

JCO ROUNDTABLE

The Future of Orthodontics Part 1 Diagnosis and Treatment

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Diagnosis

MR. VOGELS What patient records do you currently take in digital form? Will digital records completely replace paper records in the near future?

DR. GLENN I currently take digital intraoral and facial photographs. I plan to change to digital radiographs within the next two years, when I move to a new office. Over time, I expect that digital records will replace paper and film records.

DR. ALEXANDER The time for digital records has come. The technology is available. We currently do our photography in digital form and plan to be "paperless" by the end of this year.

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DR. MOSKOWITZ Intraoral and facial photographs and cephalometric and panoramic radiographs are digital in our office. While we are exploring the desirability and feasibility of digital casts, we still prefer (at this time) to have plaster dental study casts. In time, I imagine that all of our offices will be completely digital with respect to patients' physical records as well as charting, etc. The future is in a paperless and plasterless orthodontic office.

DR. SANDLER The patient records that I currently take in digital form are extraoral photographs, intraoral photographs, cephalometric radiographs, panoramic radiographs, and intraoral bitewing and periapical radiographs. I'm currently looking into changing to digital study models. Digital records will undoubtedly replace paper records, but this change will probably take another 15 to 20 years in the U.K.

DR. CARRIERE Our patient records are all in digital form now. They are stored at the central server and connected to a fiberoptic intranet with 30 points at the chairsides and in the offices. Only for x-rays and models do we like to keep hard copies as well for backup.

DR. REDMOND All our diagnostic records are now digital as well, including photographs, radiographs, cephalometric analysis, and study models. Many orthodontic offices have already progressed to completely paperless, which means that all

records, schedules, accounting, treatment records, lab slips, prescriptions, health histories, and informed consents (with digital signatures) are now digital. It appears that filing cabinets are following typewriters out of the modern office.

MR. VOGELS What experience have you had with the new three-dimensional or other imaging techniques? Will these techniques replace two-dimensional imaging? What new kinds of analysis will have to be developed to make the best use of these techniques?

DR. CARRIERE I started working with 3D virtual imaging in 1993 in the "Softlander Project", a 3D Stereoscopic Virtual Reality environment with a library of appliances and protocols, designed for orthodontic teaching.¹ Since then I have been developing all my R&D orthodontic projects with these platforms. I am a strong believer that these technologies are the future in orthodontics. In reference to the use of 3D imaging for diagnosis, it is interesting to note that the most frequently contemplated human facial posture in real life is the frontal view. Therefore, 3D imaging will give us the information we need not only for hard tissues, but for facial esthetics. In the future, advances have to be made in standardizing the morphometry of craniofacial structures in 3D imaging, not only statically, but dynamically as well, correlating different technologies.

DR. MOSKOWITZ There have been a number of recent articles in our orthodontic publications on 3D imaging. Without question, 3D imaging will replace the two-dimensional imaging that we have been using since Broadbent (in the U.S.) and Hofrath (in Germany) introduced standardized lateral cephalometric radiographs in 1931. The ability to more accurately visualize our patients' dentofacial structures and the relationships of hard and soft tissues to each other should help clinicians and researchers better and more profoundly understand the important qualitative and quantitative factors in the treatment of malocclusions. Areas that will be significantly impacted include diagnosis, treatment planning, appliance selection, and treatment outcome sim-



Mr. Vogels

ulations. Research efforts hold the promise of consequential enhancement with 3D imaging. Naturally, innovative and very different analytical systems with algorithms appropriate for 3D imaging will need to be developed.

DR. REDMOND I have purchased two cone-beam scanners: the NewTom,* in 2003, and the i-CAT,** in 2005. The NewTom is in use at the University of Southern California, and the i-CAT is located at the University of the Pacific. USC and UOP have made tremendous strides in analyzing CBCT (cone-beam computed tomography) images. One 3D scan yields all the radiographs that orthodontists need: panorex, lateral and frontal headfilms, TMJ tomograms, sinus films. In addition, stereolithography allows the 3D images to be recreated in photosensitive acrylic. Imagine the maxillofacial surgeon's delight in predicting a surgery based on a life-size, 3D acrylic model of the craniofacial complex. These models help the surgeons understand bone thickness and density before they reach for a surgical instrument in the operating room. Currently, 3D x-ray scans are being refined to produce study models of sufficient quality to allow Invisalign*** appliances and Insignia**** custom appliances to be fabricated without the use of polyvinyl siloxane impressions. This is the next step in the digital revolution, and an eagerly awaited step. Orthodontists will have the ability to take one CBCT scan, and from that tease out

all the diagnostic records, including the study models and working models.

DR. SANDLER I have had very little experience with three-dimensional imaging techniques. Only two or three of my patients have had CT scans taken, and only one patient has had three-dimensional rendering of this DICOM† data, although with very impressive results (Fig. 1). I think once the equipment is in widespread use and the patient dose is down to acceptable levels, three-dimensional imaging with i-CATs or similar machines will become standard practice. Obviously, new analyses will need to be developed to allow us to make the best use of this data.

MR. VOGELS Do you see any other new diagnostic technologies on the horizon?

DR. REDMOND Several companies are developing intraoral scanners to produce 3D images and eliminate impressions for study models and working models. The CBCT scans and the intraoral scanning devices are competing for market share.

DR. SANDLER Another diagnostic tool that may be of benefit would be to relate digital photographs of study models to the patient's digital extraoral photographs, so that much of the information that is currently obtained from cephalometric radiographs may be possible to obtain from high-quality photographs of study models superimposed accurately within lateral head photographs (Fig. 2).

DR. CARRIERE I cannot think of possible future procedures, but conceptually speaking, they should be developed on a non-invasive basis for reasons of patient safety. They should be orient-

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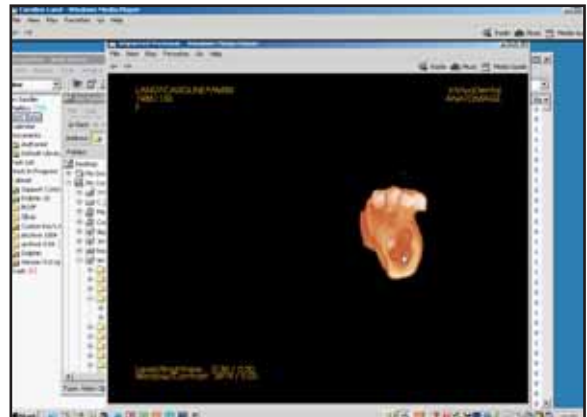


Fig. 1 Three-dimensional rendering of DICOM data allows visualization of unerupted teeth (courtesy of Dr. James Mah, Craniofacial Virtual Reality Lab, California).



Fig. 2 Accurately locating study models within facial photograph would provide many useful measurements.

ed toward the variability of individuals, trying to identify their different responses to our therapeutic action. Molecular biology can give us the complementary knowledge necessary to understand the reactions or the treatment possibilities with different technologies.

MR. VOGELS Will growth prediction become more reliable in the immediate future? What impact will technology have on growth prediction?

DR. ALEXANDER Technology will be critical. Someday, when we can do a saliva test (or some other test) and it tells us when a growth spurt is approaching, it will revolutionize treatment timing and enable the orthodontist to actually reduce total patient treatment time.

