Clinical and microbiological assessment of chronic generalized periodontitis in patients with fatty liver disease.

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Abstract. Currently, standard methods for diagnosing chronic periodontitis include clinical (bleeding indices, periodontal pocket depth, tooth mobility) and instrumental (X-ray, computed tomography) methods. At the same time, patients with chronic generalized periodontitis (CGP) show additional changes in laboratory diagnostics of the oral microbiome, inflammatory mediator system, and vascular wall, which may alter the clinical picture of the disease.

Keywords: diagnosis, periodontitis, fatty degeneration, comorbidity, oral microbiome.

INTRODUCTION. Periodontal tissue diseases are one of the pressing issues in modern periodontology, significantly affecting the general and social health of patients. Chronic generalized periodontitis (CGP) is an inflammatory and destructive periodontal disease that leads to the destruction of the ligamentous apparatus of the teeth and progressive bone loss. In recent years, increasing attention has been paid to systemic factors that aggravate the course of GGP, among which fatty liver disease (FLD) plays a special role—a pathological condition accompanied by excessive accumulation of lipids in hepatocytes [1,3,6]. Despite growing interest in studying the relationship between periodontal disease and systemic metabolic disorders, the diagnosis of CPD in FLD remains an underdeveloped area. The lack of clear diagnostic algorithms and biomarkers specific to this category of patients makes it difficult to detect and monitor periodontal disease in a timely manner.

In fatty liver disease, fat droplets are deposited and accumulate in hepatocytes. Fatty infiltration of the liver causes blockage of the bile ducts and bile stasis, leading to degenerative changes in liver tissue [7].

This is accompanied by symptoms such as a bitter taste in the mouth and loss of appetite, yellowing of the sclera and skin, and the mucous membrane of the oral cavity. Patients complain of a feeling of heaviness in the right upper quadrant and a deterioration in their general well-being. Impaired liver cell function contributes to

the formation of bile micelles with a high cholesterol content. In this regard, it is necessary to conduct research aimed at studying the pathophysiological mechanisms of this relationship, developing new diagnostic criteria, and introducing a multidisciplinary approach to the diagnosis and treatment of such patients [2,4,5,7].

The aim of our study was to investigate the composition of periodontal pathogens in patients with periodontal disease and fatty liver disease.

Materials and methods. This study is a clinical observational study aimed at investigating the characteristics of the diagnosis of chronic generalized periodontitis (CGP) in patients with fatty liver disease (FLD). The work was carried out between 2024 and 2025 at the Department of Maxillofacial Surgery and General Dentistry of the Tashkent Medical Academy. A total of 94 people were included in the study, 74 of whom had chronic generalized periodontitis. The main group included 38 patients diagnosed with moderate chronic generalized periodontitis (CGP) with background pathology of fatty liver disease. The comparison group included 36 patients without somatic pathologies but with moderate chronic generalized periodontitis. The control group consisted of 20 practically healthy individuals. Depending on their age, these patients were divided into the following categories: 20-31 years old: 27 (28.7%); 30-41 years old: 22 (23.4%); 41-50 years old: 29 (30.8%); 51-63 years old: 16 (17.0%). (Fig. 1).

Before the study began, all patients were informed and signed an informed consent form to participate in the study.

