REFRACTORY CRANIOFACIAL PAIN

Is there a role of periodontal disease as a comorbidity?

Gisele Maria Campos Fabri[1], Silvia R.D.T. Siqueira[2], Caio Simione[3], Cibele Nasri[4], Manoel JacobsenTeixeira[5], José Tadeu Tesseroli Siqueira[6]

Abstract – **Objetive:** To evaluate the influence of the periodontal disease (PD), a chronic infection, in patients with chronic craniofacial pain complaints. **Method:** Twenty patients with chronic craniofacial pain and PD (*CFP group*) and 20 patients with PD (*PD group*) were assessed before and after periodontal treatment (baseline, 30 and 180 days after treatment). The paramenters evaluated were: plaque index, bleeding index, clinical probe insertion, Visual Analogic Scale (VAS) for pain intensity and Numerical Rating Scale (NRS) and Verbal Rating Scale (VRS) for the "chief complaint". **Results:** After 180 days PD was controlled in both groups ($p<0.001$); the VAS decreased in *CFP group* ($p<0.001$); "chief complaint" improved ($p=0.005$ and $p=0.027$, respectively in *CFP and PD group*). VRS showed improvement between the groups in 30 ($p=0.004$) and 180 days ($p=0.001$). **Conclusion:** These results suggest a possible influence of periodontal disease, as a comorbidity, in refractory craniofacial pain patients and in their pain levels.

KEY WORDS: periodontal disease, orofacial pain, chronic headache, atypical facial pain.

Dor refratária crânio-facial: há algum papel para a doença periodontal como morbidade associada?

Resumo – **Objetivo:** Avaliar a influência da doença periodontal (DP) em pacientes com queixas de dores crônicas crânio-faciais. **Método:** Vinte pacientes com dor crônica crânio-facial e DP (*CFP group*) e 20 pacientes com DP (*PD group*) foram avaliados antes e depois do tratamento periodontal (baseline, 30 e 180 dias). Avaliações: índice de placa, índice de sangramento gingival, inserção clínica de bolsa, Escala Visual Analógica (VAS) para a dor, Escalas Numérica (NRS) e Verbal (VRS) para as "queixas principais". **Resultados:** Após 180 dias a DP foi controlada em ambos os grupos ($p<0,001$); a VAS reduziu no *CFP group* ($p<0,001$); a "queixa principal" melhorou ($p=0,005$ e $p=0,027$, respectivamente nos grupos *CFP e PD*). A VRS mostrou diferença entre os grupos em 30 ($p=0,004$) e 180 dias ($p=0,001$). **Conclusões:** Estes resultados sugerem a provável influência da doença periodontal, como morbidade associada, nos níveis de dor de pacientes com dores crônicas crânio-faciais.

PALAVRAS-CHAVE: doença periodontal, dor orofacial, cefaléia crônica, dor facial atípica.

Chronic craniofacial pain, like headache or facial pain, is a common complaint in the general population[1,2] , with several etiologies. The treatment depends on precise diagnosis[3,4]. However, even with the correct diagnostic and appropriate treatment some patients are refractory and do not present the expected improvement due to several reasons including the presence of an undiagnosed associated disease[3,4].

Periodontal disease (PD) is a common chronic inflammatory condition at the adult population[5,6]. It is characterized by gingival and/or alveolar bone infection[7], and it has different levels of severity[8,9]. It is chronic and usu-

Hospital das Clínicas of Medical School of University of São Paulo (USP), São Paulo SP, Brazil: [1]DDS, PhD, Dentistry Division and Experimental Physiopathology Program, Hospital das Clínicas, Medical School, University of São Paulo, São Paulo SP, Brazil (USP); [2]DDS, PhD, Assistant Professor, School of Arts, Science and Humanities, USP; [3]MD, Neurologist, Neurology Department, Hospital das Clínicas, Medical School, USP; [4]DDS, MSD, Orofacial Pain Group, Dentistry Division, Hospital das Clínicas, Medical School, USP; [5]MD, PhD, Chairman of Neurosurgery, Head of the Pain Multidisciplinary Center, Neurology Division, Central Institute and Experimental Neurosurgery Division, Psychiatric Institute, USP; [6]DDS, PhD, Head of the Orofacial Pain Clinic, Dentistry Division / Interdisciplinary Pain Center, Hospital das Clínicas, Medical School, USP. Fundação de Amparo à Pesquisa do Estado de São Paulo - FAPESP (grant Nº 2007/00934-2) and Coordenação de Aperfeiçoamento de Pessoal de Ensino Superior CAPES (33001010177P7).

