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The role of tunnel revascularization on the periodontal tissues in elderly patients

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Abstract

This article submissions examination and treatment of 30 persons aged 60-74 years with no signs of periodontal pathology and patients with chronic generalized periodontitis of II-III of the severity. For the purpose of comparative characteristics of treatments performed using X-rays, reoparodontography, ultrasound osteometric bone jaws, carried out the analysis of the functional state of the endothelium of vascular endothelial growth factor (VEGF), levels of tumor necrosis factor (TNF) and capillarization of periodontal tissues to treat and dynamics. All patients received the usual therapy of chronic generalized periodontitis, including closed curettage of periodontal pockets. 3 groups of patients on the background of basic therapy of periodontal handled tunnel revascularization with combined use of quercetin per os. It was established that with age in healthy elderly decrease in the number of functioning capillaries per unit area of fabric. The important role of the endothelium in providing compensatory angiogenesis in aging shows the relationship of vascular endothelial growth factor to the level of endothelium vasodilatation. Clinical determined that the combined use of revascularization tunnel and quercetin capillar stabilization drug in treatment of elderly patients with generalized periodontitis stimulates metabolism in periodontal tissues, stabilizes the clinical and radiological picture considerably prolongs remission.

Keywords: Old age, generalized periodontitis, tunnel revascularization, quercetin, compensatory angiogenesis

Introduction

The course of chronic generalized periodontitis (CGP) in the elderly is characterized by a predominance of destructive processes of inflammation, increased cell apoptosis effects, reduced osteogenic activity, microcirculation, progressive tissue hypoxia, decreased reparative capacity the ligaments of tooth ^[1, 2, 6].

In the chain of causality, microcirculation changes are secondary. The study of the nature of periodontal microcirculation in normal and pathology gives information about the nature of different periodontal diseases, suggests a functional body of state power authority and evaluates the effectiveness used in the dental surgery treatments.

According to some authors vasospasm can lead to prethrombotic and thrombotic processes. It is known that the vascular wall is an efferent control of the process of blood coagulation and fibrinolysis. Therefore, structural changes in the form of enzymatic processes lead to disruption of the aggregation and adhesion of blood cells and vascular permeability. Violation is tool capillary – the connective tissue structure and the physical state of red blood cells and platelets are an important pathogenetic link in the formation symptoms of the CGP ^[1, 3, 5].

In practice medicine successfully applies quercetin with angioprotective, membrane, immune modulatory effects. This drug has antioxidant effect, improves blood circulation, speeds healing and affects the processes of bone reconstruction. But today is little known about the effect of quercetin on metabolism and growth factors of elastic properties, the structural and functional state of the microcirculation of periodontal tissues in elderly patients with the CGP.

Objective: to increase the efficiency of surgical treatment of patients with chronic generalized periodontitis of II-III degree of the severity by the combined use of revascularization tunnel and quercetin.

Materials and Methods

Under our supervision there were 30 people aged 60-74 years with severe comorbidities who had undergone combined treatment of the CGP II-III of the severity. To evaluate the periodontal status and diagnosis of periodontal diseases classification used by Danilevsky MF (1994).

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Depending on the conducted treatment patients were divided into 3 groups: group 1(group) – 10 people with no signs of periodontal pathology; group 2 – 10 people who had undergone the conventional treatment according to the protocol approved by the Ministry of Health to provide medical care (ICD k 05.31) and closed curettage of periodontal pockets; Group 3 – 10 people, which in addition to traditional treatment used tunnel revascularization with combined use of quercetin orally. Operation of tunnel revascularization was performed under local anaesthesia and was the formation of subperiosteal tunnel were formed by curved needles spokes Kirschner (diameter 1 mm) with vestibular side, leaving at 5-8 mm from the edge of the gums in the area between the first molars respective jaw. The purpose of this intervention was to create conditions for directional vascular growth in the affected areas of periodontal disease. This operation was performed on the fifth day of the baseline treatment period by an average of 15 days. Quercetin (registration certificate № UA / 0119/01/01) granules 2 g administered three times per day during the treatment period.

