

# LIMITING THE SEQUELAE OF POOR COMPLIANCE

by Larry White, DDS, MSD

## Recognizing ortho's Achilles' heel

Orthodontics has advanced enormously during the past 50 years. From a time when orthodontists used pinched bands and had limited wire choices, to the present, where they face a surfeit of appliances, like 3D mass-produced, customized, computer-generated appliances that have an astonishing accuracy. The convergence of collective experience and knowledge with technical and material improvements has made orthodontics a much more pleasant and productive profession for both doctors and patients. Even though orthodontists have made great strides in their delivery of services to patients, there remains one area that seems to have remained stagnant with hardly any improvement: overall compliance of patients with their therapies. This remains the Achilles' heel of the profession and defies the best efforts of those seriously dedicated to improving patients' treatment outcomes.

## Mistakes in motivating patients

As orthodontists try to motivate patients to cooperate in their therapy, they usually rely on techniques learned from role models, which goes a long way in explaining why patient motivation remains so haphazard and ineffective. Unknowingly, most will use some variant of three forms of persuasion:

- Humanism (the belief that people are inherently good)
- Medical model developed by Sigmund Freud
- Behaviorism

The humanism approach relies on stimulating patients to find within themselves a capacity that clearly benefits them but is ordinarily outside of their power. Athletic coaches and military commanders have frequently succeeded with this, but scant confirmation exists about its ability to work over a long period of time, like two years of orthodontic therapy. Appealing to a person's available but seldom used potential ends up as exhortation, the least effective behavior-changing tool.<sup>1</sup>

Freud's medical model is likewise limited since it has never established credible effectiveness, requires an expertise that most orthodontists don't have, and doesn't provide for patients' participation in their own therapies.<sup>2</sup> Many researchers have tried to define the mental and emotional constructs that characterize the compliant orthodontic patient,<sup>3-6</sup> but these studies never offered any suggestion as to how clinicians might alter uncooperative behaviors. Further, personal experience with personality inventories and the research of others have repudiated the value of these paper and pencil assessments.<sup>7,8</sup> Apparently, personality traits alone cannot account for noncompliant behavior in orthodontic patients.



Behaviorism posits that consequences dictate behavior. Unfortunately, orthodontists do not have the ability to deliver the consequences of compliance and noncompliance in a timely and strong enough manner to affect patient behavior in a predictable manner. In a variant of behaviorism, researchers wisely suggested that when patients have the necessary skill but not the will, clinicians should consider:

- It is punishing to perform as desired.
- It is rewarding to perform other than as desired.
- It simply doesn't matter whether performance is as desired.
- There are obstacles to performing as desired.

If then, orthodontists are to follow these admonishments, they must:

- Reduce the punishments their therapies deliver.
- Reward the behavior they want in a significant, consistent and timely manner.
- Make performance matter.
- Remove the obstacles that keep patients from performing.

### Another take on patient compliance

Genetically endowed sensitivity to stimuli, which has helped humans evolve, survive and prosper, cannot change without some sophisticated and yet unforeseen interference with the human genome.<sup>9</sup> Good evidence now exists that stimuli sensitivity determines how well patients will cooperate in their therapies.<sup>10-16</sup> The highly sensitive patient has a diminished tolerance for all of the senses. For this reason they do not endure wool sweaters, tight clothes or shoes, neck labels in shirts, and their foods have to have the right texture. These people demonstrate an unusually high social sensitivity and perceive insults when none occur. Bright lights and loud or chronic noises irritate them. With such an understanding of this one genetic endowment, it should not surprise orthodontists that these patients show little inclination to

meet the demands, discomforts and inconveniences of orthodontic therapy. Such sensitive patients also display dental behaviors that complicate their treatments, like poor oral hygiene, easily fatigued jaw muscles, inability to maintain an open mouth, copious salivation, frequently broken appliances, easily provoked gag reflexes, chronic mouth ulcers, an intolerance for permissible appliances, TMD symptoms, frequently missed appointments and others. Rather than considering sensitive patients as having character defects, clinicians should view them as turtles without shells and go about developing techniques that mitigate the harmful effects their treatments cause.

