30 Rheumatoid Arthritis and Periodontal Disease: An Update
Archana Venkataraman, B.D.S.; Khalid Almas, B.D.S., M.Sc., FDSRCS
It is possible that individuals manifesting both rheumatoid arthritis and periodontal
disease suffer from a unifying underlying systemic deregulation of the inflammatory
response. Data suggest that periodontal therapies, combined with routine RA treatments,
further improve RA status.

37 Epithelial and Fibrous Hyperplasia: An Oral Manifestation of
Tuberous Sclerosis Complex
Classic characteristics of tuberous sclerosis complex, an autosomal dominant disorder, are
examined through case study of 13-year-old female with past medical history of TSC.

42 Ortho-Perio Interrelationship: Treatment Challenges
Nidhi Rathore, B.D.S., M.D.S.; Asavari Desai, B.D.S., M.D.S.; Mrudula Trehan, B.D.S., M.D.S.;
Vikas Jharwal, B.D.S., M.D.S.; Lakshmi Puzhankara, B.D.S., M.D.S.; Anand Marya, B.D.S.
Certain periodontal treatment modalities need to be undertaken before commencing
orthodontic treatment. And some periodontal procedures are required after active orth-
donadic treatment. Review of precautions and clinical techniques necessary to preserve
integrity of already compromised periodontium.

48 Methadone Maintenance Therapy and the Dental Patient
George Raymond, D.D.S.; William Maloney, D.D.S.
Patients undergoing methadone maintenance therapy experience higher incidence of
rampant caries, xerostomia, bruxism and poor oral hygiene. A review of pharmacology,
systemic effects, drug interactions and oral manifestations and discussion of possible
modifications to treatment and considerations in dental therapies.

52 Differential Diagnosis of Periapical Radiolucent Lesion
Paul A. Rosenberg, D.D.S.
Methodical approach to diagnosing periapical radiolucency that could not be diagnosed
using basic clinical and radiographic findings is described. Case report and review of
literature.

57 Plasma Cell Gingivitis: An Occasional Case Report
M.B. Mishra, M.D.S.; Swati Sharma, M.D.S.; Alok Sharma, M.D.S.
Case report emphasizes need for comprehensive history taking, careful clinical examina-
tion and appropriate diagnostic tests to arrive at definitive diagnosis and treatment plan
for gingival conditions that are refractory to conventional therapy and to exclude certain
malignancies and oral manifestations of systemic diseases.
Dentistry’s Demise is not Inevitable

The will to change and a lot of creative thinking are key to the profession’s survival.

An opinion piece by Marko Vujicic, Ph.D., chief economist and vice president of the ADA Health Policy Institute, that appeared in June in the Journal of the American Dental Association (“Where Have all the Dental Care Visits Gone”) got me thinking. In his article, Dr. Vujicic discussed the current state of dentistry in the United States and speculated on where these trends may lead in the future. The picture he paints is gloomy. It seems dentistry never really recovered from the Great Recession the way other segments of the economy did. However, the downturn in dentistry began early in this century, when the number of adult visits to the dentist began to decline. They have since leveled off. But dental schools are graduating more and more new dentists, while older dentists are not retiring at the rate they once did. This is leading to a glut of dentists with more time on their hands and more holes in their schedules.

Since the passing of the Affordable Care Act, the number of children seeking care has grown exponentially. But most of these patients are not being seen in traditional settings. Rather, they are being treated in federally qualified health centers (FQHCs). This is most likely due to the increased number of children covered under Medicaid.

Adults, meanwhile, are visiting hospital emergency rooms in greater numbers to obtain relief from acute dental problems, with no thought given to the need for ongoing dental care or to the long-term consequences of poor dental care. The cost of dental care is a factor as well, with more adults, especially those in the middle and higher income ranges, using their discretionary income for vacations, consumer electronics and the like. And, while the ACA mandated dental coverage for children, there is no such mandate for adult dental coverage. Even in states where there is Medicaid coverage for adults, reimbursement rates are so low, most dentists do not see Medicaid patients.

Dr. Vujicic pointed out that these and other factors may be contributing to the downward trend in adult dental visits. The fact that Congress did not make adult dental care part of the ACA leads to the belief that dentistry is not an essential service of health care. Likewise, people do not place significant value on dental care, which places further downward pressure on the economics of dentistry. And, finally, expansion in dental services appears to be focused on three groups of patients: children, senior citizens and those receiving Medicaid. The traditional middle-aged adult no longer sees the benefit of dental care over the long run.

Dr. Vujicic ended his piece with a series of challenging and thought-provoking questions on the future of dentistry and whether the dental profession can adapt to potential changes.
Dentistry must educate the public and the medical community as to the importance of good dental health to the overall well-being of the individual. We have the science to demonstrate this link; we have to do a better job of conveying it to the public at large.

Cost is a large impediment to adults seeking care. We need to ask ourselves if there are ways to reduce costs so that the patient is served well and properly and the dentist is able to maintain a good standard of living. We all know how difficult it is to run a practice in today’s economy. Can we run our practices more efficiently, or are there ways to economize so that savings can be made that can be passed on to our patients? Are reimbursement rates from insurance companies a stumbling block to a profitable dental practice? Do traditional delivery systems constitute the most efficient way to deliver good dental care to our patients, or are there alternative systems that would do the job better? These are all difficult questions that need answers if dentistry is to survive as a profession.

Dentistry is at a crossroad. The road we take will dictate what dentistry will look like in the future. We deliver the best oral health care in the world. We need to find innovative ways to finance and deliver cost-effective care to more people more efficiently. At the same time, we must instill in the general population the idea that dentistry is important to their health and well-being.

Changes are coming. It is inevitable. Nothing stays the same. If you remain stagnant, you get run over as the world moves past you. We need to embrace change, but we also have to be the agents of that change. In that way, we will be the ones who control the outcome, adding to the possibility of our survival. We need to be innovative. We must think “outside the box” to solve the problems we face. If not us, then who? I would not want someone who knows nothing about dentistry deciding dentistry’s future. How about you?

I didn’t think so.

D.D.S.
Wisdom

Experience and conviction come into play when the dentist and patient disagree on the treatment plan.

Paul S. Apfel, D.D.S.

ABSTRACT

Restorative dentists are often faced with the challenge of weighing best practice treatment plans against the treatment requests of their patients. I believe we all must ask ourselves prior to performing any dental procedure, “How do I know this restoration will be successful, given the multitude of physiological, pathological and anatomical limitations that can affect the prognosis?” There is no restorative dental procedure that is free of risk. The purpose of this article is to examine an interesting and somewhat controversial restorative case that illuminates perception and judgment and the consequences of risk assessment.

As health care professionals, we are obligated to perform the best we can every day and to improve upon what we learned yesterday. Every great accomplishment starts with the decision to try and to trust that little voice in our head. It’s difficult to mature into one’s greatest self, but it’s a tragedy to let fear stop us. So understand right now that fear is only as deep as our mind allows it to be.

There’s a saying I learned shortly after graduating from dental school: “You have to be willing to lose the patient before you can truly keep him or her.” Its application to dentistry is rather straightforward. We need to recommend a treatment plan that is based upon sound scientific principles and that has the patient’s best oral health interests in mind. To prejudge and propose treatment that falls short of the benchmark for what we believe is appropriate, necessary and predictable because that little inner voice is forewarning patient refusal is a window to the fear and anxiety pervasive in the relationship between patient and dentist. How ironic that it is the dentist who may become anxious anticipating that the recommended treatment will cause the patient to say no, or worse, goodbye.

Who wants to lose a patient? Definitely not me. And if my guess is correct, not you either! Walt Disney once said, “When you believe in a thing, believe in it all the way, implicitly and unquestionably.” Each of us has several unique beliefs regarding patient care. We each manage the doctor-patient interpersonal relationship differently. We also have preconceptions regarding dental procedures, restorative materials, prognoses and the quality of laboratory prosthetics. We use these principles and morals to regulate our behavior in the operatory. And we often apply them in our daily lives outside of the office. William Whewell (1794-1866), English scientist, philosopher and theologian, envisioned “prudence as the virtue by which we select right means for given ends, while wisdom implies the selection of right ends as well as right means.” All of us possess knowledge and the skills to perform a multitude of procedures. Questioning which treatment options are wise and which minimize risk, while maximizing predictability, is what’s important.

As an experienced practitioner, educator and author, I share with you now a simple restorative dental predicament that exemplifies the challenges we face in our practices when a patient refuses a treatment plan we have judged to be the most appropriate and predictable given the particular clinical circumstances.
The Patient Said “No”
A 58-year-old female who had been a patient of my dental practice for 19 years came into the office missing an extensive DO amalgam restoration from her mandibular right second bicuspid (tooth #29). During her emergency visit, recurrent caries was present, and both the lingual and buccal cusps were undermined. The tooth was asymptomatic, according to the patient; a periapical X-ray (Dexis, LLC) revealed dental caries down to the osseous level (Figure 1). My patient requested that I “just refill it.”

Clinical examination revealed that any attempt to restore the tooth would likely result in endodontic treatment, a post/core procedure and a crown restoration. However, because dental caries had extended to the osseous level, crown-lengthening surgery would be required. Consequently, this patient would require removal of a minimum of 3 mm to 4 mm of bone (1 mm to 2 mm for ferrule, and an additional 2 mm to allow for the dentogingival complex or DGC.) In addition, bone would need to be removed from the mesial of the molar or a vertical defect would be created.

To further complicate the situation, the root of this premolar tooth had a disto-angular dilaceration. As a result, the ability to insert a post would be compromised (far less than an insertion to one-half the root supported by bone), thereby amplifying an unfavorable crown-root ratio.

Given these restorative compromises, my recommendation was to extract the premolar and replace it with an implant-supported crown. We know from an abundance of available clinical data that the success rate for a single implant in the mandible is usually over 97 percent. The predictability, therefore, for this type of restoration far exceeds the long-term predictability in this particular situation for a root canal, compromised post/core and crown restoration with osseous crown lengthening. My patient’s response to my treatment recommendation was an adamant “no” and a repeat request that I “just fill it.”

Again, I discussed the considerable loss of tooth structure and the poor predictability if the tooth was restored as she desired. The success rate for an implant-supported restoration also precludes the preparation of otherwise healthy adjacent teeth for a three-tooth, fixed partial denture. However, when offered as a viable alternative restoration, she refused this option as well. She appeared annoyed and said she might seek treatment elsewhere. In spite of her visibly growing hostile demeanor, I maintained a smile as we sat face-to-face in the operatory. I recommended we take a short break so she could think about my suggestions, and I removed myself from the operatory. I proceeded to go straight to my private office, where I sat at my desk trying to absorb the conflicting thoughts about my long-time patient leaving my practice because she didn’t want to accept treatment that I believed was most predictable. In fact, my dental assistant pleaded with me to reconsider so we don’t “lose her.”

Missing the Larger Picture
Predictability is defined as the ability to declare or tell in advance; to prophesy. Almost 30 years in practice has given me knowledge and experience with treatment predictability. As practitioners, we know that the very best clinical restorations, once exposed to the detrimental effects of a watery bacterial-inhabited oral environment and to harmful occlusal forces, can, unfortunately, fail prematurely. We also know procedures that on the surface suggest questionable outcomes, given the same parameters, can last for decades.

The presentation of the radiograph in Figure 1 has evoked chatter from dentists at continuing education seminars throughout the country, as well as a steady wave of hands from colleagues.
Doctors in attendance have affirmed that their patients will not pay for implants. They’ve suggested that they can start the root canal and bill the insurance company right away. And they have questioned even, “Where is it written that a crown has to last 5 to 10 years or, perhaps, even longer?”

The apparent need for “immediacy” in operatory production often interferes with the development of sound and predictable treatment plans. This seems to be a pervasive topic of discussion when it comes to offering a patient an implant-supported restoration requiring a dental “team” approach. Doctors have told me repeatedly that they need to be productive. Consequently, they prefer to commence treatment “now,” if possible, as opposed to after the patient consults with a specialist. They subscribe to the old proverb “a bird in the hand is worth more than two in the bush” and often don’t see the larger picture.

This “start it now” philosophy too often seems to be an overwhelming, driving force, especially in times of economic adversity. Life is about choices, and nothing can be more rewarding than to offer our patients treatment options that are predictable and evidence-based. The restorative dentist is responsible for coordinating development of these predictable treatment plans. Diagnostic casts and record bases can be obtained, in addition to laboratory wax-ups, stents, and implant radiographic and surgical guides, all of which are prerequisites to predictable dental implant placement. I can’t think of a better “immediate” scenario.

