16 Follow-Up Problems with Fixed Appliances in Pediatric Dentistry
Timucin Ari, D.D.S., Ph.D.

A poor outcome to fixed appliance treatment is almost guaranteed if patients fail to keep follow-up appointments. Success depends upon proper patient selection and effective communication between dentist and patient/parents regarding the importance of regular checkups. Case reports.

21 Successful Nonsurgical Management of Post-orthodontic Gingival Enlargement with Intensive Cause-related Periodontal Therapy

By targeting the primary etiologic factor, that is, plaque, periodontal health may be restored without surgery. Reducing the bacterial load gives the biologic natural healing capacity of the body the opportunity to stabilize the periodontal condition and should be considered as the first line of intervention. Case report.

24 What it Means to be a Doctor
Sensitizing the Dentist and the Student to Professionalism
Ronald I. Maitland, D.M.D.

Professional demeanor and inter-personal behavior play a large part in building patient trust. Commanding an image of respect is determined largely by ethical and proper relationships between doctor and patient. How that relationship can unravel is told through a collection of true image-damaging episodes.

29 Surgical and Prosthetic Management of a Complex Edentulous Patient for Fabrication of Complete Dentures
Alper Çomut, D.M.D., D.M.Sc.; Tanya Somohano, D.M.D.

Clinical report describes surgical and prosthetic treatment of patient who presented with epulis fissuratum in the maxilla and severely resorbed alveolar tissue in the mandible.

34 Maxillary Implant-retained Partial Overdenture with Dolder Bar Attachment

Technique for maintaining maxillary Kennedy III partial removable dental prosthesis design in patient with non-restorable failing abutments by replacing the abutments with dental implants is described. Additional retention and support was provided, significantly increasing patient satisfaction.

38 An Analysis of the Hemophilia of the Royal Families of Europe, Its Startling Implications and Dentistry’s Role in Treating the Hemophiliac Patient

Despite being known popularly as “The Royal Disease,” hemophilia affects many people living in our communities. These patients must receive proper dental treatment and home care education to prevent possibly life-threatening emergency dental episodes.

42 Effect of Apically Separated Rotary Instruments on Bacterial Leakage of Obturated Root Canals Using Resilon

Study was undertaken to determine the effect of a separated rotary instrument on the time required for bacterial penetration of obturated root canals using Resilon.
Breathing New Life into Organized Dentistry

If we don’t come up with creative ways to attract the new generation of dentists, organized dentistry may be a thing of the past.

In January, I attended the installation dinner of the Eighth District Dental Society. It was a pleasant evening, during which the officers were sworn in to lead the society through 2015 and life memberships were awarded to our fellow dentists who had reached 65 years of age and been members of the ADA for 30 consecutive years, or 40 years in total. As you might imagine, the crowd was a bit “gray,” much grayer even, I suspect, than when I first started attending these events. Notably absent were younger members. The more I thought about this later, the more alarmed I became. If we can’t attract young members, our organization is doomed.

Recent statistics show that the largest group of non-renewing members is people aged 30 to 39 years old, a group made up largely of what are referred to as “millennials.” I consulted a variety of online sources, hoping to get a better handle on who and what millennials are. What follows is what I gleaned from my research.

Millennials, it appears, are a unique subset of the population that interacts with the world in a totally different way than the generations before them. They think they are special. It’s the way they were raised. For starts, they were as children the most wanted. I know every generation feels that way, but this time it’s true. Their births were planned by their parents, who then lavished them with attention as they were growing up, marking every milestone in their lives by some type of celebration and praise—which only added to their sense of entitlement.

Of all the generations before them, the millennials have been the most sheltered. Gone are the days when you would say goodbye to your mother in the morning, go off on your bike to meet your friends, play all day and come back at suppertime—without ever checking in at home. Millennials grew up in an era of increased safety concerns, and were rarely left unsupervised. Their parents continually advocated on their behalf, solving their conflicts for them, so they would be spared the unpleasant experience of working out their own problems.

Despite all this, these are very confident people. They are motivated and they are goal-oriented. They have a high level of optimism, and they feel connected to their parents. They are assertive, and they believe they are right in their views about the world. They are also team-oriented, more drawn to group than individual lifestyle. Indeed, they may sacrifice their own identities to be part of the group. They don’t believe in hierarchies, and they are more closely knit than previous generations. And, while
they are team-oriented, they tend to exhibit this behavior within their own cohort, not with other generations. This may account for their reluctance to commit to organized dentistry. They might be willing to try it when they first graduate from dental school, but then sour on the hierarchal structure of the organization. On the plus side, they are oriented toward service and volunteerism.

Millennials set high goals for themselves, preferring achievement over personal development. They gravitate toward the fields of math and science, as opposed to the humanities and the arts favored by baby boomers. It is not uncommon for them to feel pressured. As they grew up, their schedules were highly structured. Every hour of every day was filled with specific activities. This has caused them to struggle with the allocation of free time and with time management in general. And because they feel the need to succeed, they are likely to take on more than they can handle.

The final millennial trait worth mentioning is the respect they display toward others—to the point of not questioning authority. Members of this generation are very civic minded. They are more conforming than those who came before them. They also value their parents’ opinions highly. They believe in social rules and align with their parents on many issues, more so than previous generations.

Rising to the Challenge

How do we attract this crop of new professionals to organized dentistry? That is the $64,000 question. We have to make membership attractive to a generation of people who are totally different from us. We must think outside the box if we wish to keep organized dentistry a viable entity in the future.

Millennials are multitaskers. They desire challenges and variety. We need to find ways to tap into this, as it makes them ideal candidates for membership. And it starts with recognizing that millennials comprise the most connected generation ever. They have grown up with new technologies and are comfortable using them. They constantly check social media outlets. If organized dentistry isn’t relevant on social media channels, they will ignore us. Utilize their knowledge to get better at the social media aspects of membership.

They are also tech-savvy. We have to make our communications available on all platforms. We can use our younger members to help us achieve this goal.

They’re looking for work-life balance and flexibility. They don’t want to sacrifice their personal lives for career advancement. They expect a flexible work environment. They also like to support various causes. We must appeal to their sense of commitment to the goals of dentistry and organized dentistry. One reason many may have chosen dentistry is the flexibility it affords. We shouldn’t infringe on their sense of balance as we ask them to become active in organized dentistry. We will have to rethink the ways we accomplished things in the past. That may not work with these members.

One aspect of organized dentistry we can use to attract millennials is their spirit of teamwork. They enjoy collaborating with others and building friendships. We must let them know there will be plenty of opportunities to collaborate with others and build long-lasting friendships. We all have benefited from these opportunities and friendships throughout our professional careers. Share this information with young dentists you know.
ADA Executive Director Kathleen O’Loughlin spoke eloquently to this at the ADA House of Delegates meeting this past fall in San Antonio. She said she recognizes the importance of young dentists to the future of the ADA. And she understands that the ADA must evolve to attract them to the organization. We can no longer operate as we have in the past, she emphasized. To do so will be the death of our organization.

If you know any young dentists, mentor them. Discuss the importance of organized dentistry in their professional lives. They see the world differently than we do. Learn from them, as well.

Keep an open mind. Establish lines of communication. Get them involved in organized dentistry in any way you can. Adapt what we do to what they do. If we become irrelevant to them, our organization will become irrelevant. That would be a disservice to all the dentists who went before us and to those who will come after us.

D.D.S.

NOTICE TO MEMBERS

Pursuant to the NYSDA Bylaws, Chapter XV Section 10, the following proposed Bylaws amendment is being published at least 30 days prior to the NYSDA Annual Session at which action is to be taken.

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Amendment to NYSDA Bylaws Regarding EDPAC Contribution

*Background statement:* The Board of Trustees is aware that political advocacy is at the top of every member survey as a desired benefit of membership. EDPAC supports NYSDA as we advocate for both our members and the public. Two years ago, EDPAC sought to provide an increase in the PAC contribution and proposed to the membership that the contribution should be 15% of members’ dues, which was adopted. The Board appreciates EDPAC’s understanding of the financial pressures our members face, and is concerned that the financial pressures impacting EDPAC are also affecting NYSDA’s ability to effectively serve our members. Sending $1.50 of every $10 dues increase to the PAC will further increase an already existing deficit in NYSDA operations. For this reason, the Board recommends we return to a stated number for the EDPAC contribution, which can be periodically reviewed and adjusted by the House of Delegates, rather than a percentage of the dues. The Board offers the following resolution:

6. **Resolved,** that Chapter I, Section 20 of the Bylaws of the New York State Dental Association be amended as follows (new language underscored; deletions stricken through):

C. Dues and Special Assessments. The dues of active members shall be the amount established annually by the House of Delegates in accordance with the procedure set forth in Chapter III, Section 130Ad of these Bylaws, due January 1 each year, fifteen percent (15%) eighty-four dollars ($84.00) of which, shall be contributed to the Association’s endorsed political action committee unless the member elects to reassign such amount to another approved Association fund as designated on the dues statement.
Follow-Up Problems with Fixed Appliances in Pediatric Dentistry

Timucin Ari, D.D.S., Ph.D.

A B S T R A C T

Fixed appliances are commonly used in managing early orthodontic problems. Despite their widespread use, they have the potential to impinge on the soft tissues, interfere with the eruption of adjacent teeth and become dislodged or broken. These two case reports present the poor outcomes of fixed appliance treatments if the patient fails to attend follow-up appointments. A successful outcome of treatment with fixed appliances depends upon proper patient selection and the communication skills of the dentist to help patients/parents understand the importance of regular checkups.

Guidance of eruption and development during the primary and mixed dentition stage contributes to a stable, functional and esthetically acceptable occlusion in permanent dentition. Beyond their involvement in esthetics, eating and speech, primary teeth play an important role in growth and development until permanent successors erupt. The premature loss of primary teeth may lead to undesirable consequences, such as loss of arch length and crowding due to the drifting of adjacent teeth. This in turn may compromise the eruption of succedaneous teeth, which, it has been suggested, is a main cause of malocclusion.

An effective approach to limiting the negative effects of premature loss of primary teeth is the use of space maintainers. Both fixed and removable space maintainer designs can be employed, depending upon clinical situations. But the most common space maintainer used in pediatric dentistry is the fixed band and loop space maintainer. This design requires little chair time and is less dependent upon patient cooperation than removable appliances.

Another scenario that has been shown to affect dentofacial growth and development in children is non-nutritive sucking. Thumb sucking, finger sucking and pacifier use are considered forms of non-nutritive sucking that may result in development of an anterior open bite.

Just like space problems, correction of a thumb-sucking habit can be managed by both removable and fixed appliances. Since removable appliances have not been found to be effective in producing significant changes, fixed appliances are usually preferred, due to better patient cooperation. Among fixed appliances, the fixed thumb crib appliance has been shown to be an effective device in stopping thumb sucking.

