

JCO INTERVIEWS Samir E. Bishara, BDS, DOrtho, DDS, MS, on Growth and Orthodontic Treatment

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DR. WHITE Is it reasonable to try to coordinate treatment with the pubertal growth spurt?

DR. BISHARA At face value, the concept is a good one. If we were able to time treatment with a maximum growth period, treatment time might theoretically be shortened.

DR. WHITE Only theoretically?

DR. BISHARA The difficulty arises when the clinician attempts to apply this concept to an individual patient, because first we would need to determine who will have a growth spurt.

DR. WHITE Don't all patients experience a mandibular growth spurt?

DR. BISHARA According to Bjork's study, using metallic implants, only 25% of his sample had what he called "discernible growth acceleration".¹ Unfortunately, we are unable to predict who will have a growth spurt. Moreover, for the 25% who might have one, we are unable to predict accurately its timing, duration, amount, and direction.

DR. WHITE How about predicting changes in the face from changes in height or through the use of wrist x-rays?

DR. BISHARA The Iowa Facial Growth Study² as well as other longitudinal studies have repeatedly indicated that there is a correlation between the timing of changes in the facial structures and skeletal changes in other parts of the body. But the same studies have also repeatedly proven that these correlations are low and have little or no predictive usefulness for the individual patient.^{2,3}

DR. WHITE In other words, they are of little help to the clinician.

DR. BISHARA The picture is not as grim as it may first sound. The fact is that significant growth is occurring over a number of years in the growing adolescent patient. So the clinician should treat a malocclusion when the problem is diagnosed and treatment is indicated. Postponing treatment to try to coincide with a growth spurt is an ill-advised approach.

DR. WHITE Is it possible to make a growth prediction for an individual patient?

DR. BISHARA Not with any degree of accuracy, and no better than adding the average changes.

DR. WHITE Can clinicians predict from the molar relationship in the deciduous dentition which patients will develop into Class I, Class II, or Class III?

DR. BISHARA In the deciduous dentition, the anteroposterior occlusion is usually described by the terminal plane relationship of the distal surfaces of the upper and lower second deciduous molars. This relationship can be described as a flush terminal plane, a distal step, or a mesial step

The Iowa Facial Growth Studies pointed to some very interesting and clinically significant findings.⁴ In the absence of any intervention, 55% of children with a flush terminal plane develop a Class I molar relationship in the permanent dentition, while the other 45% develop a Class II relationship. Placement of a passive appliance such as a lower lingual holding arch will increase the percentage of these cases that will develop into a Class II molar relationship. The lingual arch prevents the mesial movement of the lower first permanent molars into the leeway space following the loss of the second deciduous molars.

In the absence of orthodontic intervention, children with a distal step end up with a Class II occlusion in the permanent dentition. There are exceptions, but not many. Once a Class II, always a Class II. In these cases, the orthodontist should initiate treatment when it is indicated, because there will be no self-correction.

The majority of children with a mesial step will develop a Class I permanent occlusion, with a smaller percentage developing a Class II occlusion, and fewer still developing a Class III permanent occlusion. Of clinical interest is that the larger the mesial step in the deciduous dentition, the higher the incidence of a Class I occlusion developing and the lower the incidence of a Class II.

DR. WHITE Are there predictable soft-tissue changes as patients mature?

DR. BISHARA It is critical for the clinician to realize that the lips become relatively more retrusive in relationship to the nose and chin between 10 and 20 years of age in females and between 15 and 25 years of age in males. The clinician needs to take these changes into consideration when planning treatment for an adolescent patient with a borderline space discrepancy and relatively retruded lips. Extractions in such a patient may result in less than optimal esthetics at adulthood.

DR. WHITE Should we be allowing more protrusiveness of the lips and teeth in treating adolescents, anticipating that both will tend to become less protrusive with time?

DR. BISHARA If one needs to err in growing patients with a straight profile and retrusive lips, it should be toward more protrusiveness of the dentition—all other things being equal.

DR. WHITE Is there any way of accurately predicting what effect treatment will have on the soft-tissue profile of a patient?