I returned to my patient in the operatory and, in spite of my rationale for my treatment recommendations, she again refused. She said she was very upset and left my office. I couldn’t help thinking of what I had learned early in my career: “You have to be willing to lose a patient before you can truly keep them.” I repeated to myself that I was offering the most appropriate and predictable restorative treatment for my patient. No patient is ever happy when he or she returns with a failed restoration and is told he or she has to spend more money and more time to “fix” it again. Failures create tension in the doctor-patient relationship.

Predictability Wins Out
Every decision we make has consequences and costs. Yielding to the temptation to comply and treat according to the demands of our patients when we believe it is not a best practice, may result in premature failure with significant professional, financial and emotional consequences. There’s the financial cost to the patient and doctor, as well as the emotional cost to both if the restoration fails. In addition, there is the possibility of a lawsuit. The bond of implied trust is damaged, often irreversibly.

Several weeks passed and my patient returned for another consultation. She appeared calm and asked me to explain the implant procedure. After our discussion, she finally agreed to have an implant-supported crown. Ultimately, her bicuspid was extracted and a dental implant was placed (Figures 2, 3, 4).

While there often are multiple treatment options, there exists only one diagnosis. We must consider the “needs and wants” of the patient and balance those against sound clinical data while considering restorative options in terms of their predictability. To know how to do a dental procedure well is often not enough. Questioning whether it is a wise procedure and in the best interest of the patient is equally as important. There’s a famous quote by legendary coach John Wooden: “If you don’t take the time to do it right the first time, when will you find the time to do it over?”
I was delighted when my patient returned and accepted the procedure, which both the periodontist and I believed was most predictable. But I can never forget that feeling of loss when she walked out of my office previously.

Wisdom has been defined as “the use of the best means for attaining the best ends.” It implies the union of high mental and moral excellence. Knowledge and wisdom, far from being one, often times have no connection. “Knowledge dwells in heads replete with thoughts of other men; wisdom, in minds attentive to their own,” said Whewell.

In conclusion, another well-known quote comes to mind. “Never let your fear steer your present or decide your future.” And, remember, courage is not the absence of fear, but rather the judgment that something else is far more important.

Queries about this article can be sent to Dr. Apfel at papfel@aol.com.

REFERENCES

Paul S. Apfel, D.D.S., is co-director of the dental implant postgraduate fellowship program and chief of prosthetics, Department of Dental Medicine, North Shore University Hospital, Manhasset, NY. He is in private practice in Huntington, NY.
Concerns about the well-being of children brought close to 40 professionals to Albany in June to participate in a two-day workshop devoted to the “Current State of Children’s Dental Health.” The workshop was sponsored by the New York State Dental Foundation. Moderator was Meg Atwood, R.D.H., M.P.S., associate professor in the Department of Dental Hygiene at Orange County Community College.

Among those gathered for the event in the Legislative Office Building were dentists, registered dental hygienists, educators and public health workers, with representatives from six of the best practices throughout New York State. Their objective was to learn about and develop strategies for treating, reducing and eradicating early childhood caries (ECC). They were motivated by the awful knowledge that ECC can result in pain, increased risk of future caries, missed school days, visits to the ER and inpatient hospitalizations.

Kara Williams, M.P.H., from the Health Foundation for Western and Central New York (HFWCNY) described an initiative named “CHOMPERS!” The program was developed to provide dental care to more preschool-aged children through education, treatment and prevention. So far, it has brought portable dental care to seven sites throughout Central and Western New York. Through education, it has successfully helped families change their behavior and has heightened their caries prevention knowledge.

Bridget Walsh, M.P.H., from the Schuyler Center for Analysis and Advocacy (SCAA) discussed “Keep NY Smiling,” a project that has brought together SCAA, the Children’s Dental Health Project, the Centers for Disease Control, the New York State Department of Health and HFWCNY to reduce ECC through the adoption of evidence-based prevention strategies tailored to individual communities. As such it takes into account local leadership, dental health statistics and existing programs. Once a strategy is chosen, it is incorporated into the infrastructure of an existing program, thereby reducing costs and initial set-up time.

Melinda Clark, M.D., FAAP, from Albany Medical Center and Albany Medical College explained how the separation of medicine and dentistry is having a detrimental effect on oral
health. She referred to oral health issues as a “silent epidemic” and “the most common unmet health need.” Noting that oral health issues are largely preventable, Dr. Clark called on primary care physicians to screen and assess ECC risk in the children they see, often 13 times in the first 36 months of life. Primary care physicians can be an excellent resource for ECC prevention, she said, when another dental home is unavailable. In addition to screening and risk assessment, pediatricians are now required to apply fluoride varnish on patients ages 5 and younger two to four times a year. This ensures that every child receives the ECC prevention benefits of fluoride varnish, regardless of whether he or she visits a dentist.

Dara Rosenberg, D.D.S., M.S., M.P.H., of St. Barnabas Hospital Health System in the Bronx described her participation in the DentaQuest ECC Collaborative, a national initiative designed to foster the spread of an alternative disease management model of ECC care that is focused on prevention and minimally invasive treatment rather than on restorative and surgical treatment. By participating in the collaborative and focusing on high-risk patients under 5 years of age, by providing families with self-management goals and increasing patient return rates, St. Barnabas was able to reduce ECC rates. Moving forward, Dr. Rosenberg has joined the NYS ECC Learning Collaborative as expert faculty to test these methods in more facilities in the state.

Christie Custodio-Lumsden, Ph.D., M.S., R.D., C.D.N., from Columbia University College of Dental Medicine discussed the MySmileBuddy iPad-based family intervention developed by a multidisciplinary team of Columbia-affiliated faculty. MySmileBuddy relies upon lay health workers using the interaction between these workers and families to achieve the following: engage, educate and train families; assess ECC risk; individualize risk and provide analysis for it; set family specific goals; individualize action plans with family input; and offer continuous support and encouragement to families. So far, this family-to-family approach has been successful at reducing ECC rates. Its success is more remarkable considering that technology is ever changing, lay health workers have a high turnover rate, the population is difficult to reach because of cultural and language barriers and, as with most groups, the population MySmileBuddy serves has many misconceptions about oral health, ECC and the importance of preventive care.

The final best practice presentation came from Tony Mendicino, D.D.S., and Carly Sisson from Finger Lakes Community Health. Finger Lakes has created a TeleHealth network, a component of which is TeleDentistry. As part of TeleDentistry, when Dr. Mendicino comes across a patient whose dental care needs are beyond what his clinic has resources for, Dr. Mendicino videoconferences an initial patient visit with a pediatric dentist at Eastman Dental Clinic in Rochester. During the real-time videoconference, X-rays and photographs are shared with the dentist at Eastman. This process allows the patient and dentist to become acquainted without the patient needing to travel to Rochester. Using this approach has reduced the no-show rates for patient appointments at Eastman. The TeleDentistry program has successfully expanded access to care where dentists are few to none and has connected patients to a source of care.

During day two of the workshop, participants were asked which best practice, best practices or components of multiple best practices could be adopted in communities throughout the state where there may be limited access to care, cultural differences between patients and dentists, lower socioeconomic status, lack of preventative knowledge and providers that do not accept children or certain insurance coverage.

Dental health education emerged as a common initiative no matter the community situation. With the help of health professionals, parent groups and trusted community figures—especially when cultural barriers are present—defining oral health, stressing the importance of children 5 years and younger visiting the dentist, and reframing dental decay as a preventable disease using methods that engage the parents, rather than reprimand or lecture them, would begin to change the focus away from treatment and towards prevention.

Additionally, participants suggested utilizing available resources whenever possible. By training pediatricians on the benefits of fluoride varnish and how to apply it and by teaching lay health workers and school nurses how to incorporate dental health concerns into their communications with families, communities without dental health providers would still have access to preventive measures and the educational resources they would ordinarily receive only at a dental home.

Participants agreed a broader reaching TeleDental program would be an excellent resource for reducing ECC, but they cited start-up costs as the largest barrier to adopting this program in communities throughout the state. A mobile dental unit would be a more practical approach, but the services it can offer tend to be more limited.

For more information on the workshop or to join an advisory committee on children’s dental health needs, please contact Mercedes Susi at msusi@nysdental.org.

Dr. Gleason is chair of the New York State Dental Foundation Board of Trustees.
Rheumatoid Arthritis and Periodontal Disease
An Update
Archana Venkataraman, B.D.S.; Khalid Almas, B.D.S., M.Sc., FDSRCS

ABSTRACT
A review of the epidemiological, pathological and immunological relationships between two chronic inflammatory diseases: rheumatoid arthritis (RA) and periodontal disease (PD). RA is a chronic inflammatory disease of the joints, characterized by loss of connective tissue and mineralized structures, the so-called “synovial membrane.” Periodontitis is the inflammatory destruction of the periodontal attachment and alveolar bone.

While the etiology of these two diseases may differ, the underlying pathogenic mechanisms are similar. And it is possible that individuals manifesting both PD and RA may suffer from a unifying underlying systemic deregulation of the inflammatory response. There is an overproduction of a variety of cytokines and MMPs that appears to be common in both diseases. Oral health parameters should be more closely monitored in patients with RA, an autoimmune disease. Data suggest that periodontal therapies combined with routine RA treatments further improve RA status. Interventions to prevent, minimize or treat periodontitis in arthritis patients will definitely promise a better quality of life for these patients.

Rheumatoid arthritis (RA) is a chronic inflammatory disease of the joints characterized by loss of connective tissue and mineralized structures, the so-called “synovial membrane.” It affects approximately 1% of the total world population. It affects women about three-times more often than men. Prevalence varies from 0.2% to 1.0% in various European, North American, Asian and Australian populations. The prevalence of periodontal disease has increased two-fold among patients with rheumatoid arthritis compared to the general population. It affects all races, but is more common in Pima Indians and in the Chippewa Indians.

Synovial and adjacent soft tissue inflammation may be initiated by a number of microbial factors, including bacterial DNA, heat shock proteins and lipopolysaccharides. MMPs, cathepsins and osteoclast activation contribute to bone resorption. A number of cytokines, like TNF-α, IL-1 and macrophage colony-stimulating factor (MCSF), are also involved. Epigenetic changes through the regulation pro-inflammatory response through NF k B regulation affecting TNF alpha may be crucially involved in the pathology of RA and other chronic inflammatory diseases. Chronic periodontitis and RA appear to share many common pathological features. Oxygen metabolism has an important role in the pathogenesis of both CP and RA. However, the presence of RA seems not to affect local and systemic Oxidative Stress Index values in patients with chronic periodontitis.

RA can affect any joint, but it is usually found in metacarpophalangeal, proximal interphalangeal and metatarsophalangeal joints, as well as in the wrists and knee. The clinical presentation of RA varies, but insidious onset of pain with symmetric swelling of small joints is the most frequent finding. RA onset is acute or subacute in about 25% of patients, but its patterns of presen-
tation also include palindromic onset, monoarticular presentation, extra-articular synovitis, polymyalgic-like onset and general symptoms. Morning stiffness duration is related to disease activity. Synovitis, destruction of cartilage and bone tissue of the joints, ultimately leads to physical impairment and disabilities.

**Periodontitis**

Periodontitis is characterized by the inflammatory destruction of the periodontal attachment and alveolar bone. Its clinical appearance can be influenced by congenital, as well as acquired factors. Periodontal disease (PD) is one of the most common chronic disorders of infectious origin known in humans, with a prevalence of 10% to 60% in adults, depending upon the diagnostic criteria. Patients affected by PD respond to bacterial dental plaque biofilm by mobilizing their defensive cells and releasing cytokines like interleukin-18, tumor necrosis factor-α, and interleukin-6, which lead to tissue destruction by stimulating the production of the collagenolytic enzymes: matrix metalloproteinase.

According to the NHANES 1999 to 2004 data, older adults, black and Hispanic adults, current smokers, and those with lower incomes and less education are more likely to have periodontal disease. It is estimated that 48.2%, or approximately half the United States adults aged ±30 years, had periodontitis in the period 1988 to 1994, and that the prevalence of periodontitis was underestimated by the NHANES III (1988-1994) Survey.

**Diagnosis of RA**

RA is an autoimmune condition diagnosed as chronic inflammatory polyarthritis when five or more joints are affected. Diagnosis is based upon clinical history, physical examination, blood count (ESR, C-reactive protein) and immunoglobulin rheumatoid factor (RF). Imaging methods are used to assess various joints. RA manifests typically with the signs of inflammation, with the affected joints being swollen, warm, painful and stiff. This inflammation leads to tendon tethering, erosion and destruction of joint surfaces.

