opinion
The role of 3-D imaging systems in present orthodontics

case report
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Dear Reader,

Dentistry willingly embraces new technologies, digital imaging, 3-D treatment planning, CAD/CAM, 3-D printing, innovative materials, we can find them all in dental offices.

In the wild and wonderful world of technology, there is always a new trending topic. Right now, it seems that 4-D printing has become the hot new issue. Dr Sherif Kandil, experienced orthodontist, CEO of K Line Europe, believes that in close future the 4-D technology will change medicine in general and orthodontics in particular. In this issue of ortho magazine, we publish an interview in which Dr Kandil explains what this new technology is and how it can be used. ‘In orthodontics, we will be able to provide patients a much more precise treatment that exactly meets their needs through customising the clear aligners or the orthodontic wire to change its shape when placed in the oral cavity to the requested final result. So it is crafting the final result with much more precision and with a smaller amount of clear aligners or wires so that only 1–2 aligners or 1–2 orthodontic wires are needed for the whole treatment’, he says. Kandil envisions the 4-D technology entering the market in 2019 and change many applied current treatment concepts in orthodontics.

Aligner therapy is one of the fastest growing areas in orthodontics, this relatively new treatment method gained its popularity as an alternative to fixed appliances for tooth straightening. We can expect that the aligner market will advance and this development will be based on science, experience and new technology like 4-D printing.

However, aligner therapy has its limits, e.g. skeletal discrepancies that are normally treated with a combination of surgery and orthodontics. Yet, many patients refuse the option of maxillofacial surgery for many reasons and remain as they are. With the Carriere Motion Appliance—a new approach, developed by Dr Luis Carrière—orthodontists can provide a minimally invasive treatment even to more complicated cases. Inside this ortho magazine you will find a very well documented case report describing this new approach.

I hope you will find this year’s first issue informative and enjoy all new techniques we would like to make you familiar with.

Yours faithfully,

Magda Wojtkiewicz
Managing Editor
Dear Reader
Magda Wojtkiewicz, Managing Editor

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Taking on work in progress in practice transaction

**Author:** Amanda Maskery

When purchasing a practice, among the many factors clinicians need to consider is the situation regarding work in progress (WIP), an area that can be particularly complex in finalising the details of the transaction. Ongoing work that has not yet been completed, though it will have been at least partly paid for, could well take up a significant proportion of one’s capacity in the early stages of ownership, so it is vital to know exactly what one is taking on. Furthermore, from the outset, buyers will need to be clear about the level of WIP against any payments already received, as well as the payments outstanding.

From the seller’s point of view, it is therefore important that an up-to-date list of WIP be kept in the run-up to completion. The situation is easier regarding WIP if the seller is remaining with the practice, but if exiting completely, then careful determination of exactly what is to be inherited needs to be made at the earliest point. It also needs to be set out in the sale agreement the terms on which the buyer can claim fees for the work.

Some WIP will have been partly paid for by the time the transaction is completed, but there must be a consideration of how that will be structured. For example, if 75 per cent of the fees for the WIP have been paid by the patient, but only 50 per cent of the work carried out by seller, it must be determined whether the buyer will keep the 25 per cent balance or whether this will remain with the seller at completion.

In many situations, the buyer will be able to claim a proportion of money in respect of the percentage of work he or she will be carrying out to complete the treatment. However, in other circumstances, a decision may be made not to pursue this. It could be deemed that cases paid up at the outset or partly paid and those paid at the end of treatment will balance out at completion, rather than carrying out complex calculations on each piece of WIP.

WIP can indeed be a complex area, so it is important that all parties involved in the transaction sit down and work through an up-to-date list of WIP shortly before completion and work out exactly what is happening with each piece of unfinished work. A carefully drafted sale agreement is extremely important in this scenario, and consulting specialist dental advisers is strongly recommended.

Both the seller and buyer need clarity on how WIP will be transferred and who will retain what percentage of fees. Establishing this will enable a smooth transaction to the benefit of the business and patients alike.

**contact**

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3M Oral Care
My complete conversion

London lingual orthodontics provider Dr Asif Chatoo describes his navigation of digital technology

Author: Dr Asif Chatoo

My professional journey has no end or destination. If I ever felt satisfied by one system and I applied it in the same way without acquiring new knowledge or discovering more advanced technologies and materials, I would consider myself ready for retirement, which I am certainly not.

My voyage through digital technology, however, has just reached a natural conclusion. I realised recently that I had progressed through all aspects of digital technology as it relates to orthodontic treatment and I had completed a circle (Fig. 1).

My journey started with photography some years ago, but the process accelerated, and in recent years, everything has gone digital, including radiography, record-taking, treatment planning, and the manufacture of brackets and wires.

Over the course of my digital conversion, I have tried several different systems, all of which have delivered important benefits. The system I have used most as I completed the digital circle over the last two years is suresmile (OraMetrix). It is a treatment management system and among its benefits...
Digital technology in dental practice

opinion

is that I am able to provide a highly customised service in a shorter space of time, saving on average six months of treatment time per patient.

I have had a digital scanner for some time, but this month I acquired an updated 3Shape TRIOS scanner. It is extremely fast and allows my team to take completely accurate and detailed records of patients’ upper and lower arches. In the past, the process took half an hour, but now it is immediate. Adult patients are particularly grateful not to have impressions taken, and the orthodontic nurses are delighted to avoid this most trying aspect of record-taking. It was invariably messy. Being impression-free has brought more value to the team than going paperless.