Received 1 October 2008, received in final form 5 March 2009. Accepted 2 May 2009.

Dr. José Tadeu Tesseroli de Siqueira – Rua Maria Cândida 135 - 02071-010 São Paulo SP - Brasil. E-mail: jtts@uol.com.br

ally painless, except in some cases when provoked by a mechanical stimuli (chewing or teeth brushing) or during an acute episode[10]. The role of the periodontal disease in some systemic conditions has been demonstrated. Recent studies have shown that it plays an important role in cardiovascular, metabolic and neurovascular conditions[11-14]. It is characterized by a chronic inflammation and mediates the interaction between the immune system and pain[15] also in the trigeminal nuclei[16].

In the current literature there is a lack of papers about the role of untreated chronic periodontal disease in patients complaining of chronic craniofacial pain, particularly when the pain is refractory to the conventional treatments[10]. To the best of our knowledge to update, there are no studies about the role of chronic periodontal disease, as a comorbidity, in patients with refractory craniofacial pain. Thus, the aim of this study was to evaluate the role of chronic periodontal disease in patients with refractory craniofacial pain.

METHOD

In this study, 20 patients were included, who presented refractory craniofacial pain and concomitant severe periodontal disease (*CFP group*). The patients included underwent to clinical treatment (antidepressants, NSAIDs, beta-blockers or anticonvulsants) for minimum 3 months. Other conditions of pain, like TMJ, cervicogenic headache and myofascial pain were investigated and the patients did not have any kind of implant tools. These patients were referred to the Dentistry Division of the hospital from the Neurology Department of the same hospital, where the diagnosis of their pain was made. Were also included 20 patients presenting only severe PD as controls (*PD group*). The objective of this control group was to compare the severity and improvement of the PD between the groups, before and after periodontal treatment.

The pain diagnosis of the *CFP group* was performed by two investigators (a neurologist and an orofacial pain dentist), according to the International Headache Society criteria (2004)[3]. Periodontal diagnosis was made by one calibrated periodontist according to the criteria of the American Academy of Periodontology[8,9]. During the time of this study there were no changes in medication or medical treatment prescribed previously to *CFP group* of patients.

Were excluded patients with dental decays, dental pain with pulpar origin, chronic systemic diseases, psychiatric conditions with cognitive deficit and pregnant women.

All the patients gave informed consent to procedures approved by the Ethics committee of the Medical School.

Evaluation of the "chief complaint"

The chief complaints of both groups were evaluated according to the following question: *"What is your chief complaint or your main problem to look for health assistance?"* The improvement of their "chief complaints" was evaluated according to the following question: *"Did you have any improvement of your chief complaint or main problem after the periodontal treatment?"* And the evaluation of the improvement of their "chief complaint" was made according to the following scales:

1. Numeric rating scale (NRS) ranging from 0 to 100% (0 was no improvement and 100 was complete improvement).

2. Verbal rating scale (VRS): NI – No improvement; LI – Little improvement (less than 25%); S – satisfactory (25 to 50% of improvement); G – Good (more than 75% of improvement); NP – No pain.

Evaluation of pain intensity of *CFP group*

Was performed according to the visual analogical scale (VAS).

Periodontal Evaluation was performed according to:

1. Clinical periodontal assessment by bleeding on probing (BOP) and the O'Leary dental plaque index (PI), as well as the clinical probing depths (CPD) measurements[8,9].

2. Panoramic radiography of the jaw and periapical radiography of the teeth.

Periodontal treatment

The periodontal treatment were performed by one calibrated periodontist according the following order: (1) detailed oral hygiene instructions; (2) periodontal scaling and root planning carried out in a minimum of 2 sessions and a maximum of four; (3) periodontal surgery by Widman modified procedure; (4) post-operatory treatment with local care (mouthwashes with 0.19% chlorexidine) and analgesic nonsteroidal anti-inflammatory drugs (etoricoxib 90) for 72 hours. Sutures were removed 7 days after the surgery. Antibiotic prophylaxis was prescribed according to the American Heart Association[17] guidelines.