DR. BISHARA First, let us quickly review what we know. In general, if we move the teeth labially, the lips will protrude in relationship to the nose and chin, and if we move the teeth lingually, the lips will retrude in relationship to the nose and chin. On the average, if we retract the upper incisors 2mm, the upper lip will retract 1mm. We also know that the correlation between these changes is rather low, so they are not of good predictive value to the clinician.⁵

DR. WHITE One might think there would be a strong correlation.

DR. BISHARA There is not a strong correlation because there are a number of factors that interplay in this process. The lip contains muscles and other tissues that have their own tonicity and maintain its morphology. The upper lip is attached to the nose and remains so attached as the upper lip is retracted. Also, as the lip is retracted it might change its form, especially if the lips were everted.

DR. WHITE Several years ago at the University of Iowa, you evaluated patients with untreated Class I occlusions and good facial esthetics. You found a large variance in commonly used diagnostic

measurements.^{6,7} How does this relate to the concept of normal cephalometric standards?

DR. BISHARA That study pointed to a simple fact. Normality is a range of relationships! We must differentiate between what is ideal and what is normal. Ideal is a conceptual notion. It rarely exists and is very difficult to define. Normality, on the other hand, is a range of relationships that could be influenced by ethnic background, gender, age, and facial type, as well as the individuality of the patient. To have one standard for all our patients is to assume that they should all look alike. We need to remind ourselves constantly that a mean value is only a reflection of many values on either side of the mean. To treat a 12-year-old patient to adult standards without taking into consideration the still-to-be-expressed growth changes can lead to an unacceptable esthetic result when the patient becomes an adult.

DR. WHITE How do you avoid that?

DR. BISHARA Each orthodontic patient has his or her own individual characteristics, and the cephalometric standards we use should be representative of that patient as close as possible. That is why at Iowa we have developed a number of cephalometric standards at different ages for males and females. They are particularly useful in making the clinician cognizant of the age and gender variations, but facial type, ethnic background, etc., must also be considered.^{6,7}

DR. WHITE Are there conditions that are better treated at an early age?

DR. BISHARA First, one needs to define what is meant by "early". Does it mean before the full eruption of the permanent dentition, or does it mean treatment in the deciduous dentition? Regardless, there are a number of cases that can benefit from early intervention, such as in the presence of functional shifts, mild-to-moderate skeletal discrepancies, significant tooth-size-arch-length discrepancies, supernumeraries, and some craniofacial anomalies. There is also scientific evidence that there is greater patient cooperation in pre-adolescence than in adolescence.

DR. WHITE What is the rationale in each of these cases? Will something be accomplished early that cannot be done later? Is there something to be gained by creating a more normal relationship early? Will treatment time in the permanent dentition be shortened?

DR. BISHARA The rationale can be restoring normal function and esthetics to the patient. If the objectives for early treatment are carefully identified and carried out, often it might shorten the treatment time of a second stage of treatment. In most cases this first stage should be completed within a year. This is followed by periodic observations every three to six months until the permanent dentition has erupted and the second stage is started. The patient and parent should be made aware of the difference between treatment time and the observation period. The greatest pitfall of early treatment is when the clinician turns that early stage into one long treatment period that merges with the second stage.

DR. WHITE Petrovic and Stutzmann claim their studies prove that functional appliances can lengthen mandibles. Gianelly, Johnston, and Creekmore contend otherwise. How do you interpret these differing opinions?

DR. BISHARA First, we need to differentiate between animal experimentation and human clinical studies. In the laboratory, the force is often applied for 24 hours a day for a prolonged period of time—the equivalent of several human years—and the force magnitudes are relatively much higher than are usually applied to the patient. These are circumstances that we cannot duplicate on our patients.

Therefore, we cannot extrapolate what happens in the laboratory directly to what might happen in the mouth, and we are talking about different species that might have different tissue reactions. With animal experimentation, it is also important to remember that we are starting with a normal animal and the experiment results in an abnormal relationship, while with our patients we are doing exactly the opposite. Whether that makes a difference in interpreting the results is still not clear.

But I feel that we might be missing an important point when we concentrate on one dimension of the problem—whether an increase of one or two millimeters in mandibular length, even if it occurs, will solve our clinical problems. Orthodontists are not correcting absolute dimensions, but the relationship of the dental and skeletal structures to one another. This is how the success of treatment is determined, and this is how the correction is accomplished. Until we are able to increase the length of the mandible consistently while controlling the direction of growth, it is ill advised to believe that a particular appliance has some unique effects. Short- and long-term studies have not consistently reproduced similar or clinically significant differences in mandibular length. On the other hand, it needs to be emphasized that many appliances are effective in treating the malocclusion in essentially similar ways.

