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ORIGINAL PAPERS

PHYSICAL ADJUVANT THERAPY IN PERIODONTAL DISEASE A COMPARATIVE ANALYSIS OF CLINICAL EFFICACYTY

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Abstract. *Periodontal disease is a chronic inflammatory condition of the tissues supporting the teeth, characterized by progressive destruction of the periodontium, resorption of the alveolar bone and, in advanced stages, tooth loss. In recent years, periodontal disease has been recognized as a condition with important systemic implications, being associated with an increased risk of cardiovascular disease, diabetes, respiratory diseases and pregnancy complications. The inflammatory processes and immune imbalance induced by periodontal disease can contribute to the aggravation of systemic inflammation, affecting the body's homeostasis. Therefore, the management of periodontal disease requires a complex approach, which includes not only local treatment of the infection, but also interventions on systemic risk factors, in a multidisciplinary context. Incorrect posture, through its influence on the cranio-cervical muscles, respiratory function, oral hygiene and general stress level, can be an indirect but significant factor in the occurrence and progression of periodontal disease. Postural dysfunctions can favor changes in muscle tone and pressure exerted on orofacial structures, thus affecting periodontal balance. Correcting posture and integrating postural exercises into therapeutic interventions can support oral health and help prevent periodontal complications. There is an important relationship between myofascial syndrome and periodontal disease: chronic muscle tension, bruxism and systemic inflammation can worsen the health of the periodontium, while periodontal dysfunctions can induce occlusal imbalances, generating additional muscle overload. In this context, the integrated approach to periodontal management, which includes the evaluation and treatment of musculoskeletal dysfunctions, can represent a therapeutic strategy. The present study is a comparative study, conducted over a period of six months, which included a number of 60 patients diagnosed with moderately advanced forms of periodontal disease and referred for specialized treatment. All participants underwent a standardized initial assessment, which included oral hygiene analysis,*

gingival condition assessment, measurement of periodontal probing depths and clinical attachment levels. The patients were randomly divided into two equal groups, each consisting of 30 people. The first group benefited from conventional periodontal treatment, according to current protocols. The second group, in addition to the classic treatment and training in appropriate oral hygiene techniques, followed a complementary physical therapy program. It included cervical spine posture exercises, temporomandibular joint neuromuscular control exercises (TMJ relaxation), diaphragmatic breathing exercises, masticatory muscle stretching and therapeutic massage techniques. The aim of this multidisciplinary approach was to evaluate the impact of the integration of physical therapy on the clinical course of periodontal disease.

Keywords: periodontitis, myofascial syndrome, stretching, bruxism

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Definition

Periodontal disease is a chronic multifactorial inflammatory disease of the supporting tissues of the teeth, mainly caused by dysbiosis of the subgingival bacterial biofilm and characterized by progressive destruction of the periodontal ligament and alveolar bone. This can lead to tooth mobility, gingival retraction and, in advanced stages, tooth loss [1].

Periodontal diagnosis is currently based on clinical rather than etiological criteria and provides limited therapeutic guidance.

The causative treatment of periodontitis consists of scaling, antiseptic rinses, and occasionally systemic antibiotics. Surgeries have been minimized, with the exception, perhaps, of the most advanced forms of periodontitis. Plastic surgical therapy includes soft tissue grafts to cover exposed root surfaces and bone grafts to support implants. Dental implants are used to replace severely damaged or missing teeth, but concerns are expressed about their overuse. The usefulness of laser treatment in periodontitis remains unclear [2].

Host modulation therapy and modification of risk factors may benefit certain groups of patients, an activity that is also the subject of our study [3].

Signs and symptoms

Plaque buildup, tartar formation, gingival redness and swelling, gingival bleeding and suppuration that can occur spontaneously or on probing, halitosis, and loss of alveolar bone. Other signs include: deepening of the gingival groove with the formation of a pathological periodontal pocket, exposure of the root due to gingival retraction, and increased mobility of the teeth. Severe forms of the

disease can lead to tooth migration, impaired aesthetics, difficulty chewing, and eventually tooth loss [3]

Associated systemic diseases

The cardiovascular system

Chronic periodontitis is associated with the incidence of coronary heart disease, independent of the cardiovascular risk factors already known [4]. A causal association between periodontal infections and atherosclerotic cardiovascular disease or its complications is currently supported [5]

Also, oral bacteria have been identified in carotid atheroma plaques, and some of these have been shown to be associated with platelet aggregation, an important phenomenon in thrombosis. There is also evidence to suggest an association between chronic oral infections and myocardial infarction [6].