Periods of evaluation:

1. Baseline, before periodontal treatment (up to 15 days);
2. 30 days after periodontal treatment;
3. 180 days after periodontal treatment.

Pain levels and improvement of chief complaints were assessed by an independent researcher.

Statistical analysis

Data were analyzed by parametric and non-parametric tests. After descriptive analysis, Fisher and Chi-squared tests were performed to compare nominal data (e.g. gender, race, body pain). For numerical and ordinal data t-test (weight, height, Body Mass Index); Mann-Whitney (chief complaint, pain intensity, chief complaint improvement); Wilcoxon (chief complaint improvement), and Friedman (pain intensity) were performed. Variance for repetaed measures was used for periodontal parameters[18,19]. Level of significance was 5%.

RESULTS

Two patients of the *PD group* could not complete the evaluations, remaining 38 patients in the study. In the *CFP*

Table 1. Evaluation of pain intensity by Visual Analogue Scale (VAS) in patients with periodontal disease and concomitant chronic craniofacial pain (CFP Group).

Group	Baseline	30 days	180 days	p
CFP (n=20)	7.11±2.08 (3–10)	4.51±3.23[1] (0–10)	3.67±3.27[2,3] (0–10)	<0.001*

*Friedman's test comparative periods in each group; [1,2]p<0.05 comparatively with baseline; [3]p>0.05 comparatively with 30 days.

group, the mean age was 48.95±13.03 years old (range: 28–73 years old) and 16 were women (80%); in the *PD group*, the mean age was 42.38±9.51 years old (range: 29–62 years old) and 14 were women (77.8%). Both groups were pared (p=1.00 for gender, p=0.207 for race, p=0.087 for mean age, p=0.34 for weight and p=0.80 for height).

Periodontal evaluation: from baseline to 180 days

The baseline evaluation showed that severity of the periodontal disease was similar in both groups and there were no differences between them in PI (p=0.0934), BI (p=0.8657) and CPD (0.1728) (Table and Fig 1).

After 30 and 180 days of the periodontal treatment, both groups had significant improvement in every periodontal parameters when compared to the baseline evaluation. Improvement was similar between the groups for PI (p=0.5202), BI (p=0.5696) and CPD (p= 0.6068).

The "chief complaint": from baseline to 180 days

At the baseline, chief complaint of the *CFP group* was persistent pain in the head and or face. The pain characteristics of this group are described in the next item. In the *PD group,* the chief complaint was gingival bleeding, gingival or dental discomfort during chewing and halitosis.

The NRS showed improvement of chief complaint of the *CFP group*, 30 and 180 days after the periodontal treatment, comparing with the baseline period (p=0.005). However, the groups had different means of NRS at 30 days with significant difference between them (p<0.001), which also was observed at 180 days (p<0.001).

The VRS also showed improvement of the chief complaint in both groups (Fig 2), comparing to baseline (Fischer's exact test). However, the groups had different means of VRS at 30 days with significant difference between them (p=0.004), which also was observed at 180 days (p=0.001).

Pain characteristics of the *CFP group*

The craniofacial pain diagnosis was distributed along to the patients as follows: migraine in 9; tension-type headache in 6 and atypical facial pain in 5.

At baseline, the mean duration of pain was 50.9 months (ranging from 8 to 300 months). The location of pain was bilateral in 15 (75%), on the left side in 4 (20%) and on the right side in 1 (5%) patient; The pain complaints were located at (according to the patients report): face in 7 (35%); face and teeth in 3 (15%); fronto-temporal area in 7 (35%); and fronto-temporal area and teeth in 2 (10%) and face and ear in 1 (5%) .

The mean pain intensity (VAS) of the *CFP group* at baseline was 7.11±2.08 (range from 3 to 10). Thirty (30) and 180 days after the periodontal treatment, the VAS of *CFP group* decreased in comparison to baseline. The results of pain intensity are outlined in Table 1.