Chronic, plaque-associated inflammation of the periodontium is among the most common oral diseases and has a prevalence of 80% to 90%, resulting in soft and hard periodontal tissue destruction and, ultimately, tooth loss. Both the amount and virulence of the microorganisms and the resistance factors of the host (risk factors and immune status) are crucial for the initiation and progression of the periodontal destruction.

To arrive at a periodontal diagnosis, the dentist must rely upon such factors as: 1. presence or absence of clinical signs of inflammation (e.g., bleeding upon probing); 2. probing depths; 3. extent and pattern of loss of clinical attachment and bone; 4. patient’s medical and dental histories; and 5. presence or absence of miscellaneous signs and symptoms, including pain, ulceration, and amount of observable plaque and calculus.

It has also been known for some years now that patients with PD not only suffer from local loss of connective and hard tissue, but also have an increased risk of developing systemic diseases. This interrelation is referred to as “periodontal medicine.” Risk factors common to both diseases are listed in Table 1. Periodontal disease is significantly higher in non-smoking, treatment-naïve rheumatoid arthritis patients.

**Plausible Link between RA and PD**

Both are chronic inflammatory reactions in an immunogenetically susceptible host.

Link via citrullination of proteins: Citrullination, also termed deamination, is a modification of arginine side chains catalyzed by peptidylarginine deaminase (PAD) enzymes. This post-translational modification has the potential to alter the structure, antigenicity and function of proteins.

In RA, antibodies to cyclic citrullinated peptides are used in clinical diagnosis. The citrullinated antigens are fibrinogen, vimentin, collagen Type II and alpha-enolase, all of which are expressed in the joint. P. gingivalis produces a microbial enzyme, equivalent to the human PAD enzyme. It has been thought to represent a susceptibility factor for RA. The antigens generated by this enzyme lead the production of rheumatoid factor and local inflammation of both the gingivae and synovium. PAD leads to the citrullination of putative RA autoantigens, which in association with major histocompatibility complex molecules and antigen-presenting cells, leads to the production of anti-cyclic citrullinated peptide antibodies (anti-CCP antibody). Periodontal diseases in RA patients are associated with high titres of anticitrullinated protein antibodies (ACPAs).

**Detection of Bacterial DNA in the Synovial Fluid of RA Patients**

It has been reported that P. gingivalis, Tannerella forsythia, and P. intermedia have been identified in synovial fluid samples from RA and psoriatic arthritis patients using the checkerboard DNA-DNA-hybridization. A recent cross-sectional study involving 19 subjects with periodontitis and refractory RA has shown that

<table>
<thead>
<tr>
<th>Individual Risk Factor</th>
<th>Exogenic Risk Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Nutritive factors</td>
</tr>
<tr>
<td>Gender</td>
<td>Socioeconomic status</td>
</tr>
<tr>
<td>Body mass</td>
<td>Psychological factors like stress</td>
</tr>
<tr>
<td>Genetic factors (IL6, polymorphism and HLA gene association)</td>
<td>Lifestyle: Cigarette smoking and Alcohol consumption</td>
</tr>
<tr>
<td>Systemic diseases</td>
<td></td>
</tr>
</tbody>
</table>

**TABLE 1**

**Common Risk Factors for Rheumatoid Arthritis and Periodontal Diseases**

The New York State Dental Journal • AUGUST/SEPTEMBER 2015 31
cyclic citrullinated peptide (CCP) antibodies. Thus, oral bacterial citrullinated antigens, predisposing them to development of anti-PAD, which allows individuals with periodontitis to be exposed to microorganism documented to express peptidylarginine deaminase and joint diseases. Heat shock proteins (HSP 60) from and could represent a potential connection between periodontal and RA patients when compared with controls. The presence of, were higher in serum and synovial fluid.

P. gingivalis and rheumatoid arthritis

P. gingivalis is the main organism associated with chronic PD. It is a gram-negative anaerobic bacteria, the fimbriae of which allow binding of the bacterial cell to host proteins. P. gingivalis is the sole microorganism documented to express peptidylarginine deaminase (PAD), which allows individuals with periodontitis to be exposed to citrullinated antigens, predisposing them to development of anti-cyclic citrullinated peptide (CCP) antibodies. Thus, oral bacterial infection (P. gingivalis) may play a role in citrullination and be involved in loss of self-tolerance and development of RA.

The IgG and IgA antibody levels against P. gingivalis, together with other periodontopathic organisms, such as P. intermedia, P. nigrescens and T. forsythia, were higher in serum and synovial fluid from RA patients when compared with controls. The presence of these antibodies could be important in the etiopathogenesis of RA and could represent a potential connection between periodontal and joint diseases. Heat shock proteins (HSP 60) from P. gingivalis can trigger molecule-linking infectious periodontitis and autoimmune atherosclerosis. Data suggest that HSPs are significant factors also in RA and are related to citrullination.

Role of IL-17

IL-17, a proinflammatory cytokine contributes to bone destruction in RA but, at the same time, is essential in the host innate immune defense against pathogens such as P. gingivalis. While recent evidence has shown that Th17 cells are more osteoclastogenic than other T helper subsets such as Th1 or Th2, and ablation of IL-17 signaling prior to the onset of infection with P. gingivalis increases susceptibility to periodontal bone loss.

IL-17 stimulates the generation and mobilization of neutrophils and plays an important role in the defense of extracellular bacteria. Th17 cells and IL-17 play an important role in the pathogenesis of RA. Th17 cells are also present in chronic periodontal disease. IL-17 can be found in periodontal lesions and potentially plays a role in the etiopathogenesis of periodontal disease. The P. gingivalis antigen stimulates the T cells to express IL-17.

IL-1

Cytokines are the main mediators of the immune response, inflammation and tissue destruction in both diseases. Elevated serum levels of TNF alpha released in response to lipopolysaccharide and other bacterial products induce the production of CRP (C reactive protein), and IL-1. IL-1 facilitates the migration of polymorphnuclear cells into the synovial tissue.
surfaces in RA are similar. There is an overproduction of a variety of cytokines and MMPs that appear to be common in both diseases.\textsuperscript{40} PD and RA both have persistent high levels of proinflammatory cytokines, including IL-1\textsuperscript{b} and tumor necrosis factor-alpha (TNF-a), and low levels of cytokines that suppress the imunoinflammatory response, such as IL-10 and transforming growth factor-\textgamma{} (TGF-\textgamma{}).\textsuperscript{30} These cytokines, together with low levels of metalloproteinase inhibitors (TIMPs) and high levels of MMPs and prostaglandin E2 (PGE2), are associated with disease activity.\textsuperscript{40}

Many studies have been made to find the association between RA and PD among humans (Table 2) and in animals (Table 3).

Management
1. Rheumatology patients should be referred to dental care for scaling, root planing and dental surgery if needed, as periodontitis is also associated with an increased risk of premature atheroma.
2. Treatment modalities may include medications, efforts to reduce joint stress, physical therapy and surgical intervention. Non-steroidal anti-inflammatory agents (NSAIDs, such as aspirin, ibuprofen, COX-2 inhibitor) corticosteroids and disease-modifying anti-rheumatic drugs (DMARDs) are commonly used to treat RA. In addition, injectable gold therapy (until late 1990s), cyclosporine, diet and climate-humidity change are considered.\textsuperscript{57}
3. Anti-inflammatory treatments of periodontitis have also been proposed. Lipoxin antagonizes \textit{P. gingivalis}-induced cell activation dependent upon leukocyte-platelet interaction through down regulation of CD11b/CD18.\textsuperscript{55,56} Administration of omega-3 polyunsaturated fatty acids, plus low dose aspirin, as an adjunctive treatment to regenerative periodontal therapy, provides additional clinical benefits.\textsuperscript{57} Adjunctive sub-antimicrobial dose of doxycycline in periodontal therapy suppresses proinflammatory cytokines and regulates the inflammatory response to therapy.\textsuperscript{58}
4. Tetracycline, non-steroidal anti-inflammatory drugs (NSAIDs) and bisphosphonates are used in the treatment of both RA and PD.
5. Treatment with anti-TNF alpha medication is commonly used to control for the inflammatory process in RA. Such therapy may also be relevant for the management of periodontitis.\textsuperscript{17} Two studies\textsuperscript{57,59} that assessed the effects of anti-TNF alpha in the treatment of RA demonstrated that anti-TNF alpha therapy resulted in clinical benefits with regard to periodontal conditions.
6. Immunization with cysteine proteases purified \textit{P. gingivalis} against periodontitis may have significance in prevention and management of RA through humoral factors and in impacting cytokine production and control of infection and inflammation.\textsuperscript{60}
7. Data suggest that oxidative stress is profound in RA. So medication used to manage oxidant/antioxidant imbalance may be an alternative treatment in RA.\textsuperscript{17} Administration of omega-3 fatty acid reduces the extent of swollen and tender joints in patients with RA.\textsuperscript{61} Dietary intake of polyphenols interferes with \textit{P. gingivalis}, suggesting that polyphenols in diet may be useful in the management of PD.\textsuperscript{62} Dietary factors like micronutrients and non-nutrient dietary components can modify epigenetic markers.\textsuperscript{63}

Role of Medical/Dental Professionals
1. To maintain good oral health, RA patients are encouraged to brush and floss regularly and to see a dental professional twice a year.
2. Periodontist consultation is necessary to decide the course of treatment for gingivitis. Reduction in the oral contribution to the total inflammatory burden following the favorable periodontal treatment outcome is highly desirable.
3. Maintaining the complete health of RA patients should be a collaborative effort. “It is important that both the dental and medical professionals work together when treating a patient with RA. This partnership will definitely influence the oral and overall health of these patients.”\textsuperscript{53}
4. Chronic periodontitis and RA appear to share many common pathological features. Oxygen metabolism has an important role in the pathogenesis of both CP and RA. However, the presence of RA seems not to affect local and systemic Oxidative Stress Index values in patients with chronic periodontitis.\textsuperscript{64}

Conclusions and Clinical Implications in Health Care
There is a strong association between RA and periodontitis. Interventions to prevent, minimize or treat periodontitis in arthritis patients will definitely promise a better future for these patients. Periodontal disease is prevalent and often severe in patients with RA; the prevalence of periodontitis in RA was 97.5%. The prevalence of mild (12.5%) to moderate (75%) periodontitis was significantly elevated in RA patients.\textsuperscript{64}

Significant evidence suggests that citrullination may link periodontal disease with RA. Genetic factors are driving the host responses to chronic diseases with a complex pathogenesis. The oral systemic link cannot be ignored any longer. We have to act on this new knowledge about the relationship between periodontal diseases and systemic diseases.

In the future, more effective therapeutic approaches will include multiple, synergistic host modulation therapies combined with treatments that target the microbial etiology. Additional studies are needed to better understand these mechanisms and help in maintaining the overall health of an individual.

Chronic periodontitis and RA appear to share many common pathological features. Oral health parameters should be moni-
### Table 2: Association Studies between Rheumatoid Arthritis and Periodontitis (Human Studies)

<table>
<thead>
<tr>
<th>First Author &amp; Reference</th>
<th>Study Design and Characteristics</th>
<th>Clinical Data</th>
<th>Lab Data</th>
<th>Findings</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ribeiro et al., 2005</td>
<td>42 patients, Group 1 (G1) - 16 Group 2 (G2) - 26, G1: OHIP-tooth cleaning, G2: SRP</td>
<td>PPD, CAL</td>
<td>ESR, RF</td>
<td>Anti-TNF alpha drug therapy</td>
<td>GROUP 2: More reduction on PPD 4mm than GROUP 1. ESR was significantly reduced in G2 after SRP. Control of periodontal infection by SRP and oral hygiene in subjects with moderate periodontitis might contribute to reduction in signs and symptoms of RA and reduction in serum levels of TNF alpha.</td>
</tr>
<tr>
<td>Ortiz et al., 2009</td>
<td>60 RA pts, Periodontal classification was assessed with periodontal screening index PPS/PSI = 1: healthy, 2: gingivitis, 3: moderate periodontitis, 4: severe periodontitis</td>
<td>PD, CAL, BOP, GI, PI, RA disease activity scores (DAS-28)</td>
<td>ESR</td>
<td>In patients receiving periodontal treatment, there is sig decrease in mean DAS28, ESR and serum TNF alpha. No sig decrease in patients who did not receive treatment. Anti TNF alpha drug therapy: sig improvement in CAL, BOP, PD, GI.</td>
<td>Controls with RA had a sig 8.05 fold increased odds of periodontitis. Subjects with RA had significantly increased attachment loss compared to controls.</td>
</tr>
<tr>
<td>Pischon et al., 2008</td>
<td>Association between RA and periodontitis was examined in 57 pts with RA and 52 healthy controls matched by age and gender</td>
<td>PI, GI, PD, CAL</td>
<td>Pool samples for PCR analysis for presence of 11 periodontal pathogens</td>
<td>24pts: Gingivitis 18 pts: moderate periodontitis 23pts: severe periodontitis</td>
<td>No association was found between RF and periodontal classification and microbiological parameters.</td>
</tr>
<tr>
<td>Ziebolz et al., 2011</td>
<td>20 RA pts, Case-control study. Subjects between 10 and 19 years. 41 juvenile idiopathic arthritis (JIA) on DMARDS.41 control subjects.</td>
<td>Plaque, calculus, PPD, CAL, and mucosal lesions dental radiographs. Child health assessment questionnaire Stanford HAQ disability index. Serum, RF, CRP, ESR, salivary flow rate.</td>
<td>68% JIA and 12% controls had pain when opening the mouth. 12% JIA had intraoral ulcers. 32% JIA but none in control group had increased PPD/IA+ subjects on anti-TNF alpha had lower BOP scores. Medications: Anti-TNF alpha, DMARD, NSAIDS, and methotrexate.</td>
<td>No sig reduction in patients who did not receive treatment. Reduction in serum levels of TNF alpha.</td>
<td></td>
</tr>
</tbody>
</table>

