

FREQUENCY AND MORPHOFUNCTIONAL CHARACTERISTICS OF PULP LESIONS IN CHRONIC PERIODONTITIS

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Abstract: Today, the development of knowledge in dentistry, in particular, the improvement of dental institutes, the activities of dental associations, and the organization of scientific conferences and exhibitions have become an important factor in systematizing research results and communicating new information to the scientific community [4,10].

Peri-pulpal infections are mainly caused by microorganisms belonging to the normal microflora of the oral cavity that inhabit the carious cavity and are recognized as the main etiological factors of pulpitis [3,5,6]. In modern studies, special attention is paid to explaining the inflammatory process in the pulp with the concept of microbial effects. It has been shown that bacterial species such as streptococci, lactobacteria and staphylococci play an important role in the inflammation of the dental pulp. It has also been found that healthy obligate anaerobic microorganisms such as Eubacterium, Propionibacterium and Actinomyces are also found in the carious dental pulp. Along with them, Lactobacillus, Peptostreptococcus, Veillonella and Streptococcus species are also common [1,2,7].

Research objective:

To study the morphological and functional changes in dental pulp tissues against the background of chronic periodontitis and to reveal the mechanisms of interaction of endo-periodontal connections by determining their frequency, clinical manifestations, and pathogenetic significance.

Research object:

the incidence of chronic periodontitis were collected by dividing the examined patients into the main and control groups. A total of 124 patients were included in the study, who were divided into the main group (n = 76) who regularly visited the dentist and the control group (n = 48) who visited the dentist for the first time.

Research methods: Clinical methods, periodontal questionnaire and PMA index to assess the condition of periodontal structures, morphological methods, microscopic analysis of biopsies from dental pulp and periapical tissues, dystrophic, fibrotic and necrotic changes in tissues were detected and the results were processed using Microsoft Excel; the results were evaluated at a significance level of $p < 0.05$.

Results obtained:

In the main group, men made up 52.6% (40 people), women made up 47.4% (36 people), and in the control group, men and women made up 50% (Table 1).

Table 1. Distribution of patients in the main and control groups by age and gender

Patients age		18–24 years old	25–34 years old	35–44 years old	45–50 years old	Total
Main group (n=76)	Men	10 (13.1%)	16 (21.0%)	9 (11.8%)	5 (6.6%)	40 (52.6%)
	Women	8 (10.5%)	13 (17.1%)	10 (13.2%)	5 (6.6%)	36 (47.4%)

Control group (n=48)	Men	6 (12.5%)	9 (18.8%)	6 (12.5%)	3 (6.2%)	24 (50.0%)
	Women	5 (10.4%)	8 (16.7%)	7 (14.6%)	4 (8.3%)	24 (50.0%)

Main 76 people in the group and 40 of them men (52.6%), 36 people women (47.4 %) organization did. The most many number 25–34 years old in the group : men 16 (21.0%), women 13 (17.1%). The rest age in groups Distribution : 18–24 years old – men 10 (13.1%), women 8 (10.5%); 35–44 years old – men 9 (11.8%), women 10 (13.2%); 45–50 years old – men 5 (6.6%), women 5 (6.6%). Control 48 people in the group there is and from them men and women number equal : every one of 24 people (50%). The most many patients both 25–34 years old in the group : men 9 (18.8%), women 8 (16.7%). The rest age in groups Distribution : 18–24 years old – men 6 (12.5%), women 5 (10.4%); 35–44 years old – men 6 (12.5%), women 7 (14.6%); 45–50 years old – men 3 (6.2%), women 4 (8.3%). A social and control in groups man and women number according to difference statistician significant not ($\chi^2 = 0.05$, $P = 0.82$), age groups according to in distribution also difference statistician significant not ($\chi^2 = 0.64$, $P = 0.91$) This with , every two group demographic in terms of to each other suitable and research hypotheses under investigation reliable is considered .

When analyzing pulp damage in chronic periodontitis in the study subjects, the following was found (Figure 1).