DR. SANDLER I don't see any great future in growth prediction with the tools we have currently available to us. Certainly the work done by Baumrind over 20 years ago showed that expert clinicians examining radiographs of patients performed no better than chance, when trying to predict forward and backward rotators.² Houston cast serious doubt on growth prediction methods and suggested that just by adding the average incremental growth to existing facial patterns, the error is probably as good as computer-based methods.³ Houston and colleagues also cast some doubt on the use of hand-wrist radiographs to accurately predict the onset of the pubertal growth spurt.⁴ Probably the best methods we have available are the standing height measurement and the Tanner and Whitehouse growth charts.⁵

DR. MOSKOWITZ I hope that the extension of 3D imaging into a more meaningful 4D type of technology at some point will indeed improve our ability to more accurately record growth changes and quite possibly lead to substantial growth-prediction capabilities. As Dr. Carrière pointed out, however, such technology is still limited by our current understanding of individual variation in our offices. Let's not make the same overly optimistic mistakes with this new multidimensional imaging that we did with traditional two-dimensional cephalometrics. The abil-



Dr. Alexander

ity to make consistently accurate growth prognostications in orthodontics will largely depend upon future developments in other areas. There are profound differences between the ability to record growth changes (regardless of the dimensions included in such assessments) and accurately and consistently predicting such growth changes in individuals. Until significant advances are made in fields such as genetics, cellular biology, physiology, biochemistry, and endocrinology, to name just a few areas, it is unlikely that meaningful growth predictions will be available to the orthodontic clinician.

MR. VOGELS Do you see an increasing multidisciplinary involvement of referring dentists and other specialists in the diagnostic process? How will this affect the practice of orthodontics?

DR. REDMOND I have spent the last 10 years practicing in a multidisciplinary office in Seattle. The transfer of information between professionals is extremely beneficial to the patient. Endodontics, crown lengthening, gingival grafts, implants, and preprosthetic and premaxillofacial surgery all play into a multidisciplinary treatment plan. The resultant treatment plan is certainly worthy of the oft-quoted phrase: "The whole is greater than the sum of the parts". I do not believe that multidisciplinary treatment will weaken the orthodontic specialty; my experience has been quite the contrary.



Dr. Carrière

DR. CARRIERE The more we know about the different components in a case, the better the treatment outcome, so multidisciplinary involvement is very important. At an institution with different specialists, it is easy. In the case of professionals located in different offices, this can be organized via Internet. With special software, such as Glance^{††} and Skype,^{†††} it can be done in real time.

DR. GLENN Digital records certainly make it easier and more convenient to involve the referring dentist and other specialists during the diagnosis and treatment-planning phase of treatment. The digital records can be shared electronically with colleagues to gain multidisciplinary input in a timely manner, both prior to and during treatment.

DR. ALEXANDER Multidisciplinary treatment has been around for many years. It has been a result of the increased popularity of adult treatment, as orthodontists realized their limitations with orthodontic treatment alone. It will continue to grow as more GPs and non-orthodontists are educated to recognize problems and refer to specialists. Teams of specialists working as one unit will become much more prevalent, and exposure on TV “make-overs” can show the public what is possible.

DR. SANDLER There will almost certainly be a further increase in multidisciplinary treatment

of complex cases as the adult market for orthodontics increases. This will necessitate involvement of the referring general dental practitioners, as well as specialists in endodontics and crown and bridge. There will probably be a much greater increase in preprosthetic orthodontics as the specialists appreciate how the orthodontist can greatly enhance the final results that they are able to achieve just by moving the teeth into a more favorable position.

MR. VOGELS Will patients and parents have more say in treatment decision-making in the future? How will this affect treatment techniques, practice management, and internal marketing?

DR. MOSKOWITZ Patients and parents of young patients already have a great impact upon the treatment decisions that are made in modern clinical orthodontic practice. The use of informed consent is not optional, but mandatory. And I suspect that this empowerment and more interactive relationship will increase in the future. The demand for orthodontic services has never been greater. No doubt, the near-invisible appliances (Invisalign, Essix,[‡] and lingual appliances) are responsible for this surge in the public’s demand for orthodontic care. Orthodontists should realize that their ultimate role should be as educators and not necessarily as salespeople. Helping patients select appropriate and meaningful treatment strategies and appliances takes time, knowledge of current treatment options, communication skills, and integrity. Successful practices now and in the future must rely upon the ability of the orthodontist to maintain treatment expectations that coincide with patient and parent expectations. Everything else is mere commentary.

DR. SANDLER Patients and parents will probably have more input into the decision-making process in the future. Certainly, over the last five

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^{†††}Trademark of Skype Technologies, 2 Stephen St., London W1T 1AN, England; www.skype.com.

[‡]Registered trademark of Raintree Essix, LLC, 4001 Division St., Metairie, LA 70002; www.essix.com.

years in the U.K., they have been made central to all decisions about treatment. On the insistence of Tony Blair's government, the patient is now given a choice not only of where treatment will be provided, but of all the different alternative treatments available. For fully informed consent, the advantages and disadvantages of all possible treatment modalities are meant to be discussed in detail with patients and parents prior to any irreversible decision being taken. This means that an increasing number of compromise treatments may end up being carried out in the future, as certainly a proportion of patients in the U.K. merely want their upper front teeth to be straight. If the patients are the final arbiters of clinical treatment, this could mean shorter and less rewarding courses of orthodontic treatment would be carried out in the future. Obviously, there would have to be changes in the management of the practice to accommodate increased numbers of shorter treatments.

DR. ALEXANDER Patients and parents have always had a role in the final treatment plan. As long as everyone understands the benefits and consequences of their choices, compromise treatment may be considered. But it seems rather sad that we are trained to "do it right", then let the patient control the treatment rather than the doctor. As university-trained specialists, our responsibility to our patients is to offer the best quality of treatment we can give them.

DR. CARRIERE I think patients and parents have much to say. Actually, the degree of information that they have is very advanced, as well as their expectations and objectives. Orthodontists have to discuss with patients the treatment project in a progressive scale of their involvement in the process, explaining the different possibilities plus the quality of result they can achieve. The logic of the process has to be clearly explained, and once it is understood and

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‡‡‡American Orthodontics, 1714 Cambridge Ave., Sheboygan, WI; www.americanortho.com. Jasper Jumper and Jones Jig are trademarks.

accepted by the patient, they will become positively involved in the treatment.

DR. REDMOND The Internet has forever changed the way professionals conduct their practices. We deal, on a daily basis, with patients and parents who are highly informed. Today's challenge for professionals is to help the public separate fact from the fiction that they have Googled.

Treatment

MR. VOGELS What "non-compliance" devices do you use? Will these eventually replace traditional appliances such as headgear?

DR. ALEXANDER You are speaking to the greatest fan of facebow-headgears! Research shows the excellent long-term stability of headgear treatment.⁶⁻¹⁰ Compared with the Herbst,‡‡ it gives equal orthopedic and definitely more stable orthodontic long-term results.¹¹ Temporary anchorage devices offer new approaches for non-compliance force application. Rapid palatal expanders and tied-in lip bumpers can also be considered non-compliance appliances.

DR. GLENN As a student of Dr. Alexander's, I have to agree that non-compliance appliances will probably not replace headgear and other traditional appliances in my practice. Temporary anchorage devices or miniscrews show promise for treatment of certain conditions and will likely be used more routinely in the future.

DR. SANDLER The non-compliance devices that I have used besides headgear are the Jasper Jumper,‡‡‡ Jones Jig,‡‡‡ Distal Jet,‡‡‡ mid-palatal implants, and microscrews. If the reliability of microscrews can be demonstrated, then they theoretically could eventually replace headgear. I have previously carried out a randomized clinical trial investigating the use of palatal implants and demonstrated that they work just as well as headgear; this will be published in the near future. Because of the not-insignificant amount of surgery required to place and remove the midpalatal implants, I would be surprised if they replace headgear in the foreseeable future.