### Pain associated with oral hygiene

The most dangerous consequences of poor compliance originate from the poor oral hygiene habits these patients display. Clinicians can often substitute fixed functional appliances for those patients with poor headgear or elastic wear. They can use temporary anchorage devices (TADs) for anchorage preservation or remove teeth to reach correct posterior occlusion. But there is hardly any way doctors can monitor patients on a daily basis to insure good oral hygiene. The most lasting damages to oral health occur from patient neglect of this feature. When tissues become inflamed, they exhibit a special sensitivity to discomfort, and it then requires much less stimulus to evoke a painful response.<sup>17</sup> With orthodontic patients, this causes a serious cycle of reinforcing events that defies correction without intelligent, aggressive and sustained therapy. The most inexperienced orthodontist recognizes that fixed orthodontic appliances make the removal of dental plaque more difficult and that all of the materials orthodontists use gather plaque.

More than four decades ago, researchers<sup>18</sup> discovered that oral bacteria increase significantly during orthodontic treatment. Researchers<sup>19,20</sup> have also discovered how the escalation of *Strep-*

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*tooccus mutans* during orthodontic treatment increases patients' risk of experiencing enamel decalcification and caries. It has been documented<sup>21</sup> how benign oral bacteria can mutate into pathogenic types during orthodontic therapy, while other findings<sup>22</sup> have demonstrated that oral bacteria nourish themselves on the adhesives orthodontists use to attach brackets to enamel.

### Combating plaque

Some commonly used preventive measures include: intensive oral hygiene instruction, fluoridated rinses or fluoridated gels and toothpastes.<sup>23,24</sup> Some have advocated fluoride varnishes or fluoride-containing adhesives or primer, and fluoride releasing or filled sealant, or lastly, antimicrobial varnishes.<sup>25-28</sup> These applications have effectiveness, but remain inefficient since they need frequent reapplication by doctors or recharging of fluoride ions through patient cooperation.<sup>29,30</sup> These requirements restrict usefulness and effectiveness. Unfilled resins remain susceptible to brushing away and do not stay attached to enamel.

Although orthodontists know about the various caries prevention and demineralization remedies available, few routinely use any of the strategies, which causes the doctor to doubt if these materials even make a statistical difference.<sup>31</sup> Research has shown through *in vitro* and *in vivo* studies that quartz-filled sealants endure much more than unfilled resins.<sup>32-36</sup> More recently, SeLECT Defense, a selenium-based product that combines selenium with a filled enamel surface sealant and adhesive has been introduced.<sup>37</sup> Researchers found that selenium has antioxidant properties with a toxicity for microorganisms but not for humans, even in elevated amounts.<sup>38-40</sup> *In vivo* and *in vitro*, university studies showed SeLECT Defense effective as an antimicrobial agent that limits plaque accumulation and also acts as a prophylactic sealant against demineralization, while simultaneously displaying adequate shear bond strength and durability when used with light-cured composites.<sup>41-43</sup> Rather than wait for excessive and chronic plaque to accumulate with its subsequent destructive qualities, patients and doctors might find it prudent to employ some effective protection at the first of treatment. Electric brushes have displayed improved plaque and gingival bleeding scores for orthodontic patients,<sup>44</sup> and clinicians should encourage the use of these instruments.

### Tame the pain

Orthodontic therapy, because of its physiological basis, involves some discomfort, and orthodontists who hope to improve patients' cooperation must use strategies that tame the pain. The following suggestions offer some reasonable features for diminishing patients' pains and improving their comfort.