### Table 3: Association Studies between Rheumatoid Arthritis and Periodontitis (Animal Studies)

<table>
<thead>
<tr>
<th>First Author &amp; Reference</th>
<th>Aim</th>
<th>Data Collection</th>
<th>Findings</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trombone AP et al., 2010</td>
<td>Basis of A.a and P.g induced PD and pristane-induced arthritis (PIA) interaction in mice was examined.</td>
<td>Higher severity PD in the genetically inflammation prone acute inflammatory reactivity maximum (AIR max) mouse strain was associated with higher levels of TNF-alpha, IL-1beta, IL-17, MWP-13, and RANKL. PD/PIA co-induction resulted in higher levels of IL-1beta, IFN-gamma, IL-17, RANKL, and MWP-13 levels.</td>
<td>Interaction between Exp PD and arthritis in mice involves a shared hyperinflammatory genotype and functional interferences in innate and adaptive immune responses.</td>
<td></td>
</tr>
<tr>
<td>Cantley et al., 2011</td>
<td>To develop an animal model to assess the relationship between pre-existing periodontitis and experimental arthritis (EA) in mice.</td>
<td>Alveolar bone and joint changes were assessed. Histological and immunohistochemistry. Serum levels of C-reactive protein.</td>
<td>Mice with preexisting periodontitis developed more severe arthritis. Mice with periodontitis only also showed bone loss within the radiocarpal joint. Evidence of alveolar bone loss in mice with EA alone.</td>
<td>Pre-existing periodontitis exacerbated experimental arthritis in mouse model.</td>
</tr>
</tbody>
</table>
tored more closely in patients with RA, an autoimmune disease. Interventions to improve oral pathology may have direct and indirect systemic benefits. In most patients with RA, the condition will necessitate few or no changes in routine dental care. However, considerations include the patient’s ability to maintain adequate oral hygiene, xerostomia and its related complications, the patient’s susceptibility to infections, impaired hemostasis, and untoward drug actions and interactions.

Patients with RA may require antibiotic prophylaxis because of joint replacement and/or immune suppression, glucocorticosteroid replacement therapy and modifications in oral hygiene procedures. Intra- and extraoral conditions, such as ulcerations, gingival overgrowth, disease-associated periodontitis and temporomandibular pathology, also need to be recognized. Oral health care providers need to recognize and identify modifications of dental care based upon the medical status of patients with RA.

It is hoped that this review will help health care professionals better understand the RA and PD mechanisms and improve the quality of life of their patients.

Authors do not have any conflict of interest in reviewing the topic. Queries about this article can be sent to Dr. Almas at khalidalmas9@gmail.com.

REFERENCES


Epithelial and Fibrous Hyperplasia: An Oral Manifestation of Tuberous Sclerosis Complex
A Case Study


A B S T R A C T
The authors present a case study of a 13-year-old female with a past medical history of tuberous sclerosis complex (TSC), an autosomal dominant disorder. It usually presents with a triad of epilepsy, mental deficiency and facial angiofibromas that are often distributed around the nose, cheek and chin, and are frequently shaped like butterfly wings. In addition, oral manifestations include gingival enlargement and developmental enamel pitting on the facial aspect of the anterior permanent dentition in 50% to 100% of patients. The patient’s chief complaint was gingival enlargement and gingival bleeding. The histology of the excised gingival tissue revealed epithelial and fibrous hyperplasia, consistent with TSC.

Tuberous sclerosis complex (TSC), also known as Bourneville’s disease or epilopa, is an autosomal dominant disorder with a neurological manifestation. It was first documented in 1862 by Von Recklinghausen in a brief report and then more thoroughly described in 1880 by Desire-Magloire Bourneville, who observed that the disease was only suspected in patients that presented with “mental retardation and fits.”

In 1908, Vogt described TSC as a disorder that presents with a triad of epilepsy, mental deficiency and facial angiofibromas that are often distributed around the nose, cheek and chin, and are frequently shaped like butterfly wings. With the advent of new techniques for genetic studies, it is currently understood that TSC is an autosomal dominant disease with high penetrance, and that males and females have a 50% chance of passing the affected gene to their offspring. It is caused by inactivating mutations of TS1 and TS2 tumor suppressor genes located on chromosomes 9q34 and 16p13.3, respectively, leading to cellular hyperproliferation and hamartoma formation in different organs of the body, most commonly, the kidneys, heart, eyes, gingiva, skin and brain.

No single organ is affected in every patient diagnosed with TSC; and there is no proof that any single clinical or radiographic sign present in one organ is absolutely specific for TSC.

Diagnosis is usually made by clinical, pathologic and/or radiographic findings. Because of the variation in symptoms of TSC disorder, the diagnosis of TSC has been divided into major and minor criteria. A patient is said to “definitely” have TSC if he or she presents with two major features or one major feature and two or more minor features. “Probable” TSC diagnosis is reached if a patient presents with one major and one minor feature, while a diagnosis of “possible” TSC is made if the patient presents with one major feature or two or more minor features (Table 1). However, patients should be considered for the syndrome if they present with a history of seizures and hypomelanotic lesions, as 90% of patients present with seizures and up to 98% present with skin lesions.

Oral manifestations of TSC include developmental enamel pitting on the facial aspect of the anterior permanent dentition in 50% to 100% of patients. The pathogenesis of pitted enamel hypoplasia in TSC is not understood. Previous studies suggest that the pits extend to the dentoenamel junction. The pits appear to
result from a reduction in the amount of enamel matrix formed. This may be because of a primary defect in odontoblasts, or in ameloblasts, or may be the result of defective interaction between odontoblasts and ameloblasts.13

However, enamel pitting is not unique to TSC; it is also associated with other abnormalities of amelogenesis, including pitted amelogenesis imperfecta, vitamin D-dependent rickets, epidermolysis-bullosa-dystrophica, pseudo-hypoparathyroidism and tricho-dento-osseous syndrome.1 Since enamel pits might be the most common oral manifestation of TSC, they may be a helpful marker in the diagnosis of this disorder.13

Multiple fibrous papules that present clinically as gingival enlargement are the second most common oral finding of TSC, affecting 11% to 56% of patients. The fibrous papules are seen predominantly on the anterior gingival mucosa, although the lips, buccal mucosa, palate and tongue may be involved.11,12 Less common oral manifestations include hemangiomas, facial asymmetry, high arched palate, bifid uvula, lip/palate, delayed eruption and diastemas.11,12,14

Because of the varying clinical manifestations, the prevalence and incidence of TSC differs among epidemiological studies. Incidence of TSC varies from 1:10000 to 1:100000, depending upon the study.5 A study showed that 1:8000 newborns and 1:6000 adults have the disorder.4,6 Differences in data may be explained by diagnostic criteria and partial forms of presentation of the disorder.4 Both sexes are affected in a similar frequency, but women may show more prominent signs. There are no reports showing disproportionate involvement in a particular ethnic group.6

Case Report
A 13-year-old female presented to Brookdale University Hospital dental clinic for comprehensive dental care and gingival bleeding from the areas of overgrowth. She had been an inconsistent patient since 2004. A medical clearance from her primary care physician, dated June 2008, described her past medical history as “tuberous sclerosis with skin lesions/seizure disorder and learning issues and two small rhabdomyomas in the left ventricle with good heart function, and shagreens patch on her back.” She is on Keppra (levetiracetam) 250 mg two times a day and has no known drug allergies. Extraoral exam shows facial angiofibromas; no swelling, no lymphadenopathy and no tempo-mandibular disorder were observed (Figure 1).

The intraoral exam showed missing permanent first molars (#3, #14, #19, #30), which were extracted in 2006. Notes from her clinic chart stated the first molars were extracted “due to dysmorphic and abnormal development”; hypoplastic maxillary central incisors (#8 and #9), gingival enlargement about 2 cm by 1 cm on facial gingival papilla between #23 and #24; gingival enlargement also observed between facial papilla of #7, #8, #9 and lingual of #6 and #7; ankylosed and over-retained primary tooth #K, edge-to-edge incisal occlusion, and rotated #28 (Figures 2-4).
Methods
On Sept. 25, 2012, the patient presented for a gingivectomy on the maxillary anterior region; a gingivectomy was achieved previously on the mandibular anterior region. Her medical history was reviewed. She was administered 72 mg 2% lidocaine with 0.034 mg epinephrine for local infiltration of the buccal and palatal gingiva, from tooth #6 to #11. Using an 11- and 15-blade scalpel, a gingivectomy was performed on the lingual and facial gingival of teeth #6 to #11; crown lengthening was performed on tooth #9; and an enameloplasty, to reduce bulbous enamel, on facial cervical third of #8 and #9 (Figure 5). Tissue from the papillary overgrowth from the palatal area between teeth #6 and #7 was sent to the laboratory for biopsy. Hemostasis was achieved with gauze, and a Coe-pak was placed in incised areas. The patient was advised to take ibuprofen every four to six hours when needed for pain and to return in two weeks for postop and again at two months (Figure 6).

The pathology report, dated 10/01/2012, of gingival tissue fixated in formalin, measuring 1.5 cm x 0.7 cm x 0.3 cm, showed “keratotic, stratified squamous epithelium covering a core of dense and cellular fibrous connective tissue. Numerous enlarged stellate-shaped fibroblasts, some containing multiple nuclei, were seen in the lesional stroma. Scattered lymphocytes and plasma cells were also seen. The diagnosis was epithelial and fibrous hyperplasia” (Figure 7).

Discussion
TSC is an autosomal dominant neuro-cutaneous disorder characterized by the development of multiple hamartomas distributed throughout the body, skin, brain, heart, kidneys, liver and lungs.15 Two-thirds of the patients report sporadic mutations. It is usually associated with the classic of mental retardation (in 70% of cases), seizures (in 90% of cases) and angiofibromas (95% of cases). However, this classic triad is only present in 29% of patients with the disorder; 6% of these patients lack all three.2,16 Oral manifestations such as enamel pitting and fibromatous growth of the gingiva are also seen in patients with TSC, and are considered minor features of the disorder.7,16,17

In the case presented here, the patient appeared with the classic triad of history of seizure disorder, “learning issues” and angiofibromas, with a butterfly-like pattern on the face;18,19 In addition, a consultation with her primary care physician revealed she had cardio-rhabdomyomas, facial angiofibromas and periungual fibromas (Koenen’s tumor); these are all major features of the disorder. Thus, her diagnosis of TSC is definite.

Her chief complaint was gingival overgrowth that bleeds when she brushes, which affects her home care and negatively affects her quality of life. She was not concerned about her esthetics but, rather, difficulty brushing and flossing. We decided on minimal gingival reduction and restorative treatment until she was older. Her treatment plan included oral hygiene instructions,

![Figure 3. Gingival overgrowth of facial papilla and gingival margins of #6 through #11.](image)

![Figure 4. Panoramic radiograph.](image)

![Figure 5. Anatomical crown exposure and gingivectomy.](image)

![Figure 6. Two-month postsurgery.](image)
mechanical debridement and periodontal re-evaluation, at which time a gingivectomy was recommended and completed to provide improved function, esthetics and, thus, improved quality of life.8

The differential diagnosis of these gingival lesions includes the gingival overgrowth induced by medications such as calcium channel blockers, phenytoin (Dilantin), or cyclosporine. The patient in this case is on Keppra (levetiracetam), which is one of the new antiepileptic drugs that pose less of a chronic risk of gingival enlargement.20 It is noteworthy that uniform and generalized gingival enlargement, the common pattern of gingival enlargement induced by other epileptic drugs, was not observed in this case;14 thus, Keppra was least likely the cause of the sporadic gingival enlargements observed.