Respiratory system

Scannapieco et al. [7] have shown that lung function decreases with the loss of periodontal attachment, thus concluding that there may be a possible association between periodontitis and chronic lung diseases such as chronic obstructive pulmonary disease (COPD). In one of their studies, there was a nearly five-fold increase in the incidence of chronic respiratory diseases in people with poor oral hygiene compared to those with good oral hygiene.

Poor oral hygiene and periodontitis influence the incidence of lung infections, especially episodes of nosocomial pneumonia in high-risk patients [8] The oral cavity have long been considered a possible reservoir for respiratory pathogens.

Musculoskeletal system

It is believed that there is a similarity between the pathogenesis of periodontal disease and rheumatoid arthritis [9]. In both conditions, a poorly regulated inflammatory response would lead to tissue damage induced by oxidative stress. By Pabio et al. [10] stated that, if this hypothesis is confirmed, chronic periodontitis could represent an important and modifiable risk factor for rheumatic diseases.

There is a growing interest in the relationship between systemic osteoporosis, oral bone loss, tooth loss, and common risk factors for these conditions. A positive correlation between systemic bone mass and oral bone loss has also been demonstrated [11].

Reproductive-pregnancy system

It has also recently been found that pregnant women with periodontal disease have a higher risk of developing gestational diabetes compared to pregnant women with healthy gums [12].

Endocrine System-Diabetes

In patients with diabetes there is a direct and dependent relationship to the severity of periodontitis in terms of diabetes complications. The biological basis of the link between periodontitis and diabetes is based on the common theme of chronic inflammation [13].

People with diabetes are more prone to developing periodontal disease, recent research suggests that periodontal disease could, in turn, be a risk factor for developing diabetes. Periodontal disease can allow bacteria to enter the bloodstream and activate immune system cells [14]. This contributes to the progression of impaired glucose tolerance to diabetes mellitus and the appearance of hyperglycemia.

Affecting other systems

Despite early studies reporting an association, there is currently little published evidence to support that periodontitis is a risk factor for the development of chronic kidney disease [15], cognitive impairment, obesity, metabolic syndrome [16], cancer [17,18,19]. Evidence from current studies on an association between periodontitis and impairment of these systems is limited and further research is needed.

Periodontal disease, as we have seen, is a systemic disease, due to its chronic inflammatory mechanisms with significant implications on general health.

Muzammil Moin et al [20], studied the effects of physical activity in people with periodontitis, and its beneficial effects were on reducing the systemic level of inflammation, improving immune function, increasing the body's resistance and combating sedentary lifestyle, physical exercise contributes to maintaining the homeostatic balance necessary for periodontal health.

Posture and orofacial muscle tension

Imbalances of the neck muscles and anterior muscle chains, comprising the masticator, trapezius, and pectoral muscles, can compromise the body while in the standing position [21]. Masticatory cycles should be balanced, since unilateral chewing consists of a source of imbalance for the neck muscles and anterior muscle chains, which could compromise the postural balance of the body while standing [21].

Studies using electromyographic activity of the masseter and temporal muscles [22,23] have shown that displacement of the most anterior position of the head can occur in people with temporomandibular joint disorders (TMJD) due to changes in the resting position of the mandible [22].

Some studies have evaluated the association of the stomatognathic system on body posture, through the correlation between malocclusion and posture [24,25,26]. Furthermore, some studies have shown the occurrence of limited cavity opening loops, dental pain, myofascial pain, plaque buildup, shoulder pain, and pain in the neck area [27,28]

The biomechanical environment of the teeth and alveolar bone is characterized by the presence of conflicting forces and pressures, generated mainly by muscle activity. This permanently exerted muscle friction, both at rest and during active functions (chewing, phonation), plays an essential role in determining and maintaining the position of the tooth in the alveolus.

The balance between the internal forces, coming from the pressure of the tongue, and the external ones, exerted by the lips and cheeks, establishes the static position of the teeth. This dynamic relationship is essential for dental stability, but it becomes disruptive in pathological conditions [29]. In cases such as bruxism, muscle forces become exaggerated and repetitive, generating an overload of the supporting periodontal and alveolar bone.

The effects of these conflicting forces include tooth migration, increased tooth mobility, acceleration of the bone resorption process, and exacerbation of periodontal damage. Understanding the interaction between muscle and periodontal components is fundamental for the development of therapeutic strategies in the prevention and treatment of periodontal and occlusal diseases.