It goes without saying that a key benefit of digital technology is the integration of the orthodontic processes and records. For instance, a scan of the patient’s teeth can be superimposed on to a photograph, which I can in turn integrate with a grid. I can relate the tooth positions to facial planes and check that the dental midline is centrally located. I can show the patient his or her teeth and bite and I can provide him or her with a visual simulation of the difference that treatment will make. The patient can then ask questions. My vision for the finished result may not be the patient’s vision and being able to manipulate the outcome on screen means one can be absolutely sure the patient understands the treatment planning. The patient can influence the treatment if he or she wishes, and if he or she changes his or her mind towards the end, the technology allows for last-minute nuancing.

“Being impression-free has brought more value to the team than going paperless.”

In my case, there is one that surpasses all others. Bending archwires at the end of treatment is almost always inevitable and it is an aspect I dread. Why am I so hung up on this? The reason is that, if one bends a wire on one tooth, one will affect all the other teeth. This will increase the chairside time. The solution is the robotic wire bending that is central to suresmile.

I aim to deliver several things to my patients: an aesthetic result, a functional occlusion and an occlusion that is comfortable at rest. More than anything, I want them to be wowed by their experience. I believe suresmile delivers that wow factor.

I have gone 360 degrees and am now fully digital, but this is only the first navigation of new and evolving technology. My orthodontic journey continues and I suspect a few more digital revolutions await.

contact

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The role of 3-D imaging systems in present orthodontics

Author: Dr Enrique González García, Mexico

Abstract

Traditionally, the diagnosis in orthodontics gives a lot of importance to cephalometry and the analysis of the dental casts. The development of new technologies does not intend to discard traditional concepts, in fact, it intends to provide more information allowing a wider approach of our patients and resulting in a more thorough diagnosis.

Introduction

Adapting to new three-dimensional concepts is not an easy task and is even harder considering that the information is so vast that it can result overwhelming. That is why when evaluating a patient for orthodontic treatment, it is intended to use a systematic method so that we can obtain the most essential information that these methods provide.

The method consists of the following:

- Coronal, sagittal and axial general visualisation
- Teeth and surrounding structures
- Airways and paranasal sinuses
- Soft tissues
- Temporomandibular joint (TMJ)

General visualisations

To perform a general exploration, it is necessary to know the three anatomical planes: coronal plane, sagittal plane and axial plane.
Coronal plane (Figs. 1 & 2)

The coronal plane is located in the anterior part of the face, approximately parallel to the buccal surfaces of the anterior teeth. It divides the skull in two; anterior and posterior. Structures can be seen from back to front or front to back.

Sagittal plane (Figs. 3 & 4)

The sagittal plane divides the skull in two symmetrical parts. Has a transversal orientation allowing examining two segments: right and left.

Axial plane (Figs. 5 & 6)

The axial plane is parallel to the floor and the occlusal plane. It divides the skull in two equal parts: superior and inferior, allowing the view of structures from top to bottom and bottom to top. The overview of these three anatomical planes should give the specialist a complete exploration of the 3-D anatomy. The result is a deeper knowledge of the anatomy of the patient or, like in some cases, a number of findings that might result in the modification of our treatment plan.

Teeth and surrounding bone structures

For obvious reasons, one of the main areas to check is the dental zone. Images that allow to check the teeth that are present and the ones in process of eruption, if that is the case, should be generated. As well as the characteristics of the adjacent bone and even take some numeric references.

Airways and paranasal sinuses

Breathing is the foundation of life. CBCT scans offer a precise visual of the airways and surrounding craniofacial structures that influence them, such as the mandible, palate, paranasal sinuses, facial relations, adenoid tissue, tonsils and more.

This view of the airway completely changes the perception of the specialist and, most important, the life of the patients.

Soft tissues

The evaluation of the soft tissues in a three-dimensional system and without magnification is ideal for the orthodontist because he/she, can now evaluate the patient fully with one exam, completely changing his perspective. Previously, with 2-D images we only had the possibility of making an unilateral evaluation of the skull and structures unless, of course, several X-rays were taken and complementary analysis in each of them. The other option was performing photographic analysis to see the facial aesthetic from different photographic angles and requiring a major number of shots that surely resulted difficult for the patient. The diagnostic evaluation with 3-D systems allows in one exam to evaluate the patient from the angles necessary as well as evaluating the soft- and hard-tissues resulting visually stunning and attractive for the patient, being this extremely positive considering that the patient has a better understanding of his/her aesthetic problems and how the specialist will proceed to eliminate them.
Temporomandibular joint

The TMJ is, by definition, a ginglymus diarthrodial complex joint. This complexity is reflected in the knowledge and importance that each professional gives it. There are a number of specialists for who the TMJ is remote from the teeth and does not interfere with orthodontic treatment. On the extreme opposite side, for the other group of specialists, the TMJ is the foundation on where they base all their treatments. Whichever concept the doctor has on this, the evaluation of the TMJ should be included in the diagnosis.

