in individuals in risk groups. The greatest risk group is individuals with anatomical lesions in the cardiovascular system. Although it often affects the heart

valves, it can be seen in intra-cardiac patches in patients with shunt use and in patients with congenital heart defects. There are some features that increase the importance of infective endocarditis. The first of these features is; The disease's incidence or mortality has not decreased in the last 30 years. Despite significant advances in diagnosis and treatment, the prognosis of the disease is still poor and mortality is high. Second feature; Since infective endocarditis is not a uniform disease, the initial clinical picture depends on an underlying cardiac disease, microorganisms involved in the process, the presence or absence of complications, and the patient's characteristics may present differently. For this reason, infective endocarditis is of great concern to primary care physicians, cardiologists, surgeons, mycobiologists, infectious disease specialists and generally other specialists such as neurologists, neurosurgeons, radiologists and pathologists [24-28].

3.2 Diagnostic criteria for infective endocarditis

The changing epidemiological profile and diverse nature of infective endocarditis poses a diagnostic challenge. It has extremely variable properties depending on the causative microorganism, the presence or absence of heart disease, and the way it occurs. Endocarditis can be a rapidly progressing infection, or it can manifest itself as a subacute or chronic disease. However, in this case, the presence of low-level fever and nonspecific symptoms may hinder or confuse the initial evaluation. That's why the patient can consult various specialists and they can consider a number of alternatives, from rheumatological and autoimmune diseases to malignancy. It is strongly recommended that a cardiologist and an infectious disease specialist be involved in the process at an early stage to guide the treatment. Up to 90% of patients have fever and are often accompanied by systemic symptoms such as chills, loss of appetite and weight loss. Heart murmur was detected in 85% of the patients. Although classic textbook symptoms can still be seen in developing countries, peripheral manifestations of infective endocarditis are increasingly less common in developed countries as patients present to a healthcare facility in the early stages of the disease [24-28].

Infective endocarditis should be suspected in the presence of the following symptoms: New onset heart failure murmur, embolic events of unknown origin, sepsis of unknown origin, fever is the most common finding in infective endocarditis. Suspicion of infective endocarditis is strengthened if fever is associated with: Presence of intra-cardiac prosthesis, previous history of infective endocarditis, previous valve disease or congenital heart disease, other conditions that predispose to infective endocarditis, presence of predisposition and recent attempts at bacteremia, evidence of congestive heart failure, new onset conduction disturbance, blood containing typical microorganisms that cause infective endocarditis, culture or positive serology for chronic Q fever, vascular or immunological events, focal or nonspecific neurological signs and symptoms, evidence of pulmonary infiltration in pulmonary embolism, peripheral abscesses of unknown cause [24-28].

3.3 Clinical and Laboratory Findings of Infective Endocarditis

Findings of infective endocarditis are fever, tachycardia, chills and shivering symptoms, weakness, loss of appetite, weight loss, sweating, joint pain, cardiac findings, dermatological findings: petechiae osler nodules, splinter bleeding, janeway lesions, club finger, splenomegaly, eye symptoms, findings related to bacterial embolism, kidney findings laboratory findings: (anemia, leukocytosis, or leukopenia, thrombocytopenia, increased sedimentation or C-reactive protein, proteinuria, microscopic hematuria and erythrocyte casts, rheumatoid factor positivity may be noted). Another diagnostic method for diagnosing infective endocarditis is the Duke criteria [24-28]. The physician must first have information regarding the diagnosis of endocarditis. In 1994, Duke and colleagues (29) introduced criteria for the diagnosis of endocarditis. According to Duke's criteria, the disease criteria are divided into 3 categories. Definite infective endocarditis, possible infective endocarditis, those who are not likely to have infective endocarditis. In short, in order to make a definitive diagnosis using clinical criteria, at least 2 major or 1 major + 3 minor or 5 minor criteria must be present together. Major Criterion: (+) blood culture, endocardial involvement findings. Minor Criteria: Predisposing factors, fever $\geq$ 38, vascular events (embolism, Janeway, lesions), immunological events (osler nodule, roth stain, RF positivity), microbiological findings, echo cardiogram.

3.4 Patients with Infective Endocarditis Risk Group

The use of antibiotic prophylaxis in preventing infective endocarditis is limited by the lack of strong evidence and also by the lack of routine antibiotic prophylaxis (disadvantage resistance, adverse drug reactions). Prophylaxis is usually achieved by administering a single dose of antibiotics expected to cover potential pathogens 30-60 minutes before such procedures. Observational, epidemiological data from the post-guideline period have not been strong enough to resolve the controversies. Although the incidence of Infective Endocarditis is low, preventive measures are required due to high mortality and morbidity rates and difficulty of treatment. Previous guidelines recommend antibiotic prophylaxis in patients with intermediate or high risk of Infective Endocarditis and cardiac conditions undergoing a wide range of invasive procedures that can cause bacteremia, including invasive dental procedures. The low incidence of the disease makes it virtually impossible to conduct an adequately powered prospective randomized controlled trial investigating the effectiveness of prophylactic antibiotics in preventing Infective Endocarditis. Data on prophylaxis were obtained mainly from studies in which bacteremia was considered a predisposing factor for endocanditis. In the absence of randomized controlled trials and other high-quality data supporting the routine use of antibiotic prophylaxis, there has been a shift in approach in major society guidelines [24-28].