Dr. Glenn

DR. CARRIERE Orthodontics proposes an acceptance of a foreign mechanism into the mouth. This is in itself an act of compliance, with the expectation of a result that compensates for it. If a patient accepts orthodontic treatment, it is in the hands of the orthodontist to convince him. He has to develop the confidence that cooperation will be rewarded with a good result, that it will be a good deal for him. The key to achieve this is to explain the logic of the process. Once it is understood by the patient, he is able to follow a protocol and become involved in a successful adventure. The orthodontist has to take advantage of the initial expectations that the patient has at the beginning of treatment. Surgical procedures and other alternatives such as miniscrews are discussed with the patient to evaluate the pros and cons.

MR. VOGELS In what types of cases do you prefer skeletal anchorage to traditional forms of anchorage? Will miniscrews eventually become a standard form of treatment?

DR. SANDLER Skeletal anchorage is preferable to more traditional forms of anchorage in any situation where patient compliance is in doubt. Miniscrews will eventually become standard practice if they can be demonstrated scientifically to be reliable. I am currently setting up another randomized clinical trial on the use of microscrews, and in five years' time I will hope-

fully be able to give the answer on their effectiveness and reliability.

DR. CARRIERE Where traditional forms of anchorage fail, especially in hyperdivergent cases, we like to propose miniscrews. When anchorage loss produces a forward movement of the lower incisors, skeletal anchorage can preserve the facial esthetics of the patient, preserving the harmony in the curvature of the supra-mental sulcus.

DR. GLENN Miniscrews or TADs are showing a great deal of promise for cases that are difficult to treat with traditional mechanics. This is especially true of cases with missing posterior teeth and specific anchorage concerns.

DR. ALEXANDER Skeletal anchorage seems to be best suited for non-growing patients with skeletal discrepancies who will not accept surgical treatment. The future of miniscrews seems bright. Types of cases where this technology will be helpful include bimaxillary protrusions, mutilated cases, and asymmetrical malocclusions. Controlling and decreasing the vertical dimension by molar intrusion has incredible possibilities.

DR. REDMOND TADs are already in use in a large percentage of orthodontic practices. What is yet to be completely understood is the impact that TADs will have on diagnosis and treatment planning. Combining the knowledge gained from CBCT scans and 3D growth prediction with TADs, the resulting treatment plans will dramatically alter orthodontic treatment as we know it today.

MR. VOGELS How do your average treatment times today compare with 10 or 20 years ago? Will advances in technology, materials, or mechanics be able to shorten treatment times even further?

DR. CARRIERE Our average treatment time has decreased from 24 to 18 months in extraction cases and to 12-15 months in nonextraction cases. Some of the last group can be reduced still further, to nine or 10 months, in cases of good cooperation and response. At present we are



Fig. 3 Carrière Distalizer and Passive Self-Ligating Brackets.

working with passive self-ligating brackets, complemented by ultralight new-technology wires (Fig. 3). In the protocol developed in our Orthodontic Positioning Technique, the Carrière Distalizer[§] is a complement of utmost importance for nonextraction cases and for atypical extraction cases.¹²⁻¹⁴ This opens the door to a more creative approach for a new type of treatment based on preservation of facial esthetics.

DR. GLENN I have seen decreased treatment times due to improved wire technology and experience in practice. I still find that the finishing phase relies on patient cooperation with elastics, which is often the limiting step.

DR. ALEXANDER Compared to 20 years ago, there have been amazing changes in how efficiently we can move teeth. In years past, I needed to see patients every three weeks with the stainless steel archwires. Today, because of the advances in metallurgy, it is every six weeks. The issue today is not “moving teeth”. This is the easiest and fastest part of treatment. But so many other factors affect treatment time. The issue is correcting the skeletal deficiencies while having a patient who never misses an appointment or never has a loose bracket and follows your instructions explicitly. I admire those who can routinely treat a Class II nonextraction case in 12 months. In our office, the treatment time depends on achieving correct skeletal relationships and final occlusion. This takes time (and growth) and compliance! In summary, our total treatment time has decreased by possibly three to six months,

depending on the case. Our chairtime has decreased dramatically, without damaging the quality of the finished result.

DR. SANDLER Average treatment times are probably slightly shorter than they were 10-20 years ago due to the advent of fully programmed appliances and nickel titanium archwires. Further advances in bracket and archwire technology could theoretically take another 10-20% off total treatment times, but if there is a major movement to private treatment in the U.K., this will hopefully be offset by an increased amount of time spent in finishing.

MR. VOGELS How much do you use preadjusted appliances in your practice? Can these be effective in most cases, and will they become more effective? Will new systems ever allow complete customization of appliances for individual patients at a reasonable cost?

DR. GLENN I use preadjusted appliances 100% of the time. I believe they are effective in most cases and will become more effective over time. I routinely bend wire in the finishing stages to improve final tooth positions when indicated.

DR. SANDLER We also use preadjusted appliances 100% of the time in our clinical practice, as these are effective in every case where patient cooperation is forthcoming. Complete customization of appliances may eventually be pos-

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Dr. Moskowitz

sible, so that individual torque requirements could be built in for particular aspects of the individual malocclusion.

DR. MOSKOWITZ Preadjusted appliances rank as one of the great advancements in orthodontics. Their use will continue to increase and become more sophisticated. Orthodontic manufacturers realize this, and one company has already marketed customized brackets for each patient. Indeed, this is the future. The more customized these attachments become, coupled with more precise methods of placing these same attachments, orthodontists will be able to achieve more precise and better treatment outcomes. Naturally, we have to continually reevaluate these technological advances to determine if the manufacturers' promise of noticeably more precise tooth movement actually does occur.

There are a few misconceptions about preadjusted appliances that we should dispel. Firstly, these "smart" appliances are only as smart as the orthodontists using them. Secondly, there is still a need for postgraduate residents and orthodontists to learn to routinely bend wire for intended movements that simply do not occur with preadjusted appliances for whatever reason. Thirdly, preadjusted appliance use must include special considerations as far as anchorage is concerned. And fourthly, and perhaps most important, preadjusted appliances are just a way to efficiently move teeth. The manner in which we ultimately use these

appliances should stem from a thorough diagnosis, problem list, and establishment of orthodontically sound treatment goals. "Any road will do, if you don't know where you want to go."

DR. ALEXANDER Having created my own preadjusted appliance 25 years ago and continually improving it over the years, I am exceedingly happy with the routine results it produces. My experience has been that my preadjusted appliance is very effective in virtually all cases. To individualize our system, we make bracket positioning changes for certain malocclusions, archwire design changes involving curve of Spee, and individualized changes in orthopedic forces and elastics. The quality of our finished result today is better than ever.

DR. CARRIERE All of our treatments with fixed appliances are with preadjusted .022" × .028" brackets of the passive self-ligating type. The system can be "activated", whether with metallic ligatures or a special program of wire sizes, to fulfill the individual needs of the case. More customization may be available in the near future. Just as we all have photocopiers in our offices today, in the future we'll have rapid 3D prototyping available as a tool for research, to demonstrate with models, and to manufacture individualized appliances on site, according to the needs of the situation.

MR. VOGELS To what extent will stainless steel be superseded by space-age materials such as ceramics and titanium? How will this affect orthodontic mechanics? Do you see any other new materials entering the market?