Myofascial syndrome frequently affects the posture of the head and neck, the position of the mandible, the occlusal contact (bite), they can contribute to imbalances in the oral cavity and implicitly to periodontitis.

The patients filled out an anamnesis form, which contained questions related to their general health, use of medications, symptoms of spinal pain, muscle weakness, dental pain, bleeding and postural imbalance.

Cervical mobilizations (for posture), left/right head rotations – 10 repetitions/side, lateral inclinations – ear to shoulder, 10 repetitions/side, forward bend – chin towards chest, hold for 5 seconds, (without lifting the shoulder), torment tuck: chin towards the chest, without tilting the head frequency: 1-2 sets per day. The proposed exercises aimed to put the jaw in the resting position. The maxillary teeth should sit about 2 mm away from the mandibular teeth, while the tip of the tongue should sit the hard palate (without touching the teeth). Patients

were instructed to perform 15 repetitions, three times a day, for 6 months, (control at 3 months) of repeated opening and closing movements, paying particular attention to the position of the tongue during the exercises.

The link between myofascial syndrome and periodontitis

Orofacial pain is defined as pain associated with hard and soft tissues of the head, face, mouth, and neck. It can come from dental, periodontal, vascular, glandular and muscular structures, as well as bones, sinuses and joints [30].

Myofunctional therapy (also called orofacial myofunctional therapy or OMT) [31] trains the muscles of the mouth and face to move as they should and rest in the correct positions. This involves performing certain exercises with the cheeks, tongue, or lips. These exercises strengthen the muscles and perfect the awareness of facial movements (proprioception).

Myofascial pain syndrome is a condition characterized by chronic muscle pain, caused by trigger points (tense and tender areas in the muscles), most commonly in the muscles of the neck, shoulders, back, but also in the masticatory muscles (masseter, temporal, pterygoid), and compression on the temporomandibular joint.

Myofascial pain can be confused with dental or periodontal pain, which can lead to delays in the correct treatment of periodontitis

Muscle groups, other than the masticatory group, can contribute to myofascial pain dysfunction syndrome. Patients may present with a wide range of normal malocclusions and occlusions, deep overbites and overbites, complete dentition, and missing teeth (either missing right and left teeth equally, or right and left missing unequally) [32]

The masticatory muscles have two bone insertions, one of which is on the mandible, intervene in the act of chewing and are innervated by the mandibular nerve. The muscles we will refer to are the masseter muscle, medial pterygoid, lateral pterygoid. All movements in the temporomandibular joint occur under the action of the masticatory muscles.

These techniques are used as a complementary support to dental treatment, to support local circulation, gum regeneration and reduce inflammation.

Thus, we have proposed a series of exercises aimed at relaxing the orofacial muscles, [33] reducing myofascial tension, improving posture and preventing factors that can aggravate periodontitis.

Mandibular relaxation (rest position), the execution position was with the back straight, shoulders relaxed, mouth slightly open (without the teeth touching),

tongue on the hard palate, behind the upper incisors. Mandibular stretching the mouth open (without pain), hold 5–10 seconds, then the mouth closed slowly. Passive mandibular stretching (for joint decompression) mouth slightly open to the point of maximum comfort, then with two fingers (index and middle finger) between the front incisors, without forcing, hold this position for 30 seconds, repeat 3 times. This exercise decreases compression in the joint and reduces vertical forces on the periodontium.

Lateral mobilizations of the mandible, movements of the jaw slightly left-right, without pain, movements should be executed slowly and controllably.

The effectiveness of gingival massage in increasing peripheral circulation, promoting metabolic function and improving inflammation in the gums has long been disputed.

Experiments so far have shown that stimulation by massage of the gums activates the microcirculatory function in the gingival tissue, promotes keratinization of the gingival epithelium [34], improves oxygenation of the gingival tissue [35], reduces the volume of gingival groove fluid [36], increases capillary permeability [37] and intensifies the proliferative activity of the basal cells of the gingival groove epithelium [38].

The massage can be done with a sanitized hand or with gloves, using your choice of sesame oil, coconut oil [39], sunflower, mustard or olive oil [40].

Massage of the trigger points (masseter and temporal muscles), performed with the right back, apply light circular pressure with the index finger on the cheek area (masseter) for 20-30 seconds, then on the temporal muscles.

Gingival massage with the finger through gentle circular or vertical (up-down) movements, thus stimulating blood flow, improving oxygenation and gingival tone.