Also, in the literature, gingival enlargement due to familial or medication causes are histologically described as showing elongated, narrow rete ridges, which was also not observed histologically in this case.8

Excised tissue from a gingivectomy submitted to the lab was diagnosed as epithelial and fibrous hyperplasia. In the literature, histology of the enlarged gingiva of TSC has been described as showing keratotic stratified squamous epithelium overlying dense fibrous connective tissue, surrounded by abundant distinctive pleomorphic stellate-shaped cells with multiple nuclei present,8,14

**What Good are Rewards Points If They’re Impossible to Use?**

The ADA VISA Signature card allows for travel on more than 150 airlines with **no black-out dates**. You need only 25,000 points to earn a $450 ticket. Apply today, get approved and earn 10,000 bonus points after you spend $3,000 in the first 90 days.

For more information, visit usbank.com/ADA94595 or call 888-327-2265

We may change APRs, fees, and other Account terms in the future based on your experience with U.S. Bank National Association and its affiliates as provided under the Cardmember Agreement and applicable law. Subject to credit approval. Accounts must be open and in good standing (not past due) to earn and redeem points. Points earned on net purchases (purchases minus credits and returns). The creditor and issuer of this card is U.S. Bank National Association, pursuant to a license from Visa U.S.A. Inc.

For more information about this and other Endorsed Programs call: 800-255-2100
which we saw in this case. Thus, we can deduce that the gingival overgrowth in this case was most likely primarily a result of the TSC disorder. However, some literature also observes numerous dilated capillaries histologically, but these were not observed in this case.

The recurrence of these lesions in the gingival tissue after gingivectomy and periodontal care is rare, probably because of the effectiveness of the treatment. However, there can be possible rebound of gingival enlargement with anti-seizure medications; thus, routine recall and plaque control are strongly advised after gingivectomy.

Conclusion

Signs and symptoms of TSC vary, with many cases going undiagnosed. Dentists should be aware of the oral clinical manifestations of TSC, which include enamel pits and gingival overgrowth. The 2012 International Tuberous Sclerosis Complex Consensus Conference concluded that skin and oral lesions are common in TSC and that early intervention, including genetic counseling, may help to increase the quality of life of these patients.

The authors thank Dr. Stephanie Wetzel and Dr. Renee Reich for the histology report and description used in preparation of this manuscript. Queries about this article can be sent to Dr. Segelnick at EperioDr@aol.com

REFERENCES

Ortho-Perio Interrelationship

Treatment Challenges


ABSTRACT

It is an undisputed fact that sound periodontal health is a prerequisite for successful orthodontic therapy. Various complex dental problems necessitate a multidisciplinary approach; there cannot be a better example than an ortho-perio interaction. Certain periodontal treatment modalities need to be undertaken before commencing orthodontic treatment. And some periodontal procedures are required after active orthodontic treatment. The aim of this article is to familiarize clinicians in the field of both periodontics and orthodontics with the precautions and clinical techniques necessary to preserve the integrity of already compromised periodontium.

The cornerstone to a successful orthodontic outcome in a periodontally compromised patient depends upon the patient’s periodontal health before, during and after active orthodontic treatment. Periodontal disease can result in pathologic migration of involved teeth, which clinically manifests as rotation, elongation and spacing, or crowding of the incisors. These changes might complicate long-term periodontal care by reducing the efficacy of plaque control. They can also compromise the esthetics and function of the dentition. However, if high quality periodontal intervention is performed, and the patient is able to maintain optimal oral hygiene to control the disease, then fixed appliance treatment can be carried out safely and satisfactorily, even in the presence of previous alveolar bone loss.

Thus, the primary aim before commencing orthodontic treatment is to stabilize the periodontal condition. The aim of this article is to review the benefits of integrating orthodontics and periodontics in the management of periodontally compromised patients.

Treating Periodontally Compromised Patients

Before commencing orthodontic treatment, it is mandatory to assess the status of the periodontium. Periodontal screening and recording is highly sensitive in detecting deviations from periodontal health. The Michigan “O” probe and the Marquis probe serve as alternative means of detecting periodontal disease. With proper probe angulation, depth of interproximal osseous defects can be evaluated precisely. OPG serves as an excellent tool for generalized screening; however, the bitewing radiograph is the best diagnostic tool for evaluating periodontal osseous lesions, as it allows better crestal bone evaluation. IOPA may also serve as a viable option for interproximal bone level assessment.

Laboratory markers can supplement these findings to predict high risk sites in these patients. These tests for causative factors include cultures, DNA probes, enzyme-linked immunosorbent assay (ELISA) and benzoyl DL-arginine napthylthalamide (BANA). Tests for susceptible hosts include polymorphonuclear leukocyte chemotaxis, markers for inflammation, tissue damage and cell death (collagenase, elastase, prostaglandins, etc.). Prostaglandin E2 is reported to be a principal mediator of periodontal tissue destruction. Its high levels indicate active disease, whereas low levels are seen in sites of remission and areas with no attachment loss.
Initial scaling and root planing performed prior to orthodontic treatment must be followed by an observation period of four to six months to allow tooth movement to occur in healthy tissues and to assess the patient’s motivation for oral hygiene maintenance.\(^7\)

Assessment of advanced mobility is important. In clenchers and bruxers, extensive osseous breakdown can be prevented if a nightguard or biteplate appliance is used during orthodontic treatment.\(^4\)

Patients who run a high risk of developing sites with additional attachment loss include those with multiple residual probing depths greater than or equal to 6 mm and bleeding on probing at three-month re-evaluation after periodontal therapy.\(^8\)

Periodontal surgical procedures should be reserved for cases where suppuration from one or more sites is seen and bleeding on probing occurs despite good oral hygiene, in addition to increased pocket depth.\(^7\)

Age per se is not a contraindication to orthodontic treatment. The difference is that tissue response to orthodontic forces is much slower in adults than in children and teenagers.\(^9\)

**Orthodontic and Periodontal Treatment**

Comprehensive assessment and occlusal adjustments are mandatory, as occlusal interferences promote dental “jiggling,” aggravate attachment loss, bone loss\(^10\) and significantly decrease potential re-attachment after periodontal treatment.\(^11\)

Gingival grafting should be considered prior to orthodontic treatment for areas with less than 2 mm of attached gingiva, denticions with prominent roots, areas of gingival recession, root exposure and when orthodontic treatment includes moving the teeth facially.\(^4\) As these are high risk areas for future gingival recession and bone dehiscences,\(^2\) reevaluation by a periodontist is needed. Grafting enhances the type of tissue around the tooth and controls inflammation during orthodontic treatment. However, when lingual tooth movement is planned, the soft tissue margin migrates coronally, thereby reducing gingival recession and dehiscence without the need for a gingival augmentation procedure.\(^12\) Traditional methods for root coverage are gingival and pedicle grafts; however, connective tissue grafts have now become the treatment of choice, as they are more esthetic, less traumatic and provide a greater degree of root coverage than traditional methods.\(^4\)

Periodontal osseous defects, like osseous craters, three-wall defects and furcation defects, need to be treated before beginning orthodontic treatment. Osseous craters should be treated preorthodontically, as treatment increases the ability to maintain interproximal areas during orthodontic treatment and because they do not improve with orthodontic treatment. Shallow craters (4 mm to 5 mm pocket) may be maintained nonsurgically.

Three-wall defects are amenable to correction with regenerative periodontal therapy using bone grafts. They must be reevaluated after three months for assessment of sulcular depth and amount of bone regeneration. Orthodontic therapy can be initiated only if the periodontium remains stable over the next three to six months after periodontal therapy.

Furcation defects should be treated preorthodontically by hemisection procedures in cases where the hemisected molar will be used as an abutment for a bridge following orthodontics. In this case, hemisection is performed after endodontic therapy, followed by orthodontic treatment, which involves placing the brackets on the root fragments. Open coil spring can then be used to separate the roots, allowing for a more favorable restoration and eliminating the furcation problem, thus enabling the patient to maintain the area with greater efficiency.\(^4\)

**Precautions during Orthodontic Treatment**

During orthodontic treatment, oral hygiene instruction should be reinforced, and professional tooth cleaning should be done every three months.\(^7\) The biological rationale for using a three-month periodontal maintenance schedule is based upon the observation that repopulation of subgingival pathogenic bacteria generally takes six to eight weeks to occur after the pocket has been cleansed thoroughly.\(^13\) Periodontal reexamination at every 6- to 12-month interval should include recording of probing depths, bleeding on probing, suppuration, gingival recession, and bone level assessment through radiographs, depending upon the situation.\(^7\)

Orthodontic appliances and mechanics should be kept as simple as possible, as they have a tendency to accumulate plaque.\(^14\) Use of steel ligatures is opted on all brackets rather than elastomeric modules, as the latter attracts more plaque.\(^15\) Self-ligating brackets may be a better alternative than conventional brackets.\(^16\) Bonded molar attachments are preferred over molar bands, as the bands present with greater gingival inflammation, plaque accumulation and loss of attachment.\(^6\)

Bone level must be used as a guide to position brackets in patients with advanced horizontal bone loss. If the interproximal bone is oriented in the same direction as the marginal ridge discrepancy, then leveling the marginal ridge will help level the bone. However, in case of unequal discrepancy between marginal ridge and interproximal bone, the bone should be leveled orthodontically and any discrepancy in marginal ridge should be equilibrated to achieve the best occlusal results and improve periodontal health. Recall visits should be planned every two to three months during leveling to control inflammation interproximally.\(^4\)

As the center of resistance of the involved teeth moves more apically, due to significant alveolar bone loss, teeth become more prone to tipping. There is also expression of greater moments and a higher extrusive component of the applied force.\(^17\) Implant-orthodontic anchorage has become a valid treatment option in such cases to allow better control of tooth movement in all three dimensions with no loss of anchorage.\(^2\) Lighter orthodontic
forces should be applied, as greater orthodontic force can further weaken the periodontium.\textsuperscript{18}

When the treatment plan includes attempting orthodontic intrusion and formation of new attachment, scaling is suggested at shorter intervals than normal because intrusion shifts supragingival plaque to a subgingival location.\textsuperscript{19} Forces for intrusion must be kept very low (5 gm to 15 gm/tooth).\textsuperscript{20} During orthodontic extrusion, gingival sulcus depth can be maintained and periodontal pocket formation can be prevented, provided oral hygiene is well controlled. But as potential risk for relapse exists, the use of fixed permanent or semi-permanent retainers is recommended.\textsuperscript{21} Orthodontic therapy involving bodily tooth movement may enhance the rate of destruction of the connective tissue attachment at teeth with inflamed, infrabony pockets.\textsuperscript{22}

Furcation defects require special attention in patients undergoing orthodontic treatment, as molars will usually require bands with tubes and attachments, which may impede the patient’s access to buccal furcation for home care. Reevaluation and instrumentation of furcation defects during orthodontic treatment every two to three months is required. In cases where root proximity is exacerbated due to molar supraeruption, orthodontic intrusion results in leveling of bone and opening up of embrasure space between the molar roots, thus making home care and periodontal maintenance easy. Orthodontic decrowding in the anterior region will improve the embrasure forms and maintain healthy and esthetic papillae.\textsuperscript{4}

**Periodontal Procedures after Orthodontic Treatment**
Following orthodontic treatment, the patient should remain on a three-month periodontal maintenance program and should be reassessed to evaluate further periodontal needs.\textsuperscript{23} A new set of periapical radiographs are advised after six months to allow for bone remodeling, cessation of tooth mobility and narrowing of periodontal ligament.\textsuperscript{4}

A gingival grafting procedure might be considered after orthodontic treatment in cases where it has to be performed for cosmetic reasons and also for areas of borderline attached gingiva that have become narrower during orthodontic treatment. When the orthodontic treatment plan does not include moving the roots apart, it is advisable to perform the hemisection after treatment. The molar to be hemiseected thus remains intact during treatment, thereby simplifying the finishing and tooth movement for the orthodontist.\textsuperscript{4} Surgical removal of the maxillary labial frenum is delayed until after orthodontic treatment, unless the tissue prevents space closure.\textsuperscript{24}
Semi-permanent or permanent retention is required, as these cases show a marked tendency to return to their pretreatment position following active appliance therapy. Thin flexible spiral wire (FSW) and a modified A-splint have been recommended as optimal long-term retainers. A modified A-splint has the advantage of being invisible after placement and home care instructions are simplified involving conventional floss threaders. A removable plate or spring retainer should be avoided because of the high risk of jiggling of teeth, which can lead to attachment loss and bone resorption. The patient should be reeducated about oral hygiene measures following appliance removal in order to prevent labial gingival recession, which may occur as the result of overzealous brushing, as the cleaning becomes easier after decrowding.