DR. GLENN For brackets, I still prefer stainless steel over ceramic, unless the patient has a specific esthetic concern. I find that the stainless steel brackets are easier to use and deliver a more predictable result in my hands. Space-age wires, like nickel titanium, have been a wonderful addition to our armamentarium. These flexible wires have many uses during the course of treatment, but I still finish my cases in stainless steel wires.

DR. CARRIERE Stainless steel will continue

to be a very good material for moving teeth, and in later stages of a treatment it is still indicated. New-technology wires delivering low force are of course the most promising materials at present, especially with self-ligating brackets. In the future, intelligent wires that deliver light forces for time intervals with precalculated interruptions could be developed. In terms of brackets, ceramics are still desired by many patients. The future can bring us smaller sizes and better mechanical features of ceramic brackets, with better control of movements and patient comfort.

DR. SANDLER If the price of ceramic brackets can be brought down to a competitive level, then I could see them ultimately challenging stainless steel as the material of choice for orthodontic brackets. Obviously, if this occurs, then orthodontic treatment mechanics will have to be altered to a small degree, in that friction within the system will increase; therefore, orthodontists will have to stay in flexible wires for a slightly longer period, and space closure may be significantly slower. Nickel titanium wires have a very large share of the market, and I can see no reason why this will decrease in the future. As the properties of nickel titanium wires improve, there may ultimately be no need for stainless steel archwires apart from the finishing stages of treatment.

DR. ALEXANDER Stainless steel still delivers the most economical, safe, reliable bracket. Maybe titanium will offer an alternative—but is it worth the increased cost? “Clear” brackets are for esthetics, and only for selected patients. As for archwires, do you want torque control early in treatment? I really sound like an old fogey, but there is nothing in the world of orthodontics that works like a heat-treated rectangular stainless steel archwire filling the slot to level arches, control torque, and position the roots. This is best achieved with an .017" × .025" stainless steel archwire in an .018" slot. Space-age materials work great early in treatment, but may be too slow for finishing.

DR. REDMOND I would only add that I believe the next big push in orthodontics will

involve nanotechnology.

MR. VOGELS What are the best adhesives in use today? How will bonding develop in the future?

DR. SANDLER I believe the best adhesive available for bands is Band-Lok Blue,§§ and the best adhesive available for brackets is 3M’s Transbond.§§§ The consistency of the paste is unsurpassable, and there is minimal float of the brackets once placed on the teeth. Light curing will almost certainly take over completely from chemical-cure cementing techniques, and indirect bonding may become a lot more popular as the use of orthodontic therapy increases.

DR. MOSKOWITZ The best adhesives in orthodontics are the ones that provide adequate bonding strength and do not present too many obstacles in their handling. There are many. But the real future of orthodontic bonding will revolve around indirect bonding techniques. These techniques hold the promise of more accurate and precise placement of attachments and reduced chairtime. Orthodontic postgraduate programs should devote more emphasis in this area than they do currently. Orthodontic attachments are now being manufactured with a greater sophistication than our ability to place these attachments. The ability of the orthodontist to take full advantage of the prescriptions of these “smart” appliances will greatly depend upon the capability of precision placement. Direct bonding techniques are generically unacceptable to this end.

MR. VOGELS How much lingual treatment do you perform? Does lingual orthodontics have a future in the United States?

DR. REDMOND As a pioneer in lingual orthodontics, I found the experience interesting and, I believe, contributory to my sore back. The appli-

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§§§Trademark of 3M Unitek, 2724 S. Peck Road, Monrovia, CA 91016; www.3Munitek.com.

ance has matured since the late '80s, and has found a resurgence outside the U.S.

DR. GLENN I personally perform no lingual treatment. Because of esthetic demands, especially from adult patients, lingual treatment may increase in popularity. Time will tell.

DR. SANDLER I also perform almost no lingual treatment. There is a small minority of practitioners in the U.K. who provide lingual treatment. I think with the increasing popularity of techniques such as Invisalign and the increasing use of esthetic brackets, there will not be a burgeoning increase in demand for lingual techniques.

DR. ALEXANDER I had the opportunity to become involved in lingual treatment in 1980 and have been doing it ever since, averaging 10-20 cases per year. We now have over 25 active cases in treatment. It is interesting to look at the amount of lingual treatment in the U.S. today as compared with Europe and Asia. It is much more popular internationally than it is in America. But the future of lingual is great in the U.S.! Because of the increased exposure of adult orthodontics resulting from advertising, patients come to the office hoping for Invisalign. Often their malocclusion is too severe, so the second option is lingual. Lingualcare's technology is amazing. It almost makes it simple—but not easy. The bracket design and preformed archwires are extremely high-tech.

DR. MOSKOWITZ We are doing more lingual orthodontics and suspect that this technology will only increase in the future. The new lingual appliances are more clinician- and patient-friendly, and there is definitely a need for such esthetic appliances that are more clinician-directed than some of the removable clear aligners. The entire subject of decreased visibility of appliances has shown all of us that adult patient motivation to seek treatment will in large measure depend upon their perceptions of the visibility of the appliances that we use. The orthodontic manufacturers have realized this and have expended a tremendous effort in this direction. The genie is out of the bottle, so to speak. It is not a question of



Fig. 4 Carrière Lingual Self-Ligating Bracket.

whether the orthodontic specialty will be moving to appliances with decreased visibility (such as Invisalign and lingual orthodontics), but rather how quickly these appliances can be refined to the point where they are delivering clinical outcomes similar to what we know we can obtain with traditional labial appliances.

DR. CARRIERE Lingual orthodontics has a place in orthodontic therapy, although the degree of comfort to the patient is not too high. The only way to promote it is by improving the design of lingual brackets. Lingual self-ligating brackets will be the next step in providing more comfort for the patient with low forces; for the orthodontist, the ligation of wires on the lingual side will be eliminated, which is a great advantage in itself. The new Carrière Lingual Self-Ligating Brackets[§] are the most recent devices we have developed (Fig. 4).

MR. VOGELS In what kinds of cases do you use Invisalign appliances? Will these and similar computer-designed removable appliances eventually become more common than fixed appliances?

DR. MOSKOWITZ The use of Invisalign has dramatically increased in our office, and I suspect that Invisalign will continue to be used by

§§§§Trademark of Lingualcare, Inc., 5304 Beltline Road, Dallas, TX 75254; www.lingualcare.com.

§Trademark of ClassOne Orthodontics, Inc., 5064 50th St., Lubbock, TX 79414; www.classoneortho.com.

both the orthodontist and generalist in the United States. In fact, Align Technologies has done something unprecedented in orthodontics: they have been significantly successful in direct marketing to the public. Of course, pharmaceutical companies have done this for years. But the public is demanding Invisalign, and individual adult patients are calling offices inquiring about Invisalign use or going directly to the Invisalign website to find more information, or even to find clinicians using this appliance in their areas. If you want to see just how successful Invisalign has been, their stock prices, quarterly earnings, and number of cases submitted to Align Technology are all a matter of record. They have also expended great efforts in educating clinicians and appear to remain sensitive to clinicians' needs, assisting them with internal and external marketing strategies. While Invisalign will not

replace traditional orthodontic appliances in the near future, it is highly likely that the range of cases that might be treated with the Invisalign system will be broadened. No orthodontic clinician should ignore the dramatic and sustained increase in the number of Invisalign cases under progress today.