Intraoral massage for the internal pterygoid (with caution!) With a clean finger (or with gloves), insert the finger into the mouth to the back of the last lower molar, with the other on the inner side of the jaw apply light pressure, hold for 10 seconds, then release.

External massage on the external pterygoid area with the fingers at the level of the cheeks, near the temporomandibular joint (in front of the ear) a light circular pressure and forward and slightly downward massaging movements are applied. [Table 1]

Vigorous rinses with chlorhexidine guga water [41] 30 seconds with gentle pressure, as a "liquid massage" of the gums. Antiseptic, anti-inflammatory, soothing properties.

Exercises and massage for masseter, temporal and pterygoid muscles, TMJ relaxation

During the day	Massage Massage Exercise	Temporal Massage Exercise	Active mandibular stretching	Internal pterygoid self-massage	ATM relaxation exercise
Monday	☑ minute part	1 / ☑ minutes	1-2 ☑ 5 reps	☑ points	2-3 ☑ 2-3 minutes
Tuesday	☑ minute part	1 / ☑ minutes	1-2 ☑ 5 reps	☑ points	2-3 ☑ 2-3 minutes
Wednesday	☑ minute part	1 / ☑ minutes	1-2 ☑ 5 reps	☑ points	2-3 ☑ 2-3 minutes
Thursday	☑ minute part	1 / ☑ minutes	1-2 ☑ 5 reps	☑ points	2-3 ☑ 2-3 minutes
Friday	☑ minute part	1 / ☑ minutes	1-2 ☑ 5 reps	☑ points	2-3 ☑ 2-3 minutes
Saturday	☑ minute part	1 / ☑ minutes	1-2 ☑ 5 reps	☑ points	2-3 ☑ 2-3 minutes
Sunday	☑ minute part	1 / ☑ minutes	1-2 ☑ 5 reps	☑ points	2-3 ☑ 2-3 minutes

Bruxism (teeth grinding) – a bridge between myofascial and periodontal

Bruxism is a sleep disorder characterized by teeth grinding and clenching that can be linked to irreversible damage to the teeth [42]. Thus, there is an overload of the periodontitis through the mechanical movements produced at the level of the teeth and at the muscle level. Burxism is frequently linked to myofascial syndrome and leads to tension of the facial muscles. This repetitive force affects the periodontal ligaments, leading to tooth mobility and inflammation of the gums. Bruxism and prolonged tension can contribute to gum inflammation, gingival retractions and, over time, to the worsening of periodontitis.

This overload aggravates gingival inflammation and accelerates bone and periodontal attachment losses, favoring the progression of periodontitis.

Sleep hygiene techniques (e.g., relaxing before sleep or avoiding caffeine) are also recommended to control bruxism in sleep; However, recent data has shown that these therapies have not been effective for controlling muscle activity.

People diagnosed with bruxism have difficulty controlling pain, temporomandibular disorders, or trying to control the progression of tooth wear and periodontal [43, 44]. The multifactorial etiology of orofacial pain and temporomandibular disorders makes these problems take another approach (in addition to the aligner) [45], relaxation exercises, sleep hygiene measures, cognitive instructions and physical therapy, facial massage, exercises for masticatory or facial muscles.

It is very important to teach the body to distinguish between tension and relaxation in the facial area. This way we can reduce the force of unconscious bruxing. The decrease in stress-related bruxism is an aggravating factor in periodontitis.

Exercise	**Spotted per day**
Physiological rest position	5–10 times
Progressive relaxation	2 times
Deep breathing	3 times
Mandibular stretching	2 times

Conclusions

Periodontal disease is a chronic inflammatory pathology with systemic impact, being associated with numerous comorbidities, including cardiovascular disease, diabetes mellitus and respiratory diseases. Given its systemic nature, the therapeutic approach to periodontal disease could benefit from the integration of additional interventions aimed at improving general health, such as physical activity and postural rebalancing.

In the comparative study, patients with moderately advanced periodontitis were divided into two groups: a first group treated according to the classic periodontal therapy protocol and a second group that, in addition to the standard treatment, also benefited from an adjuvant program of physical therapy and massage, including exercises to correct posture, relax the temporomandibular joint and improve diaphragmatic breathing.

The results indicated a favorable clinical response in the group that benefited from the additional interventions, suggesting that multidisciplinary

approaches that include physical activity and muscle relaxation techniques may bring additional benefits in the management of periodontal disease. However, given the limited sample size and relatively short duration of monitoring, further larger cohort and long-term studies are needed to validate these observations and establish standardized integrated protocols in the treatment of periodontal disease.

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