**Beneficial Effects of Orthodontic Therapy on Periodontium**

The benefits of orthodontic treatment for establishment of a stable periodontal status in cases of loss of periodontal support have been confirmed in large scale studies, regardless of the applied orthodontic technique.

1. It improves oral hygiene maintenance by eliminating dental crowding, which serves as a facilitating factor for periodontal disease. A lesser number of periodontal pathogens are found in sites of aligned teeth.
2. It results in vertical occlusal impact along the long axis of the teeth, thereby allowing uniform distribution of the applied muscle force throughout the dental arch, thus preventing damage to the periodontium. It also improves the positioning of abutment teeth for fixed prostheses.
3. Orthodontic extrusion of teeth is useful in reducing half-wall infrabony defects, tooth lesions between the cementoenamel junction and coronal third of the root, angular defects and isolated periodontal pockets. It increases bone ridge height, as well as quantity of attached gingiva by forcing coronal migration of the root. And it helps achieve favorable crown-root ratio.
4. The combination of orthodontic intrusion and periodontal treatment improves compromised periodontal conditions, provided oral hygiene is maintained and tissues are healthy.
5. Orthodontic tooth uprighting may facilitate improvement of gingival architecture and correction of bony vertical defects in mesially tipped molars.
6. Orthodontic treatment eliminates occlusal interferences, which may lead to periodontal breakdown, and also decreases the effects of bruxism during orthodontic therapy.

**Possible Adverse Effects of Orthodontic Procedures**

1. In the presence of plaque, orthodontic forces can cause angular bony defects and attachment loss, especially with tipping and intruding movements. Orthodontic therapy, when performed in patients with active periodontal disease, can accelerate attachment loss because of greater difficulty in removing plaque due to the presence of the orthodontic appliance.
2. Gingivitis and gingival enlargement is observed soon after placement of a fixed appliance. However, it rapidly improves within 48 hours of appliance removal. Increase in probing depth during orthodontic treatment has been attributed to gingival enlargement.
3. A generalized increase in salivary bacterial counts is seen after orthodontic band placement. However, pathogen level was not found to be significantly higher after 12 months of orthodontic treatment.
4. Uncontrolled intrusive forces may result in root resorption, pulp disorders, alveolar bone resorption and a concentrated stress within the apical part of the ligament. Intrusion, when attempted in poor oral hygiene conditions, may result in the formation of infrabony defects and loss of connective tissue attachment, as intrusive forces displace supragingival plaque apically.
5. Gingival invaginations occur during orthodontic treatment with extraction space closure. These may become sites where dental plaque can get embedded, thus acting as a risk factor for the occurrence of periodontal disorders during orthodontic treatment.
6. Marginal ridges, if leveled orthodontically in cases where the interproximal bone is flat and only the marginal ridge is at different levels, may result in hemiseptal defects. In these cases, ideal treatment would be equilibration of the crown to level the marginal ridge and endodontic therapy if required, followed by full crown restoration.4

Discussion

There have been various controversies with regard to orthodontic techniques, brackets, archwires and periodontal treatment modalities to be used in periodontally compromised patients.

Mini-brackets and low profile brackets may be preferred because of their smaller size. Complicated wire configurations incorporating loops may be avoided because of their higher tendency to accumulate plaque.

Tipping appliances such as “tipedge” brackets may be preferred in cases of horizontal bone loss, as they will move the crown quickly without apical root movement and, thus, prevent formation of periodontal defects.

Heat-activated NiTi wires may be preferred over normal NiTi wires, as they exert low and intermittent forces. Chun et al. suggested surface modification of orthodontic archwires with photocatalytic TiO2 as a way to prevent development of dental plaque during orthodontic treatment.24

Guided tissue regeneration (GTR) techniques may be useful when orthodontic treatment aims to extrude or intrude teeth with intraosseous defects or to upright molars with mesioangular lesions, as they result in the formation of new supracrestal and PDL collagen fibers on the tension side and, thus, help in transferring the orthodontic force stimulus to the alveolar bone.41

Hemiseptal defects present around tipped teeth and supraerupted teeth improve with orthodontic therapy alone involving uprighting and intrusion, respectively, of the involved teeth without requiring any periodontal intervention other than scaling and root planing. However, the teeth must be stabilized for at least six months on completion of orthodontic treatment and must be reassessed later.4 With orthodontic molar uprighting, osseous defects are eliminated, provided the fucration is not involved; however, it aggravates a periodontal problem if attempted in cases with fucration involvement.42

Adjunctive periodontal procedures like mucogingival surgeries, crown lengthening procedures, alveolar ridge augmentation and placement of dental implants may be undertaken to facilitate the achievement of orthodontic treatment goals.24

In cases of impaired manual dexterity, powered toothbrushes may be prescribed to improve the efficacy of plaque removal.

Conclusion

Orthodontic treatment is no longer a contraindication in the periodontally compromised patient.43 The maintenance of healthy periodontal tissues throughout active orthodontic treatment is of paramount importance to ensure a healthy periodontium. A successful orthodontic outcome can thus be achieved with an integrated ortho-perio approach.4

Queries about this article can be sent to Dr. Rathore at nidhirathore11@gmail.com.

REFERENCES


Nidhi Rathore, B.D.S., M.D.S., is senior lecturer, Department of Orthodontics and Dentofacial Orthopedics, Eklavya Dental College and Hospital, Rajasthan University of Health Sciences, Katputli, Rajasthan, India.

Asavari Desai, B.D.S., M.D.S., is senior lecturer, Department of Orthodontics and Dentofacial Orthopedics, Manipal College of Dental Sciences, Manipal University, Mangalore, Karnataka, India.

Mridula Trehan, B.D.S., M.D.S., is professor and head of the Department of Orthodontics and Dentofacial Orthopedics, Mahatma Gandhi Dental College and Hospital, Mahatma Gandhi University of Medical Sciences and Technology, Jaipur, Rajasthan, India.

Vikas Jharwal, B.D.S., M.D.S., is senior lecturer, Department of Orthodontics and Dentofacial Orthopedics, Mahatma Gandhi Dental College and Hospital, Mahatma Gandhi University of Medical Sciences and Technology, Jaipur, Rajasthan, India.

Lakshmi Puzhankara, B.D.S., M.D.S., is senior lecturer, Department of Periodontology and Oral Implantology, Arvita School of Dentistry, Kochi, Kerala, India.

Anand Marya, B.D.S., is a third-year postgraduate student, Department of Orthodontics, College of Dentistry, University of the East, Manila, Philippines.
Methadone Maintenance Therapy and the Dental Patient

George Raymond, D.D.S.; William Maloney, D.D.S.

Abstract
Methadone is a Schedule II drug best known for its use in the treatment of opioid dependence. Dental providers should be aware of the oral and systemic effects of methadone. In patients undergoing methadone maintenance therapy, there is a higher incidence of rampant caries, xerostomia, bruxism and poor oral hygiene. A review of the pharmacology, systemic effects, drug interactions and oral manifestations is presented, as well as possible modifications to treatment and specific considerations in dental therapies.

Methadone was approved by the Food and Drug Administration in 1972 as a treatment for opioid addiction. Research began in 1964 at Rockefeller Hospital in the then-Rockefeller Institute for Medical Research. Methadone prevents cravings while blocking the euphoric effects of heroin to establish abstinence. Originally the hope was that refraining from heroin would decrease criminal activity as well but, according to a 2009 Cochrane review, methadone maintenance treatments decreased the likelihood that heroin-dependent patients would use heroin, but it did not change crime or mortality rates.

There are currently over 1,400 methadone maintenance therapy (MMT) centers in the United States. There are well-documented drug interactions with methadone that will be discussed, along with the effect of alcohol on methadone levels.

Pharmacology
Methadone occurs in R-enantiomeric and S-enantiomeric forms, with the majority of activity due to the activity of R-methadone. It is a lipid soluble drug; estimates of the half-life are between 15 to 55 hours. Methadone has high oral bioavailability, so it gives reliable effects when administered orally; both tolerance and physiological dependence develop more slowly than with morphine.

Methadone exerts its activity through binding to and activating μ opioid receptors centrally and in the periphery. This activity produces the effects common to all μ opioid agonists: analgesia, euphoria, constipation, sedation, respiratory depression, nausea and miosis. Additionally, methadone antagonizes N-methyl-D-aspartate receptors, which may increase its effectiveness in the treatment of neuropathic pain compared with other opioids.

Methadone binds directly to proteins and to plasma proteins, chiefly albumin, globulins, and alpha 1-acid glycoprotein. Steady state is not attained until methadone is fully distributed and bound in tissues. Therefore, blood levels continue to rise slowly for four to six weeks. Although patients sometimes complain about drug formulation changes (tablets versus liquid; differing flavors), there are no correlated changes in pharmacokinetics or dynamics.

The route of metabolism of methadone is hepatic and involves the cytochrome p-450-related enzymes. The methadone is broken down into two biologically inactive metabolites, a pyrrole and a pyrrolidine, which are further metabolized. These are eliminated by the kidney and excreted through the bile. In total, nine metabolites have been identified, including two minor active metabolites, methadol and normethadol.
Most patients require a dose of 60 mg to 120 mg/day to achieve the optimum therapeutic effects of methadone. Compared to those on lower doses, patients on higher doses are shown to stay in treatment longer, use less heroin and other drugs, and have lower incidence of HIV infection. Some patients need even higher doses for fully effective treatment.13

**Systemic Manifestations**

In a well-controlled methadone maintenance therapy patient, the two most common side effects are constipation and sweating.1,14 Other side effects include sedation, nausea, vertigo, emesis and pruritus.1,15

Metabolism of methadone can be affected by interactions of other medications, such as phenytoin, carbamazepine, rifampicin, fluconazole and some protease inhibitors. These drugs cause an increase in the metabolism of methadone.16 If taken concurrently, erythromycin and ketoconazole may enhance the risk of a methadone overdose in susceptible individuals due to their potential to inhibit the metabolism of methadone. Fluoxetine (Prozac) can also increase the plasma concentration of methadone, as can other selective serotonin reuptake inhibitors.16-18

Higher doses of methadone (200 mg to 400 mg/day) have been implicated in prolongation of the QT interval on electrocardiogram and, possibly, with Torsades de pointes.1 Torsades is a form of ventricular tachycardia manifested by episodes of alternating polarity with the amplitude of the QRS complex twisting around an isoelectric baseline. The rhythm usually starts with a pre-ventricular contraction and is preceded by a widening of the QT interval.19

Methadone levels are also affected by the regular intake of more than four alcoholic beverages a day. Studies performed on 129 long-term MMT men and women indicated that although one quarter of the cohort reported four or more drinks a day, there were no significant changes in liver enzymes after three years of MMT.1,20 These findings indicate that MMT does not potentiate alcohol-induced hepatotoxicity.1,20

**Dental Manifestations**

Residual effects from heroin addiction are often prevalent in MMT patients. Rampant caries, poor oral hygiene, xerostomia and periodontal disease are frequently lingering effects of the time spent abusing opioids.

The MMT patient may present as part of a referral program, or be genuinely interested in restoring his or her oral health. Heroin addiction produces xerostomia with hypoglycemia. Individuals combat this with frequent ingestion of sugar (chocolate, sugar cubes), resulting in rampant caries.21 The altered taste preference for sweet foods seen in heroin addiction continues into many patients on MMT. This high cariogenic diet is compounded in these

---

**FIGURE 1**

**Oral Manifestations of Methadone Use**22-27

- Increased Caries Risk Rampant.
- Decay Periodontal Disease.
- Xerostomia.
- Bruxism Candidiasis.
patients by their dental phobias and poor oral hygiene, with many MMT patients exhibiting a fear of needles, especially in the hands of others, which further accentuates heightened anxiety.22,23

The dental provider is at times posed with a significant clinical decision when a MMT patient presents with pain. At times, the patient may have simulated symptoms, seeking a prescription for a narcotic. Tolerance is achieved to the analgesic effect of methadone so a patient’s usual MMT dose cannot be considered to be analgesic. Premedication with a non-steroidal anti-inflammatory, such as ibuprofen, 600-800mg, one to two hours prior to the procedure, has been demonstrated to lower postoperative pain and to result in a decreased need for opiates.24 Patients on MMT should be maintained on their current dose and, if needed, receive additional opiate analgesics for pain, often at higher doses than usually given and at shorter dispensing intervals.24,25

Bruxism has been reported more frequently in opioid-dependent individuals and may be attributed to a general increase in neurosis in this cohort of patients.22,26 Abfraction lesions are also commonly found on former opioid abusers and may require treatment. The overall oral health of a patient in this category is often poor and may require multiple visits to restore to optimal health. Unrealistic expectations may also exist in the MMT patient. As such, it is imperative to be empathetic yet direct about the prognosis of dental treatment.