The functional state of the endothelium was studied by laser Doppler fluvette on the device Lucky –2 (Russia). The level of vascular endothelial growth factor VEGF (Vascular endothelial growth factor) was determined in using ELISA using a set of chemicals firm Bender Med systems (Austria). The level of tumor necrosis factor (TNF) was determined in serum by ELISA using reagents recruitment firm Vector Best (Russia). The level of capillarisation of periodontal tissues was evaluated by the method of biomicroscopy in capillarscope TM-1. For the purpose of comparative characteristics of methods of surgical treatment performed to assess data radiography and ultrasound osteometric bone of the jaws (computer osteometrist – 01 C), the qualitative and quantitative characteristics of the curves reohrafic alveolar processes of the jaws (rheograph Reo– Spectrum – 2, Russia) before treatment and after 6 months after surgery.

The reliability difference between the average quantitative values of the samples was determined by Student’s test. In order to clarify the nature and extent of the relationship of the

various parameters measured correlation coefficients (r).

Results and Discussion

According to the data, with age, there is a relative decrease in capillary density, as evidenced by an increase in the percentage of capillary deficiency in elderly groups 2 and 3 compared with group 1 (Table 2).

As shown in the laboratory parameters of physiological compensatory angiogenesis activity is the level of vascular endothelial growth factor, we examined the level indicator set in three groups of subjects. This, patients in group 2 compared with group 1 elderly observed a slight increase, which may be due to the need to maintain normal perfusion conditions by age – related changes in the metabolism of organs and tissues. In determining the level of VEGF in the elderly, it was noted: in group 1 studied its level continued to rise according to the needs of the age, and in groups 2 and 3 – terihalose of the increase in this index (Table 1).

It is necessary to note the presence of correlation of vascular endothelial growth factor with the number of functioning capillaries according biomicroscopy periodontal (r = 0,39), indicating the important role of physiological compensatory angiogenesis to provide the optimum level capillaries tissues during aging.

On the objectivity of this conclusion are the results of periodontal biomicroscopy. So in the elderly 2 and 3 groups observed a significant lower density of functioning capillaries compared with 1 group of people with almost healthy periodontium. Noteworthy that in the 2nd and 3rd group of older people with capillary sparsity not tend to vascular endothelial growth factor, unlike in 1 group with optimal capillaries, which appointed as an level indicator of a relatively sufficient level.

Our results show that the number of functioning capillaries in the periodontal tissues of patients 2 and 3 groups significantly lower than in group 1, which undoubtedly, among other factors should be regarded as a prerequisite to the development of perfusion disorders, age – dependent and hypoxia syndrome capillary abortion failure.

Table 1: The level of vascular endothelial growth factor (VEGF) in the serum of elderly patients suffering from CGP, pg / ml

Index VEGF	Before treatment			6 months after treatment	
	Group 1	Group 2	Group 3	Group 2	Group 3
	242,3 ±8,97	220,25±7,51	220,25±7,51	223,15±6,42	238,30±8,15

Table 2: The number of functioning capillaries per unit area of tissue of elderly patients suffering from CGP according by biomicroscopy periodontal tissues

Index The number of capillaries 1 mm	Before treatment			6 months after treatment	
	Group 1	Group 3	Group 2	Group 3	Group 2
	11,18 ±0,55	6,25±0,35*	6,18±0,35*	8,21±0,15*	9,10±0,14*

Note. * – significant changes compared with the group of healthy individuals, p<0,05

In the study of the relationship marker of intravascular inflammation (tumor necrosis factor) with the level of vascular endothelial growth factor has been shown that in 2 or 3 groups of patients to treatment observed increase of TNF. Were observed correlation of necrosis factor down to the level of vascular endothelial growth factor, which indicates the absence of stimulating effect on intravascular inflammatory process physiological compensatory angiogenesis in healthy elderly (Table 3).

