

AN UPDATE AT THE INTERFACE BETWEEN INFECTIOUS PATHOLOGY AND THE STOMATOGNATHIC SYSTEM

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ABSTRACT

The stomatognathic system normally hosts of an extremely diverse microbial flora responsible for the anti-infectious defence, but which, preponderantly in some special categories of patients, through dissemination or toxin release, may have an unfavourable influence on patients' health state. Both dental patients and medical staff are also exposed, due to direct contact with mucus and secretions of the stomatognathic system, to a great number of non-bacterial pathogens, such as hepatitis virus B or C, Epstein-Barr virus, herpes simplex virus 1 or 2, HIV, fungi, which colonize, infect or are just expressed at this level. A large series of infectious diseases have primary or secondary manifestations located in the area of the stomatognathic system, and a well-trained medical personnel can decisively contribute to avoid the spreading or aggravation of infection, by setting an early diagnose or an adequate treatment.

Keywords: bacteraemia, hepatitis, immunodepression

The stomatognathic system hosts an extremely diverse microbial flora, present in impressive quantities (10^{11} microorganisms / mg of dental plaque [1]), with an important role in the body's defence system, but which can sometimes contribute to the emergence of local or general infections especially in immune-compromised patients.

Endodontic and periodontal infections are usually determined by an association of microorganisms, mostly anaerobic, Gram negative, and over 200 different species have been encountered in apical periodontitis [2] and 500 in marginal periodontitis [3].

Dental interventions, many of which are quite common, are often followed by a haematogenous dissemination of some of these bacteria, causing severe systemic infections (infectious endocarditis, acute myocarditis, cerebral abscess, cavernous

sinus thrombosis, sinusitis, angina, orbital or laterocervical cellulites, infections of articular prostheses) in some groups of patients (with cardiac valvular disorders, diabetics, oncologic patients, HIV-infected). According to a study by Heimdahl, bacteraemia emerges in all patients after dental extraction, in 70% of patients after scaling, in 55% of them following surgical treatments of molars, in 20% of patients after endodontic treatments and in 55% succeeding amigdalectomy [4].

Dissemination of these microorganisms is extremely rapid through the blood stream and it is estimated that in less than one minute after the stomatological intervention these bacteria reach the area of the heart, lungs or the peripheral capillary network [5].

This bacteraemia is in most cases transitory, as the patient does not present clinical symptoms (sometimes, a small rise in

body temperature may occur), while microorganisms released in the circulatory system are eliminated under the action of the phagocytary system.

Infections of the stomatognathic system may have an unfavourable influence even in the absence of the haematogenous dissemination of bacteria. Synthesis and release of exotoxins at the level of Gram positive bacteria or of components of the cell wall (lipopolysaccharides), after the death of those Gram negative, may be the cause, directly or through the immune system (chronic inflammation), of a large series of disorders (febrile syndrome, shock, myocardial infarction, chronic rash, colitis, Crohn's disease).

Both dental patients and medical personnel find themselves exposed, due to contact with mucus and secretions of the stomatognathic system, to a great number of non-bacterial pathogens which colonize, infect or are just present at this level, such as hepatitis B (HBV) or C (HCV) viruses, cytomegalovirus, Epstein-Barr virus, herpes simplex virus 1 or 2, HIV, fungi.

These may be transmitted most frequently in a direct manner or through objects (medical equipment or contaminated surfaces). As the area in question is situated at a junction between the respiratory and the digestive systems, transmission by aerogeneous route of some pathogens (influenza virus, *Mycobacterium tuberculosis*, pneumococci) is easily possible, favoured by the small distance between doctor and patient and, at times, by the lack of adequate protection measures.

Hepatitis B represents one of the most commonly spread infections worldwide and a major risk for dentists, due to the great number of virus carriers and considering how easy the inter-human transmission of the virus occurs.

According to the latest numbers of the World Health Organization [6],

approximately 1/3 of the global population has contacted HBV, and 240 million people are chronic carriers of the virus. It is estimated that 600,000 patients die each year due to natural evolution or complications of acute or chronic infections with HBV.

Thus, HBV infection is a major health problem worldwide, considering the large number of patients and the serious consequences of the infection which, once it becomes chronic, it is difficult, if not impossible, to eradicate, not to mention the high costs (direct or indirect) required for the treatment of such patients.

Given the amplitude of the problem, urgent measures need to be taken to enlarge immunization programs, ensure therapeutical intervention in patients with chronic infection and proper education to prevent transmission of illness.

The main mode of transmission of HBV varies geographically and depends also on the degree of social and economic development. In developed countries, sexual contact or use of intravenous drugs are most commonly recorded, and in underdeveloped countries, lacking national immunization programs, the main routes of transmission are preponderantly vertical or parenteral (medical manoeuvres, blood transfusions). In both cases, HBV is a major occupational risk for the medical staff, irrespective of their field of activity.

Due to virus' high concentration in blood and high resistance to environmental factors (it survives in dried blood, at room temperature, for approximately one week), it is estimated that its transmission rate is 50-100 times higher in comparison with HIV [6].

According to Voiculescu [7], Romania is situated into the medium endemic zone, if we are to consider prevalence of HBsAg carriage, which varied, in 2010, between 2.15% and 7.91% (medium value 5.59%).

In the HBV-infected patient, the virus is present in several organs and tissues, in large

quantities in blood, serum, wound secretions, in medium quantities in saliva, sperm or vaginal discharge, and in low quantities in urine, faeces and maternal milk.