Limit the use of permissible appliances. Elastics, headgears and removable appliances create intolerable intermittent forces and discomforts for sensitive patients, and they will benefit from using appliances that offer fixed mechanisms that have a constant presence. Some who frequently use headgears for the correction of Class II malocclusions may contend another alternative doesn't sat-

isfy the patients' needs. In light of the discovery<sup>45</sup> about the etiology of Class II malocclusions, which is that most result from a mandibular deficiency rather than a protrusion of the maxilla, perhaps it is time for those clinicians to begin to determine the real cause of the malocclusion and apply appropriate therapy to the source. As far as preserving anchorage with headgears, recently developed TADs offer a constant-force, nonmoving anchor. Patients who find elastics a vexing problem often find intermaxillary NiTi springs or non-removable Class II correctors such as the Herbst, Forsus, MARA, MPA, or acceptable alternatives. This is not to say patients gleefully accept these aforementioned appliances. They don't and often destroy them, but if patients give the fixed appliances opportunity, they typically experience less discomfort and more efficacious treatment than with intermittent forces.

### Reduce wire forces.

Clinicians can dramatically reduce patient discomfort by starting treatments with small wires, like .013 or .014 NiTi wires and gradually moving to larger ones. A new addition to the arch wire armamentarium is the .018 x .014 and .021 x .015 NiTi ribbon wires<sup>46</sup> that allow orthodontists to move quickly into light-force wires that control the teeth in three dimensions, while still allowing the removal of horizontal rotations because of their thinness. Ribbon arches deliver excellent 3D control, while exerting much less force and causing much less patient discomfort than typical edge-wise wires. Ribbon arches are available in stainless steel and NiTi.

### Alleviating capillary strangulation.

Whenever teeth move to new positions, they will produce pressures that result in periodontal capillary strangulation, which ultimately results in the production of prostaglandins, bradykinins and arachidonic acid with subsequent hyperalgesia for the patient. Clinicians can limit this discomfort by having the patient immediately chew on a plastic Thera Bite wafer for a period of time.<sup>47</sup> When clinicians use elastomeric separators, they can lessen the discomfort and simultaneously reduce the resistance of tooth contacts by lubricating the elastomers. Anesthetic gel can also reduce the discomfort of wearing Essix retainers and aligners by placing the gel in the tooth sockets. Patients can add this gel as often as needed to let them adjust to the appliances without discomfort. The gel anesthetizes the periodontal membrane, which reduces the pain.

### Keep it simple

Dentists generally and orthodontists specifically have a penchant for therapy at the expense of diagnosis and treatment planning, and often the therapy they choose can be fairly complicated. One of the easiest and best ways of limiting the consequences of poor compliance is to use the simplest mechanics possible and involve the patient as little as possible. If a Class II malocclusion can be successfully treated by the removal of only the maxillary premolars, do everything possible to avoid removing mandibular premolars. If early treatment goals are achievable with partial



appliances then don't bond entire arches, which will only complicate therapy. The bonding of posterior teeth can occur later after the early goals are reached. If posterior cross-bites can be corrected with wire mechanics such as those advocated by some,<sup>48</sup> then avoid using more complicated mechanisms. Clinicians can simplify the mechanics of orthodontic therapy in a variety of ways, limited only by their skill, experience and imagination.

## Conclusion

If patient discomfort carries the responsibility for the major part of poor patient compliance, then it behooves orthodontists to make the reduction of appliance aches a major feature of their

therapies. Improving the oral hygiene habits of patients offers the feature most likely to improve all areas of compliance. Only rarely do patients with good oral hygiene fail to comply with their treatments and only rarely do patients with chronically poor oral hygiene comply with their therapeutic needs. Orthodontic clinicians have the means to affect better oral hygiene for their patients and subsequently reduce the inflammation that results in chronic hyperalgesia. Any augmentation of their genetic-gifted sensitivity guarantees less compliance in every area of therapy. Improvement of the oral hygiene of patients is the common denominator for increasing compliance and deserves more emphasis than it usually receives. ■