Although fixed appliances are commonly used effectively in both of the clinical situations described, they have the potential...
to impinge on soft tissues, interfere with the eruption of adjacent teeth, become dislodged or broken, and may place patients at a greater risk of caries and gingival inflammation due to their high plaque retention. Therefore, proper patient selection that takes into consideration the level of oral hygiene, the caries risk and the dental attendance pattern should be weighed before the decision is made to place a fixed appliance.

Case Report One
A healthy 12-year-old female patient presented as a returning patient for a routine checkup to a pediatric dental clinic within a university teaching hospital. Her mother was concerned about the spacing of her anterior teeth and wanted to know whether she needed orthodontic treatment to improve the aesthetics (Figure 1).

Clinical extraoral examination of the patient presented symmetrical facial proportion with competent lip closure. The temporomandibular joint function was within normal limits, with no tenderness on palpation of either side. Intraoral examination revealed healthy soft tissues and no signs of caries. The patient was in the early permanent dentition stage, with missing upper lateral incisors and the upper left second premolar. She exhibited a Class II malocclusion on right and left sides, and the lower midline was 3 mm left of upper midline.

Further intraoral examination revealed two band and loop space maintainers, the first spanning tooth #30 to tooth #28 (Figure 2) and the second from tooth #16 to tooth #14 (Figure 3). The loop of the lower band and loop space maintainer had pushed the mandibular right first premolar mesially and caused the crowding and midline shift in the anterior region. The maxillary left first premolar was rotated and tilted distally due to the retained space maintainer, with the loop now sitting on its occlusal surface. Spacing was present in the upper anterior region, with 2 mm overjet and 50% overbite. Radiographic examination revealed congenitally missing upper lateral incisors (#7 and #10) and impaction of the upper left second premolar (#13) (Figure 4).

Review of her previous records revealed that band and loop space maintainers had been placed 26 months ago and that despite receiving follow-up appointment reminders, she had never attended since that time, resulting in the over-retained space maintainers impacting significantly on her erupting dentition. The band and loop space maintainers were removed, and the patient was scheduled for follow-up appointments to address her orthodontic needs (Figure 5).

Case Report Two
A healthy 10-year-old female patient attended a pediatric dental clinic within a university teaching hospital complaining of pain from her gums. Extraoral examination revealed a convex profile with incompetent lip closure. The temporomandibular joint function was within normal limits, with no functional shift during
opening. Intraoral examination indicated late mixed dentition stage with Class II molar relationship on both sides. An anterior open-bite was observed; and her clinical records indicated that a fixed thumb crib appliance had been placed 10 months earlier to stop a thumb-sucking habit. Despite being informed of the importance of regular follow-up and several appointments being scheduled, the family had not attended any appointments since that date. The mother reported disappointment that the thumb-sucking habit had continued during that time.

On clinical examination, gingival trauma and inflammation were noted on the anterior area of the palatal mucosa, which was directly attributed to impingement of the crib appliance in this area (Figure 7). Therefore, the crib appliance was removed. An alternative strategy without appliance therapy was implemented using a psychological approach and positive reinforcement. A contingency contract was made between the child and her parents, simply stating that the child should be rewarded and praised for not sucking her thumb for a specific time (Figure 8).

**Discussion**

Fixed space maintainers are commonly used in children because of their benefit in eliminating compliance problems. The success rate of various different designs of fixed appliances can vary from 27% to 91.5%.5,12,22,24,26-31 Regardless of the design chosen, this doesn’t eliminate the need for regular follow-up. With fixed appliances, vigilance is critical. This allows the practitioner to assess the integrity of the space maintainer and to ensure removal of the appliance in coordination with eruption of the permanent successor.12,22,24,26,29

A primary tooth is the ideal space maintainer; this is why every effort should be made to preserve arch length in both the primary and mixed dentition. If early loss of a primary tooth is unavoidable, and nothing is done to preserve the space, the permanent first molars usually move mesially into this space and eventually a decrease in arch length is observed.4,9,10,25

In case one, following the early extraction of the primary molars, fixed space maintainers were placed to control arch length and to prevent potential orthodontic problems.13,6,14 According to the patient’s chart, the parents were told of the importance of regular checkups for both space maintainers and congenitally missing lateral incisors. Despite this explanation, the patient failed to attend any recall appointments until such a time that the mother became concerned about her daughter’s esthetic problems. Unfortunately, the consequence of their non-adherence to the review schedule resulted in the appliance exacerbating her previous orthodontic problem, resulting in impaction of tooth #13 and increased crowding in the mandibular anterior region.

In the second case, a fixed thumb crib appliance was placed to control a thumb-sucking habit. The incidence of soft-tissue
lesions resulting from impingement of fixed appliances has been reported to be as high as 11%. Clinical records indicated there was no problem with the fit of the appliance and that, again, the parents were informed about care and follow-up regarding the maintenance of the appliance. Non-adherence to the post placement review regime resulted in failure of the appliance, most likely due to biting forces in the anterior region or continued excessive thumb sucking by the patient. The appliance consequently dislodged superiorly and impinged on the mucosa. This could have been prevented by simple adjustment or by changing to a psychological approach far earlier during regular visits.

A successful outcome of treatment with fixed appliances depends upon the parents/caregivers and patients understanding and complying with advice given related to oral hygiene, device maintenance and commitment to periodical review appointments. Failure to adhere to any of these components may result in a poor outcome and potential problems, as illustrated by these two case reports. Such problems include damage to oral structures, increased duration of treatment or worsening of a malocclusion.

The practitioner must always keep in mind the parents’ level of understanding regarding the risks involved in placing fixed appliances in children. Dentists should take care that they use effective communication methods and choose language appropriate to the literacy levels of the parents in order to explain the importance of regular review. The use of techniques such as motivational interviewing could also encourage better adherence to dental attendance regimens to minimize the potential risks to oral health from over-retained appliances.

Queries about this article can be sent to Dr. Ari at timucin.ari@schulich.uwo.ca.

REFERENCES

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Dr. Ari

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**New NYSDA Insurance Program offers Competitive Rates and Dividend Eligibility**

NYSDA has recently announced new business insurance programs for members through an affiliation with Arthur Gallagher Insurance. New coverage includes:

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Successful Nonsurgical Management of Post-orthodontic Gingival Enlargement with Intensive Cause-related Periodontal Therapy


A B S T R A C T

Successful nonsurgical management of severe post-orthodontic gingival enlargement and erythema in a 24-year-old male is presented. The patient received an intensive cause-related periodontal therapy, consisting of oral hygiene instruction, scaling and root planing, and weekly recall visits. At week five, complete resolution of the lesions was achieved. By targeting the primary etiologic factor, i.e., plaque, periodontal health was restored without needing surgical intervention. Reducing the bacterial load will give the biologic natural healing capacity of the body the opportunity to stabilize the periodontal condition and, thus, should be considered as the first line of intervention before a surgical approach is taken.

Periodontal complications might be a concern among patients undergoing orthodontic treatment.1,2 Clinically, patients might present with gingival enlargement, erythema and edema, which may be accompanied by pain, spontaneous bleeding and esthetic concerns. These lesions may persist after completion of orthodontic treatment.3-5 Orthodontic appliances such as fixed brackets and lingual fixed retainers can act as local plaque-retentive factors and, thus, might cause an environmental shift in microbial flora from aerobic to predominantly anaerobic strains, including the so-called “red complex” periodontal pathogens.5-9 This microbial shift is often accompanied by elevated gingival crevicular fluid flow and its pro-inflammatory cytokine levels, such as interleukin-1 beta, transforming growth factor-beta 1.5,6,7 Thus, if untreated, they can result in irreversible destruction of the periodontium.1,10-12

The purpose of this report is to describe a patient presenting with post-orthodontic gingival enlargement. Gingival enlargement is a condition that commonly develops during orthodontic treatment.3,7,13,14 Even after debonding, complete resolution is not often attainable3,12 necessitating surgical intervention, which may be complex and carry morbidity to patients.3,14,15 In this case report, an intensive, cause-related periodontal therapy targeting the etiologic factor, i.e., dental plaque, resulted in successful management of gingival enlargement.

Case Report

Following completion of orthodontic treatment, a 24-year-old male was referred to Harvard School of Dental Medicine, Division of Periodontology, for a gingivectomy procedure due to gingival enlargement. The patient was systemically healthy, with no history of smoking. His oral hygiene was poor. Clinical examination revealed severe gingival enlargement in the interproximal gingiva around the maxillary anterior teeth (Figure 1). Furthermore, there was generalized gingival inflammation, as suggested by erythema at the marginal gingiva (Figure 1). These conditions appeared in the last six months before completion of orthodontic treatment and debonding. Radi-
graphic examination did not reveal any significant finding. The diagnosis of plaque-induced gingival enlargement was made.\textsuperscript{10-12}

Intensive, cause-related, nonsurgical periodontal therapy was planned to avoid surgical treatment.\textsuperscript{16} At the initial treatment visit, the patient’s oral hygiene status was assessed and scored using a plaque-disclosing tablet. It revealed generalized plaque deposits around the gingival margin and interproximal areas (O’Leary plaque score >90%).\textsuperscript{17} A personalized oral hygiene instruction program of removing dental plaque with a toothbrush and an interproximal toothpick (Stim-U-Dent, Madison, Revive Personal Products Co., NJ) was provided to the patient. The patient was instructed to use these aids three times a day. Finally, dental prophylaxis in conjunction with localized scaling and root planing treatment in the maxillary anterior sextant was provided to the patient.

Thereafter, the patient was recalled at weeks one, two and three (Figures 2, 3). At each recall visit, the patient’s home care was re-assessed, reinforced and scored using a plaque-disclosing tablet; and the patient was immediately instructed to remove any residual plaque. Subsequently, supragingival debridement was performed. At week five, the patient’s periodontal condition was re-evaluated (Figure 4). Clinical examination revealed complete resolution of the gingival enlargement and inflammation. Pre-existing gingival erythema and edema were no longer present. All periodontal clinical parameters were within normal limits, without any deep periodontal pocket or bleeding upon probing. No additional periodontal intervention was necessary.

The patient was scheduled for periodontal maintenance for every three months. His oral hygiene was excellent, as suggested by O’Leary plaque score index <5%.\textsuperscript{17}

Discussion

During orthodontic treatment, patients are susceptible to developing gingival or periodontal disease.\textsuperscript{1} Orthodontic brackets and wires may make it challenging to physically remove dental plaque around them and, thus, may act as local plaque-retentive factors.\textsuperscript{1-9} Furthermore, Atassi and Awartani\textsuperscript{2} found that approximately 60% of patients undergoing orthodontic treatment exhibited poor oral hygiene status. They also reported that 68% of patients reported not having a dental hygiene visit during their orthodontic treatment.\textsuperscript{2} Similarly, Berlin-Broner, et al.\textsuperscript{18} found only 52% of patients reported that their orthodontist verified if they had attended regular checkups by their general dentists.