DR. CARRIERE Evidently there is a place for Invisalign appliances, and the more experience professionals gain with "invisible" appliances, the more complicated cases they treat. The demand from patients also has a big influence on appliance selection, provided it is adequate for the malocclusion they present. I would like to point out a new strategy that opens up a broader use of Invisalign in cases in which there is a Class II dentoalveolar relationship. In this group of cases, in a first stage, the Carrière Distalizers are placed

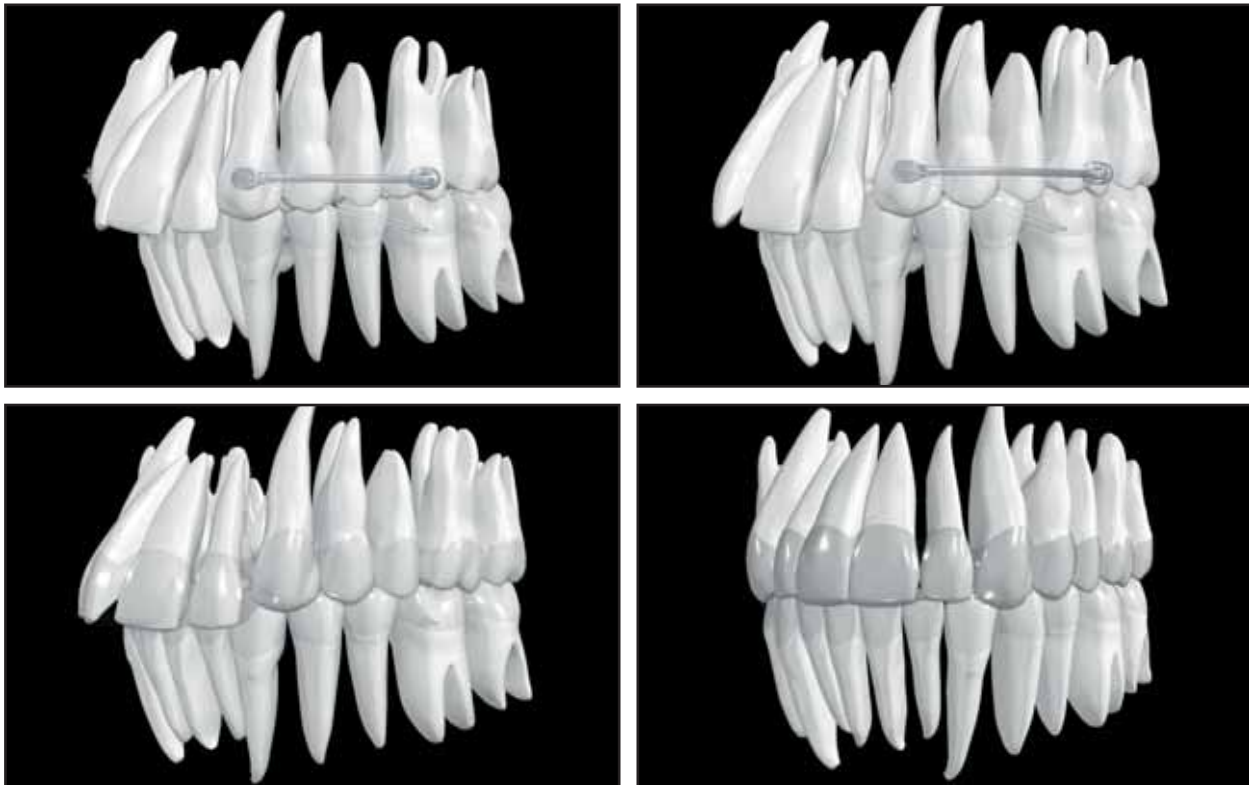


Fig. 5 Distalizer complementing Invisalign in Class II treatment.

and the maxillary posterior segments moved in a block to a “Class I Platform” between canines and molars. This stage can last from three to five months. Once the Class II is corrected, the Distalizers are removed, and the case can be finished using Invisalign to close the diastemas between the maxillary incisors and canines created in the first stage (Fig. 5).

DR. ALEXANDER Invisalign can be very effective in correcting mildly rotated teeth. We use them as “glorified retainers”. In other hands, they may be used more effectively, but I have never been a big fan of using removable appliances to correct major problems.

DR. GLENN My use of Invisalign has been very limited. I have used removable aligners successfully on adult patients with mild crowding or spacing and a good Class I occlusion.

DR. SANDLER I use Invisalign appliances where no major contraindications exist—that is, where extractions are not required, where no major tooth movements are required, where no intermaxillary retraction is required, and largely in non-growing patients. From the aforementioned criteria, you can understand that this precludes Invisalign treatment in about 95% of patients I am currently providing treatment for. I find it very hard to believe that computer-designed removable appliances will ever become more common than fixed appliances; however, time will tell.

MR. VOGELS Will nonextraction treatment continue to predominate over extraction treatment in orthodontics?

DR. ALEXANDER Yes! The larger question is, “Where should the teeth be at the end of treatment?” With anchorage control using Class III elastics or temporary anchorage devices, gaining arch length by posterior expansion and interproximal enamel reduction, probably 80-90% of our patients should be treated nonextraction and achieve stable results. The sad reality is that many cases that should have extractions are treated nonextraction. Why? Is it because nonextraction



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tion treatment is easier or the extraction mechanics are too difficult?

DR. GLENN Yes, nonextraction treatment will predominate, because the practitioners and the public prefer the broader smiles. However, I feel that extraction treatment will continue to be used in cases with severe tooth-size-arch-length discrepancies and bimaxillary protrusive profiles. As a more ethnically diverse patient population seeks orthodontic care, the use of extraction treatment may increase in some regions of the country.

DR. REDMOND As more orthodontists give up their closely held beliefs regarding the relationship between extraction and stability, I believe even more nonextraction treatment will be attempted.

DR. SANDLER Nonextraction treatment will continue to predominate over extraction treatment for the foreseeable future. The pendulum is swinging quite a long way in the nonextraction direction, particularly when used in association with self-ligating brackets.

DR. CARRIERE I agree, especially concerning the increasing use of low-friction self-ligating brackets, together with new-technology wires.

DR. MOSKOWITZ Regrettably, nonextraction treatment will seem to dominate orthodontics in the future. And the reasons for this are not necessarily good. The emphasis on nonextraction treat-

ment has little to do with new techniques or appliances that facilitate such a strategy, but rather a good deal of dogma, practice management convenience during initial consultations, and our specialty turning not one, but two blind eyes toward the evidence-based information on the benefits of extraction strategies in select cases. Additionally, extraction cases are generically more difficult to manage and finish, as numerous biomechanical concerns have to be considered as part of the overall treatment effort. Incisor position, torque, root parallelism, and other considerations place increased technical demands upon the orthodontic clinician. We have to keep the extraction/nonextraction decision as a potential strategy in our treatment protocols and not as a “goal” of treatment in itself. The vast majority of quality investigations support the empirical perspective that extraction therapies

indeed have a legitimate place in modern orthodontic practice. Gross expansion of cases to resolve severe dental arch-length issues and significant intercanine width increases have been shown to be ill-advised for long-term stability.

MR. VOGELS What will be the role of unusual extractions such as single incisors?

DR. SANDLER There is going to be an increasing use of unusual extractions, such as single lower incisors and upper canines, as these definitely have a place in adult orthodontics or in any other cases where a compromise treatment plan is considered appropriate.