Conclusion

The specialist cannot be unaware of the constant advances in technology. Of course, these developments have to be taken in moderation and with responsibility because it does not substitute the knowledge acquired during ones professional training and even less the experience obtained from treating patients. Needless to say, an effort is required for the training and understanding of these new systems but such systems are every time easier and perceptibles and the quality, quantity and usefulness of the information it generates is unquestionable.

It is important to remember the concept that we are healthcare providers and our goal is more than to just straighten teeth. Therefore, it is mandatory to diagnose our patients fully and when necessary, seek consultation from other specialists, since nowadays a great number of our patients require multidisciplinary treatments.

Acknowledgement

The author would like to thank the Group Cedirama Digital, for their constant support in the realisation of the exams and software managing; especially to Elie Matta Haddad, BBA._

about

Dr Enrique González García

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 cunningly superimposed on the surface of the gum.}

**Immunochemistry**

This new approach allows for a deeper understanding of the immune response in dental tissues. By using advanced imaging techniques and antibodies specific to immune cell markers, researchers can visualize and quantify the interactions between the immune system and the oral cavity. This information is crucial for developing targeted therapies for oral infections and inflammatory diseases.

**Conclusion**

In summary, the study emphasizes the importance of bridging the gap between basic and clinical research in dentistry. By integrating advanced imaging technologies with molecular profiling, the field of oral health is poised for significant advancements in the near future. This interdisciplinary approach not only enhances our understanding of the underlying mechanisms of oral diseases but also opens new avenues for treatment and prevention.
“In the not so distant future, half of all treatments will be done with aligners”

An interview with Dr Sam Daher, Canada

Vancouver orthodontist Dr Sam Daher is one of the world’s leading experts in clear aligner treatment. Having performed more than 4,000 treatments with Invisalign, he currently runs two practices entirely specialised in this treatment modality in addition to his other four clinics. At the last year’s British Orthodontic Conference (BOC) in Brighton in the UK, where he presented a paper on open-bite treatment with clear aligners, Dental Tribune International had the opportunity to speak with him about the benefits of digital technology, the future of clear aligners in general and his business model.

Dr Daher, this is the first time you have spoken at the BOC. How was your presentation received?

Dr Sam Daher: I have never been to the BOC, but I have spoken in London many times before. I can recall my first talk to a UK audience a couple of years ago. Back then, the interest in Invisalign was not what it is today, perhaps owing to a lack of faith in the system. Today, far more experience has been gleaned and we have seen much better results with it, so there is generally more interest from specialists. The attendance of my lecture here in Brighton was amazing. There is clearly much interest and far greater acceptance than before. Also, the questions posed were far more genuine.

Your presentation in Brighton focused on open-bite treatment with clear aligners. Could you summarise some of your key points for our readers?

One of the main advantages of clear aligners is that with them we can control the vertical dimension. One of the worst things we can do in open-bite treatment is to allow the posterior teeth to push through. With clear aligners, we do not only prevent the posterior teeth from extruding, but actually intrude them a little, when needed, allowing us to control the vertical dimension and close the anterior open bite at a much faster rate than with any other fixed appliance as a matter of fact. Thus, what I aim for is to intrude the posterior teeth when there is already an anterior open bite. With both an anterior and posterior open bite, we create a mandible that simply autorotates and that will help close the anterior open bite.

ClinCheck and digital scanning have advanced clear aligner treatment. What impact have they had on digital technology in the field?

I have been using scanners for six years and have not taken one conventional impression since then. The first thing one notices when one starts using scanners is that aligners adapt so much better to the teeth because the scan is far more accurate. Second, it allows for an improved patient experience. Using polyvinyl siloxane material is always a hassle and a discomfort for the patient if the material gets into the mouth. Using scanners saves a great deal of time and is more comfortable for the patient.

Furthermore, with ClinCheck, which provides 3-D treatment planning, I am able to plan different approaches and then decide for myself. If I am still not certain, I can show the patient what each treatment outcome will look like and then let him or her decide. This way, it becomes an educational tool that can enhance patient compliance.

Aligner treatment is not without its critics. Is there any justification for this, in your opinion?

The aligner market has actually advanced quite a bit and this development is based on science, technology and experience. Aligners are custom made and that alone should be enough to elicit a positive response to aligners. What I personally like about this treatment modality is that the aligners do not apply a great deal of force, maybe 10, 20 or 30 grams. Research has shown that this is the optimal amount...
of force; strong forces are not actually needed. Also, the clinical achievement is really in the hands of the orthodontist. There is very little downside to this as far as I am concerned.

There are certain shortfalls. For example, patient compliance and sometimes teeth do not move as one intended, but that happens with fixed braces too.

What was obvious in Brighton is that orthodontics is at a crossroads. What role will clear aligners play in the future, in your opinion?

I believe—and I said that already five years ago—that in ten to 20 years, a much larger portion of our patients will be treated with aligners as opposed to fixed braces. Braces have allowed us to understand the biomechanics very well and aligners just take that same knowledge and apply it to invisible aligners.

The future role of clear aligners is also determined by patients asking for this treatment. Dentists not yet using aligners have had to learn this treatment modality and quickly. Thus, its role is definitely defined by a combination of technology improving quite nicely and patients requesting it as an aesthetic treatment modality, for example. I am sure that in the not so distant future half of all treatments will be done with aligners.