In comparison, continuous patient motivation by treating clinicians was associated with significant improvement in patients’ gingival health during orthodontic treatment.\textsuperscript{19} In addition, Zanatta, et al.\textsuperscript{20} found that orthodontic patients using dental floss regularly exhibited significantly better gingival conditions than those who did not use floss. Similarly, according to Silvestrini Biavati, et al.,\textsuperscript{21} proper toothbrushing during orthodontic treatment was associated with improvement in plaque and gingival indices.
Therefore, establishment of a stringent preventive program among a general dentist, an orthodontist and a patient is strongly recommended before initiating orthodontic treatment. Through this program, patients should be able to demonstrate that they can effectively remove plaque using a toothbrush and interproximal cleaning aid. General dentists, as well as orthodontists, should also closely monitor patients’ compliance with home care and their periodontal condition during the active orthodontic treatment phase, with frequent recalls and periodontal prophylaxis. In case of any emergence or recurrence of severe gingival or periodontal disease, treating clinicians should consider discontinuing orthodontic treatment until periodontal health is restored.

This case report demonstrates successful management of post-orthodontic gingival enlargement and inflammation. By targeting the primary etiologic factor—dental plaque—with stringent oral hygiene instruction, in combination with frequent supragingival cleaning, the patient’s periodontal health was restored without needing surgery. Reducing the bacterial load by these means will give the biologic natural healing capacity of the body the opportunity to stabilize the periodontal condition and, thus, should be considered as the first line of intervention before the surgical approach is taken.

Queries about this article can be sent to Dr. Kwon at taehyun_kwon@hsdm.harvard.edu.

REFERENCES
What it Means to be a Doctor
Sensitizing the Dentist and the Student to Professionalism

Ronald I. Maitland, D.M.D.

ABSTRACT
Professional demeanor and the inter-personal behavior of the dentist play a large part in building the trust patients measure as they gain confidence in their choice of practitioner. Most of the time, patients experience comfort through the competent, compassionate care of a genuinely respected provider. That important image is determined by the ethical and proper relationships every patient encounters. The following discussion brings to the forefront image-damaging episodes that have occurred as a result of unwise or unthinking circumstances playing out not only in the office, but in the community and in private life as well. Can a professional shield the public from disappointing legal, unprofessional entanglements that could cast doubt on the good judgment and safety expected of the doctor? What effects on a practice may be seen?

Almost all dentists know that there is a code of ethics and decorum for professionalism. Governmentally, state dental boards are legally constituted to uphold the health, safety and welfare of the public. The boards are sensitive to the aberrant, unlawful or potentially dangerous behavior of their licensees. Any activity that puts the public at risk or that brings into question the competent and safe delivery of health care is investigated, and prosecuted where warranted.

Over many years, state agencies, through their professional boards, have encountered very few licensees who are aware that they can also be charged with out-of-office-related infractions. There is no appreciation, first, that the licensing agency has the authority over and an intense interest in the private-life misdeeds of professionals, even though, often, these misdeeds have little or no connection to the practice of dentistry.

Second, and perhaps more important, dentists often construct an artificial shield separating their private life from their practice life, failing to realize how questionable behavior affects their career. Third, in many cases, such as criminal activity and/or abuse and impairment issues, there exists a kind of double jeopardy, as after the civil or criminal governmental disciplinary system in court is enforced, the state professional board can revisit the episode and mete out its own professional misconduct sanctions, including the possibility of additional fines, suspension of license, mandated behavior modification therapy and, even, revocation of license.

Ill behavior is certainly not a rarity and can be episodic in anyone’s life by design or through ignorance, although the average dentist has no idea how frequently these troubling issues arise among professionals. News outlets are filled with it daily for consumption by the general population, but the expectation that the doctor, while as many proffer is human and can err the same as anyone else, has a higher calling, a more stringent ethical duty and is educated to act with respectful restraint far beyond the lay population.

Certainly, doctors can and should enjoy life, play vigorously and party. All that is enrobing them is the need to be circumspect, lawful, to refrain from excess that might invite criticism, and to avoid being labeled for poor judgment and losing the public’s trust and confidence. Both the public and the state expect a different standard for a professional’s behavior.
What it Means to be a Professional

Let us discuss professionalism, duty to self, to the community and to the profession that is the basis of this public expectation.

The title “doctor” is a powerful label. It imparts special status based upon, among other characteristics, the individual’s tested intellect, educational achievement, high level of practical training, expertise, wisdom and trustworthiness. The word means “teacher.” To maintain this special status, each doctor must adhere to the pillars of what a professional embodies—for example, competent skill, academic and behavioral honesty, financial responsibility, fairness, respect and compassion to all, reliability and actions worthy of public trust.

One’s demeanor and behavior outside of the practice have tremendous influence on the doctor’s reputation and respect in the community. More importantly, behavioral misadventures may have serious repercussions on the professional’s practice and licensure, and the special status of the profession as a whole.

Deviating from professional qualities may be indicative of an absence of moral character. During dental practice, disregard for patient welfare (often motivated by financial gain), for example, and unfortunate expedient shortcuts in service that result in outcomes falling below the standard of care can irreparably damage trust and professional respect. When ethics are cast aside, undue commercialism and disingenuous treatment ensues. Truthfulness decreases. Integrity is lost.

What is the effect of such amorality? In academic circles, cheating not only marks the character, morality and lifestyle of the individual, it becomes an addiction. Each act of dishonesty, without immediate recriminations, builds a comfort level that encourages repeat behavior. With students, it shortchanges their own educational experience and subverts the values of an inquisitive scientific mind. Disregarding evidence-based support for modern practice and allowing excessive anecdotal distraction also challenges the scientific basis for competent care. The unprofessional student or doctor becomes dependent upon the perceived success of the deceit.

Bankrupt of professional practice standards, the practitioner becomes a harbinger of future professional irresponsibility and, even worse, amasses a dossier of credentials that falsely speak of an education worthy of licensure. Credentials are based in trust; they certify a minimum level of competence. Tainted credentials become a subterfuge and undermine the public’s expectation.

Copying the written work and ideas of others and claiming them as your own, falsifying data, generating dishonest records and altering scientific research results are only a few examples of academic dishonesty. Certification that one has trained his or her mind and hands to a requisite level of competency but in reality has been abbreviated is (by the nature of circumvention) a false achievement, a disingenuous pursuit and a tragedy in the making. Dishonesty at all levels hurts the entire profession, the unsuspecting public and the perpetrator as well. A doctor who has earned respect is looked up to with great confidence. Once that respect is questioned, one’s reputation is greatly impaired.

That reputation is not generated and upheld just in the dental office. A dentist is always in the public eye. Dental students, upon entry into school, are considered to be members of the profession too; they should conduct themselves according to the expectations for a fully licensed professional. A doctor’s behavior and lifestyle, because of the special status that society grants him or her, is under constant, critical view. Students assume a professional role and the dictates of public trust that accompany their entry into dentistry.

This responsibility begins as soon as they commence navigation through the educational process. Sensitivity to this new professional role is an important part of the student’s educational process. Arrogance, academic dishonesty, illegal and ill behavior, all can become the subject of professional inquiry in school honor code enforcement, as well as in legal and public arenas. Embarrassing acts stemming from a lack of good sense, amorality and/or immorality certainly denigrate both the new and seasoned professional’s image among colleagues and the community.

Social indiscretions and sophomoric episodes acted out in public, as well as misdemeanors and felony criminal convictions that become known, can be devastating to the community’s trust and respect of the individual as a professional. Adverse publicity, as a result of indiscretion or illegality, hurts the individual, the school where applicable, the practice and the entire dental profession.

Principles of ethics and professional behavior in the dental office are addressed in dental school. Often, they are revisited in practice management discussions during and after commencement of practice. Some management advisors, however, promote business rubrics in an effort to enhance commercial success without much regard for professional ethics and demeanor. Walking a tight line, or crossing over the threshold of professional ethics, is often more avarice than good business sense and, therefore, will also cross the propriety of good business ethics and the pragmatics of profit and sustainability.

State licensing boards, through practice acts and national, state and local membership dental associations, and through the
articularation of ethical principles and professional codes of conduct, spell out unacceptable professional behavior with applicable enforcement regimens. There are lapses in display of good character, episodes of untrustworthy behavior and demonstrations of poor self-control, however, that occasionally contribute to denigration of the special status that a professional enjoys in the community.

Many of these indiscretions, or more serious departures, are not involved with actual dental care and practice issues. These, too, are not insulated from community scrutiny and can have a significant influence on public trust and respect. Indeed, practices have been ruined by a professional who displays adverse behavior that would be unacceptable in any setting. In the interest of the duty to uphold public protection, state boards are, therefore, leveling misconduct proceedings against practitioners who have demonstrated a lack of self-control or questionable, unstable behavior. Just being accused, even though later exonerated of any wrongdoing, may be solace to the accused doctor, but the damage to the professional and the profession remains. The original report still leaves questions in the minds of patients, friends and colleagues. Such reputational damage, deserved or not, is difficult to repair.

The following examples of ill behavior may appear extreme, and they certainly represent noxious behavior by anyone, not just professionals. However, when the doctor’s judgment lapses fall to these levels, it is surmised that one’s self control, mental abilities and professional decision-making are questionable, to the point of compromised patient care. Dentists are human, and can succumb to the pressures of daily life as anyone else can, but their actions are subject to higher scrutiny; a higher expectation of judgment, decision-making and trust; and a much higher standard for respect.

**Misconduct #1: Road Rage**

J.M., D.D.S., age 34, while driving home from work on the interstate, was abruptly cut off and forced off the road by another speeding and weaving vehicle. Enraged, J.M. re-entered the highway and chased after the offender. Overtaking the other vehicle, he engaged the driver with gestures and shouted epithets. Both drivers pulled off to the shoulder and got into a fist fight on the side of the highway. The doctor, who was getting the worst of this entanglement, took a baseball bat from the back of his car and assaulted the other driver, opening up a serious head wound and severely damaging his auto.

The police and an ambulance arrived. The doctor was put into handcuffs and taken into custody. The charges were reckless endangerment, road rage, property damage, and assault and battery (with a deadly weapon). The conviction was reported widely in the local media. Imprisonment was waived in a plea bargain. In addition to the felony record, the fines, the mandatory program of anger management and probation, the doctor’s insurance company refused to defend the personal liability action against J.M. taken by the other driver. Also, the state dental board later convicted him of professional misconduct and imposed appropriate discipline, a hefty fine and suspended his dental license until satisfactory completion of an anger management program. (Suspension of license can also cause a doctor to be dropped from a number of third-party payment panels.)