## References

- Mager RF, Pipe P. *Analyzing Performance Problems*. Pitman Learning, Belmont, CA; 1984.
- Watson DL, G. TR. *Self-Directed Behavior*. Monterey, CA: Brooks-Cole Publishing Co.; 1985.
- Mangouy NH. Orthodontic cooperation. *Am J Orthod*. 1981;80:604-622.
- Herscher R. A personality inventory related to patient cooperation in orthodontics. *Orthodontics*. Dallas: Baylor University College of Dentistry; 1970.
- Allan T, Hodgson E. The use of personality measurements as a determinant of patient cooperation in an orthodontic practice. *Am J Orthod*. 1968;54:433-439.
- Gabriel HF. Motivation of the headgear patient. *Angle Orthodontist*. 1968;18.
- Nanda R, Kierl M. Prediction of cooperation in orthodontic treatment. *American Journal of Orthodontics and Dentofacial Orthopedics*. 1992;102:15-21.
- Bos A, Hoogstraten J, Prahl-Andersen B. On the use of personality characteristics in predicting compliance in orthodontic practice. *Am J Orthod*. 2003;123:568-570.
- Ches S, Thomas A. *Know Your Child*. New York: Basis Books, Inc.; 1987.
- McNamara JT, C.A. *Creating the Compliant Patient*. Ann Arbor, MI: Center for Human Growth and Development; 1997.
- White LW. Pain and cooperation in orthodontic treatment. *J Clin Orthod*. 1984;18:572-575.
- White LW. Toothbrush pressures of orthodontic patients. *Am J Orthod*. 1983;83 No.2:109-113.
- White LW. A new paradigm of motivation. *PCSO Bulletin*. 1988 44-45.
- White L. Behavior modification of orthodontic patients. *J Clin Orthod*. 1974;9:501-505.
- Aron EN. *The Highly Sensitive Person*. New York City: Carol Publishing Group; 1996.
- Sergi H, Klages U, Zentner A. Pain and discomfort during orthodontic treatment: causative factors and effects on compliance. *Am J Orthod*. 1998;114 684-691.
- Dubner R, Sesle BJ, Storey AT. *The Neural Basis of Oral and Facial Function*. N.Y., N.Y. Plenum Press; 1978. p. 49.
- Bloom RH, Brown LR. A study of the effects of orthodontic appliances on the oral microbial flora. *Oral Surg*. 1964;17:658-670.
- Abn SJ, Lim BS, Yang HC, Yi C. Quantitative analysis of the adhesion of cariogenic streptococci to orthodontic metal brackets. *Angle Orthodontist*. 2005;75:666-671.
- Abn SJ, Kho HS, Ki KK, Hahn DS. Adhesion of oral streptococci to experimental bracket pellicles from glandular saliva. *Am J Orthod*. 2003;124:198-205.
- Grant DA, Grant DA, Flynn JM, Sloss J. Periodontal microbiota of mobile and non-mobile teeth. *J Periodontol*. 1995;66:386-390.
- Matafola C. Microbial attack on adhesives. *Am J Orthod, Dentofacial Orthop*. 1995;108:132-141.
- Benson PE, Shah AA, Millett DT, Dyer F, Parkin N, RS V. Fluorides, orthodontics and demineralization: a systematic review. *Journal of Orthodontics*. 2005 32:102-114.
- Benson PE, Parkin N, Millett DT, Dyer FE, Vine S, Shah A. Fluorides for the prevention of white spots on teeth during fixed bract treatment. *Cochrane Database of Systematic Reviews*. 2004;3:DC003809.
- Ogaard B. White spot lesions during orthodontic treatment: Mechanisms and fluoride preventive aspects. *Seminars in Orthodontics*. 2008;14:183-193.
- Ogaard B, Larson, Henrikson T, et al. Effects of combined application of antimicrobial and fluoride varnished in orthodontic patients. *Am J Orthod*. 2001;120:28-35.
- Bishara SE, Ostby AW. White spot lesions: Formation, prevention and treatment. *Seminars in Orthodontics*. 2008;14:174-182.
- Soliman MM, Bishara SE, Wefel J, al e. Fluoride release from an orthodontic sealant and its clinical implications. *Angle Orthodontist*. 2006;76:282-288.
- Farhadian N, Miremaelii A, Eisa oB, <ejrabo.S. Effect of fluoride varnish on enamel demineralization around brackets: an in-vivo study. *Am J OrthodDentofacial Orthop*. 2008;133:S95-S98.