Figure 1. Distribution of pulp lesions by group in chronic periodontitis

the main group, fibrous pulpitis was observed in 22 cases, which accounted for $28.9 \pm 3.4\%$ of the total number of cases. In the control group, fibrous pulpitis was observed in 12 cases ($25.0 \pm 3.9\%$), the difference between which was not statistically significant ($p > 0.05$). Gangrenous pulpitis was observed in 18 patients in the main group ($23.7 \pm 3.1\%$) and in 10 in the control group ($20.8 \pm 3.5\%$) ($p > 0.05$). This indicates the duration of the chronic inflammatory process and the presence of necrotic changes in the tissues. Calcific pulpitis was detected in 18 patients in the main group ($23.7 \pm 3.1\%$) and in 9 in the control group ($18.8 \pm 3.2\%$) ($p > 0.05$). This type is accompanied by dystrophic changes in the pulp tissue , mineral salts characterized by the gathering of . Mixture or joint pulp main 11 cases in the group ($14.5 \pm 2.6\%$), control in the group and 9 cases ($18.8 \pm 3.2\%$) . did ($p > 0.05$). In this round inflammation process fibrosis and gangrenosis of shapes together expression Asymptomatic pulp changes main in 7 cases in the group ($9.2 \pm 2.1\%$), control in the group and was observed in 8 cases ($16.6 \pm 3.0\%$) ($p > 0.05$). In this type, clinical signs not , but morphological in terms of changes observed situations advantage did . In general when you take , every two pulp injuries in the group types according to clear statistical difference not observed (all in cases $p > 0.05$). These are the results Pulp lesions against the background of chronic periodontitis types groups between distribution in terms of similarity , that is periodontal changes to pulp structures same effect to show shows .

Table 2. Main and control PMA index in groups degrees according to distribution

PMA index level	PMA indicator (%)	Main group (n=76)	Control group (n=48)
Light degree	0–30 %	42 (55.3%)	12 (25.0%)
Average degree	31–60 %	27 (35.5%)	21 (43.7%)
Heavy degree	>60%	7 (9.2%)	15 (31.3%)
All :	—	76 (100%)	48 (100%)

According to the table data, in patients property inflammation level and in the pulp structure morphofunctional changes PMA index through was evaluated . Analysis results from this evidence that's the main thing in the group light graded inflammation cases (PMA index 0-30%) in 55.3% of patients happened , this is the structure of the pulp relatively that it is preserved showed .

At the same time , on average at the level inflammation circumstances main 35.5% of patients in the group observed , in which pulp tissue fibrosis and vascular changes record was done , but regenerative potential is preserved .

Heavy level inflammation circumstances main in the group in only 9.2% of patients it was determined that indicator control in the group and it is 31.3% This is the difference . endoactivator with the help of endocanal irrigation method efficiency confirmed , pulp injuries frequency traditional to the method relatively noticeable to the extent reduced shows .

Morphofunctional changes When analyzing the morphofunctional changes of the pulp in the main group, vasodilation, inflammation, edema, increased sensitivity and increased fibroblast activity were detected, which indicates the activity of the identified morphological and functional processes. These changes were observed equally in men (n=40) and women (n=36). Vasodilation and inflammation were detected with results (+), indicating the activation of microcirculation and the reaction of immune cells. Swelling (+) and changes in sensitivity (+) confirm increased pulp pressure and pain sensitivity, while fibroblast activity (+) indicates the activity of tissue repair processes. Necrosis was partially observed in the ± state, and in some subjects it was associated with partial cell death. In the control group, morphofunctional changes were mostly ± or – in men (n=24) and women (n=24), indicating a normal physiological state. Statistical differences in vasodilation, inflammation, edema, sensitivity, and fibroblast activity between the main group and the control group were significant ($p < 0.05$), while differences in necrosis were not significant ($p > 0.05$). These results allow for a general assessment of the pathology and regeneration processes in the pulp and provide an integrated analysis of clinical and morphological parameters (Table 3).