In many jurisdictions, suspension or loss of one’s dental license can be a significant economic loss. As a non-licensee, the dentist can no longer own or operate a practice, nor practice in any way. This is not a matter that can be addressed by just taking a vacation while a colleague covers the practice. The legal entity, the practice, must close or be transferred. The legal aspects of this kind of disciplinary action are complex, extremely costly and can be devastating.

In this and the cases that follow, dentists who may be licensed in more than one state are also subject to professional misconduct proceedings in each state in which a license is held. The act(s) committed, which resulted in a conviction in the original primary state board disciplinary case, if considered a violation within the regulations of another state, may be prosecuted over again, with additional discipline handed out in each of those states.

**Misconduct #2: Assault**

P.J., D.M.D., who practiced orthodontics in a small town, was in the grandstands at his son’s Little League championship game. His son, at bat, hit a ball to deep shortstop territory, but was called out by the umpire in a close play at first base. Enraged at the call, believing his son to have beaten the throw, P.J. jumped out of the stands and ran to first base and assaulted the umpire. He had to be restrained and escorted from the field, all in full view of a large number of parents, youngsters, patients and potential patients. The newspaper headline screamed, “Dentist Goes Berserk.” Suitable repercussions ensued, legally and professionally, including state board insistence on supervised counseling, probation and a fine.

**Misconduct #3: Alcohol Abuse**

R.R., D.D.S., a long-time member of his local country club, was attending the wedding of his patient’s daughter at the club. At the end of the evening, he and his wife went to the coat check room to retrieve their coats. The young female attendant couldn’t locate his wife’s fur coat. Dr. R. got very agitated and started to verbally abuse the young attendant. He obviously had had a lot to drink.
The entire club was privy to this episode. In fact, the coat had been taken by mistake and was returned the next day.

Dr. R’s run for president of the club was woefully unsuccessful several months later, and his practice suffered significant damage. His staff was concerned about his use of alcohol—and not just at evening social functions. They had observed he was coming to the office impaired. They called a dental colleague of R.R. to ask if he might suggest to their employer that he enter a substance abuse program. The state board decided to honor his voluntary enrollment into an approved substance abuse program, which monitored the enrollee’s compliance. The state then exacted a short-term temporary license suspension, with no charges against R.R., based upon his compliance. A state action could have been initiated if the doctor had denied his alcohol abuse, however, which would have stimulated a formal charge resulting in far more legal ramifications, longer license suspensions and further practice interruption.

While R.R.’s difficulties stemmed from alcohol abuse, numerous other cases can be found related to abuse of and addiction to drugs and recreational substances.

**Misconduct #5: Fraud**

H.S., D.D.S., was getting numerous calls about this headline: “Bank Sues Doctor Over Building Sale Fraud.” Dr. S. and two other partners were involved in the sale of a building that they jointly owned. That sale was now being investigated by the district attorney for false documents and dishonest disclosures. Further investigation revealed tax evasion and unpaid tax liens that had not been divulged. The headline created a significant change in the character and busyness of the doctor’s practice. Criminal charges ensued, with federal and state liens and IRS seizures of other properties and bank accounts.

When a licensee is convicted of a felony, the state board prosecutes secondarily, after the district attorney and the federal and state tax courts. Fraud of any kind, within the conduct of business of the practice or outside dealings, is considered professional misconduct.

**Misconduct #6: Bearing False Witness**

Dr. J.M. and his wife, Dr. M.M., are both dentists. They have a 12-year-old daughter. The doctors practice separately. The couple is in the midst of a bitter divorce. The rancor and fighting have become quite public, including M.M.’s accusation that J.M. is sexually abusing their daughter. Their story is played out in the media. When the smoke settles, J.M. proves unequivocally that M.M.'s accusations are lies, but the facts are too late. After many months of expensive legal entanglement, J.M. has to move out of state and start building a practice again.

J.M. does prevail in his civil lawsuit for defamation. The state, furthermore, takes criminal action against M.M. for filing a false and malicious complaint, perjury and aggravated defamation. She serves one month in prison, has her dental license suspended for six months, receives a $10,000 fine and has to make substantial restitution to J.M.

This is a professional and personal tragedy in so many ways, but it is also a public relations nightmare for dentistry.

**Misconduct #7: Drunk Driving**

S.D., D.D.S., while driving home from an evening dinner party, was stopped at a police sobriety checkpoint and asked to step out of the car. Subsequent evaluations ended up with his arrest for driving while intoxicated, DWI. His attorney, based on the blood alcohol level being just over the legal limit and this being a first offense, was able to plea bargain the offense to driving while impaired, a misdemeanor rather than a felony. S.D. paid the $500 fine, but still needed to attend an alcohol abuse program in order to regain his suspended driver’s license.

Six months later, he was stopped again at another routine checkpoint and arrested for DWI, this time with a significantly higher blood level, in fact, twice the legal limit. He was remanded to jail for the night and was convicted of driving while intoxicated. He was hit with a mandatory $5,000 fine, his driver’s license was suspended for no less than one year, predicated on completing the DMV driver safety course and his substance abuse rehabilitation. Since this conviction, states have significantly upgraded and increased penalties for DWI. Auto insurance, if available, will charge prohibitive rates. Subsequently, the state board for dentistry suspended his dental license for at least four months and until he satisfactorily completed the mandated rehabilitation program. Many patients, unable to schedule appointments, delved into the facts, which are a matter of public record, and departed from the practice.

State boards are very sensitive to the lack of responsibility and judgment of a professional who will drive under the influence of alcohol or drugs and threaten the safety and lives of oth-
These scenarios are only a handful of examples of dentists breaching professional decorum in and out of the office. So much of the success of a professional lies in the trust and respect earned in the delivery of compassionate, competent and concerned care, as well as in assuming an exemplary, trustworthy, respected lifestyle in the community.

Professional Decorum In and Out of the Office

These scenarios are only a handful of examples of dentists breaching the public trust through their misdeeds in private, out-of-the-office, or civil/community-related matters. Criminal indictments, business and financial irregularities, drug-related offenses, sexual offenses, public indecency, questionable morality associated with adulterous interpersonal relationships, deviant behavior and other kinds of abuse are all open to secondary state board scrutiny. Degradation of the special status that is afforded those wearing the robe of a “doctor” also ensues. The dentist, once separated from direct doctor/patient relationships and in-office encounters and treatment concerns, segues into personal human behavior and private life. Many believe that this crosses into a distinctly separate role governed by different ethics and different standards. As one becomes aware of the pitfalls of deviancy and public displays of ill behavior, however, it should become abundantly clear that any mistake in professional behavior separate from private activity can have career changing outcomes.

The professional must be aware that the ethics and professionalism of dental practice is but a part of the decorum and behavior that dentists should consider in guiding their daily lives, in and outside the office. So much of the success of a professional lies in the trust and respect earned in the delivery of compassionate, competent and concerned care, as well as in assuming an exemplary, trustworthy, respected lifestyle in the community.

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10. New York State DWI Penalty Update: Jail time, longer suspensions, much larger fines and felony convictions are posted. Aggravated DWI, failure to submit to chemical tests (blood or breathalyzer), use of ignition interlock devices are discussed IID’s) and similar penalties for driving while ability impaired (DWAI). See NYS DWI.com.

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Fabrication of well-fitting complete dentures becomes a challenge in the presence of epulis fissuratum in the maxilla or severely resorbed alveolar tissue in the mandible. This clinical report describes the surgical and prosthetic treatment of a patient who presented with both problems. The neutral zone technique was used to improve the stability of the mandibular complete denture. Both dentures were fabricated prior to surgical excision of the epulis fissuratum and inserted immediately following the surgery.

According to the American College of Prosthodontics, more than 35 million Americans are currently edentulous. Ninety percent of this edentulous population wears complete dentures, and about 15% receive a new complete denture each year.1

Dental implants provide an opportunity for edentulous patients to have either fixed or removable implant-supported prostheses and, therefore, improve retention and stability problems associated with complete dentures. Today, the standard of care for the edentulous mandible is the addition of two implants and fabrication of an overdenture.2

For edentulous patients who will have an implant-supported fixed dental prosthesis as a definitive restoration, the initial phase involves a complete denture fabrication as an interim prosthesis.

A proper complete denture fabrication for these patients is important for many reasons, including the patient’s comfort at the transitional stage. The average time the patient will wear the denture ranges from 12 to 18 months before the surgical and healing phases are completed.

A second reason is to determine if and where bone augmentation procedures will be required by duplicating the complete denture as a radiographic/surgical guide. A third reason is to guide the surgeon in proper placement of implants using the radiographic/surgical guide. And, lastly, to provide the dental technician with information about esthetics and position of the teeth for the definitive implant-supported fixed prosthesis.3

Granting that implants offer many advantages to the edentulous population, complete dentures still represent the prosthesis of choice as a definitive prosthesis for many patients due to anatomic restrictions, objection to surgical interventions or financial limitations. As a result, complete dentures remain very important in today’s dentistry, since they are used as either a definitive or transitional prosthesis.

Fabrication of a well-fitting complete denture requires adequate extension with positive contact of the soft peripheral tissues and bony anatomic structures for support.4 Problems or limitations can be encountered with soft tissues, hard tissues or a combination of both.

When referring to the soft tissues, a clinician can encounter inflammatory responses, hyperplasias, chemical burns, white lesions, ulcerative lesions, mechanical irritations or malignan-
cies. One of the hyperplasias, epulis fissuratum, is defined as a tumor-like hyperplasia of fibrous connective tissue that develops in association with the flange of an ill-fitting complete or partial denture. The lesion forms as a pathological response to chronic irritation. The most common complications for the patient are pain and discomfort. Another complication is extension of the lesion to a point where it compromises the retention and stability of a denture.

Various treatments for this type of lesion have been described, including surgical excision, a more conservative approach such as soft relining of the existing denture or a combination of both. The conservative method is based on the belief that the soft relining material may facilitate shrinkage of the fibrous tissue mass. The decision for surgical excision depends upon the amount of redundant tissue, its location and a patient’s acceptance of surgery. Once the surgical intervention is decided upon, two approaches can be taken in terms of the timing for the new denture fabrication—either prior or after the surgery. The advantages of fabrication prior to surgery are that the denture can be used as an aid for healing following excision and the patient does not have to be without the prosthesis for a long time. Its main disadvantage is the potential need for reline procedures if the tissue changes drastically following surgery.

As with the soft tissues, certain limitations can arise when evaluating the hard tissues for support in complete denture fabrication. The presence of unerupted teeth, large bony maxillary tuberosities, severe residual ridge undercuts and exostosis may require pre-prosthetic surgery. On the opposite end of the treatment spectrum, lack of bone or severe alveolar ridge resorption can also be a problem. This becomes a bigger concern in the mandibular arch because the surface area is less than that in the maxilla and muscles of the tongue, cheeks and lips can dislodge them. To aid in the retention and stability of a complete denture, the neutral zone technique can be utilized.