Where would you personally like to see aligner treatment heading in the future?

I think aligner suppliers need to provide auxiliaries as part of their systems too. At present, we obtain aligners from one company, but have to go elsewhere to obtain the elastics and mini-screws etc. In a few years, companies will hopefully offer a comprehensive package to allow dentists to plan much ahead of time.

Another area where clinicians could benefit is being able to use different materials for the start and the end of treatment—just like in conventional orthodontic treatment where we use NiTi at the start of treatment and stainless steel at the end. However, there is a great deal of improvement in this regard already.

You run two practices entirely focused on aligner treatment. What advice would you give a clinician who would like to switch to that business model?

It is important to first acquire the necessary clinical skills and become really comfortable using aligners. Treatment with aligners is not necessarily difficult, but it is a bit different, so it is necessary to become acquainted with it. The way to attain confidence is to treat enough patients—my guess is 1,000 or so. Once the clinician has become comfortable working with aligners, he or she can start thinking about switching.

Thank you very much for the interview.
The concept of clear aligners has grown in leaps and bounds internationally since the introduction of Invisalign (Align Technology) in 1999. In the 1940s, Dr Harold Kesling first proposed the original theoretical basis for moving teeth with a series of retainers, but it took more than 50 years before computer technology made the idea workable.

Although some of the initial excitement attending the idea that all patients could be treated without metal-fixed orthodontic appliances wore off quickly, early adopters and innovators have worked diligently to improve and enhance clear aligner methods. Limitations of clear aligner treatment simply required some time and experience to discover, but ultimately resulted in a series of articles quantifying issues often experienced clinically.1–16

As patients’ and practitioners’ desires for aesthetic alternatives to fixed appliances continued to coalesce in the past decade, there have been a number of technological and biomechanical advancements that have led to an ever-increasing number of treatment application possibilities for aligners, including the expansion to treating teenagers.17, 18 In those endeavours, a series of articles were published suggesting innovative treatment options with various adjuncts to clear aligners,19–21 including Hu-Friedy’s Clear Collection instruments (Fig. 1).22–24

**Fig. 1:** The Hu-Friedy Clear Collection consists of four instruments: the TEAR DROP, HOLE PUNCH, VERTICAL, and HORIZONTAL. — **Figs. 2a–c:** The TEAR DROP is designed to cut a teardrop-shaped notch in the margin of clear aligners to retain orthodontic elastics for various applications. — **Fig. 3:** Class II clear aligner treatment enhanced with Class II inter-maxillary elastics and Class I intra-maxillary elastics attached to mini-screw anchors to produce the intended vectors of force. — **Figs. 4a & b:** The HOLE PUNCH is used to cut a half-moon of plastic at the aligner margin to clear the way for bonded buttons or brackets in order to connect orthodontic elastics or elastomeric chains. — **Fig. 5:** Seating elastics used to improve posterior intercuspation in finishing aligner treatment. The HOLE PUNCH cleared plastic to permit bonding of buttons for the inter-maxillary box elastics.
Clear Collection

As understanding of some of the limitations of clear aligner applications came to light, alterations to biomechanics, materials and treatment planning were introduced. The primary aims were to improve the predictability of specific tooth movements and to expand the scope of treatment to a wider variety of presenting malocclusions.

A set of instruments were created specifically for clear aligners in order to enhance, accent and increase the spectrum of applicability and acceptability of this form of aesthetic orthodontic treatment. The Clear Collection consists of four instruments designed to individualise aligners to address specific treatment needs.23–24

The TEAR DROP

The TEAR DROP instrument is used to add a notch or hook in the gingival margin of aligner plastic for the application of typical orthodontic elastics.19–21, 23 The design of this cut-out is in the shape of a teardrop with the intent that the reservoir of the notch will keep an elastic in place on the aligner (Figs. 2a–c). In this manner, the aligner with elastics can be inserted into the mouth, reducing the fumbling and difficulty associated with attempting to put elastics into slits or notches after the aligner tray is already on the teeth. The TEAR DROP cuts can be made anywhere along the aligner tray edges where elastics may be needed, such as inter-maxillary Class II, Class III or delta, or Class I intra-maxillary applications, even involving the use of mini-screw anchors to support the elastic forces (Fig. 3).19, 21, 23

The HOLE PUNCH

The HOLE PUNCH instrument is used to create a half-moon cut-out at the gingival margin of aligner plastic (Figs. 4a & b).19–21, 23 The intention is to relieve the plastic to permit the application of bonded buttons or brackets on specific teeth to support orthodontic elastics or chains. These cuts can be placed wherever needed along the aligners on either buccal or lingual surfaces. A common scenario would be punching holes in the buccal margin of plastic at the maxillary and mandibular first molars and canines to bond buttons to support seating or box elastics (Fig. 5)23 or cutting a half-moon on both the lingual surface of the maxillary first molar and buccal surface of the mandibular first molar to facilitate the use of a through-the-bite cross-bite elastic.

In addition, the HOLE PUNCH may be employed to simply clear plastic away from impinging gingival tissue anywhere along the aligners.23 The incisive papilla is a common location for this type of irritation that can be quickly resolved by clipping the plastic in that area for each tray in a series (Figs. 6a & b).