- Todd MA, Staley RN, M.J. K, Donly KJ, JS W. Effect of fluoride varnish on demineralization adjacent to orthodontic brackets. *Am J Orthod*. 1999;116:159-167.
- Derks A, Kuipers-Jagman A, Frencken J, Van't Hof M, C.K. Caries preventive measures used in orthodontic practices: An evidence-based decision? *Am J Orthod*. 2007;132:165-170.
- Benham A, Campbell P, Buschang P. Effectiveness of pit and fissure sealants in reducing white spot lesions during orthodontic treatment: a pilot study. *Angle Orthod*. 2009;79:S38-S45.
- Banks PA, Bur A, O'Brien K. A clinical evaluation of the effectiveness of including fluoride in an orthodontic bonding adhesive. *Eur J Orthod*. 1997;19.
- Buren JL, Staley RN, Wefel ZF. Inhibition of enamel demineralization by enamel sealant, Pro Seal: an in vitro study. *Am J Orthod*. 2008;133:88-94.
- Heinig N, Harimann A. Efficacy of a sealant: study on the efficacy of a sealant (Light Bond) in preventing decalcification during multibracket therapy. *Jorofacial Orthop*. 2008;154-167.
- Hu W FJ. Prevention of enamel demineralization: An in vitro study using light-cured filled sealant. *Am J Orthod*. 2005;128:592-600.
- Van Bebber L, Campbell P, Honeyman A, Spears, R, P.B. Does the amount of filler content in sealants used to prevent decalcification on smooth enamel surfaces really matter? *T. Angle Orthodontist*. 2011;81:134-140.
- Tran PL, Hammond AA, Mosley T, al e. Organoselenium coating on cellulose inhibits the formation of biofilms by *Pseudomonas aeruginosa* and *Staphylococcus aureus*. *Applied and Environmental Microbiology*. 2009;75:3586-3592.
- Matthews SM, Spalholz JE, Grimson MJ, al e. Prevention of bacterial colonization of contact lenses with covalently attached selenium and effects on the rabbit cornea. *Cornea*. 2006;25:806-814.
- Kryukov GV, Castellano S, Novoselov SV, al e. Characterization of mammalian selenoproteomes. *Science*. 2003;300:1439-1443.
- Amacchi B. Investigation of the antimicrobial effect of SeLECT Defense Primer and Sealant: in vitro study. *J Am Dent Assoc*. 2011;Submitted for publication.
- Amacchi B. Comparative study of products for prevention of demineralization around orthodontic brackets: Part III - Influence on adhesive bond strength. submitted for publication 2010.
- Amacchi B. Clinical trial of a new pit and fissure sealant for preventing dental decay in the permanent teeth of children and adolescents. submitted for publication 2011.
- White LW. Efficacy of a sonic toothbrush in reducing plaque and gingivitis in adolescent patients. *J Clin Orthod*. 1996;30:85-90.
- McNamara JA, Jr. Components of Class II Malocclusion in Children 8-10 Years of Age. *The Angle Orthodontist*. 1981;51:177-202.
- White LW. Integrative orthodontics with the ribbon arch. *World J Orthod*. 2004;5:147-151.
- Mugrave M. *Orthodontic Pearls: A Clinician's Guide*. Dallas, TX: Taylor Specialty Books; 2011.
- Mulligan TF. *Common Sense Mechanics in Everyday Orthodontics*. Phoenix, AZ: CSM Publishing; 1998.

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## Author's Bio



**Dr. Larry White** graduated from Baylor Dental College with a DDS degree and then served in the United States Air Force from 1959 to 1961. He then practiced general dentistry in Hobbs, New Mexico from 1961 to 1966 and subsequently returned to Baylor Dental College to receive a MSD degree in orthodontics in 1968. He returned to Hobbs to practice orthodontics exclusively. Dr. White had orthodontic offices in Hobbs and Roswell, New Mexico, and Denver City, Texas. He currently practices in Texas.