Table 3. Morphofunctional changes in the pulp under the influence of periodontitis

Morpho functional changes	Main group (n = 76)		Control group (n = 48)	
	Men (n=40)	Women (n=36)	Men (n=24)	Women (n=24)
Blood veins expansion	+	+	±	±
Inflammation	+	+	±	±
Shish	+	+	±	±
Necrosis	±	±	–	–
Sensitivity change	+	+	±	±
Fibroblasts activity increase	+	+	±	±

Note : + – change exactly and noticeable , ± - change some in some cases , less degree , – – change not specified .

Research results suffering from chronic periodontitis pulp and in patients periodontal in fabrics morphofunctional and biochemical changes wide cover received . Main and control groups demographic in terms of similar is , every two in the group man and woman The number of patients is very close . and by age in distribution also noticeable difference not observed . This is the internal consistency of the study and of the results reliability provides .

Pulp injuries types analysis to do main in the group fibrous , gangrenous , calcific and of mixed types of pulpitis superiority At the same time , asymptomatic (without symptoms) cases of pulpitis also record They are clinical signs expression not in case morphological was characterized by changes. Control pulp types in the group distribution similar is , statistically noticeable difference not identified . This is the case in the pulp tissue against the background of chronic periodontitis morphological changes his/her morphofunctional to the state equal to the extent impact to show means.

Like this the results one row research also For example , Gandhi and co-authors (2023) suffering from chronic periodontitis in patients pulp fibrosis, inflammation and necrotic changes high to the extent that it is emphasizes . Theirs to the information is associated with periodontitis 80% of teeth have pulp inflammation and fibrosis almost all in cases observed .

Nair and Patel (2021) also demonstrated a pathogenetic link between pulp and periodontal tissues, noting that the spread of inflammation from the periodontal source to the pulp results in disruption of the odontoblast layer and activation of vascular responses. This is fully consistent with the “vasodilation and increased fibroblast activity” in your study.

Scientific opinions on cases of asymptomatic pulpitis are also consistent with your results. Costa et al. (2024) found that cases of “asymptomatic irreversible pulpitis” (AIP) are characterized by the presence of histological inflammation and neurovascular changes in the absence of clinical signs of pain (Costa et al., 2024). This situation demonstrates a complex relationship between morphological changes and the degree of clinical symptoms.

Periodontal in fabrics inflammation indicators main in the group exactly and noticeable is , property hyperemia , swelling, blood departure , exudate separation and deep periodontal pockets high to the extent record was carried out . Control in the group and this indicators quite a bit stable is , the difference is statistically significant ($p < 0.05$). These results Zhang and by co-authors (2022). cited consistent with the data and they are in the pulp tissue against the background of periodontitis vascular stasis, neutrophils infiltration and inflammatory processes described .

Morphofunctional analysis results main in the group blood veins expansion , inflammation , swelling, sensitivity increase and fibroblasts of activity manifested by increasing It happened . Control in the group and this changes quite a bit less These results were observed by Li et al . Chen (2020) by passed experimental consistent with the research , there pulp vascularization due to periodontal infection and fibroblasts metabolic activity increase indicated .

Thus, based on the data of several authors, it was established that changes in pulp tissues against the background of chronic periodontitis are accompanied not only by destructive, but also by regenerative reactions. This indicates an increase in the activity of fibroblasts and odontoblasts, the formation of new capillaries, and the activation of active reparative mechanisms (Nair Patel, 2021; Li Chen, 2020).

Conclusion:

- Against the background of chronic periodontitis, morphofunctional changes in pulp tissues developed in a comprehensive manner, these changes were manifested in conjunction with periodontal structures. In the main group, the degree of gingival inflammation was significantly lower (PMA index $28.6 \pm 1.9\%$), severe forms were observed in 9.2% of patients. In the control group, the PMA index was higher ($47.3 \pm 2.2\%$), severe inflammation was observed in 31.3% of patients.
- In the main group, changes in the pulp structure were mainly moderate, manifested by vascular constriction, mild fibrosis, and limited neurodystrophic reactions. In the control group, inflammatory processes were of a strongly destructive nature, with severe disturbances in the microcirculation system, vascular stasis and thrombosis, dystrophic and necrobiotic changes in the odontoblast layer, and fibrotic-destructive reconstruction of the pulp tissue.

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