4. Bacteriamia and Sepsis in Terms of Dentistry

In research, various bacteria found in the oral mucosa have also been found in arteriosclerosis lesions. For example, the bacterium called Clamidia pneumoniae, found in the mouth, pharynx or bronchi, has been investigated in detail and it has

been observed that this bacterium enters the bloodstream through monocytes. It was subsequently understood that this invasion mechanism is an important factor in the development of atherosclerosis. It is useful to classify the bacteria that cause sepsis in the oral area as strong and weak bacteria. Weak bacteria are common and often cause opportunistic infections. The infection conditions resulting from the entry of these bacteria into the body are not severe, and it has been observed that it heals spontaneously without any problems, except for patients with suppressed immune systems. On the other hand, strong bacteria destroy the artery wall and heart valves after adhesion. In some severe cases, this destruction can result in the death of the patient. This group of bacteria includes syphilis, tuberculosis, salmonella, staphylococci (some types) and streptococci. Strong bacteria such as streptococci are found in the oral cavity and easily infect and damage the heart valve and vascular walls after operations such as tooth extraction, surgery, and periodontal treatment. Additionally, viruses such as cytomegalovirus can enter the body from the oral cavity and cause opportunistic infection. Cytomegaloviruses have also been found in infected abdominal aortic aneurysmal walls. For this reason, the possibility of sepsis should be taken into consideration in both surgical and non-surgical procedures performed in the oral region. Bacteremia is an infection caused by bacteria entering the bloodstream. It may also be called septicemia, sepsis, septic shock, blood poisoning, or bacteria in the blood [30-33].

Sepsis is a word meaning decay in Greek, introduced into medical literature by Hippocrates, and was used at the time to describe tissue destruction that caused disease or death. After the recognition of the microorganism in the nineteenth century, it began to be perceived as a condition caused by bacteria and as synonymous with the appearance of bacteria in the blood and the invasion of tissue by microorganisms. For nearly forty years, a large number of studies have been conducted on sepsis using the term septicemia. Bacterial endotoxin; It has been determined that it affects many humoral pathways such as complement, kinin and coagulation system. The idea that the host factor is passive in the formation of sepsis and that the bacterial factor is responsible for the entire clinical process has been replaced by the idea that the excess in the host's defense system causes this. Certain standards have been introduced for the diagnosis, monitoring and treatment of sepsis. Systemic inflammatory response syndrome (SIRS) SIRS; It is a systemic inflammatory response that manifests itself with different clinical findings. Two or more of the four criteria listed below are indicative of this response. The presence of these Criteria in many cases indicates the prevalence of SIRS: Body temperature > 38 C or < 36 C, Heart rate > 90/minute, Respiratory rate > 20/minute or PaCO2 > 32 mmHg, White blood cell count > 12,000/mm3 or <4000/mm3 or immature cell rate > 10% [30-33].

Sepsis diagnostic criteria: The presence of a proven or suspected infection and the presence of some of the following are used as sepsis diagnostic criteria. General criteria: Fever (> 38.3 C), Hypothermia (< 36 C), Heart Rate >90/minute or >2 SD (according to age), tachypnea, changes in consciousness, Marked edema or positive fluid balance (>20ml/kg in 24 hours), Hyperglycemia (plasma glucose level>120 mg/dl or 7.7 mmo/l in a patient without diabetes), Inflammation markers: Leukocytosis (white blood cell count >12,000/m2), Leukopenia (white blood cell count <4000/mm3), Normal white blood cell count and immature forms more than 10%, Plasma C-reactive protein >2 SD, Hemodynamic markers: Arterial hypotension (systolic blood pressure < 90 mmHg, MAP < 70, or a drop in systolic blood pressure of more than 40 mmHg or a drop of 2 SD below normal values for age), SvO2> 70%, Cardiac index> 3.5 L/minute, Organ dysfunctions, Arterial hypoxia (PaO2/FiO2>300, acute oliguria, Increase in keratin > 0.5mg/dL, Coagulation disorders: thrombocytopenia, hyperbilirubinemia, tissue perfusion, Hyperlactemia (>1 mmol/L), Decrease in capillary refill [30-33].