DR. WHITE Is there any evidence in humans that functional orthodontic treatment can grow mandibles beyond the patient's growth potential?

DR. BISHARA No, but distraction osteogenesis, once perfected, might be useful in that regard.

DR. WHITE How effective is a high-pull headgear in limiting vertical dentoalveolar development in the maxilla?

DR. BISHARA The skeletal effects of the high-pull headgear are essentially limited to the redirection of maxillary growth, causing a clockwise rotation of the palatal plane. This is the result of slowing the descent of the posterior part of the maxilla. The overall effect is dependent on patient cooperation in wearing the appliance, the amount of time worn, the magnitude of the applied force, and the individual's growth potential in the maxilla and mandible and in the alveolar processes. Another factor is whether the headgear is applied to the molars only, or to the molars connected with a transpalatal arch, with an orthopedic Hawley, or with a full-banded appliance.

DR. WHITE What is an orthopedic Hawley, and how does it work?

DR. BISHARA It is a Hawley appliance with circumferential clasps around the distal of the banded first molars. The clasps are engaged gingival to the buccal tubes on those teeth. This construction holds the maxillary arch as one unit in an attempt to increase the orthopedic effect of the headgear. As with other appliances, the teeth also move.

DR. WHITE Is there a difference in long-term post-treatment changes in the dentition between extraction and nonextraction patients?

DR. BISHARA The trends in the post-treatment changes in the dentition between extraction and nonextraction cases are similar. The changes are essentially toward the characteristics of the original malocclusion.⁸

DR. WHITE Is there a difference in long-term changes between treated and untreated cases?

DR. BISHARA The changes that occur in untreated cases are, in general, age-related changes such

as decrease in arch length and increase in tooth-size-arch-length discrepancies.9-11

DR. WHITE Don't those changes also occur in treated cases?

DR. BISHARA Yes, they do, but in the treated cases these changes are also superimposed on the changes that occur after treatment, and are related to the original malocclusion.

DR. WHITE If arch length decreases over time, would you advocate posterior stripping to maintain stability and avoid post-treatment crowding?

DR. BISHARA Yes, if only we knew who will have the crowding and how much of it will occur in a particular patient. Since we do not know that yet, I cannot recommend wholesale reproximation on every patient as a prophylactic measure.

DR. WHITE Are there indications for maxillary second molar extraction in Class II cases?

DR. BISHARA In my opinion, there are very few orthodontic indications for the extraction of maxillary second molars, unless they have advanced periodontal involvement or nonrestorable carious lesions. To extract second molars to facilitate the retraction of the whole upper dentition in Class II cases is dependent on two assumptions: patient cooperation and optimal growth. Also, that the third molars are well formed and that they will erupt. Even if all that happens, an additional period of treatment will be needed to optimally align the third molars after they erupt.

DR. WHITE Are third molars implicated in lower incisor crowding?

DR. BISHARA The role of third molars in mandibular incisor crowding following orthodontic treatment has been debated for almost a century. The preponderance of evidence at this point suggests that third molars do not play a significant role in mandibular incisor crowding. Essentially, these are two separate events that occur at the same time, but do not have a cause-and-effect relationship.

DR. WHITE What does that say about extracting third molars or third molar buds prophylactically?

DR. BISHARA There are a number of indications for the extraction of these teeth—for example, nonrestorable caries, periodontal involvement, impaction, and resorption of second molar roots. However, third molars should not be extracted just to guard against future crowding.

DR. WHITE Is it possible to anticipate that third molar impaction will occur?

DR. BISHARA Not very accurately, but their development should be followed by periodic radiographic evaluation.

DR. WHITE Can extraction of deciduous maxillary canines prevent the impaction of permanent canines?

DR. BISHARA The extraction of the deciduous canines may help in decreasing the incidence of impaction.

DR. WHITE How do you decide which cases will benefit from that?