Individualising aligners with accent pliers

Two accent pliers round out the Clear Collection. These unique instruments were designed to enhance specific types of tooth movement by increasing plastic contact points in precise locations for individual teeth. The intent is to increase the predictability of tooth movements by creating shallow indents in the plastic to augment prescribed mechanical couples. Most importantly, these pliers are not heated. In addition, these indents may be produced to increase the retentiveness of aligners or clear retainers in undercuts and at line angles.
Controlled rotations of teeth are often difficult to achieve with aligners, as the computer-generated prescribed movement may not be translated accurately to the tooth. The first of the two accent pliers is called the VERTICAL and it is used to gently impress a vertical indent into the aligners in a specific location in the lingual and/or facial plastic for an individual tooth. Rotating maxillary lateral incisors and canines are often sites of these types of problems. As an example, the rotated lateral incisors in Class II Division 2 malocclusions are difficult to correct and typically require that overcorrection be designed into the aligners at the outset. If additional rotation is indicated, an indent can be placed in the plastic at the mesial line angle on the facial surface and the distal line angle on the lingual surface to create some extra force in the form of a rotational couple in a series of aligners. This may preclude the necessity of another round of refinement appliances to achieve the intended goal. If a composite attachment is in place on a specific tooth, the VERTICAL can be used at the right-angle contact of the aligner and the composite.

Figs. 11a & b: Chewies Aligner Tray Seaters were developed as a kind of mini-tooth positioner for patients to clench in specific sites to encourage trays to seat and reduce the development of aligner lag.

The VERTICAL

Figs. 10a & b: Chewies Aligner Tray Seaters were developed as a kind of mini-tooth positioner for patients to clench in specific sites to encourage trays to seat and reduce the development of aligner lag.

The VERTICAL

Figs. 12a–d: Bootstrap mechanics are designed to extrude individual teeth into clear aligners with orthodontic elastics. (a & b) The HOLE PUNCH is used to cut out a half-moon clearance for a bonded button on the lingual surface of a selected tooth. (c) The TEAR DROP is used to place two elastic notches in the facial margin of the aligner at both the mesial and distal gingival embrasures. An elastic is then stretched from the dual notches, over the aligner, to the lingual button to generate an extrusive force. (d) A second option is to cut a second half-moon in the facial surface, bond a labial button and place the elastic from the labial to lingual surfaces over the aligner. — Fig. 13: A Clear Collection prescription form is completed for each patient to indicate the instruments that will be required to customise each aligner in a series, along with the specific sites where they will be employed on each tooth.
ite to sharpen the contact point in that location for more efficient transmission of force to the tooth (Fig. 8).

The HORIZONTAL

The second accent instrument is the HORIZONTAL19–21, 24 and it is primarily used to produce an indent to affect a change in tooth root rotation or torque.18, 24, 28, 29 A horizontal impression into the plastic at the gingival margin of the aligners will emphasise the force applied to torque the roots of individual teeth (Fig. 9a). These horizontal indents can also be placed at the right-angle junction of a composite attachment and the tooth to enhance the contact, thereby increasing the effectiveness of the intended tooth movement and reducing the risk of lag as the plastic may slip away. Another option is to place horizontal indents at the marginal undercuts of the crown of the teeth to increase the retentiveness of aligners or retainers (Fig. 9b).

Common applications: Beating aligner lag and bootstrap mechanics

Besides facilitating the typical addition of inter-maxillary elastics for a variety of anchorage supports for tooth movement or intention to alter dentoalveolar compensation (i.e. Class II, Class III, resolving deep and open bites, extraction space closure, etc.19–24, 30–34), a common application for the TEAR DROP and the HOLE PUNCH is establishing bootstrap mechanics.20, 23 For instance, a tooth or teeth may be lagging behind the prescribed movement, especially in terms of extrusion—the tooth may not be following along the projected path (Fig. 10). This may be due to inadequate space created adjacent to each side of the tooth or lack of adequate contact on the tooth or attachment. Initially, Chewies Aligner Tray Seaters20, 23, 35 (another of our creations from our private practice; DENTSPLY Raintree Essix) are routinely used at each new aligner to assist in seating them on to the teeth (Fig. 11a), along with instructions to massage the trays into place (use fingers to push the trays on to the teeth as though attempting to stretch them over attachments and undercuts for the first few days). Despite those efforts, an air gap between the incisal edge of the teeth and the plastic may develop (Fig. 11b). It may be that inadequate space has been created prior to extrusion and the interproximal contacts thus cannot pass by each other (consider the widening taper towards the anterior incisal edges) and aligner lag or lack of tracking is the result.

In these instances or in anticipation thereof, a bootstrap set-up is prepared.20, 23 This consists of placing bonded buttons on the lingual surface of the offending tooth near the gingival margin by creating clearance for the button in the aligner plastic with the HOLE PUNCH (Figs. 12a & b). On the facial surface of the same tooth there are two options: another button and a hole punch (Fig. 12c). The TEAR DROP is used to create two elastic notches at the mesial and distal gingival embrasure spaces (Fig. 12d). A small-diameter orthodontic elastic is then applied to either the teardrop notches or the button on the facial surface of the tooth and stretched over the occlusal surface of the aligner to the lingual button. In this scenario, the elastic is intended to more predictably extrude the tooth into the aligner to the prescribed position.