The main physiological mechanisms support a satisfactory level of activity of physiological compensatory angiogenesis

is the integrity and safety of functional endothelium, including NO– synthesis sufficient activity as vascular endothelium is the site of synthesis and action of basic growth factors [4, 6]. To determine the role of the functional state of the endothelium in physiological compensatory angiogenesis activity in elderly patients with HHP, we have investigated the levels of NO – synthesis activity in endothelial groups examined through LDF test with reactive hyperaemia.

In the study of NO – synthesis activity of endogenous significant differences of endothelial vasodilatation in 1 group of healthy subjects was optimal and consistent physiological

age-related changes. In the 2nd and 3rd group of elderly people observed a general tendency to decrease in endothelium vasodilatation, but in group 1 patients with sufficient levels of vascular endothelial growth factor percentage growth rate of microcirculation (PM) was significantly higher than in those with insufficient levels of VEGF (Table 1).

The data indicates a decrease in the activity of endothelial NO – synthesis with age, indicating a decrease in the production

of nitric oxide and leads to disruption of the protective properties of the endothelium during aging.

In conducting the correlation analysis, it was found in patients 2 and 3 groups observed the relationship of vascular endothelial growth factor levels and endothelium vasodilatation ($r = 0,37$), indicating the important role of the endothelium in providing compensatory angiogenesis in periodontal tissues.

Table 3: The level of tumor necrosis factor (TNF) in the serum of elderly patients suffering from CGP, pg / ml

Index TNF pg/ml	Before treatment			6 months after treatment	
	Group 1	Group 3	Group 1	Group 3	Group 1
	1,65 ±0,08*	1,73±0,15*	1,73±0,05*	1,71±0,05*	1,67±0,03*

Note.* – Significant changes compared with the group of healthy individuals, $p < 0,05$.

Patients 2 and 3 groups for the surgical treatment of CGP set circulatory deficiency (if indicated PTAs, defense, PVV, IEC), reduced vascular tone and elasticity of blood vessels, and in turn – the deterioration of trophic tissue. Dynamics of reogram in elderly patients with CGP 3 groups at 6 months after surgery tunnel revascularization was more pronounced compared with similar patients in group 2. The studies found that patients in groups 2 and 3 during 6 months of follow – going improvement of blood circulation in the periodontal tissues, but positive results were more pronounced in patients 3 groups. After 6 months of treatment qualitative and quantitative indicators reogram (PTAs, defense, PVV, IEC) in 3 groups of patients indicate a steady improve regional circulation alveolar processes of the jaws and long – term periods after surgery of the CGP.

X–ray picture and performance of ultrasonic osteometry in both groups of patients before surgery showed the presence of pathological changes in periodontal tissues: reduced height compact plate of the alveolar process of the jaw and bone demineralization. Performance of X–ray and ultrasound examination in most patients 2 and 3 groups after surgery upgraded. When X–ray 6 months after surgery in 10 patients and 3 group 4 group 2 patients was observed stabilization process, as manifested in the seal and a clear definition of compact plate of the alveolar process of the jaw.

The results of the osteometric studies indicate a significant difference between the treatment of patients 2 and 3 groups. After 6 months, after an operation time of the ultrasonic waves in the 2 groups of patients was $18,90 \pm 0,15$ microseconds, 3 groups of patients – $16,31 \pm 0,05$ microseconds ($p < 0,05$). At 6 months after surgery in 4 patients in group 2 and group 3 of 10 patients the passage of ultrasound decreased indicating positive processes of bone mineralization.

Conclusions

1. It is proved that the number of functioning capillaries on one flat tissue is reduced by reducing the thickness of the capillaries, which will lead to an increase in the percentage of the capillary deficiency in elderly groups 2 and 3 compared with group 1.
2. It was found in patients 2 and 3 groups observed the relationship of vascular endothelial growth factor levels and endothelium vasodilatation ($r = 0,37$), indicating the important role of the endothelium in providing compensatory angiogenesis in periodontal tissues.
3. After surgery the tunnel revascularization using quartering in treatment improves blood flow in the area

where held manipulation, warned the development of destructive processes in the periodontium resulting in positive dynamics of clinical, radiological and osteometric performance of the microcirculation and bone metabolism.

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