Presence of widespread body pain in both groups

At baseline, 75% of the patients of the *CFP group* reported pain in other parts of the body and 39% of the patients of the *PD group* reported the same complaint (p=0.024). The distribution of the overall body pain was reported as follow: (A) *CFP group:* back 4 (20%), cervical 4 (20%), several joints 4 (20%), and widespread body pain 3 (15%). (B) *PD group:* inferior limbs, 5 (28%) and joints at the inferior limbs, 2 (11%). Pain was more diffuse and spread in the *CFP group* (p=0.001).

DISCUSSION

Our data showed that the characteristics of periodontal disease were similar in severity in both groups at the baseline, and all the patients were under control of periodontal disease (Table 1), which could be observed by the decrease of gingival bleeding which was achieved 30 days after the periodontal treatment (p<0.001 in both groups, in comparison with baseline) and maintained for 180 days after (p<0.001 in both groups, in comparison with baseline). Another expected finding of this data was the significant differences between the groups on the presence of widespread body pain (p=0.024) and its distribution (p=0.001), and the literature reports that patients with chronic pain have more complaints of overall body pain and more physical and psychiatric comorbidities as well[18,19]. The *CFP group* had typical characteristics of chronic pain patients with more complaints of pain in other regions of their body.

However, the relevant finding of our data and never published before, was the significant reduction in the pain intensity (VAS) of the refractory craniofacial pain group (p<0.001), 30 and 180 days after the periodontal treatment, in comparison with baseline. This reduction of their