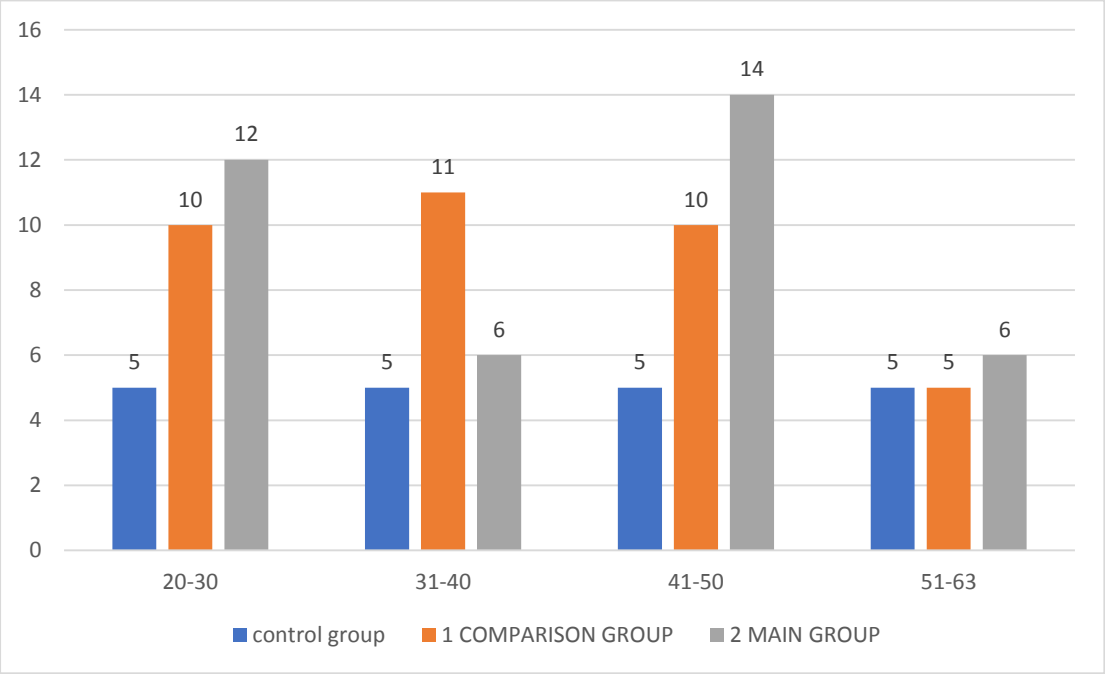
Patients with bleeding gums (IK) when eating solid food and brushing their teeth, inflammation - hyperemia, swelling, bleeding gums, as well as pathological pockets were selected for the study. The clinical examination included a questionnaire, external examination, and examination of the oral cavity. All patients were examined in a dental chair under natural and artificial lighting.

A standard set of dental instruments (mirror, tweezers, probe) was used, and a button probe was used to determine the depth of the periodontal pocket. Microbiological examination of periodontal pathogenic microflora was performed to determine the quantitative and qualitative composition of microorganisms associated with inflammatory periodontal diseases. Material from periodontal pockets was collected using sterile paper sticks, placed in a transport medium, and delivered to the laboratory for analysis. The pathogens were identified by sowing them on selective nutrient media, followed by determination of the species of microorganisms and their concentration (in CFU/ml). Particular attention was paid to determining the content of such key periodontal pathogens as Porphyromonas gingivalis, Tannerella forsythia, Prevotella intermedia, Treponema denticola, and Aggregatibacter actinomycetemcomitans, as the most significant representatives of the “red complex” associated with periodontitis, a genetic approach at the molecular level (real-time PCR) was used. For this purpose, the instrument was placed in a 1.5 ml polypropylene tube with a cap containing a solution of “Proba-Rapid” from NPO DNA-Technology LLC.

The condition of oral hygiene, periodontal tissues, and oral mucosa was determined according to the following criteria: oral hygiene condition (OHI-S),

bleeding index (BI), and periodontal condition. In terms of treatment, all patients underwent oral sanitation and elimination of traumatic factors. The comparison group received traditional treatment, while the main group received application of lidocaine gel anesthesia and alkalization of the oral cavity with a baking soda solution twice a day, Parodontax irrigator treatment for 5-7 days, and Bicosen denta gel twice a day for 10 days. The wavelength of the PDT was 620-650 nm with a density-power of 200 mW/cm2. The distance from the end of the emitter was 2-3 cm, and the irradiation time was 15-20 minutes. The course of treatment consisted of 3-6 sessions.

RESULTS. The total number of participants was 42 men (44.6) and 52 women (55.3). The duration of the disease ranged from 1 to 12 years. The control group consisted of 20 healthy people (11 women and 9 men) who were assessed for gingivitis tissue index (PMA).