5. Septic Pulmonary Emboli Developing Secondary to Surgical Interventions

Septic pulmonary embolism is a disease with high morbidity and mortality that spreads from the primary infection focus by hematogenous means, and usually has bilateral involvement in the lungs because it spreads by hematogenous spread. Lesions are often found on chest radiography in patients complaining of chest and back pain. Multiple cavitary lesions can be observed on thorax computed tomography. It is also a disease with leukocytosis, high sedimentation and C-reactive protein levels, and the primary focus of infection is dental. Septic pulmonary embolism (SPE) is a rare disease that manifests itself with fever, respiratory symptoms and lung infiltration. Diagnosis is often difficult because initial clinical and radiological features are often nonspecific. Risk factors associated with SPE are intravenous (IV) drug use, pelvic thrombophlebitis and suppurative events related to the head and neck. Although the posterior-anterior chest radiograph often has a nonspecific appearance, peripheral, cavitating lung nodules can rarely be seen. Thorax computed tomography (CT) is more helpful in imaging peripheral cavitary lesions. The presence of infiltrates on chest X-ray, bilateral and multiple cavitary nodules located subpleurally on chest CT, and signs of infection in another focus are important clues that pneumonia may be of hematogenous origin. Septic embolism is a rare disease and very difficult to diagnose. Septic embolism was previously considered an important complication of septic pelvic thrombophlebitis secondary to septic abortion or post-puerperal uterine infection. However, in recent years, it has become common with the widespread use of intravenous catheters and the increase in intravenous drug addiction. (46) Drug addiction includes alcoholism, lymphoma, skin functions, congenital heart diseases, osteomyelitis, mastoiditis, A-V shunts in cases undergoing hemodialysis, liver abscess, periodontal diseases, toxic shock syndrome [34-36].

Characteristic feature of septic embolism; fever, lung infiltration and the presence of an extra-pulmonary focus of active infection. In cases of septic embolism, progression to septic fever, dyspnea, cough, pleuritic chest pain and hemoptysis are observed. In addition, in some cases, chest back pain, bilateral infiltrates on chest X-ray and thorax CT, and a history of inflammatory surgery as a focus of extra-pulmonary active infection are observed. Radiological findings are multiple, small opacities mimicking diffuse pronchopneumonia, wedge opacities in the lung periphery, bilateral nodules, nodules. It may appear as cavitations. If

acute septose emboli is massive, it may be accompanied by hilar or mediastinal lymph node enlargement. CT is guiding in suspicious cases. Cavitating nodules at different stages and subpleural and wedge-shaped opacities with consolidation areas localized in some pulmonary vessels (a sign of feeding vessels) may be seen. Cavitation may also occur in aseptic emboli, but when cavitation is observed, it should be considered that bacterial infection may have been added to the thromboembolic infarction. Additionally, tuberculosis, fungal and gram (-) infections, parasitic infections (hydatid cyst), metastasis, rheumatoid arthritis, and Wegener's granulomatosis should be considered in the diagnosis. In treatment, the source of infection should be eliminated and appropriate microbial treatment should be performed. As a result, septic embolism should be considered in cases where bilateral and peripheral infiltrates are seen on chest radiography, subpleurally located cavitary nodules are seen on thoracic CT, and there are signs of infection in another focus [34-36].

6. Acute Meningitis After Oral Surgery

Although very rare in the literature, it has been observed that meningitis may develop as a result of oral surgical procedures. (48) Classical findings of acute bacterial meningitis are fever, headache, meningeal irritation findings and cerebral dysfunction findings. The prodrome period is short-lived in most cases and quickly results in local signs and symptoms. Fever is the most common sign and symptom. It may be accompanied by loss of appetite, upper respiratory tract infection findings, myalgia, arthralgia, severe weakness, sweating, tachycardia, hypotension and skin rash. Local signs and symptoms occur as meningeal irritation; Headache stiffness, nausea, vomiting, Kerning and Brudkinski symptoms. Babinski and similar pathological reflexes are observed. Symptoms such as headache, nausea and vomiting, which are important in the diagnosis of meningitis, are seen in less than 50% of adults. Vomiting is more common in children. There may be no signs of meningeal irritation. Or neck stiffness, Kernig and Brudzinski signs may be detected alone or together. Kernig's sign; When the patient lies on his back, the hip is flexed on the abdomen, and when the knee is brought to flexion, the other knee is also flexed, and the patient resists when the leg is passively extended. Brudzinski's sign is seen as passive flexion of the neck and flexion of the hip and knee [37-39].

If clinical diagnosis and findings suggest meningitis, lumbar puncture (LP) should be performed. Diagnosis is made by examining the CSF obtained by lumbar puncture. Signs of increased intracranial pressure include dilated or non-reactive pupils, abnormal eye movements, drowsiness, bradycardia, hypertension, respiratory problems, and Cushing's reflex. The fundus of the eye is evaluated for papilledema. If there is no increased head pressure, papilledema, coagulation disorder, thrombocytopenia, or infection in the area where the LP will be performed, LP can be performed. Normal CSF is clear and colorless, CSF cell count is 0-5 lymphocytes/mm3, CSF protein is 15-45mg/dL, CSF glucose is 50-80 mg/dL. The diagnosis of acute bacterial meningitis is based on clinical findings and CSF examination. Cranial imaging methods have a limited place in the diagnosis of bacterial meningitis. However, they are useful in detecting other pathological conditions and complications in the brain [37-39].

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