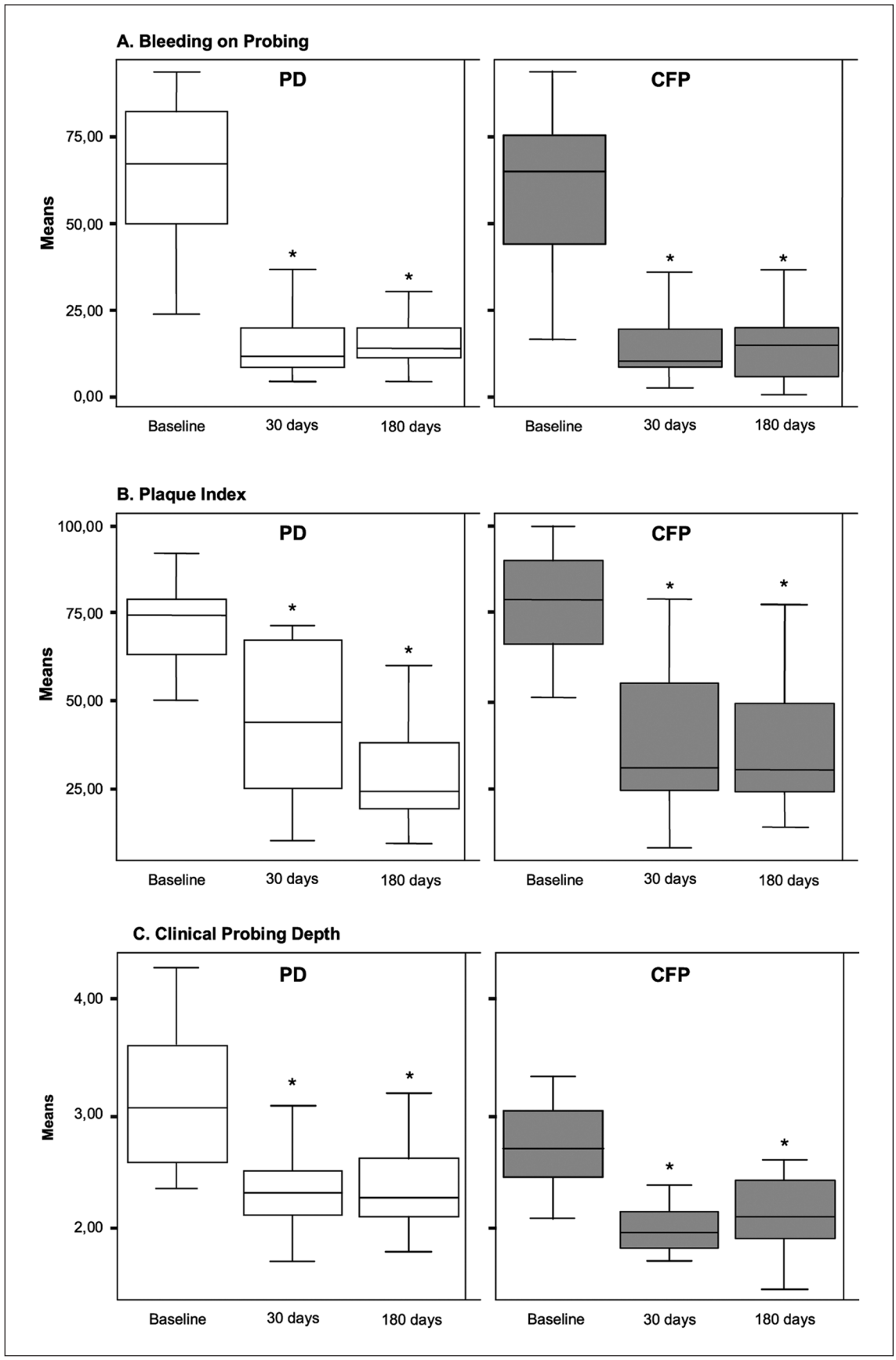

*Fig 1. Evaluation of periodontal disease parameters in patients without chronic craniofacial pain (PD Group) and with chronic craniofacial pain (CFP Group). There is no difference between the groups. Variance analyze (each group): *p<0.001, comparative to baseline.*

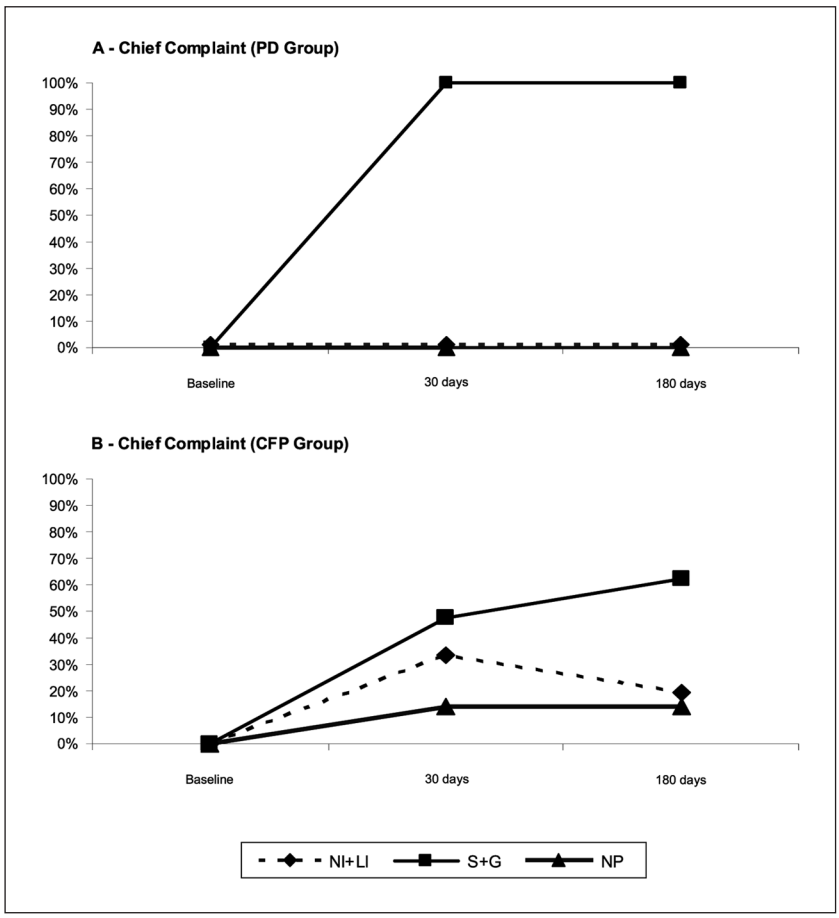

Fig 2. Evaluation of the chief complaint, by the Verbal Rating Scale (VRS), 30 and 180 days after the periodontal treatment in comparison with baseline period. There was improvement in both groups but with difference between them. In CFP group, 65% of the patients reported improvement of their pain at 30 days and 60% at 180 days. Fischer's exact test, comparative between group: p=0.004 at 30 days and p=0.001 at 180days. Descriptors of VRS: NI (No improvement), LI (Little improvement), S (Satisfactory), G (Good), NP (No pain).

pain levels reflected also in a statistically significant improvement of their chief complaints (p=0.005). Although the literature refers that the periodontal disease is painless and despite these patients had no changes in their pain medication, 65% of the patients had improvement after 30 days, which increased to 80% after 180 days. Taken together, these findings strongly suggest the influence of the periodontal disease as comorbidity in refractory craniofacial pain.