Caries prevention should be stressed and various treatment modalities, such as home fluoride treatments, adjunctive oral hygiene devices and nutritional support, are possible avenues to be explored with the patient. Many MMT patients combat xerostomia by simply drinking copious amounts of water. Water is a poor substitute for saliva, because it lacks certain necessary ions, buffering capacity, lubricating mucins and protective proteins.27 Many of the saliva substitutes available on the market today may be suggested for xerostomia. It should be noted that if they contain sorbitol, their use reinforces the need for topical fluoride treatments.

Conclusion
The dental care of a patient engaged in methadone maintenance therapy is multifaceted. The importance of educating the patient about oral hygiene and proper diet is paramount. The dental pho-
bias of these patients require attention to insure the completion of dental treatment. Depending upon the dosage and stage of therapy in the methadone program, shorter appointments may be required or appointments set around the patient’s schedule of methadone ingestion. Attention should be given as well to avoiding prescribing any narcotic pain relievers when possible. And the practitioner needs to be aware that the methadone might mask dental pain in the earlier stages. This information should be relayed to the patient to reinforce the importance of follow-up examinations at proper time intervals.

Queries about this article can be sent to Dr. Maloney at wjm10@nyu.edu.

REFERENCES
Differential Diagnosis of a Periapical Radiolucent Lesion
A Case Report and Review of the Literature


A B S T R A C T
This article demonstrates a methodological approach to diagnosing a periapical radiolucency that could not be diagnosed using only basic clinical and radiographic findings. The patient was a 59-year-old Hispanic female with a small tender mass on the lower gingiva associated with tooth #25. Radiographic appearance demonstrated a well-defined radiolucent lesion at the apices of the mandibular incisors. The patient had no significant medical history. Cone-beam computed tomography (CBCT) showed bony expansion of the buccal plate. Differential diagnosis included non-endodontic unilocular radiolucent lesions in the anterior mandibular region. Biopsy findings were consistent with periapical cemento-osseous dysplasia (PCOD). In conclusion, clinical appearance of PCOD varies from non-expansile and asymptomatic to being expansile and sometimes symptomatic. In the latter cases, it may be necessary to use additional diagnostic tools to confirm the diagnosis.

Establishing an accurate diagnosis for a periapical lesion may be challenging, especially when the nature of the lesion cannot be determined through basic diagnostic tests. The most important question to be addressed is the origin of the lesion, since radiographic bone changes that mimic lesions of endodontic origin may occur as a consequence of neoplastic and developmental alterations.1

The initial diagnostic step is to determine whether the lesion is of endodontic origin. This is most often accomplished through use of high-quality radiographs and a thorough clinical examination, including sensibility tests. Interpretation of periapical radiography may lead to subjective conclusions;2 and there is insufficient evidence to determine the diagnostic accuracy of pulp sensibility tests.3 Therefore, relying solely upon periapical radiographs and inconclusive clinical tests may lead to misdiagnosis and unnecessary treatment for a healthy tooth with a periapical radiolucency.4,5

When diagnosing an apical radiolucent lesion seemingly associated with vital teeth, the clinician should follow an organized thought process to reach a definite diagnosis.6 Some lesions may be accurately diagnosed through radiographs and clinical findings.7 But in cases where the diagnosis is not clear, the clinician would benefit from other diagnostic methods to further evaluate the lesion. Studies have shown that a high-resolution, three-dimensional technique, such as cone-beam...
computed tomography (CBCT), can be valuable in diagnosing periapical lesions.\(^8\) Biopsy and histopathological analysis of the lesion can provide definitive confirmation of the diagnosis of a suspected lesion.\(^9\) Few authors have strongly suggested biopsy and the sequential histopathological analysis for cases that the initial diagnostic tests indicate a lesion of non-endodontic origin.\(^1\) However, biopsy has been recommended only if there are concerns about the clinical diagnosis and not as a routine audit to merely confirm the clinical diagnosis.\(^10\)

The following case report demonstrates a thought process that includes the use of different diagnostic modalities in a sequential manner to reach a definite diagnosis.

**Case Report**
A 59-year-old Hispanic female was presented for the purpose of root canal treatment on the mandibular right central incisor. Her chief complaint was pain upon palpation around the gingival tissue of the mandibular central incisors. Her medical history was noncontributory (Figure 1).

**Radiographic Appearance**
The radiograph showed a relatively well-defined radiolucency with slightly irregular borders at the apices of the mandibular left and right central incisors (Figure 2). No caries, restorations or fractures were present on the mandibular anterior teeth. Intraoral and radiographic examination revealed normal probing depths and mild-to-moderate generalized chronic periodontitis. A small tender mass was noted on the gingival mucosa of the mandibular right central incisor.

All four mandibular incisors responded normally to Endo Ice (Coltene/Whaledent Inc., Newark, NJ) and to the electrical pulp tester (Sybron Endo, Orange, CA). No percussion sensitivity was detected on the four anterior incisors, but the gingival mucosa around the apex of the mandibular right central and lateral incisors was sensitive to palpation.

**Cone Beam Computed Tomography (CBCT)**
In order to evaluate the nature and extent of the lesion and its expansion, we utilized a CBCT. On panoramic reconstruction, we noted a large lytic lesion in relation to the mandibular anterior teeth. In the cross-section view, the lesion appeared to have expanded the mandibular cortices and measured approximately 10 mm × 7 mm. The lesion extended from the apex of the mandibular left central incisor to the apex of the mandibular right lateral incisor (Figures 3, 4).

Considering tooth vitality, the differential diagnosis included non-endodontic unilocular radiolucent lesions that can be found in the anterior mandibular region. These lesions include the following: periapical cemento-ossesous dysplasia (PCOD);\(^9\) central giant cell granuloma (CGCG);\(^6\) ameloblastoma;\(^11\) poorly calcified periapical osteopetrosis;\(^12\) odontogenic keratocyst (OKC),\(^13\) which is also referred to as keratocystic odontogenic tumor; simple bone cyst (traumatic bone cyst);\(^14\) and central ossifying fibroma.\(^12\)

We also took into consideration certain systemic diseases. For example, hyperparathyroidism—including renal osteodystrophy—may manifest as radiolucent areas in the anterior mandible area.\(^15\)

---

**Figure 1.** Preoperative intraoral image. Arrow is pointing to area of gingival mucosa where hard swelling was palpable.

**Figure 2.** Preoperative periapical radiograph of mandibular anterior teeth, revealing periapical radiolucency.

**Figure 3.** Sagittal section of mandibular right central incisor, showing extent of expansion.

**Figure 4.** Inferior view of axial section showing labial extension of lesion and its relation to roots of mandibular incisors. Arrows are pointing to bony expansions on buccal and lingual plates.
Metastatic carcinomas\textsuperscript{16,17} may also present with the same manifestation. Metastases to the mandible are four-times more common than those to the maxilla. And the most common primary tumor sites are breast, lung, kidney, thyroid and prostate.\textsuperscript{18} Since the patient’s medical history was unremarkable, hyperparathyroidism and renal osteodystrophy were unlikely. But the patient could have a metastasis without having a primary lesion diagnosis.

Because the clinical and radiographic findings did not yield a definitive diagnosis (see “Discussion” that follows), we recommended an incisional biopsy.

Biopsy
We performed an incisional biopsy under local anesthesia with 68 mg (2 carpules of 1.7 cc) lidocaine 2\% with 1:100,000 epinephrine, using a full thickness flap with sulcular incision with two vertical releases at distal of mandibular canines. After flap reflection, we performed an osteotomy, exposing and incising 5 mm x 5 mm x 5 mm\textsuperscript{3} of the lesion.

Histopathological Analysis
Histological sections demonstrated cellular fibrovascular tissue with plump fibroblasts and scattered foci of new bone, osteoid and cementum-like material with associated osteoblasts and osteoclasts. There were also a few infiltrating chronic inflammatory cells. The histopathological diagnosis was benign fibro-osseous lesion and in view of the radiographic findings was consistent with periapical cemento-osseous dysplasia (Figure 5).

We informed the patient of the diagnosis and explained the prognosis to her, which based upon the self-limiting, non-progressive nature of the lesion, was considered to be good. At the one-year follow-up, radio-opaque areas were visible in the lesion; all four anterior mandibular teeth responded normally to pulp tests; and while the patient still experienced some mild sensation upon palpation, the tender mass on the labial mucosa was gone (Figure 6).

Discussion and Review of Literature
PCOD was originally classified as a type of cementoma. In 1992, it was removed from the World Health Organization (WHO) classification of odontogenic tumors and placed among the fibro-osseous bone lesions.\textsuperscript{18} This lesion, along with focal cemento-osseous dysplasia and florid cemento-osseous dysplasia, form cemento-osseous dysplasia (osseous dysplasia), one of the most common groups of fibro-osseous lesions encountered in clinical practice.\textsuperscript{19}

PCOD has three radiographic features that indicate stages from early formation to maturation: 1. osteolytic; 2. cementoblastic; and 3. mature. In the early stage of osteolytic, lesions are well-defined radiolucencies at the apex of one or more teeth.\textsuperscript{18} The histologic appearance demonstrates fibrous connective tissue mixed with woven bone, lamellar bone and cementoid particles. This appearance changes with the stage of maturation, such that as the lesion matures, the ratio of fibrous connective tissue to mineralized material decreases.\textsuperscript{15} The calcified structures in the osteolytic stage are of insufficient size to be observed radiographically.\textsuperscript{18}

PCOD is a benign, slowly growing tumor.\textsuperscript{20} In most cases, no further treatment is necessary after its diagnosis.\textsuperscript{18} In some cases, when a cemento-osseous lesion becomes significantly sclerotic,
it tends to become hypovascular and prone to necrosis. The addition of an inflammatory component to the disease would basically turn this process into a chronic osteomyelitis involving dysplastic bone and cementum. In such instances, further treatment may be necessary.\textsuperscript{19}

The etiology of the lesion is not well understood. Based on its origin, it consists of three variations: 1. originating from periodontal ligament tissue; 2. originating from medullary bone tissue; and 3. resulting from the simultaneous involvement of both tissues.\textsuperscript{12} There have also been reports of autosomal dominant PCOD.\textsuperscript{21}

PCOD predominantly involves the apical areas of vital mandibular incisors. There is a marked predilection for female patients; and most cases affect the African-American population. Most patients are between the ages of 30 and 50 when diagnosed initially; in fact, PCOD is almost never found in individuals younger than 20.\textsuperscript{19,20,22} PCOD has also been found in the maxilla; in rare cases, it may be present simultaneously in both the mandible and the maxilla.\textsuperscript{23}

PCOD is asymptomatic and is usually discovered upon a radiographic examination. Radiographically, the lesion may demonstrate variable appearances based upon the stage of its maturation: from a well-circumscribed radiolucent lesion, to a mixed radiolucent/radiopaque one; and at its final stage, a radiopaque lesion involving the apices of one or several teeth. Individual lesions are rarely more than 10 mm in diameter;\textsuperscript{19} most are less than 5 mm.\textsuperscript{22}

No systemic disease has been found to be significantly associated with this condition. Clinically, no misalignment in local structures, including the teeth, and usually no soft tissue reaction or discoloration have been found to be significantly associated with PCOD.\textsuperscript{19,20} The lesion is self-limiting, and progressive growth rarely happens.\textsuperscript{19}

Differentiating PCOD from other radiolucent lesions may be possible through radiograph and clinical findings.\textsuperscript{6} However, the differential diagnosis of PCOD may vary according to the stage of development of the lesion. The most difficult stage in diagnosing PCOD is its early stage. There are a number of reported cases in which an incorrect diagnosis of PCOD resulted in inappropriate treatment.\textsuperscript{22,24,25} This is because in the initial osteolytic stage, the radiolucent appearance mimics periapical periodontitis,\textsuperscript{19} which may cause diagnostic difficulty.\textsuperscript{9} Moreover, in this early stage, a neoplastic process (ossifying fibroma) or simple bone cyst cannot be ruled out by radiographic assessment alone.\textsuperscript{12}
In this case, the presence of pain upon palpation and buccal expansion did not completely match the classic features of PCOD. Some studies have described PCOD as non-expansile.\textsuperscript{20,27,28} In one such study, the authors considered the non-expansile nature of this lesion to be a key criterion in distinguishing this lesion from other expansile lesions.\textsuperscript{20} Moreover, some other lesions may also create bony expansion, thus creating a need for further investigation. For instance, ossifying fibroma (cementifying fibroma) may cause bone expansion.\textsuperscript{12,19} And cystic ameloblastoma (one of the most commonly reported benign lesions mimicking an endodontic lesion)\textsuperscript{1} may also cause enlargement of the jaws without pain or paresthesia.\textsuperscript{11,29} OKC may be associated with bony expansion.\textsuperscript{13} And traumatic bone cysts have also been reported to cause expansion.\textsuperscript{2} CGCG, which mostly occurs in the anterior mandible of young females, may also cause bone expansion.\textsuperscript{16} In a recent study on lesions mimicking lesions of endodontic origin,\textsuperscript{1} it was found that swelling and pain were the most frequently cited symptoms of malignant lesions (46.6%), whereas benign lesions presented these associated symptoms in only 10.8% of all cases.