The neutral zone, first introduced in the 1950s by Wilford Fish and Russell Tench, is described as the area in the potential denture space where the forces of the tongue pressing outward are neutralized by forces of the cheeks and lips pressing inward. The neutral zone is captured by a patient’s functional movements and transferred to the laboratory to guide artificial tooth setup.

This patient report describes management of an edentulous patient who presented with both complications, a large epulis fissuratum in the maxilla and severe alveolar ridge resorption in the mandible. It explains surgical and prosthetic treatments provided.

Clinical Report
A 92-year-old Hispanic woman presented to the Advanced Education Program in Prosthodontics at the New York University College of Dentistry with a chief complaint of ill-fitting maxillary complete denture and missing mandibular complete denture. Medical history revealed high blood pressure and severe arthritis. Medical consultation and clearance for dental surgery were obtained prior to any procedure. Dental history revealed no dental visit for the last 10 years. Clinical examination of the residual
The New York State Dental Journal

Dentsply Caulk, Milford, DE) of both edentulous arches using stock metal edentulous trays. The impressions were poured in Type III stone (Microstone; Whipmix, Louisville, KY). Custom trays were fabricated with Triad Original Blue material (Triad: Dentsply Caulk, Milford, DE), adjusted intraorally. Border molding was done with modeling plastic impression compound (Impression Compound; Kerr Corp., Orange, CA). Final impressions with light body rubber base impression material (Permlastic Light Body; Kerr Corp., Orange, CA) were made and the master casts poured in Type III dental stone (Microstone).

Occlusal rims were fabricated with TruWax; Denstply Prosthetics, York, PA) following averages for height and width. The maxillary occlusal plane was adjusted intraorally following inter-pupillary and ala-tragus lines as references; then a face-bow transfer was made. The mandibular occlusal rim was adjusted and the vertical dimension of occlusion evaluated using the rest position, esthetics and phonetics. Centric relation record followed using bilateral manipulation and Blu-Bite (Blu-Bite; Henry Schein, Melville, NY) recording material. Mounting was completed in a semi-adjustable articulator (Hanau Wide-Vue; Whipmix Corp., Louisville, KY).

In order to proceed with the neutral zone technique, the mandibular occlusal rim was adjusted by removing the majority of the baseplate wax, leaving 1 cm at both posterior ends to maintain vertical dimension of occlusion. An orthodontic wire (Permachrome Resilient OrthoForm; 3M Unitek, Monrovia, CA) was bent and added to the baseplate with sticky wax (Sticky Wax; Kerr Corp., Orange, CA) as a retentive element. Both maxillary occlu-
The treatment plan chosen, based upon the patient’s finances and viable options, was fabrication of maxillary and mandibular removable complete dentures.

The mandibular base plate with Coe-Soft was indexed on the mandibular master cast as a guide of the neutral zone area (Figure 6). The Coe-Soft was then removed, replaced by wax, and the artificial tooth arrangement was completed, guided by the index (Figure 7). The completed artificial tooth arrangements on the respective record bases were placed intraorally (Figure 8), and the mandibular record base was evaluated for stability (Figures 9A and B). Festooning of the polished surfaces of the denture was completed, taking into consideration the indexes. The posterior palatal seal was recorded and prepared into the maxillary master cast. The dentures were processed using the SR Ivocap System (SR Ivocap System Ivoclar Vivadent, Inc., NY) and polished for insertion following surgery.
At the time of the surgical excision of the epulis fissuratum, the patient was anesthetized with three carpules of lidocaine 2% and 1/100,000 epinephrine (Lidocaine HCl 2% with Epinephrine; Henry Schein, Melville, NY). An incision was made surrounding the excess tissue while pulling with a hemostat (Figure 10). The laser was used simultaneously and at the end of the excision to control areas of bleeding. Three chromic-gut sutures were placed in areas where coagulation could not be obtained (Figure 11).

Post-operative instructions and prescriptions for antibiotics and pain control medication for seven days were given to the patient. The new complete dentures were inserted at that time (Figure 12).

The patient was instructed not to remove the dentures and to return for a 24-hour follow-up visit. At the 24-hour follow-up visit, the dentures were removed and inspected; pressure-indicating paste (Pressure Indicating Paste; Mizzy Inc., Cherry Hill, NJ) was used to evaluate the proper fit of the intaglio surface, and areas of excessive pressure were eliminated. The patient returned for a one-week follow-up and sore spots were adjusted. At the two-week follow-up, healing was almost complete and no surgical revisions were recommended. Final occlusal adjustments were made. The patient was very satisfied with the stability of the mandibular denture and overall treatment outcome. A follow-up protocol of 3, 6 and 12 months was established.

Summary
This clinical report describes the treatment of a completely edentulous patient with severe resorption in the mandible and a large epulis fissuratum in the maxilla. The treatment rendered was fabrication of a maxillary complete denture prior to surgical excision of the epulis fissuratum and a mandibular complete denture using a neutral zone technique. The advantage of the neutral zone technique is improvement of stability with the understanding that complete dentures must function in the oral cavity in harmony with the neuromuscular system.

Queries about this article can be sent to Dr. Çomut at alpercomut@nyu.edu.

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Maxillary Implant-retained Partial Overdenture with Dolder Bar Attachment

A Clinical Report


ABSTRACT

This article describes a technique for maintaining a maxillary Kennedy III partial removable dental prosthesis design in a patient who had non-restorable failing abutments by replacing the abutments with dental implants. Two implants were placed immediately after extraction of the abutment teeth in the anterior maxilla. After the implants were fully integrated, a Dolder bar attachment was fitted onto the implants. A new maxillary partial removable dental prosthesis was fabricated using the implants and the remaining natural teeth as abutments to restore function and esthetics. With the aid of dental implants, this Kennedy III maxillary removable dental prosthesis design could provide additional retention and support by promoting cross-arch stability and tissue, implant and tooth support. The patient’s satisfaction was significantly increased.

The efficacy of the implant-supported/retained overdenture is apparent in a completely edentulous patient, and has been well documented.1-4 When it comes to treating partial edentulism, there are several treatment options, such as conventional partial fixed dental prostheses, partial removable dental prostheses and implant-supported fixed prostheses.5,6 However, the benefits of incorporation of dental implants into partial removable dental prostheses for a compromised dentition and severely resorbed alveolar ridges are also shown in the dental literature.7-12 An in-vitro study indicated that an implant placed in the distal edentulous ridge prevented the displacement of distal extension partial prostheses and decreased the pressure on soft tissues.13

Most clinical reports about the implant-retained partial removable dental prosthesis described an approach to incorporate the dental implant into the removable dental prostheses to convert Kennedy Class I or II to Kennedy Class III removable partial design in the maxilla and the mandible.14-17 This treatment modality can also be a compromise, allowing patients who are not suited to a complex treatment to easily reach prosthetic goals. Kaufmann, et al. indicated that this option may be used to rescue hopeless abutments for the existing partial dentures.19 Bortolini, et al. also suggested that this can constitute an interim treatment option while dentists and patients make decisions about the extraction of minimally compromised teeth and can later be transformed into a complete implant-supported overdenture.20

However, there have been a few studies of its long-term success. Objections to such a treatment modality are that there are fewer evidence-based articles to support this option and that implants are mostly single standing, not rigidly splinted. In a long-term retrospective analysis, Bortolini, et al.19 reported that overall survival rates of implants and the implant-retained partial denture for both the maxilla and mandible were 93.75% and 100%, respectively, for an eight-year period.

Grossman, et al.10 also reported that an overall implant survival rate of 95.5% was observed with improved masticatory function and esthetics in their 31-mean follow-up study. Kaufmann, et al.19 followed for up to eight years to analyze pros-
thetic maintenance in partially edentulous patients with removable prostheses supported by teeth and strategic implants. They summarized that overall, 3 maxillary implants were lost out of 93 implants, and the placement of a few implants allowed for maintaining a compromised residual dentition. They also addressed technical problems, such as complications related to anchorage types, mechanical failures of the dentures and prosthesis-related adjustments.

In another retrospective study of an average 2.57-year observation of clinical applications of dental implants on distal extension removable prostheses, Mitrani, et al.\(^7\) reported increased patient satisfaction with a minimal radiographic bone loss. Wesmeijer, et al.\(^20\) concluded that the implant-assisted mandibular bilateral distal extension removable partial denture was a preferable treatment option over the conventional mandibular bilateral removable partial denture in their three-year prospective study. This implant-assisted partial removable dental prosthesis has many advantages, including preservation of the proprioception of teeth and alveolar bone, improved stability of the partial denture framework that allows a mechanically favorable design with excellent esthetics and a cost-effective treatment modality.\(^11,21\)

Most articles have described how to incorporate the dental implant into removable denture designs by placing dental implants in the distal extension areas to distribute adverse forces. This article describes the fabrication of an implant-retained maxillary partial overdenture in a unique way by placing two strategically located implants to replace unrestorable root-coping abutments in the anterior ridge with the aid of the Dolder bar attachments and natural posterior abutments.

**Clinical Report**

A 74-year-old man presented with an ill-fitting maxillary partial overdenture and a mandibular Kennedy Class I partial removable dental prosthesis. Evaluation of the existing prosthesis revealed deformed plastic components of the Zaag attachment (Zaag; Preat, Santa Ynez, CA) and a broken retentive clasp of the maxillary prosthesis. Severe wear was apparent on the occlusal surfaces of the denture teeth opposing the natural dentition. Overall, stability and retention of the prosthesis was very poor. Recurrent caries was seen on both maxillary anterior abutment teeth. One of the intra-radicular attachments (Zaag; Preat) was lost. The maxillary anterior palatal mucosa demonstrated mild denture stomatitis due to the ill-fitting prosthesis. A palatal torus, 11 mm in width and 16 mm in length, was present on the hard palate. The posterior or complete cast crowns were clinically acceptable, as abutments were presented with no recurrent caries (Figure 1).

The treatment plan selected by the patient included extraction of the maxillary anterior abutment teeth, followed by immediate implant placement, and an implant-retained maxillary partial overdenture together with a mandibular bilateral distal extension removable partial denture. The resilient type of Dolder bar attachment (Dolder bar; Preat, Santa Ynez, CA) was selected for the retention and the stress distribution by splinting the implants. This attachment system allows rotation and vertical movement of the prosthesis, and is relatively easy to make parallel to the path of insertion. The patient declined alternative options, including a complete RDP and removal of the palatal torus, or an implant-supported fixed or removable dental prosthesis. The patient was taking digoxin and atenolol for irregular heartbeat, and baby aspirin (81 mg) for stroke prevention; otherwise, he was a healthy

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**Figure 1.** Pre-treatment maxillary arch without prosthesis. Note central incisor lost intracoronal attachment.