Clinical examination. Upon examination of the oral cavity of patients with periodontal disease and fatty liver disease, the pallor of the mucous membrane and gums was noticeable. Against this background of pallor, there were areas of hyperemia and cyanosis of the alveolar ridge. Periodontal pockets with serous or serous-purulent contents were also identified, and the inflammatory process in the periodontal tissues was accompanied by granulation edema from the pockets. Patients complained of gum pain, bad breath, dry mouth, tooth mobility, as well as paresthesia, itching, and burning in the gums (Fig. 2).

Figure 2
Patient X, 38 years old. HGP before treatment

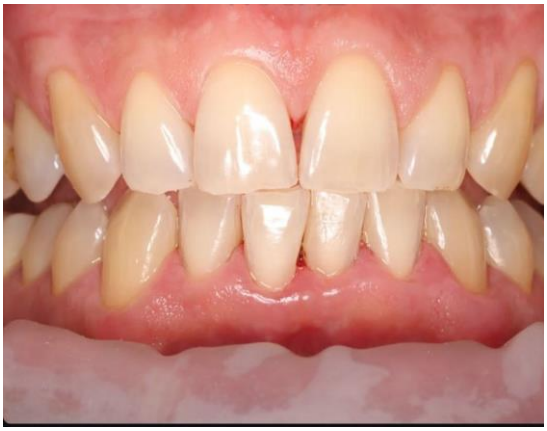


Figure 3
Patient X, 38 years old, HGP after treatment

Periodontopathogens have the property to cause intoxication of the body, damage to the immune and endocrine systems, promotes the development of atherosclerosis, increases the risk of stroke and myocardial infarction. When examining in patients with moderately severe GGP, B.forsynthus was detected in periodontal pocket secretion in 73.33% of cases; the corresponding dynamics of T.denticola - 46.7%; P.gingivales amounted to 66.67%; P.intermedia - 61.11%; A.actinomycetencomitans - 13.33%. (Tab 1)

Table 1.
Mean number of periodontopathogenic microorganisms (Lg GE/mL)

Periodontal pathogens	Control group, healthy, n=20	Generalized periodontitis, n=74
Actinobacillus actinomycetemcomitans	10	13,33%.
Porphyromorans gingivalis	47	66,67%;
Prevotella intermedia	33	61,11%;
Tannerella forsythensis (Bacteroides forsythus)	53	73,33%
Treponema denticola	30	46,7

The total number of microorganisms and the content of Actinomycetencomitans, Porphyromonas gingivalis, Tannerella forsythensis, Prevotella intermedia, and

Treponema denticola was significantly higher in patients in the main group diagnosed with moderate periodontitis compared to the control group without pathology (P<0.05). Real-time polymerase chain reaction (PCR-RT) The real-time polymerase chain reaction (PCR-RT) method was used to quantitatively determine the ratio of periodontal pathogenic bacteria in the oral cavity. The study used a set of Dentoflor DNA-Technology reagents containing The study used a set of Dentoflor DNA-Technology reagents containinga unique genomic sequence and specific fluorescent destructible probes (taqman type) to the sequences of conservative regions of the 16S rDNA gene. Each detection was performed for two independently obtained DNA samples from the same patient, and the results were averaged provided that the spread of Ct values did not exceed one cycle. Pathogenic bacteria capable of causing periodontal disease were also studied. Using a program to operate the amplifier, which performs DT-322 detection, the reaction was analyzed, measured by the Ct threshold cycle parameter.

Conclusion. The study of the composition of periodontal pathogens using microbiological methods allows us to identify which microorganisms are capable of causing the progression of periodontal disease in patients with fatty liver disease.

1. According to the results of our study, bacteria such as T. forsythensis and T. denticola show the most pronounced correlation with the severity of chronic periodontitis in patients with fatty liver disease.
2. According to these studies [6,7], the bacterium P. intermedia is an important factor in the development of aggressive forms of periodontal tissue disease. According to our study, the presence of P. intermedia on the periodontium is not associated with the development of chronic periodontitis.
3. Porphyromonas gingivalis, found in 66.67% of our studies, significantly accelerates the progression of fatty liver disease. This is associated with the ability of P. Gingivalis to parasitize inside liver cells. Scientists suggest that the most likely route for these microorganisms to enter the hepatobiliary system, namely the liver, is their migration from the oral cavity to the intestines and further through the bloodstream.

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