Future view on aligners

As demand by patients for more comfortable, hygienic and aesthetic treatments increases, the clear aligner market will respond with more advances and alternatives. In addition, orthodontists will learn to better push the envelope of applications by adding adjuncts to improve the effectiveness and ultimately the predictability of treatments with aligners. Much like fixed appliances, the ability to individualise, accent and enhance clear aligner biomechanics reduces the known limitations of aligners and the associated clinical frustrations of the orthodontist. Managing alterations of series of aligner trays in real time (including the use of a Clear Collection prescription form;24 Fig. 13) provides increased flexibility in the endeavour towards increased predictability of aligner orthodontic outcomes.

More details on the Clear Collection, treatment applications, downloadable publications (including the Clear Collection prescription form) and a series of instructional videos can be found on the Hu-Friedy website.

Editorial note: A list of references is available from the publisher.

contact

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Widening the scope of aligner application: A case report

Authors: Drs Gurkeerat Singh, Sherif Kandil & Aswathy Menon, India & Germany

Introduction

Over the last two decades, extensive research has been carried out to alleviate the two major shortcomings of orthodontic treatment: visibility and duration.

In order to decrease treatment duration, three methods have been proposed: chemical-led interactions, surgery, and device-assisted therapies. The chemical-led interactions require further research to be accepted as routine methods and the surgical methods are found to be invasive and rarely acceptable to the patient. A simpler and less invasive method is the use of micro-osteoperforation, which increases the local inflammatory response, promotes osteoclastogenesis and leads to faster tooth movement through the bone. This process has been proven to be safe and repeatable and well tolerated and accepted by patients.

Deepbites are difficult to treat using aligners and often lead to prolonged treatment time. To facilitate this movement, Invisalign uses attachments on the premolars for anchorage, while an active intrusive force is placed on the incisors as well as bite ramps built into the lingual of the aligner of the upper anterior teeth that act as a bite plane; as yet no data exist on the effectiveness of these auxiliaries. Active intrusion can be facilitated with TADs.
Even though aligners might be the most aesthetic, hygienic, as well as acceptable treatment modalities available with the orthodontist, a decrease in treatment time is often desired by the adult patient. A case report is presented with the combined short-term use of bonded appliances, TADs combined with clear aligners from K Line Europe GmbH, Düsseldorf, Germany (K Clear) for an aesthetically conscious patient.

Case report

A 24-year-old male patient presented to the practice with a chief complaint of overlapping front teeth. As a model he wanted to avoid the use of bonded appliances. On examination, he presented with Class II features with the maxillary lateral incisors labially inclined and palatally inclined, supraerupted maxillary central incisors with a resultant 100% deep bite (Figs. 1a–h). He had an impacted mandibular incisor along with another incisor congenitally missing. The patient insisted on getting only the upper arch treated in the shortest time possible with an aesthetic appliance, as he had a modelling assignment starting in 4 months!

Treatment procedure

Keeping the patient’s professional commitments and the limitation of aligner therapy in mind it was decided to place a fixed bonded appliance for a short duration, along with TADs placed between the maxillary central and lateral incisors bilaterally for intrusion of anterior teeth (Figs. 2a–d). Force systems to achieve intrusion of the incisors to be in force from day 1 for a duration of 3–4 months (Figs. 3a–d) and subsequently to shift him to K Clear for residual bite opening, space closure and final finishing. Attachments on the maxillary first molar and premolars, bilaterally were provided to provide better retention to the aligners. The K Clear aligners were placed for 5 months (Figs. 4a–d). At the end of active treatment, retainer was bonded from canine to canine in upper arch (Figs. 5a & b). Additionally, the patient was provided an Essix retainer for night time wear. The patient is in retention for the past 1 year and the occlusion as well as other movements achieved are stable (Figs. 6a–d).

Discussion

The presented case involves three major aspects of orthodontic treatment, from a patient’s perspective, aesthetics and duration of active treatment and, from a clinician’s perspective, the control of planned tooth movement. Any clinician who has had the opportunity to work with traditional pre-adjusted appliances as well as aligners understands the pros and cons of both appliance systems. It is this recognition of limitations that propels us as clinicians to seek better appliances in order to deliver treatment results in the best interest of our patients. The aim of orthodontic therapy ought to include words such as ‘in the least amount of time’. It has been postulated by Nicozisis6 that aligners can be changed as frequently as 3–4 days when micro-ossteoperforations are used along with aligner therapy to initiate the RAP phenomenon. The use of TADs not only provides the means of stable anchorage to apply forces from an ideal location avoiding any untoward movement, but also cause a local insult leading to an inflammatory response.

This case was started with a pre-adjusted bonded appliance along with the use of TADs placed close to the teeth requiring intrusion. When used in this manner, the flexible NiTi wires cause alignment and the vertical forces generated lead to intrusion and

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Fig. 1a Fig. 1b Fig. 1c Fig. 1d Fig. 1e Fig. 1f Fig. 1g Fig. 1h
flaring of the incisor teeth. Since TADs also cause trauma, a RAP phenomenon is generated, which causes an increase in the rate of tooth movement. The bite opening led to the increase in the upper incisor to NA from 12 degrees to 22 degrees (Figs. 7a & b). This led to minor spacing appearing between the anteriors. Clear aligners have been shown to provide good control where tipping movements are used and such controlled movements led to a near ideal finish for this case. The K Clear appliance was selected in this case based upon the variable thickness used to achieve different movements in a predictable manner and our experience with it.