We need to remember that chronic pain is a complex phenomenon[20,21] and periodontal disease could have a modulating or contributing role in the refractory pain although the mechanisms underlying are still not clear. Indeed, there are also interacting factors, like emotional stress and pain remission periods that need to be taken account. It is important to highlight that the periodontal disease is an infectious disease and recent studies have shown the interaction between pain and the immune system[15]. Periodontal disease expresses neurotransmitters related to neurogenic inflammation[7,22,23] that underline central sensitization, which allows neuroplastic changes that are present in chronic pain patients.[20,21] Thus, it is expected that the *CFP group* could be under the influence of peripheral stimuli, as observed in experimental orofacial pain models[15].

Pain is a subjective and individual experience and its evaluation must consider the patient's opinion about his/her improvement[28]. The evaluation by an independent researcher also gives more trustiness to the results[24-27].

It is important to note that in this study although all the *CFP group* presented severe periodontal disease most of them did not complain about it, with the exception of three patients who complained about generalized dental pain (not from pulp origin, which was an exclusionary criteria of this study). As the periodontal disease has relevant prevalence at the adult population and is a common chronic infectious disease, that could have systemic implications if it is not treated[11,12], we should consider a routinely evaluation also in refractory chronic pain patients of the periodontal tissues. Moreover, the literature has demonstrated that pain with dental origin frequently co-exists with several types of craniofacial pains (eg. headache, atypical facial pain, and neuropathic pain)[19,26,30]. Hence it is important to consider the overlap of these conditions.

In conclusion, our data showed that severe periodontal disease can be related to refractory craniofacial pain. Further research is necessary to clarify the reasons underlying this finding. These data indicate that periodontal assessment must be included as a routine in patients with

chronic craniofacial pain, particularly when the pain persists after medical approach.