**Figure 2.** Surgical template adaptation over extraction sites without flap elevation.

**Figure 3.** Radiograph after implant placement.

**Figure 4.** Dolder bar-custom abutment assembly on maxillary final cast and laboratory silicone putty index of trial denture.

**Figure 5.** Brazed Dolder bar assembly with retentive sleeves and spacers.

**Figure 6.** Framework for removable partial prosthesis.

**Figure 7.** Maxillary occlusal view with definitive prosthesis.

**Figure 8.** Facial view of definitive prostheses.
individual. Medical clearance was obtained from his physician for implant placement procedures aimed at improving retention and stability of the maxillary partial prosthesis.

Preliminary impressions were made for diagnostic casts and trial dentures using irreversible hydrocolloid (Jeltrate; Dentsply Caulk, Milford, DE). The occlusal vertical dimension of the patient was determined clinically using the trial bases (Triad; Dentsply Trubyte, York, PA). Casts were mounted in a semi-adjustable articulator (Denar Combi, Whip Mix Corp., Ft. Collins, CO) using a facebow (Slidematic face-bow; Denar, Whip Mix Corp., Ft. Collins, CO) and centric relation record (Blue-mousse; Parkell, Edgewood, NY). Denture teeth (SR Ortholingual DCL; Ivoclar Vivadent, Amherst, NY) were arranged with lingualized occlusion concept on trial dentures. Trial dentures were placed in the patient’s mouth and evaluated clinically. The diagnostic trial denture was duplicated to fabricate a clear acrylic radiographic template using laboratory silicone putty (Lab-Putty; Coltene/Whaledent, Cuyahoga Falls, OH) and a denture processing flask (Hanau Varsity Flask, Fort Collins, CO). The position and direction of the implants were confirmed by a cone beam imaging system (i-CAT; Imaging Sciences Intl, Hatfield, PA).

The maxillary anterior teeth were extracted atraumatically using periotomes, followed immediately by implant placement in the extracted sockets (Figure 2). Surgical templates with drill guides (Brass tubing; KS Engineering, Chicago, IL) were used to facilitate precise drilling. Two internal-platform, tapered endosseous implants (4.3 × 10 mm, NobelReplace; Nobel Biocare, Yorba Linda, CA) were placed with a flapless technique and torqued to 35 Ncm. At the same time, cover screws (Nobel Biocare) were placed into the implants. A maximum of 1 mm gap between the implant and surrounding socket was noticed, but grafting procedures were not indicated (Figure 3), according to Paolantonio, et al.22 Primary closure of the surgical sites was achieved.

It was noticed two weeks after the implant placement that the cover screws were partially exposed. The two cover screws were replaced with two healing abutments (Nobel Biocare) after the implants were uncovered with a soft-tissue punch (Biopsy punch 4 mm; Miltex Inc, York, PA). The implants were allowed to heal for eight weeks. An anterior acrylic resin base of the existing prosthesis was relieved to eliminate the occlusal loading on the implant during the healing time and returned to the patient.

A custom impression tray (Triad; Dentsply Trubyte) was border molded with a modeling plastic impression compound (Compound Stick; Kerr Corp., Orange, CA). An implant level impression of the maxillary arch was made to fabricate custom gold abutments (GoldAdapt; Nobel Biocare) after the healing of soft and hard tissues was completed. Wax casts were invested (Fujivest II; GC Corp., Alsip, IL) and cast using a gold alloy (Harmony Hard; Au 74.0, Pd 3.8, Ag 12.0, Cu 9.0, Zn <1.0, In < 1.0, Ir < 1.0 %, Ivoclar Vivadent). Dolder bars were assembled on the custom gold abutments using an autopolymerizing acrylic resin (Pattern Resin LS; GC Corp.) (Figure 4). After the position of the bars was assessed using a surveyor (Ney Surveyor; Dentsply CA, Woodbridge, ON, Canada) and a silicone putty (Sil-Tech Plus; Ivoclar Vivadent) template of the trial denture, the Dolder bar assembly was invested with a solder investment (Soldervest; GC Corp.) and brazed (Figure 5) in a heat-assisted microwave oven (ThermWave; EPL Ceramic Materials LLC, Youngstown, NY) with a solder (.385 Fine Solder; Au 58.5, Ag 16.0, Cu 18, Ga 7.2, Zn <1.0%, Ivoclar Vivadent). After clinical verification of the fit of the Dolder bar assembly was assessed to be satisfactory, a new implant level impression was made to pick up the Dolder bar assembly intraorally using an open tray and vinyl polysiloxane material (Aquasil Ultra; Dentsply Caulk). The new maxillary definitive cast with Dolder bar assembly was sent to a dental laboratory for the fabrication of the metal framework using a base metal alloy (Wironium; Co 63, Cr 29.53, Mo 5, Si, Mn, Fe, N each < 2, C max. 0.17, BEGO, Lincoln, RI) (Figure 6).

After the clinical trial of the maxillary metal framework, the maxillary trial wax denture was completed, flasked and processed using heat polymerized acrylic resin (SR Ivocap, Ivoclar Vivadent). Denture bases were adjusted with a pressure-indicating paste (Detail Pressure Indicating Paste; Pfingst & Co., Inc., South Plainfield, NJ) according to relieve pressure during the clinical trial placement. The removable dental prosthesis was remounted in the articulator to adjust occlusal interferences. The removable dental prostheses were finished and polished for final placement (Figures 7, 8).

The patient was advised to maintain a prescribed schedule for the periodic recall evaluation, including oral hygiene and prosthetic maintenance. The patient has been followed for six years since completion of his treatment. The prosthetic complication of the maxillary RDP during the recall examination included wear of the anterior denture teeth and replacement of a broken denture tooth opposing the natural teeth. The patient was highly satisfied with the improved esthetics and function of the prosthesis.

Summary
The authors replaced the existing natural abutments of the overdenture with dental implants immediately after extraction. Because there was the minimum gap between the implant and surrounding socket, the same osseointegration was expected in immediate placement as placed in mature bone.22 The existing prosthesis was relieved to eliminate the occlusal loading on the implant during the eight-week healing time.

For the retention of implant-assisted partial dental prostheses, several attachment systems have been used, such as the ERA system,15,16 healing cap,10,14 bar system,11 Locator attachment13,17,18 and ball attachments.8,9,11,19,20,21 Although there is no advantage to selecting the splinted bar attachment over unsplinted abutments in mandibular overdentures in terms of retention and implant survival rates,23,24 the splinted bar device seems to be more retentive and require less maintenance than the unsplinted attachment in patients with severe resorption of the alveolar ridge.25
The Dolder bar system (Large resilient; Sterngold, Attleboro, MA) used in this report consists of the oval-shaped metal bar, the retentive metal sleeve and a spacer for the acrylic processing. The precision bar attachment provides retention of the prosthesis as well as anterior-posterior rotational movement. The space used in denture processing allows settlement of the denture base, resulting in maximum mucosal support. Overall, it combines excellent retention and minimal wear of the attachment system.

This article presents a simplified treatment modality in which a limited number of strategically placed implants serve to improve an otherwise unfavorable function. Without the option of two dental implants placed in the anterior maxilla, the patient would have received a maxillary removable complete denture with unfavorable anterior alveolar ridge occluding the mandibular bilateral distal extension removable partial denture. With this method, it was possible to maintain the existing Kennedy Class III condition by strategically placing dental implants, which led to increased patient satisfaction.

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REFERENCES

An Analysis of the Hemophilia of the Royal Families of Europe, Its Startling Implications and Dentistry’s Role in Treating the Hemophiliac Patient


Abstract

Hemophilia is an inherited x-linked recessive disorder. It is known popularly as “The Royal Disease,” as it has affected many of the royal families of Europe by virtue of Queen Victoria being a carrier for the gene and, subsequently, passing it on to her offspring. They, in turn, married and had children with other royal families of Europe. Hemophilia is certainly not limited to royalty. There are many hemophiliacs living in our communities, and they must receive both proper dental home-care education and dental treatment in order to prevent possibly life-threatening emergency dental episodes. Individuals with hemophilia pose different management issues to the dental professional. The various precautions and modifications that must be taken in order to ensure the safe delivery of dental care to hemophiliac dental patients are discussed.

Certain disorders patients possess require various precautions and, possibly, modifications to the usual course of delivery of dental care. Hemophilia is one such entity. Virtually all aspects of dentistry—from the prescribing of oral analgesics to the possible need for factor replacement therapy prior to certain oral surgery procedures—necessitate that prudent measures be taken for the hemophiliac patient. A comprehensive understanding of all necessary precautions must be achieved prior to commencing any dental procedure, even an oral examination, on a hemophiliac patient.

Hemophilia is an x-linked recessive disorder. There are two types of the disease—Type A and the more severe and rarer Type B. A daughter who inherits the gene for hemophilia from her father becomes an obligate carrier. Only in the rarest of instances does a female manifest clinical signs of the disease. This would occur when her father is a hemophiliac, her mother is a carrier and she inherits the mother’s x chromosome, which carries the genetic defect for hemophilia.

The genetic inheritance pattern of hemophilia played an immense role in shaping the history and political landscape of Europe in the 19th and 20th centuries. Queen Victoria of Great
Britain was a carrier and passed the gene for hemophilia down to her offspring, who married into the other royal families of Europe. It would be reasonable to predict that Victoria’s father (and her other male ancestors) would have exhibited signs of hemophilia, but none were ever observed. To explain this apparent genetic impossibility, certain individuals have argued for the possibility of a spontaneous genetic mutation in the sperm of Victoria’s father at the moment of Victoria’s conception. While this theory is not impossible, it is extremely unlikely. A more plausible explanation was that Victoria’s biological father is not Edward, Duke of Kent, thus making Victoria’s birth illegitimate and, consequently, setting off an illegitimate succession to the English throne by her son Edward VII.

Hemophilia

Hemophilia is a rare hereditary bleeding disorder in which the blood does not clot in a normal manner at the site of a wound or injury. There are two main types of inherited hemophilia: Type A and Type B (Christmas disease). There is a deficiency of Factor VIII in Type A, while there is a deficiency in Factor IX in Type B. The gene for hemophilia is located on the X chromosome. They are clinically similar X-linked recessive disorders. Hemophilia is almost always found exclusively in males, while females can be carriers and pass it down to their offspring. There is also a non-inherited hemophilia whereby the body starts to attack and destroy its own clotting factors. This type is very rare.

The incidence of Type A is 1/5,000 live male births; the incidence of Type B is 1/300,000 live male births. Individuals with hemophilia A demonstrate bleeding tendencies that are not always predicted by their Factor VIII level. It has been suggested that bleeding in hemophilia is due not only to defective prothrombin activation, but also to aberrant fibrinolysis.