A bonded retainer is a must for all adult cases. A 0.175" coaxial wire was used for this purpose and bonded to all incisors individually. Retroclined incisors have a high tendency to relapse, especially when not supported by the mandibular incisors, hence the night time use of a K Clear retainer. The settling in this case was excellent and that sometimes is one of the pitfalls of treating cases with aligners.
Conclusion

An appliance that satisfies the aesthetic needs of the patient and also the orthodontic goals of the treating clinician in a short duration should be chosen to treat patients. Customisation is the new in thing in orthodontics.

References


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When Dr Edward Angle first classified malocclusions for orthodontic treatment, he created the categories of Class I, Class II and Class III, the principal categories by which cases are still identified today. In founding his classification system on this one dimension—the sagittal dimension—Dr Angle confirmed the sagittal relationship of primary importance and the one most critical and, indeed, most difficult to solve.

The Carriere Motion* appliance is a technology that first addresses the patient’s sagittal dimension to establish a Class I platform prior to comprehensive orthodontic treatment. This is accomplished usually within the initial 3 months of treatment. We call this protocol ‘Sagittal First’. Sagittal First eliminates competing force vectors inherent in traditional methodologies when traction is employed concurrent with fixed appliance treatment. After establishing a Class I platform in the buccal segments (intercuspation of molars, premolars and canines), the clinician finishes therapy with Carriere SLX** brackets or another finishing appliance of choice, including Invisalign,*** if appropriate. Employing the Sagittal First approach using the Motion Appliance makes achieving high-quality finishes easier and simpler.

The purpose of this discussion is to demonstrate application of the Sagittal First concept using the Carriere Motion Appliance to treat Class II and Class III patients. The following two cases offer typical examples of the types of difficult sagittal corrections the Motion appliance can address.
Case 1

Diagnosis and treatment plan
A female, age 23 years, 5 months, presented for treatment exhibiting a moderate Class III malocclusion with negative overjet, proclined lower lip with flat supramentale sulcus, open bite and crowding in the lower arch. The treatment plan was to distalise the lower dentition into a Class I occlusion (Sagittal First) using the Carriere Motion CL III Appliance, then generate space to alleviate the lower arch crowding and close the bite, utilising light-force archwires in a passive, self-ligating system. While tongue trainers would be bonded in conjunction with the fixed appliances later in treatment, the patient would also engage in tongue training exercises to correct her improper tongue positioning, especially while swallowing. Incorrect tongue positioning can compromise a satisfactory result. Bite closing would be accomplished by action of the archwires in the PSL brackets, not by use of any vertical elastics. Vertical elastics would be employed only during the finishing phase of treatment. In this way, gentle forces would be acting on the roots, minimising stress to the periodontal ligament.

Treatment sequence

Motion Class III appliance bonded
Treatment commenced with the Motion Class III appliance bonded directly to the lower canines and first molars with 6 oz, ¼" intraoral elastics engaged for Class III traction to molar tubes bonded to the
upper second molars. An Essix .04" vacuum-formed retainer was employed in the upper arch for maximum anchorage.

By 3 months, the sagittal aspect had corrected to the occlusal lock of the Class I platform (Sagittal First) with the counter clockwise movement of the lower occlusal plane. Note that the lower canines had extruded slightly. Some extrusion of canines is a positive sign of the counter clockwise rotation of the lower posterior occlusal plane that fosters a better positioning of the mandible in relation to the maxilla—a direct effect of the appliance. The Motion appliance was removed and tongue trainers were bonded to the lingual aspects of the lower incisors to continue to train the tongue to position itself properly in the oral cavity, specifically during swallowing and mastication. Concurrent with the tongue trainers, Carriere SLX .022" PSL brackets were bonded.

Treatment followed the Carriere System archwire sequence. The archwires were all thermally activated wires with lower transformation temperatures chosen as archwire sizes increased to limit force on the periodontium.

Wire sequence:
- .014" Cu Nitium (27 °C)
- .014" x .025" Cu Nitium (27 °C)
- .017" x .025" Cu Nitium (35 °C)
- .019" x .025" Cu Nitium (35 °C)

When the upper .019" x .025" archwires were engaged, three links of power chain were run bilaterally from the second premolars to the first premolars and from the first premolar to a crimpable hook attached to the wire distal to the lateral incisor to retract the anterior segment, bringing it into the final desired position.

14 months: Sagittal and fixed appliance treatment complete

With 3 months of sagittal treatment and 11 months of fixed appliance treatment, the case finished to a satisfactory result. The final cephalometric and pantomographic X-rays highlight the positioning and health of the roots, a positive sign of the respectful approach of these appliances on the periodontium.
Case 2

Diagnosis and treatment plan

A 27-year-old female patient presented for treatment exhibiting a Class II, division 1 malocclusion with a severely protrusive maxilla and a severely retrusive mandible. The patient had had previous orthodontic treatment with extraction of the lower premolars. In consultation with other orthodontists, orthognathic surgery was recommended, which she wanted to avoid.