DR. CARRIERE Unusual extractions are going to increase in cases in which facial esthetics can be damaged with the extraction of the upper bicuspids. We take advantage of the different histo-

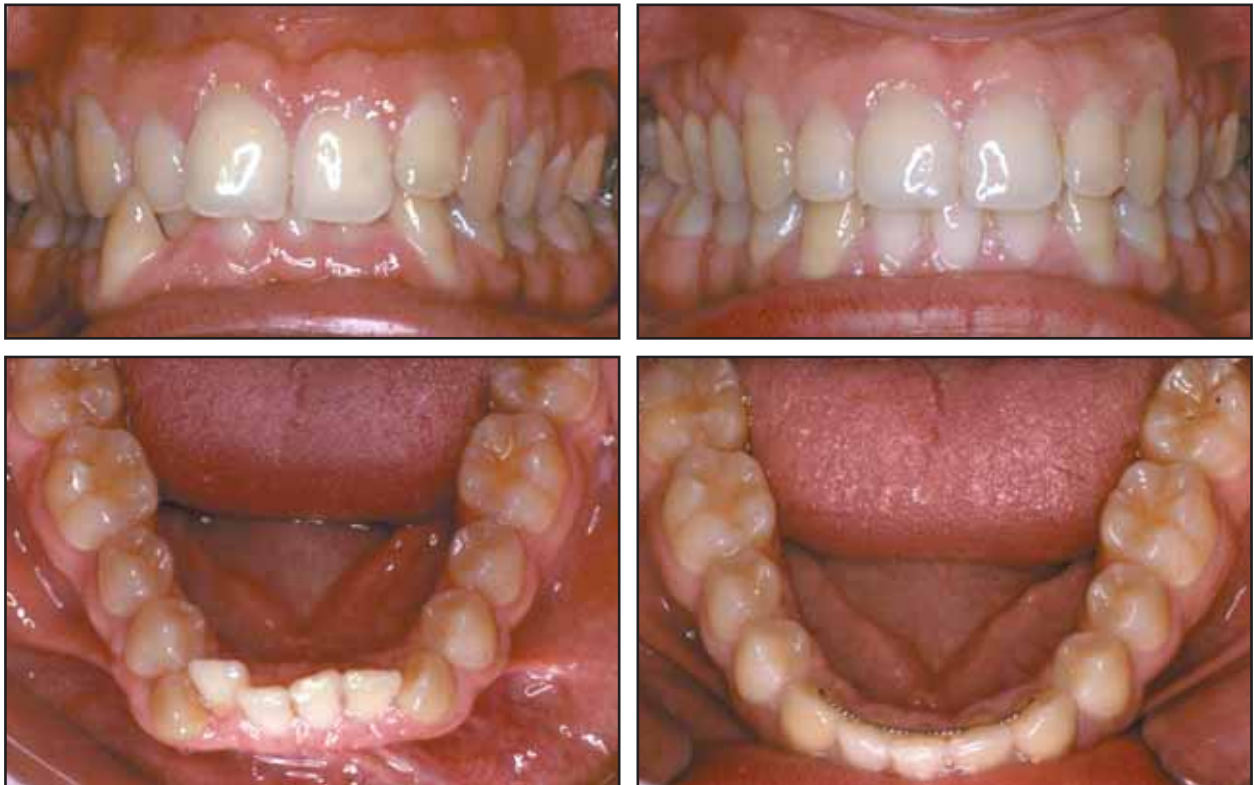


Fig. 6 Pre- and post-treatment photos of single-lower-incisor extraction patient.

logical conditions of the maxilla and mandible. Maxillary bone, with a better response, permits an esthetically protective approach. Using the Distalizer, we recover the lost and hidden space in the maxillary arch. With it, we can correct a Class II without extraction of premolars, as well as cases with crowding of maxillary anterior teeth without protruding them. Upper canine distalization gives us the possibility of treating the case with the extraction of only one or two bicuspids in the lower arch; this is a creative approach to reduce extractions and preserve the facial profile. With lower incisors, we limit it to one extraction in case of a Bolton tooth-size discrepancy.

DR. MOSKOWITZ I foresee the use of more atypical extractions (including lower incisor extractions) as a reasonable compromise in some cases, as the more esthetic appliances (lingual appliances and Invisalign) should advance their technologies shortly to accommodate these types of cases. We must maintain caveats such as esthetics, function, and stability as guiding forces in our treatment decisions. If we do just that, we will find that the extraction strategies have great benefits to our patients. I hope that the future of orthodontics will include a critical reexamination of this entire subject with a little more science and a lot less emotionalism and dogma.

DR. ALEXANDER Unusual extractions will always be an option in selected cases, usually in adults. Extracting a single mandibular incisor could be recommended when the patient has a good Class I molar occlusion and small maxillary laterals (Fig. 6).

MR. VOGELS What methods of palatal expansion do you use? What devices or techniques hold promise for the future, in either growing or non-growing patients?

DR. GLENN I usually use a banded fixed palatal expander, either Haas or Hyrax^{‡‡} design.

DR. CARRIERE We use palatal expansion plates

^{‡‡}Trademark of Dentaureum, Inc., 10 Pheasant Run, Newtown, PA 18940; www.dentaureum.com.



Fig. 7 Rapid palatal expander designed by Dr. Alexander.

in early mixed dentition cases with crossbite. In cleft-palate cases, we use fixed palatal expanders.

DR. ALEXANDER An all-metal rapid palatal expander with bands on the bicuspids and molars works best for us. This unique design includes a Hyrax screw parallel to the first molars, 3mm from the palatal tissue and angulated 20° to allow easier engagement of the key before activation, and an .030" stainless steel wire soldered to the bicuspid and molar bands (Fig. 7). These are very successful in both children and adults.¹⁵⁻¹⁷

DR. SANDLER The method of palatal expansion that we use in Chesterfield is rapid maxillary expansion with or without surgical assistance. The Hyrax appliance, banded to the first premolars and first molars, is the most popular technique, and this can be used in growing and non-growing patients. We tend to use surgical assistance where the patient is older and has a need for a large amount of maxillary expansion, and we therefore feel there is a possibility of the mid-palatal suture having ossified.

MR. VOGELS Is growth modification feasible? Will biochemical engineering lead to new possibilities? Will orthopedic therapy continue to be appliance-based, or will other techniques emerge?

DR. SANDLER There is no clinical evidence to

date that growth modification can be carried out to a large degree. The randomized clinical trials organized over the last 10 years by Kevin O'Brien, based in Manchester, have shown that a small but worthwhile amount of growth modification is achievable with the use of both twin blocks and the Herbst appliances. It is difficult to predict how biochemical engineering may lead to new possibilities with growth modification; orthopedic therapy will for the time being continue to be appliance-based.

DR. REDMOND A recent study was done to determine the possibility of using a naturally occurring hormone, relaxin, to determine its effect on the speed of tooth movement. Although the animal studies were encouraging, but the human clinical trial proved disappointing, I view this study as a trend in orthodontics directed by the pharmaceutical companies. Imagine a transmucosal medication lining the Invisalign aligners that promotes rapid tooth movement. Now that would be something you could market.

DR. ALEXANDER This is really space-age! When we see such incredible advances in all types of technology in the 21st century, we must say that it may be feasible. During my lifetime, however, I believe that orthodontics will be appliance-based. A quote from my first book, written over 20 years ago: "The basic concept of archwires placed in brackets to move teeth will, by and large, continue to be the most efficient method." To date, this is still true.

MR. VOGELS What do you see as your role in TMJ and myofunctional treatment? Will orthodontists become more or less involved in these therapies?

DR. GLENN I feel that it is my role to recognize these problems and refer when appropriate.