Hemophilia may lead to joint swelling, which can bring on damage or swelling in the muscle, as well as bleeding in the head and sometimes in the brain that can lead to brain damage, to other organs and death, which can occur if bleeding cannot be stopped or if bleeding occurs in a vital organ. These recurrent joint bleeds, which inevitably lead to disabling arthropathy, were the hallmark of the disease before the 1970s, when plasma fractions containing Factor VIII or Factor IX were still not available. At that time, mortality for bleeding was markedly high and the life expectancy of persons with hemophilia was lower than that of the general population.

Currently, there are 141 federally funded treatment centers and programs across the United States that provide comprehensive care for the individual and his family. As a result, individuals with bleeding disorders have become more independent and productive, with an improved quality of life.

The Royal Disease

England’s Queen Victoria (1819-1901) was a carrier of the gene for hemophilia and, eventually, passed it down to the royal families of Germany, Russia and Spain. Prince Leopold was born on April 7, 1853. His birth marked the first instance of hemophilia in the British royal family. Leopold was Queen Victoria and Prince Albert of Saxe-Coburg and Gotha’s eighth child and fourth son. Prior to Leopold, there was no known occurrence of hemophilia in the royal family. This is extremely important, as one must conclude that the mutation occurred as an extremely rare de novo point mutation in the sperm of Queen Victoria’s father, Edward Augustus, Duke of Kent. Otherwise, the only other scientific explanation as to the origin of Victoria’s recessive trait is that Queen Victoria’s birth was of an illegitimate nature. The Royal Society of Medicine has investigated 17 generations of the family on Queen Victoria’s mother’s side. It could not find anyone with hemophilia.

The first written allusion to the hemophilia of the British royal family was in the British Medical Journal of February 8, 1868. It stated that His Royal Highness Prince Leopold, “who had previously been in full health and activity, has been suffering during the last week from severe accidental haemorrhage. The Prince was reduced to a state of extreme and dangerous exhaustion by the loss of blood, but has since greatly recovered and has regained his strength.”

Leopold was the only son of Victoria to suffer from hemophilia. However, Victoria’s youngest child, Beatrice, gave birth to Eugenie, who was a carrier and later married King Alonso XIII of Spain. The couple had five sons. Four out of the five suffered from hemophilia. The Spanish royal family was discredited, as it disinherited the legacy of heirs on medical grounds.

Alice, Queen Victoria’s third child, passed hemophilia to the German and Russian imperial families. Alice had two daughters, Irene and Alix. Irene married Prince Henry of Prussia, her first cousin. The couple had two hemophiliac sons. Alix married Tsar Nikolas II of the Russian imperial family. Their fifth child was, finally, the long-awaited son, Alexis, heir to the Russian throne. It was apparent from a very early age that Alexis suffered from hemophilia. His father is said to have become preoccupied with Alexis’s illness and let the affairs of the state deteriorate. The family turned to a spiritualist, Rasputin, who seemed to be able to relieve the boy’s suffering. The grateful family gave Rasputin unlimited trust. These factors are believed to have led to the Russian Revolution and the eventual execution of the entire Russian royal family.

Dental Treatment of the Hemophiliac Patient

Although there are no inherent differences in the oral health of an individual with hemophilia and that of an average individual, it is imperative that meticulous oral hygiene be practiced in he-
mophiliacs in light of the many potential problems associated with oral surgery. Thus, the dentist plays an extremely vital role in the overall well-being of the hemophiliac.

There are certain necessary precautions to be taken when performing restorative dental procedures, including crown and bridge procedures, in order to decrease the potential for serious hemorrhage. Isolation with a rubber dam is of utmost importance. It provides retraction of the gingiva, improved visibility, and minimizes the potential for laceration of the buccal mucosa and lips. Care must be taken with cotton rolls, high-speed suction tips and saliva ejectors. High-speed suction, as well as saliva ejectors, may cause hematomas. Saliva ejectors should be placed on top of gauze on the floor of the mouth, and cotton rolls should be wet prior to placing in the mouth to avoid mucosal bleeding.

A thorough clinical and radiographic examination needs to be conducted prior to any oral surgery procedure. No more than two teeth should be extracted at the first appointment if multiple extractions are required. This is to ensure that hemostasis can be achieved. All hemophiliac patients must be observed after extractions for a prolonged period of time, which can range from a few hours to supervision overnight in a hospital for individuals with a history of prolonged bleeding despite hemostatic coverage.

There are generally no contraindications for performing endodontic treatment on a hemophiliac patient, and it is preferable to perform a pulpotomy or a pulpectomy rather than extractions. However, on a vital tooth, instrumentation and obturation should never go beyond the apical region. In non-vital teeth, the treatment should always be at least 2 mm to 3 mm short of the radiographic apex. Performing periradicular surgery on a hemophiliac poses unique problems for the endodontist, who must maintain hemostasis in the operating field. There are various tests that need to be conducted prior to surgery. They include tests for bleeding time, clotting time, reptilase time, partial thromboplastin time, activated partial thromboplastin time and prothrombin time.

Intravenous coagulation treatment is required only when an inferior dental nerve block or lingual infiltration is required. It has been demonstrated that the use of intraligamentary anesthesia during certain restorative procedures might eliminate the need for factor replacement. The practitioner should prescribe pain relievers other than NSAIDs or aspirin, as they decrease the ability of the blood to clot.

Orthodontic appliances, both fixed and removable, may be used on the hemophiliac patient. Extra effort should be made to prevent injury to the gingiva during the fitting of such appliances. It is imperative that pediatric patients with hemophilia be placed on frequent recall programs and have proper oral hygiene reinforced on a continuing basis. It has been demonstrated that children with hemophilia A have significantly higher gingival index and DMF(T)-DMF(DS) scores than matched healthy control subjects.

Removable prostodontics are unlikely to pose problems for patients with inhibitors. However, trays should be removed carefully from the mouth when making impressions for removable prostheses.

Minor, uncomplicated oral surgeries in hemophilia patients can be performed by a general dentist or an oral surgeon with the close assistance of a hematologist. However, a hemophilia treatment center is the preferred site of any major oral surgeries performed on a hemophilia patient, with antibodies administered to counteract coagulation agents. Individuals with mild hemophilia A (Factor VIII > 5%) may have minor surgery with desmopressin (DDAVP) cover. Fibrin glue used locally and swish-and-swallow rinses of tranexamic acid before and after extractions help control bleeding. Factor replacement is necessary for individuals with severe hemophilia.

Preventive dentistry is essential for the hemophiliac patient. Hemophiliac patients have been shown to be more susceptible to dental caries and periodontal disease than non-hemophiliacs. It is essential that individuals with hemophilia be instructed in ways in which to reduce their risk factors for dental disease. This includes practicing good oral hygiene, avoiding smoking, using fluoride, reducing the frequency and amount of sugars in the diet, and having regular dental examinations. The application of fissure sealants to the occlusal surfaces of posterior teeth can aid in decreasing the incidence of dental caries.

Periodontics play an important role in the oral health of the hemophiliac, as hyperemic gingiva contribute to both spontaneous and induced gingival bleeding and because periodontitis is a leading cause of tooth morbidity, which would lead to the need for an extraction.
leading cause of tooth morbidity, which would lead to the need for an extraction.\textsuperscript{10,37} Patients with pocket depths up to 4 mm have a sound prognosis and should be capable of being maintained on a home-care program.\textsuperscript{35} It is unlikely that routine scaling and polishing will cause prolonged bleeding for patients with mild conditions. This includes the use of ultrasonic scaling.\textsuperscript{21} Factor replacement therapy is necessary before scaling when treating severe hemophiliacs.\textsuperscript{32}

Conclusion

Dentists play an immense and vital role in the overall health care of individuals with hemophilia. Hemophilia itself has played a crucial role in 19th and 20th century world history. Whether performing a seemingly routine restorative procedure or evaluating the need for extraction of a symptomatic third molar, the dentist must be intimately familiar with all necessary precautions and modifications to ensure the safety and well-being of the hemophiliac patient. \textsuperscript{16} Queries about this article can be sent to Dr. Maloney at wjm10@nyu.edu.

REFERENCES


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Effect of Apically Separated Rotary Instruments on Bacterial Leakage of Obturated Root Canals using Resilon


ABSTRACT

The purpose of this study was to determine the effect of a separated rotary instrument on the time required for bacterial penetration of obturated root canals using Resilon. Eighty-four extracted human maxillary premolars with single canals were used in this study. Group 1 consisted of teeth obturated with gutta-percha and AH-26 sealer (n=15); Group 2 consisted of teeth obturated similarly to Group 1 but without a separated file; Group 3 consisted of teeth obturated with Resilon and Epiphany sealer (n=15); and Group 4 consisted of teeth obturated similarly to Group 3 but without a separated file. Six teeth were used as positive controls, and six teeth were used as negative controls for each experimental group. Negative controls were obturated similarly to experimental teeth. On the other hand, positive controls were obturated with gutta-percha or Resilon without sealer. A suspension of Enterococcus faecalis was placed in the access chamber daily, and penetration was determined when turbidity was noted in the culture broth during a three-month period. No significant difference between experimental groups was observed. However, differences between experimental groups and control groups were statistically significant.

Separation of instruments is an unfortunate sequela of endodontic instrumentation. Reasons include improper use of the instrument, overuse of the instrument, microcracks inherent in the new instrument, and curved or calcified canals. When instrument separation occurs, the clinician has the choice of leaving the instrument in the canal or attempting to remove it, either surgically or nonsurgically.1

Nickel-titanium (Ni-Ti) instruments seem to fracture most commonly in the apical region of the root canals,2 which often renders orthograde removal ineffective.3 A fractured rotary Ni-Ti instrument retained in a root canal has no adverse influence on the prognosis of nonsurgical root canal treatment and retreatment if endodontic therapy and final coronal restoration are performed to a high technical standard.2,4

Torabinejad and Lemon5 suggested that the prognosis is best when separation of a large instrument occurs in the later stages of canal instrumentation close to the working length. The prognosis is poor for teeth with undebrided canals in which a small instrument is separated short of the apex or beyond the apical foramen early in instrumentation because the prognosis depends upon the extent of undebrided infected canal space apical to the separated instrument. Furthermore, the presence of preoperative periapical
radiolucency is clinically more significant as a negative prognostic indicator than the fractured Ni-Ti instrument itself.²,⁶

Resilon (Epiphany, Pentron Clinical Technologies, Wallingford, CT; RealSeal, SybronEndo, Orange, CA) is a thermoplastic synthetic polymer-based root canal filling material. Based on polymers of polyester, Resilon contains bioactive glass and radiopaque fillers. It performs like gutta-percha, has the same handling properties, and for retreatment purposes may be softened with heat or dissolved with solvents like chloroform. Similar to gutta-percha, there are master cones in all ISO sizes and accessory cones in different sizes. The sealer, Epiphany Root Canal Sealant, is a dual curable dental resin composite sealer.⁷

The sealing ability of canals containing a separated instrument and obturated with Resilon/Epiphany has yet to be assessed. Therefore, the purpose of the present study was to determine the effect of apically fractured rotary instruments on the time of bacterial penetration of obturated root canals with Resilon and Epiphany sealer.