REFERENCES

1. Lipton JA, Ship JA, Larach-Robinson D. Estimated prevalence and distribution of reported orofacial pain in the United States. J Am Dent Assoc 1993;124:115-121.
2. Rasmussen BK, Olesen J. Migraine with aura and migraine without aura: an epidemiological study. Cephalalgia 1992;12: 221-228.
3. Okeson JP. Orofacial pain: guidelines for assessment, diagnosis and management. Chicago: Quintessence, 1996.
4. Headache Classification Subcommittee of the International Headache Society. The international classification of headache disorders, 2nd edn. Cephalalgia 2004;24(Suppl 1):S9-S160.
5. Albandar JM, Rams TE. Global epidemiology of periodontal diseases: an overview. Periodontology2000 2002;29:7-10.
6. Projeto SB Brasil 2003. Condições de saúde bucal da população brasileira 2002-2003: resultados pricipais. Ministério da Saúde, Secretaria de Atenção à Saúde, Departamento de Atenção Básica. Brasíla. Ministério da Saúde, 2005.
7. Bartold PM, Walsh LJ, Narayanan AS. Molecular and cell biology of the gingiva. Periodontology 2000;24:28-55.
8. Parameter on chronic periodontitis with slight to moderate loss of periodontal support. J Periodontol 2000;71:853-855.
9. Parameter on chronic periodontitis with advanced loss of periodontal support. J Periodontol 2000;71,856-858.
10. Lundy FT, Linden GJ. Neuropeptides and neurogenic mechanisms in oral and periodontal inflammation. Crit Rev Oral Biol Med 2004;15:82-98.
11. Amar S, Gokce N, Morgan S, Loukideli M, Van Dyke TE, Vita JA. Periodontal disease is associated with brachial artery endothelial dysfunction and systemic inflammation. Arterioscler Thromb Vasc Biol 2003;23:1245-1249. Epub 2003 May 22.
12. Tonetti MS, D'Aiuto F, Nibali L, et al. Treatment of periodontitis and endothelial function. N Engl J Med. 2007;356:911-920.
13. Yamazaki K, Ueki-Maruayama K, Honda T, Nakajima T, Seymour GJ. Effect of periodontal treatment on the serum antibody levels to heat shock proteins. Clin Exp Immunol. 2004; 135:478-482.
14. Seymour GJ, Ford PJ, Cullinan MP, Leishman S, Yamazaki K. Relationship between periodontal infections and systemic disease. Clin Microbiol Infect 2007;13(Suppl 4):S3-S10.
15. Watkins LR, Maier SF. The pain of the being sick: Implications of Immune-to-Brain communication for understanding pain. Ann Rev Psychol 2000;51:29-57.
16. Xie YF, Zhang S, Chiang CY, Hu JW, Dostrovsky JO, Sessle BJ. Involvement of glia in central sensitization in trigeminal subnucleous caudalis (medullary dorsal horn). Brain Behav Immun 2006;21:634-641. Epub 2006 oct 20.
17. Dajani AS, Taubert KA, Wilson W, et al. Prevention of bacterial endocardites: recommendations by American Heart Association. JAMA 1997;277:1794-1801.
18. Kouyanou K, Pither CE, Rabe-Hesketh S, Wessely S. A comparative study of iatrogenesis, medication abuse, and psychiatric morbidity in chronic pain patients with and without medically explained symptoms. Pain 1998;76:417-426.
19. McWilliams LA, Cox BJ, Enns MW. Mood and anxiety disorders associated with chronic pain: an examination in a nationally representative sample. Pain 2003;106:77-83.
20. Sessle BJ. Acute and chronic craniofacial pain: brainstem mechanism of nociceptive transmission and neuroplasticity, and their clinical correlates. Crit Rev Oral Biol Med 2000;11:57-91.
21. Ren K, Dubner R. Descending modulation in persistent pain: an update. Pain 2002;100:1-6.
22. Lappin DF, Kjeldsen M, Sander L, Kinane DF. Inducible nitric oxide synthase expression in periodontitis. J Periodont Res 2000;35:369-73.
23. Awawdeh LA, Lundy FT, Linden GJ, Shaw C, Kennedy JG, Lamey PJ. Quantitative analysis of substance P, neurokinin A and calcitonin gene-related peptide in gingival crevicular fluid associated with painful human teeth. Eur J Oral Sci 2002; 110:185-191.
24. Moore A, Moore O, McQuay H, Gavaghan D. Deriving dichotomous outcome measures from continuous data in randomised controlled trials of analgesics: use of pain intensity and visual analogue scales. Pain 1997;69:311-315.
25. Turk DC, Melzack R. The measument of pain and the assessment of people experiencing pain. In Turk DC, Melzack R (Eds). Handbook of pain assessment, 2nd Ed. New York: Guilford Press, 2001.
26. Siqueira JTT, Ching LH, Nasri C, et al. Clinical study of patients with persistent orofacial pain. Arq Neuropsiquiatr 2004; 62:988-996.
27. Cepeda MS, Africano JM, Polo R, Alcala R, Carr DB. What declines in pain intensity is meaningful to patients with acute pain? In Proceedings of the 10th World Congress on Pain, Progress in Pain Research and Management, Vol 24. eds Dostrovsky, J.O., Carr, D.B. & Koltzenburg, M. Seattle: IASP Press, 2003:601-609.
28. Coghill RC, McHaffie JG, Yen Y-F. Neural correlates of interindividual differences in the subjective experience of pain. PNSA 2003;100:8538-8542.
29. Nóbrega JCM, Siqueira SRDT, Siqueira JTT, Teixeira MJ. Differential diagnosis in atypical facial pain: a clinical study. Arq Neuropsiquiatr 2007;65:256-261.
30. Siqueira SRDT, Nóbrega JCM, Valle LBS, Teixeira MJ, Siqueira JTT. Idiopathic trigeminal neuralgia: clinical aspects and dental procedures. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2004;98:311-315.