DR. BISHARA According to Ericson and Kuroi, there are a number of factors that need to be taken into consideration.¹² The two most important are the relationship between the cusp tip of the canine and the long axis of the lateral incisor, and the angulation of the impacted canine. If the cusp tip crosses the median axis of the lateral incisor, there is only a 64% chance for self-correction. On the other hand, if the cusp tip is distal to that axis, there is a 94% chance of self-uprighting following the extraction of the deciduous canine. With regard to the angulation of the impacted canine, the more horizontally inclined, the less chance for spontaneous uprighting.

DR. WHITE What is the time frame for self-correction?

DR. BISHARA If there is no improvement in the axial inclination of the ectopic canine within one year, the chances for self-correction are rather slim.

DR. WHITE What is the best approach if the impacted canine does not self-correct?

DR. BISHARA If the canine does not self-correct, it needs to be surgically exposed and moved orthodontically.

DR. WHITE If the exposed canine does not respond to usual orthodontic measures, how long would you persist before seeking other solutions?

DR. BISHARA Six months should be sufficient to determine if a tooth is moving or not.

DR. WHITE In light of what is known of post-treatment changes, should retention be continued for a lifetime?

DR. BISHARA All orthodontic tooth movements have a potential for post-treatment changes, even in well-treated cases. That is why we retain cases at the end of treatment, and we know that the longer we retain the more stable are the treatment results. So ideally, indefinite retention might be a good idea, but it may not be practical.

DR. WHITE Does overcorrection contribute to stability?

DR. BISHARA On face value, the concept is reasonable, but from a practical point of view, what should the clinician do? Correct a Class II to a Class III? What if in this particular case there are no post-treatment changes? I feel our most practical option in most cases is to treat to the best possible functional occlusion we can achieve. The topic of overcorrection would be an excellent one for a well-structured scientific study.

DR. WHITE Does intermolar expansion usually result in relapse?

DR. BISHARA Not necessarily. It depends on the age of the patient, the amount of expansion, and whether it is in the maxillary or mandibular arch.

DR. WHITE Does intercanine expansion usually result in relapse?

DR. BISHARA The preponderance of scientific studies indicate that the answer is "yes" in the mandibular arch. In the maxillary arch we have a little more leeway, especially if done in early adolescence before the maxillary arch dimensions are completely attained.

DR. WHITE What does that say about archform?

DR. BISHARA In general, we try to maintain archform.

DR. WHITE Is there any evidence that malocclusion is related to TMD?

DR. BISHARA There is no consistent scientific evidence of that. Persons with the same malocclusion might or might not have TMD. There has to be some other predisposing or contributing factor or factors in addition to the malocclusion.

DR. WHITE Is there any evidence that orthodontic treatment can cause TMD?

DR. BISHARA Actually, there is evidence that symptoms of TMD may decrease during orthodontic treatment.

DR. WHITE We've seen a number of studies in recent years on fluoride-releasing composites. How effective are these?

DR. BISHARA The fluoride-releasing composites presently on the market have not proven to be very effective orthodontic adhesives. They do not release fluoride for a sustainable time period, and they have significantly lower shear bond strength.

DR. WHITE What about the glass ionomers?

DR. BISHARA These compounds can release fluoride over a longer period, but those on the market still do not have sufficient bond strength for routine orthodontic use. Recently, hybrid glass-ionomer-composite adhesives have been introduced. These new adhesives have the combined properties of the two compounds and might serve the desired purpose. They are still being clinically evaluated.

DR. WHITE Should today's orthodontists be testing for nickel allergies?

DR. BISHARA No. Using a patch test might introduce nickel allergy to a patient who did not have it. The patient should be referred to a specialist for proper diagnosis.

DR. WHITE What are the symptoms of these allergies?

DR. BISHARA Redness and inflammation of the oral mucosa and gingiva. Often the reaction is close to areas touched by or in proximity to the orthodontic appliances.

DR. WHITE If it is established that a patient is allergic to nickel, what are the orthodontist's appliance alternatives?

DR. BISHARA If it is established that the patient has a nickel allergy, the orthodontist should use appliances that are nickel-free, such as the new titanium brackets.

DR. WHITE Dr. Bishara, we have covered a wide-ranging set of topics. On behalf of our readers, I want to thank you for your insightful discussion. □

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