Materials and Methods
Eighty-four extracted human maxillary premolars were used in this study. All of the teeth were caries-free and contained either minimal or no coronal restoration. The teeth all possessed fully formed apices. The teeth had been stored in 0.05% sodium hypochlorite and were kept moist throughout the experiment. The teeth were radiographed both from the buccal and proximal directions to ensure one straight canal.

The crown of each tooth was removed using a rotary diamond saw at 1000 rpm (Isomet Plus precision saw, Buehler, IL) under water-cooling in such a manner that a 16 mm root was obtained. Working length was determined by subtracting 1 mm from the canal length. All of the canals were flared coronally with #2 to #4 Gates-Glidden drills (Dentsply, Maillefer, Switzerland), and the apical canal was instrumented using M-two rotary files. The canal was flushed with 2 ml of 2.6% sodium hypochlorite (Sigma Chemicals Co., St. Louis, MO) between every instrument, and apical patency was maintained with a #10 file throughout the instrumentation. Furthermore, 5 ml of 17% EDTA (pH 7.2) rinses were used during and after instrumentation to remove the smear layer and decrease coronal leakage.⁸ The teeth were divided into two experimental groups of 15 teeth each. Six teeth were used as negative and six teeth were used as positive controls for each experimental group.

Group 1: Teeth were obturated with gutta-percha (AriaDent, Tehran, Iran) and AH-26 sealer (Dentsply, Darmstadt, Germany) (n=15).

Group 2: Each tooth contained a 3 mm piece of broken FlexMaster file (#30 with 0.04 taper) and was obturated with gutta-
percha (AriaDent, Tehran, Iran) and AH-26 sealer (Dentsply, Darmstadt, Germany) (n = 15).

Group 3: Teeth were obturated with Resilon (Epiphany, Pentron Clinical Technologies, Wallingford, CT) and Epiphany sealer (RealSeal, SybronEndo, Orange, CA) (n = 15).

Group 4: Each tooth contained a 3 mm piece of broken FlexMaster file (#30 with 0.04 taper) and was obturated with Resilon (Epiphany, Pentron Clinical Technologies, Wallingford, CT) and Epiphany sealer (RealSeal, SybronEndo, Orange, CA) (n = 15).

Six teeth were used as positive controls and six teeth were used as negative controls for each experimental group. Negative controls were obturated similarly to experimental teeth. On the other hand, positive controls were obturated with gutta-percha or Resilon without sealer. All the areas of root surfaces of the experimental samples and positive controls were covered with two layers of nail varnish except for the apical foramen. The negative control teeth were completely covered with two layers of nail varnish, including the apical foramen.

All teeth in the gutta-percha groups were obturated using the lateral compaction technique. All teeth in the Resilon groups were obturated in the following manner. A self-etch primer (Epiphany Primer; Pentron Clinical Technologies) was placed into the canal with a thin needle. Excess primer was then removed with paper points (Patterson Dental Supply, Inc., St. Paul, MN). Roots were filled with a lateral compaction of Resilon and Epiphany sealer. A sterile technique was used for obturation of all teeth. A heated plugger was used to remove excess filling material. After obturation, the coronal 2 mm of the canal was light-cured for 40 seconds.

Teeth were stored in gauze that was dampened with storage medium (Tryptic Soy Broth), enclosed in sealed tubes and placed in an incubator for 14 days at 37°C to allow the sealer to set. The microbial leakage model consisted of an upper and a lower chamber. Five ml of culture medium was placed in 40 individual test tubes. Each tooth was placed into the test tube so that at least 2 mm of each tooth’s apex was within the Tryptic Soy Broth. The chamber of each tooth was filled with a suspension of Enterococcus faecalis on day 0. A fresh bacterial suspension of E. faecalis, which was prepared daily, was added to the upper chamber of each sample until the chamber was nearly full. This procedure was performed every day throughout the experiment. Penetration of the root canal was recorded when turbidity was noted in the broth. Cultures were checked daily until the final test system became positive at day 90. Data were analyzed using the Fisher exact test.

Results
Control groups behaved as expected. Turbidity was noted on day one for all of the positive controls. The culture medium of the negative controls showed no turbidity over the 90-day course of the experiment, thus confirming the methodology.

Among the experimental groups, Group 3 showed the least amount of leakage (33.3%). The amount of leakage in other experimental groups was as follows, in ascending order: Group 4< Group 1< Group 2. The differences between experimental groups were not statistically significant.

Furthermore, results showed that the least and greatest amounts of additive risk of microleakage were associated with groups 1 and 4, respectively.

Irrespective of the type of root filling material, the incidence of leakage in the groups with and without a fractured file was 40% and 50%, respectively. In addition, irrespective of the presence or absence of a fractured file, the incidence of leakage in the Resilon and gutta-percha groups was 36.7% and 53.3%, respectively (Table 1).

Discussion
The use of bacteria to assess leakage (mainly coronal) is considered to be of greater clinical and biological relevance than the dye penetration method. Many different strains of bacteria have been used to assess marginal leakage.9,10

E. faecalis is also a normal inhabitant of the oral cavity. E. faecalis is found in 4% to 40% of primary endodontic infections. However, its frequency in persistent periradicular lesions has been shown to be nine-times higher. The prevalence of E. faecalis in root-filled teeth with periradicular lesions using culturing and polymerase chain reaction (PCR) methods is 24% to 70% and 67% to 77%, respectively.11

In the present study, the presence of turbidity indicated full bacterial penetration through the root canal of the teeth. The results of the positive and negative control groups confirmed the methodology. All positive control teeth showed turbidity by day one. On the other hand, none of the negative controls showed turbidity after 90 days. Statistical analysis demonstrated that there was no significant difference between experimental groups. However, teeth obturated with Resilon without separated instruments showed less bacterial leakages compared to other groups.

Table 1
Results of Study

<table>
<thead>
<tr>
<th>Group</th>
<th>Number</th>
<th>No leakage</th>
<th>Leakage</th>
<th>P.Value</th>
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<td>Gutta-percha/sealer</td>
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<td>8</td>
<td>7</td>
<td>0.358</td>
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<tr>
<td></td>
<td></td>
<td>(53.3%)</td>
<td>(46.7%)</td>
<td></td>
</tr>
<tr>
<td>Gutta-percha/sealer +Fractured file</td>
<td>15</td>
<td>6</td>
<td>9</td>
<td>0.358</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(40%)</td>
<td>(60%)</td>
<td></td>
</tr>
<tr>
<td>Resilon/Epiphany</td>
<td>15</td>
<td>10</td>
<td>5</td>
<td>0.500</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(66.7%)</td>
<td>(33.3%)</td>
<td></td>
</tr>
<tr>
<td>Resilon/Epiphany +Fractured file</td>
<td>15</td>
<td>9</td>
<td>6</td>
<td>0.500</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(60%)</td>
<td>(40%)</td>
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</table>
Seventeen percent EDTA was used during and after instrumentation to remove the smear layer and decrease coronal leakage. The adherence of the sealer to the dentin walls is a function of smear layer removal. High bond strength cannot be achieved unless the smear layer is removed. Epiphany primer was applied to the dentin walls of the root canals that were to be filled with Resilon. Epiphany primer is a self-etch primer that contains sulfonic acid terminated functional monomer, HEMA, water and polymerization initiator. The preparation of the dentin through these chemical agents may prevent shrinkage of the resin filling away from dentin wall and aid in sealing the roots filled with Resilon.

The better sealing ability of Resilon may be attributed to the “monoblock,” which is created by the Resilon filling closely adapting to the Epiphany sealer and, in turn, the Epiphany sealer adhering to the dentin walls. A number of studies have compared the sealing ability of Resilon and gutta-percha. Shipper, et al. found that the sealing ability of Resilon was significantly superior to gutta-percha. In an in vivo study, they confirmed the superior coronal sealing ability of Resilon compared to gutta-percha and AH-26 sealer.

Bodrumlu and Tunga compared the coronal sealing ability of Resilon/Epiphany to that of gutta-percha/ AH-26 and gutta-percha/AH-Plus. Their findings demonstrated the su-
prior sealing ability of Resilon/Epiphany. The better sealing ability of Resilon compared to gutta-percha in the presence or absence of a separated instrument was shown in the present study as well.

Another important factor that may influence the leakage of obturate root canals containing separated files is the type or, more accurately, the cross section of the file.17 Altundas, et al.17 investigated the sealing properties of two different obturation systems (cold lateral compaction and thermoplastized gutta-percha) applied over different apically fractured rotary Ni-Ti files (ProFile and ProTaper) using a fluid transport model. Their findings showed that roots with a retained ProFile fragment showed significantly greater leakage than those filled without ProFile fragments, whereas significantly less microleakage was observed in the presence of fractured ProTaper instruments than their nonfractured versions. They attributed these findings to the differences in the cross-section design of these two systems.17 The cross sections of ProFile instruments have U-shaped grooves with radial lands and a central core, whereas the cross sections of ProTaper files, which have rather superficial grooves, show a modified triangular shape with sharp cutting edges and no radial land. K3 files, like ProFile, have radial land and triple U-shaped grooves.18

Despite this similarity in the cross sections of ProFile and K3 rotary files, in the present study, apically fractured K3 files had no significant adverse effect on the sealing of obturated root canals. This can be attributed to the root filling material (gutta-percha and AH-Plus sealer versus Resilon and Epiphany sealer).

Considering the fact that root canal anatomy is quite variable and is not completely round like the separated instrument, as well as the fact that the separated instrument is fluted, it would be unlikely to completely obturate the root canal space by itself.4,12 However, the real determinant for evaluating the effect of separated instruments on the prognosis of endodontic treatment and retreatment lies in clinical studies. The classic Washington study19 showed that treatment outcome was unaffected by a retained fractured instrument. Spili, et al.2 investigated the influence of retained fractured rotary Ni-Ti instruments on the prognosis of endodontic treatment. From a pool of 8,460 cases, the authors conducted a case control study of 146 teeth with a retained fractured instrument (plus 146 controls), for which clinical and radiographic follow-up for at least one year was available. The overall healing rates were very high both for cases with a fractured instrument (91.8%) and for the matched controls (94.5%), but with no statistically significant difference. However, it seems that the most important factor influencing the outcome of endodontic treatment of teeth containing fractured files is the presence of a preoperative periapical lesion.

Based on the results of the present study, the separated instrument itself does not play a significant role in the sealing ability of the obturation material. Extrapolation of the results of this in vitro study to clinical situations must be done with caution because the vitality status of the pulp as well as how much undebrided and unobturated canal apical to and including the instrument remains.

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