Following an accidental sting with a needle contaminated with infected blood coming from an HBsAg+, HBeAg+ patient, the risk of developing acute hepatitis is 22-31% and the risk to develop an initially asymptomatic infection is 37-62%. If the patient is HBeAg negative, the risk is thought to be smaller: 1-6% for acute symptomatic infection and 23-37% for an asymptomatic one.

HBV transmission from doctor to patients in dental practices has not been reported in the US since 1987. Proven transmission of HBV between two patients of the same doctor is extremely rare, two cases having been reported in the US in 2003 and 2007 [8].

Anti-HBV vaccination of dentists prevents virus transmission from patient to doctor, but not between different patients treated with potentially non-sterile surgical equipment.

Hepatitis D virus (HDV) is RNA defective, resembling in structure the satellite viruses of plants. It is dependent on hepatitis B virus for replication and pathogenesis. HDV geographical spreading is universal, our country together with Southern Italy and some regions in Russia being considered as zones with high prevalence of double infection (20% among asymptomatic HBV carriers and 60% of chronic hepatitis B)[9]. Transmission modes of HDV are similar to those of HBV, and double infection usually has a "noisier" clinical picture, a more rapid evolution towards aggravation and limited therapeutic possibilities.

Hepatitis virus C (HCV) is an RNA virus of the *Flaviviridae* family and the infection it causes may take varied forms, from asymptomatic to auto-limited acute forms and chronic infection with a potential to evolve towards cirrhosis or hepatocellular carcinoma. Worldwide, it is estimated that

there are 150 million people with chronic hepatitis, 3-4 million being infected each year; 150,000 people die each year from disorders related to HCV infection [10].

Transmission of HCV is mostly parenteral, through contact with contaminated blood, during medical or dental manoeuvres with non-sterile surgical equipment, tattoos or piercings made in unsafe conditions, among users of intravenous drugs. Other less frequent modes of transmission include sexual contact and common use of personal hygienic items. Transmission rate through blood transfusion and haemodialysis has dropped significantly in the last years in developed countries [11].

Viral RNA is present in saliva and salivary glands of patients with sialadenitis [12, 13], on toothbrushes of viremic patients [14], its concentration in gums being much bigger than in saliva [15].

Although dentists, like the rest of the medical staff, are highly exposed to infection with HCV, available data suggest that the risk of transmission is smaller than for HBV [16, 17], and the prevalence of chronic infection contacted in dental practices is comparable with that in the general population, according to the study by Ashkenazi [16].

Therapy of chronic infection with HCV involves high costs (on behalf of the medical system), it is time consuming, is frequently associated with side effects, and the eradication of the virus is not guaranteed, not even with the latest drugs present on the market. In Romania, the treatment is available free of charge for patients who benefit from the public health insurance system, and according to unofficial data, between 1997 and 2007 approximately 20,000 patients received treatment.

The emergence of HIV infection in the early 1980's, its rapid pandemic spreading and inexorable evolution towards AIDS and death, the impact on the individual and social life of

those infected (family, profession), as well as on the health of the population in general and on the global economy, marked the end of the 20th century and the beginning of the 21st.

WHO reports that about 34 million people around the globe are at present HIV infected, among which 3.4 million are children. The great majority of them (22.4 million) live in Africa; Eastern Europe may host between 1.3 and 1.7 million seropositive subjects. For 2010, a number of 2.7 million people are estimated to have been newly infected with HIV, while 1.8 million died from this infection [19].

In Romania, at the end of 2011, there were 9428 HIV-infected patients registered, most of them young adults. 80% of patients undergo anti-viral treatment, all costs borne by the national health insurance system.

Oral lesions are an important and frequently met component of the large clinical spectrum that derives from this infection. Almost 40 types of lesions of the stomatognathic system have been described, some present from the incipient phase of the disease, others common in patients with AIDS and advanced immunosuppression.

Oral manifestations in HIV infection are not generally pathognomonic, as they may be present in other categories of patients too. However, some of them are frequently associated to severe immunodepression that comes with the natural evolution of HIV infection: oral erythematous or pseudomembranous candidiasis, oral hairy leukoplakia, gingivitis or necrotizing ulcerative periodontitis, Kaposi's sarcoma or non-Hodgkin's lymphoma [20].

A major priority of any doctor treating a HIV-seropositive patient is to minimize the risk of exposure for himself or other members of the medical staff, or that of other patients

in relation with pathological products of the HIV-infected patient. Saliva by itself may contain small quantities of virus and has low infectious potential, but it can easily mix with blood during dental procedures, representing a high risk for infection. The use of standard protection measures to prevent contact between these pathological products and teguments or mucous surfaces of medical staff is essential in stopping direct transmission of the virus from patient to doctor, while correct sterilization prevents transmission from patient to patient.

Anti-HIV treatment has registered a significant progress since the end of the 1980's, when life expectancy for a patient with AIDS was under 2 years. At present, given the multiple classes of antiviral substances available, the associated highly active treatment and a good patient compliance, their life expectancy reaches the medium estimated for the non-infected subjects.

Nevertheless, antiretroviral therapy has adverse effects with possible manifestations at the level of the stomatognathic system too. The most frequent ones are xerostomia, chapped lips, and angular non-fungal cheilitis. This dryness of the oral mucus may determine a rapid deterioration of dentition, especially in patients with preexistent periodontal disease [21].

It was thus determined that a large variety of infectious diseases have primary or secondary manifestations located in the area of the stomatognathic system, and a well-trained medical personnel may contribute decisively to limit the spread or aggravation of the infection, by establishing an early diagnose or initiating an adequate treatment for this type of manifestations.

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