DR. ALEXANDER The initial exam should focus on TMJ health. If it is a big TMJ problem, we refer. In addition, we routinely teach our "squeezing" and tongue exercises to address myofunctional problems.¹⁸

DR. SANDLER As there has been no scientific



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evidence whatsoever for a very convincing relationship between malocclusion and temporomandibular joint dysfunction, I see no major role for the orthodontist in the treatment of these cases. As future scientific studies will reiterate this lack of relationship, I suspect orthodontists will eventually become involved in fewer and fewer therapies for this unique group of patients.

MR. VOGELS What do you see as your role in treating patients who need oral and maxillofacial surgery? How will this multidisciplinary field develop in the future?

DR. CARRIERE The role of the orthodontist is to program correct functional and esthetic dental arches, to be built on adequate skeletal bases, or corrected to a Class I by the surgeon in case this is needed. Surgical procedures are invasive and extensive, for which reason they should be proposed only to correct severe skeletal problems. Refined orthodontic techniques permit us to treat many borderline skeletal problems in a more orthodontic-oriented approach. Sometimes restricted procedures can include minimal esthetic surgery of the soft tissues, such as chin implants, lip remodeling, etc. The patient has the final word in this election, since surgery is usually performed in adulthood.

DR. MOSKOWITZ There is no question that orthognathic surgery is a procedure that should

be recommended in a modern orthodontic practice when indicated. The manner in which the orthodontist and oral and maxillofacial surgeon interact is critical to both facial and dental outcomes. We work closely with oral surgeons and take a more active role than merely referring the patient. We also receive referrals from oral and maxillofacial surgeons, as it is clearly recognized today by the surgeon how important the orthodontist's contribution can be to the overall surgical effort. Details as to the specific requirements of both the orthodontist and oral surgeon should be discussed prior to beginning treatment. What surgical procedures are contemplated and the critical presurgical orthodontic decompensations and other movements that need to be performed are important aspects of successful treatment. The only limiting factor in the future might be the reluctance of insurance companies to actually cover the surgeon's fee and hospital costs.

DR. SANDLER I suspect that in the future there will be increasing demand for this type of treatment, and as surgical techniques improve, it will probably be provided for less severe malocclusions, providing the high-standard result can be almost guaranteed. I think caring for joint orthognathic cases will become a larger part of the orthodontic training in the future.

DR. ALEXANDER We have been blessed with incredible maxillofacial surgeons very close to our office and have worked successfully with them over the years. I agree that this kind of combined treatment should get even more popular in the future as the public becomes more educated regarding its possibilities.

MR. VOGELS What do you see as your role in treating patients who need prosthetic replacements or cosmetic enhancements? How will these multidisciplinary fields develop in the future?

DR. GLENN I feel that my role is to work with the restorative dentist to align the teeth in the optimal position to make the prosthetic replacement or enhancement easier and more successful. Communication between the orthodontist and the

restorative dentist is very important in these cases. This is an area where digital records have greatly enhanced our communications.

DR. SANDLER As the adult market increases in the U.K., there is going to be an increasing role of the orthodontist in treatment of patients who require prosthetic replacement of teeth or cosmetic enhancements of the existing teeth. It is quite possible that orthodontists in the future may subspecialize as there becomes an increasing need for this kind of work.

DR. MOSKOWITZ I also believe the orthodontist's role in multidisciplinary treatment will increase in the future. The orthodontic specialty is far less insular than it was 30 years ago. Postgraduate training and continuing education courses stress our role as legitimate stakeholders in the overall esthetic effort of improving dental and facial esthetics in complex adult cases. Orthodontic education supports this view, as residents have a much keener sense of the periodontal, restorative, implant, and prosthodontic needs of our patients. My sense is that this enlightened path will continue, as we have earned the respect of dental colleagues due to our ability to see the big picture, as well as to expertly move teeth as might be required in complex dental rehabilitation treatment.

DR. ALEXANDER As orthodontics moves to a higher level, so do the other dental specialists. We love working with Pankey-educated prosthetic dentists. They can teach us many things. Often, our role is to be the quarterback in coordinating treatment plans and sequences, as well as educating other specialists so they can recognize potential future cases.

MR. VOGELS What percentage of your practice is devoted to adult care? Will more adults seek orthodontic treatment in the next decade, and if so, why? How will emerging technologies and treatment methods affect this trend?

DR. GLENN Only about 12% of my practice is adult, as my top referrers are the pediatric dentists in my area.

DR. SANDLER About 10-20% of my practice is devoted to adult care in the hospital in which I work. Many more adults are going to seek orthodontic treatment over the next 10 years as we in the U.K. slowly but surely follow the trends in the United States. Today, it is felt that the adult market is probably less than 5% of the total orthodontics practiced, whereas in the United States, I believe it is over 25%. Therefore, there is potentially an enormous increase in adult orthodontics over the next decade or so in the U.K., with the increasing availability and popularity of Invisalign techniques and ceramic brackets.

DR. CARRIERE Adult care occupies approximately 25% of our practice. The most frequent reasons for their seeking care are improved esthetics of the smile, a better facial profile, and a desire to have long-lasting masticatory function. In the next decade, new technologies that are biologically friendly and less conspicuous, and that shorten treatment time with ultralight forces, will promote even more demand in the adult population.

DR. ALEXANDER We have approximately 30% adult patients. We have always encouraged adult treatment and will continue to do so. The percentage may even increase in the future as older adults continue to take better care of themselves and want to look better as they age. Invisalign, lingual, and clear brackets will help make treatment more palatable. When dealing with extraction and mutilated adult cases, temporary anchorage devices will allow the orthodontist to produce much better results.

DR. REDMOND My Seattle practice is 98% adults. Many have been treated as teen-agers and relapsed, and I am retreating them with Invisalign. They are knowledgeable and unusually motivated, and most important, realize the absolute necessity of “lifetime” retention.

MR. VOGELS What other demographic changes do you see in orthodontic practices over the next decade?

DR. MOSKOWITZ Without question, the in-

crease in adult patients will continue. In many orthodontic practices, this increase has already occurred due to many factors, including a substantially more robust predoctoral orthodontic curriculum that stresses the inclusion rather than exclusion of orthodontic services for adults. But the explosion of technology with “invisible” appliances probably will account for a continued incentive for adult patients to seek orthodontic treatment.

DR. GLENN I feel that a more ethnically diverse patient population will seek orthodontic care. We will need to be more aware of ethnic and cultural norms and preferences.

DR. ALEXANDER In our practice, we continue to see more home-schooled and private-schooled children. The advantage of having been in practice for over 40 years is that our No. 1 referral source is probably second- and third-generation patients. Since we have kept our patient records, this is also a great opportunity to study long-term stability.

Retention

MR. VOGELS How do you see the long-term stability of cutting-edge techniques such as those we’ve discussed?

DR. REDMOND Long-term stability is a myth!

DR. SANDLER The quest for the “holy grail” of orthodontics—the “stable position of the lower labial segment”—is probably going to be a fruitless search. Certainly as the pendulum swings toward more and more nonextraction treatment, the amount of “orthodontic relapse” seen over the next decade is going to increase. With the increased use of self-ligating systems and Invisalign, I suspect there are going to be a lot of disappointed patients in the future unless they are willing to wear their removable retainers indefinitely.

DR. ALEXANDER If I have a particular expertise, it may be my studies on long-term stability.^{6-9,15,19,20} I believe that long-term stability is *not*

a myth! There are specific, evidence-based goals, which, if reached, will place the teeth in positions that can have long-term stability. Cutting-edge techniques can be stable *if* the orthodontist achieves these goals. The problem is that some of these techniques could be moving teeth in the wrong direction when the clinician ignores these goals. The bracket does not change biology.