Because of these uncertainties, a CBCT was obtained to further evaluate the extent of the lesion. Its results confirmed the bony expansion of the lesion. We then opted to perform an incisional biopsy; the histopathologic report was consistent with the early (osteolytic) stage of PCOD. We informed the patient of the diagnosis and her prognosis, and will continue to review her status every six months to monitor any changes in the size and density of the lesion.

**Conclusion**

An accurate diagnosis of this lesion required knowledge of biology and pathology, as well as the ability to interpret and utilize various diagnostic tools. Differential diagnosis is the first step in diagnosis. And the various possibilities should be ruled out one by one using a methodological approach until one reaches a definite diagnosis. An important caveat to this approach is to avoid using diagnostic tools solely for the purpose of screening or confirming a well-established diagnosis. In the case presented here, due to the expansile nature of the lesion and sensitivity to palpation, we deemed the use of additional diagnostic tools necessary to confirm the diagnosis. \(\blacksquare\)

Queries about this article can be sent to Dr. Malek at matthewmalek@nyu.edu.

**REFERENCES**


Matthew Malek, D.D.S., is clinical assistant professor and director of the Advanced Education Program in Endodontics, New York University, New York, NY. He is a diplomate of the American Board of Endodontics and in private practice limited to endodontics in Manhattan.

Lina M. Cortes, D.D.S., is in full-time private practice limited to endodontics in San Antonio, TX.

Asgeir Sigurdsson, D.D.S., M.S., is associate professor and chairperson of the Department of Endodontics, New York University, New York, NY. He is a diplomate of the American Board of Endodontics.

Paul A. Rosenberg, D.D.S., is professor in the Department of Endodontics, New York University, New York, NY. He is a diplomate of the American Board of Endodontics.
Plasma Cell Gingivitis
An Occasional Case Report

M.B. Mishra M.D.S.; Swati Sharma, M.D.S.; Alok Sharma, M.D.S.

A B S T R A C T

Plasma cell gingivitis, an infrequently observed oral condition, has been clinically characterized by diffuse gingival enlargement, erythema and sometimes desquamation. These lesions are usually asymptomatic, but invariably the patient will complain of a burning sensation in the gingiva and bleeding from the mouth. The diagnosis requires hematological screening in addition to clinical and histopathological examinations. This case report outlines one such case of plasma cell gingivitis in a 15-year-old female caused by use of an herbal, homemade toothpowder. The case presented here highlights the adverse effects and irrational use of herbal agents in dentifrices. At the same time, it emphasizes the need for comprehensive history taking, careful clinical examination and appropriate diagnostic tests in order to arrive at a definitive diagnosis and treatment plan for gingival conditions that are refractory to conventional therapy and to exclude certain malignancies and oral manifestations of systemic diseases.

Plasma cell gingivitis (PCG) is an uncommon inflammatory condition of uncertain etiopathogenesis. PCG has been clinically characterized by diffuse gingival enlargement, erythema and sometimes desquamation. These lesions are usually asymptomatic, but invariably the patient will complain of a burning sensation in the gingiva and “bleeding from the mouth.”

PCG is known by a variety of other names. They include atypical gingivostomatitis, idiopathic gingivostomatitis, allergic gingivostomatitis and plasmacytosis of the gingiva. A localized lesion called plasma cell granuloma has also been reported by Phadnaik et al.

Although the etiopathogenesis of PCG is still not clearly understood, it is considered a hypersensitivity reaction to some antigens, such as the components of chewing gums and dentifrices. Flavoring agents added to chewing gums and dentifrices can produce an inflammatory reaction in both free and attached gingiva. The most prominent microscopic picture of plasma cell gingivitis is diffuse and massive infiltration of plasma cells into the sub-epithelial connective tissue, resulting in disruption or damage to the basement membrane. The capillaries in the connective tissue may also become dilated.

It is important to be able to differentiate PCG from other mucous membrane lesions affecting the gingival tissues. Often, microscopic examination is necessary to make this distinction.

The diagnosis requires hematological screening in addition to clinical and histopathological examination. Pathological changes in this condition are clinically similar to those of pemphigus, pemphigoid, desquamative gingivitis, lichenoid or allergic reactions, anti-seizure (such as Dilantin) or calcium channel blocker hyperplasia and a leukemic infiltrate, which must be differentiated through hematologic and serologic testing. It has been
observed that histopathological changes of PCG mimic those of multiple myeloma or solitary plasmacytoma.  

This case report concerns plasma cell gingivitis in a 15-year-old female caused by the use of herbal, homemade toothpowder.

Case Report
A 15-year-old female was referred to the Department of Periodontics and Oral Implantology at Mahatma Gandhi Dental College and Hospital, Jaipur, Rajasthan, India, with a chief complaint of red swollen gums. It was associated with bleeding on slight provocation and pain when eating hard food.

The patient had neither relevant medical history nor any history of mouth breathing. However, her oral hygiene history was significant, revealing a recent use of herbal toothpowder made at home. The contents of this toothpowder were grounded black pepper, black salt, alum and ajwain. The patient had been rubbing the powder on her teeth and gums twice daily for the last six months. There was associated gingival bleeding on slight provocation. The patient first noticed a mild reddish discoloration around five months ago, which progressively increased in size without any apparent discomfort.

Clinical examination revealed severe inflammation of the gingival tissues extending from the free gingival margin to the mucogingival junction in both the maxillary and mandibular arches. Gingival enlargement was Grade III (Bokenkamp et al.; 1994) in the maxillary and mandibular anterior sextant; the entire tissue was a bright fiery red, moderately thick and edematous, with profuse bleeding on gentle manipulation (Figure 1). The gingiva in the posterior region of both arches was relatively less edematous. The entire length of gingival tissue was easily reflectable, which exposed heavy plaque accumulation around the teeth in the maxillary and mandibular anterior sextants (Figure 2). Nikolsky’s sign was negative, with no blister formation. The patient exhibited mild clinical attachment loss in relation to the maxillary and mandibular anterior sextant and the maxillary first molars. Based upon the history and
clinical signs, a provisional diagnosis of plasma cell gingivitis was made.

Laboratory investigations included routine blood examination, peripheral blood smear and erythrocyte sedimentation rate. Antibody titer of immunoglobulins was also assessed. Under local anesthesia, an incisional biopsy was taken from the right mandibular anterior region for histopathological (HPE) examination.

Blood test results revealed total leukocyte count (TLC) and differential leukocyte count (DLC) within normal limits. However, red blood cells (RBCs) showed mild anisocytosis with hypochromasia. Serum IgG and serum IgM levels were within normal limits (991 mg/L & 202 mg/L, respectively). However, serum IgE level (512 IU/ml) was considerably higher than the normal range (1.4-300 IU/ml).

**Histopathologic Findings**

HPE of the biopsy specimen of the gingival tissue was carefully examined under different magnifications. HPE showed hyperplastic epithelium at places, with erosion at several spots. The epithelial cells in certain areas exhibited hydropic degeneration. The rete-ridges were also found widened. Underlying connective tissue had dense aggregates of infiltration of plasma cells supported by fibrous connective tissue. Multiple neutrophilic abscesses were found, depicting acute exacerbation. HPE findings confirmed the diagnosis of plasma cell gingivitis (Figures 3, 4).

**Clinical Management**

The patient was advised to immediately stop using the offending powder preparation for toothbrushing and to avoid possible allergens, such as chewing gums, cosmetics and food additives. A super soft toothbrush with an over-the-counter toothpaste was prescribed, and proper brushing technique for care of edematous bleeding gingival was demonstrated.

Nonsurgical therapy included thorough oral prophylaxis, strict oral hygiene instructions and 0.2% Chlorhexidine mouthwash. There was a significant reduction in the inflammation of the gingival tissue after nonsurgical therapy. However, the inflammatory enlargement still persisted in the mandibular left quadrant and maxillary quadrant, extending from right maxillary canine to left maxillary second molar region. Because of this, a surgical approach was planned in those regions.

An internal beveled incision was made and a full thickness periodontal flap was raised. Thorough debridement with root planing and irrigation was done. After positioning the flap and suturing, a Coe-pack was placed, and postoperative analgesics and antibiotics were prescribed for five days. Appropriate instructions for wound care were given, and the patient was recalled after one week for suture removal. Clinically, there was excellent resolution of inflammation, and the entire phase was uneventful. The patient was advised to maintain strict oral hygiene and was recalled after one, three and six months. After six months, clinically, the entire gingival tissue appeared healthy with normal morphology (Figure 5). The patient has been put on regular recall visits every three months.

**Discussion**

Plasma cell gingivitis is a rare benign condition of the gingiva characterized by sharply demarcated edematous and erythematous gingivitis, often extending to the mucogingival junction. The etiology of plasma cell gingivitis is not clearly known, but because of the obvious presence of plasma cells, many authors believe it is an immunological reaction to allergens, among them, the ingredients of toothpaste, chewing gum and oral care products. Cases related to the use of herbal toothpaste have been reported. It has been suggested that strong spices and some herbs, such as chili, pepper and cardamom, may be important triggering factors.

Three categories of plasma cell gingivitis have been proposed based upon the etiology of the condition. They are:

1. Lesions caused by an allergen.
2. Neoplastic lesions.
3. Lesions of unknown cause.

The case report presented here was Type 1. Usually, the patient presents with edematous and inflamed gingiva on the labial aspect of the anterior region of the maxillary arch. A tendency for gingival bleeding upon gentle tissue manipulation is invariably present in all cases. Similar findings were present in our case where Grade III gingival enlargement was noticed in the maxillary and mandibular anterior sextant and moderate enlargement in the posterior aspect. The entire tissue was bright red, moderately thick and edematous.

Differential diagnosis of this condition is very important because of the similarity with other aggressive conditions. Pathological changes in this condition are clinically similar to those of pemphigus, pemphigoid, desquamative gingivitis, li-

![Figure 5. Six months postoperative view.](image-url)
such as multiple myeloma and solitary myeloma. However, such condition was also ruled out considering the age of the patient. Aggregates of plasma cells upon microscopic examination might cause concern of a plasma cell dyscrasia, notably, multiple myeloma or plasmacytoma. However, in contrast to malignant plasma cell lesions, the plasma cells in PCG are normal and are found within a connective tissue matrix rather than replacing the background stroma.

The histopathological picture revealed that the underlying connective tissue had a dense infiltration of plasma cells; multiple neutrophilic abscesses were found, thus depicting acute exacerbation. Hence, a confirmatory diagnosis of plasma cell gingivitis was made.

Once the diagnosis of plasma cell gingivitis is made, the screening of various antigenic substances must be done. In the case presented here, the patient had switched to an herbal toothpaste fabricated at home and consisting of alum, black pepper, black salt and ajwain. Alum (although used as an astringent) and pepper have already been reported as potential allergens in the literature.

The case presented here highlights the adverse effects and irrational use of herbal dentifrices. This case also illustrates the need to explore a patient’s individual background and habits when several possible etiologic agents have been eliminated and the desired clinical results are not obtained with conventional therapy.

**Conclusion**

This case highlights the adverse effects and irrational use of herbal agents in dentifrices. Plasma cell gingivitis is a diagnosis of exclusion, distinguished primarily by the histologic findings of a marked submucosal infiltrate, after excluding certain conditions.

It emphasizes the need for comprehensive history taking, careful clinical examination and appropriate diagnostic tests in order to arrive at a definitive diagnosis and treatment plan for gingival conditions that are refractory to conventional therapy and exclude certain malignancies and oral manifestations of systemic diseases.

__The authors report no potential conflict of interest relevant to this article. Queries about this article can be sent to Swati Sharma at drswwatinagpal@gmail.com.____