DR. CARRIERE As in conventional orthodontic procedures, stability is more related to the individual characteristics of the treated malocclusion. Relapse is multifactorial, and it should be taken into consideration in the diagnostic and treatment-planning process.

DR. GLENN It is my feeling that, regardless of the technique used, expansion of mandibular intercanine width is not stable long-term.⁶ Long-term retention is especially critical in cases that violate this principle.

MR. VOGELS What is your usual retention regimen? What new retention devices or techniques hold promise?

DR. MOSKOWITZ Admittedly, retention is a major problem in orthodontics. You would think that it would be addressed a bit more seriously and less casually than it tends to be in both private practice and orthodontic residency programs. Our usual retention regimen begins with a reexamination of the pretreatment malocclusion. It is obvious that if you had severe mandibular incisor crowding, this particular area is going to need some special considerations. For whatever reasons, stability in this area is most problematic. We use a lot of lower lingual canine-to-canine bonded retainers. The overall benefits of such retention (at least in our opinion) greatly outweigh the disadvantages. Some of these disadvantages include the ethical responsibility of following post-orthodontic patients more formally and for longer periods of time. This might represent a management issue in some practices. We discuss this aspect of orthodontic treatment up front, and we charge fees (although nominal) for retention visits. Naturally, oral hygiene considerations might rep-

resent another potential disadvantage.

Adult treatment should routinely and critically evaluate the level of supporting alveolar bone. Such cases will frequently demonstrate relapse. Pretreatment severely rotated anterior teeth also represent some special problems in post-treatment retention. While fiberotomies have been shown to be helpful for this particular problem, I wonder how many of us actually prescribe such procedures today, and if so, how many patients accept this soft-tissue surgical procedure.

DR. SANDLER My usual retention regimen is removable, thin, clear vacuum-formed Essix retainers worn on a night-time only basis for the first 12 months and for alternate nights the second 12 months, and then reducing to one night a week over the third 12-month period. At the end of three years of retention, I ask the patient to continue wearing the appliances one night a week if they wish their teeth to remain straight. As the patients get into their late teens and early 20s, they have more important things in life going on than the continued long-term wearing of removable retainers; therefore, during their 20s a certain amount of tooth movement will almost certainly occur.

DR. REDMOND Lifetime retention is my usual routine. I use both fixed and removable appliances.

DR. GLENN For the maxillary arch, I usually use a removable wraparound retainer. For the mandibular arch, I use either a fixed canine-to-canine retainer or a removable Hawley retainer. For removable retainers, I recommend full-time wear for the first year, then night-time wear after that. I like for the teeth to occlude during retention to allow the teeth to settle into a final occlusion after debonding.

DR. ALEXANDER We feel very comfortable with our present regimen. A maxillary wrap-around circumferential retainer is worn at night only from the beginning—every night for one year, then as needed. There are no wires crossing the occlusal surfaces; therefore, the posterior teeth can continue to have “vertical driftodontics” and improve the occlusion. Bonding the

upper 2-2 works well in some cases, rather than removable retainers.

In the mandibular arch, an .0215" multi-stranded wire is bonded on the lingual of the six anterior teeth. This is worn until the wisdom teeth are "resolved" (extracted or erupted) and all growth is completed. When the 3-3 retainer is removed, interproximal enamel reduction is performed. If the mandibular incisor roots are spread, IMPA has been controlled, and the cuspids have not been expanded excessively, the chances for long-term stability are good.

DR. CARRIERE After treatment, our cases are put on "activable retention". We use a maxillary upper plate with passive adapted lingual springs, which can be activated, in the anterior segment. In the mandible, we use a hybrid of a Crozat appliance with acrylic buttons on the molars to support the wires; it is passive, but it can be activated if needed.

DR. MOSKOWITZ I began answering this question with the statement that our retention protocol begins with a reexamination of the original malocclusion. To amplify this point a bit further, let me say that retention considerations really begin (or at least should begin) at the time that the orthodontist is developing a diagnosis and treatment plan. Most experienced orthodontists should be able to anticipate most retention issues prior to the actual orthodontic treatment.

I see the problem of retention remaining with us for quite some time, and I do not see any new types of retention devices on the horizon that hold any promise for any one of us. As someone once said, "Retention is more than just *a* problem in orthodontics, it is *the* problem in orthodontics". When we finally learn where teeth are best suited to be repositioned in our individual patients, we will then first begin to resolve the problem of retention. Until then, our retention devices are like the little boy with his finger in the dike: trying to prevent the inevitable.

MR. VOGELS What do you see as the future of long-term patient management?

DR. CARRIERE Body structures and the stomatognathic system, treated orthodontically or not, undergo changes throughout life. The fact is that life expectancy has increased in the present generation. The attitude of patients has to change in terms of developing the maintenance habits to promote good health for a longer time. This also applies to teeth. We propose to our patients to continue with the maintenance of orthodontic results after the retention period with the "activable retention". After two years of wearing retainers, we request them to wear the retainers once a week, to check for any changes. This is long-term patient management, but this maintenance can detect any influence of deleterious habits or a relapse tendency when it is still possible to recover.

DR. GLENN I think that long-term retention will continue to be important for successful orthodontic results. Patients need to be educated to the fact that teeth may shift throughout their life, whether they have had orthodontic treatment or not.²¹ Retainers are the key to keeping post-treatment changes to a minimum.

DR. ALEXANDER "Lifetime retention" is a popular phrase today in orthodontics. If anterior "expansion" continues to be in style, there will be many opportunities for lifetime retention or retreatment of former patients in the future. The unanswered question is the long-term periodontal health in the area where teeth have been proclined, expanded excessively, and held in that position over a long period of time. If we focus on achieving certain guidelines for stability during treatment, then stability should not be a major issue in most cases. Of the 15,000 patients we've treated over the years in our office, less than a dozen still return for long-term retainer checks, and these are former adult patients.

DR. SANDLER The future of long-term patient management will be getting the patients used to the idea that their teeth will be straight at the end of treatment and as long as they are willing to wear their retainers on a part-time basis. The idea of a second and even third course of treatment during a

lifetime should be discussed with them before the initial course of treatment is undertaken.

DR. MOSKOWITZ In addition, the future of long-term patient management will rely upon a tremendous shift in orthodontic philosophy as taught in our residency programs, practiced in our offices, and espoused by the practice-management gurus. It will ultimately depend upon the degree that we, as health-care practitioners, are willing to educate our patients, so that realistic patient expectations are established early in orthodontic treatment and extend throughout the retention phase. It is also related to both clinician and patient accountability as well as more complete discussions of the risks, benefits, and limitations of orthodontic treatment. Orthodontists tend to perform their consultations in “poetry” and then treat in “prose”. Perhaps a little less preoccupation with the glitz of marketing and more of an emphasis on patient education as to the true nature of our services would serve as useful goals if we are going to establish longstanding relationships with our patients—the very same patients that will refer other patients to our practices.

Patients should understand that undergoing orthodontic treatment is a long-term commitment, not unlike other forms of cosmetic services that require maintenance and/or revisions from time to time. Appropriate and justifiable fees for follow-up radiographs and maintenance of our treatment outcomes should be established for this long-term (and in many cases, life-long) service called orthodontics. Orthodontists who continue to compete on fee alone have probably done themselves, their patients, and the orthodontic specialty a tremendous disservice. Retention, in my opinion, and long-term management of our patients are the “forgotten phase” of orthodontic treatment. My views on this subject, I hope, will not be perceived as elitist, but rather as more of an ethical imperative for all of us.

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