The treatment plan was to reposition the mandible forward, placing the case into a Class I occlusion (Sagittal First) using the Carriere Motion Clear Class II Appliance, then complete treatment utilising light-force archwires in a passive, self-ligating system. The Motion Clear Appliance is the latest addition to the family of Motion appliances, designed for the patient with high aesthetic demands.

Treatment sequence

Motion Clear Class II appliance bonded

Treatment commenced with the Motion Clear Class II appliance bonded directly to the upper canines and first molars with 6 oz, 1/4” intraoral elastics for the first month and 8 oz, 3/16” elastics for the second and third months, engaged for Class II traction to molar tubes bonded to the lower second molars. An Essix .04” vacuum-formed retainer was employed in the lower arch for maximum anchorage.

3 months: Class I platform achieved

By the end of the first month of sagittal correction, there was already evidence of some derotation of the upper first molar and movement of the buccal segment (molars, premolars and canines) toward a Class I occlusion. Space was also beginning to open between the upper incisors. After 3 months of sagittal correction, the occlusal lock of the Class I platform had been accomplished (Sagittal First) and the case was ready to progress to the next stage. The Motion appliance was removed. While in this case, it would have been easy to finish the case with Invisalign, the patient chose fixed appliances so Carriere SLX .022” PSL brackets were bonded.

Treatment followed the Carriere System archwire sequence:

- .014” Cu Nitanium (27 °C)
- .014” x .025” Cu Nitanium (27 °C)
- .017” x .025” Cu Nitanium (35 °C)
- .019” x .025” Cu Nitanium (35 °C)

The first wire, a .014” round Cu Nitanium wire, corrected the rotations of the incisors. With the .014” x .025” Cu Nitanium wire, power chain was used to close the spaces between the incisors. After these spaces closed, the .017” x .025” Cu Nitanium wire would begin torque control with the final archwire, the .019” x .025” Cu Nitanium wire, to finalise the axial angulations of the anteriors. The upper .019” x .025” archwire was engaged, three links of power chain were run bilaterally from the 2nd premolar to the 1st premolar and from the 1st premolar to a crimpable hook attached to the wire distal to the lateral incisor to retract the anterior segment, bringing it into the final desired position.

11 months: Sagittal and fixed appliance treatment complete

With 3 months of sagittal treatment and 8 months of fixed appliance treatment, the case finished to a harmonic occlusal and facial result. The result exhibits an excellent repositioning of the mandible held in position by the occlusal lock of the Class I platform (intercuspation of the molars, premolars and canines). The mandibular repositioning...
Figs. 9a–c: Situation after 1 month of correction with Sagittal First approach. – Figs. 10a–c: Situation after 2 months of correction. – Figs. 11a–c: Situation after 3 months of correction: Class I achieved. – Figs. 12a–c: Situation after 4 months of treatment (3 months of Motion sagittal treatment and 1 month in fixed appliances). .014” x .025” wire with power chain to close the spaces between the incisors. – Figs. 13a–c: Situation after 7 months of treatment (3 months of Motion sagittal treatment and 4 month in fixed appliances). .019” x .025” archwire was engaged with power chain to retract the anterior segment and bring it into the final desired position. – Figs 14a–c: Final situation achieved after 11 months of treatment (3 months of Motion sagittal treatment and 8 months of Carriere SLX fixed appliance therapy).
was obviously not a result of growth in a 27-year-old woman, but the result of balancing the structures of the temporomandibular joint, reposturing the mandible in the temporomandibular space. Prior to treatment, she could not protrude her mandible even to position her lower anterior teeth into the lingual aspect her upper anterior teeth. For this patient, the mandibular reposturing created a dramatic, positive change in her facial profile to create a beautiful symmetry. Figures 16 to 18 offer illustrations of this reposturing. An indication of the extent of this movement is the fact that after treatment, the patient was able to protrude her mandible beyond her maxilla.

**about**

**Dr Luis Carrière**, DDS, MSD, PhD, is a contributing editor to the Journal of Clinical Orthodontics and on the editorial board of the American Journal of Orthodontics and Dentofacial Orthopedics. An invited professor at orthodontic departments throughout the world and a world-renown lecturer, Dr Carrière is the inventor of the internationally known Carriere SLX bracket and the Carriere Motion Appliance. He maintains a private practice in Barcelona, Spain.

**Figs. 15a–g**: Comparison of pre- and post-treatment situations. Cephalometric X-rays: initial situation (a); after 3 months of correction – Class I achieved (b); final result (c). Patient’s facial lateral view: initial situation (d); comparison of pre- and post-treatment situations (e). Post-treatment intraoral situation: buccal view lower forward movement (f); central view lower forward movement (g).
BiTurbo2 (BT2) system for rapid deep overbite correction

Authors: Dr John Constantine Voudouris, Canada; Dr Vittorio Gaveglia, Italy & James John Poulos, USA

Abstract

The aim is to introduce a new, miniaturised BiTurbo2 device (BT2) as part of an overall, four-component system to treat severe, skeletal deep overbite malocclusion. Methods: Clinical applications of the first generation of BiTurbo (BT1) devices initially manufactured as one-piece were evaluated over a 2-year period in the private orthodontic clinic of Dr J. Voudouris. Improvements were implemented to develop a second generation BT2. The BT2 was manufactured by SIA Orthodontic Manufacturer, in Italy as a four-piece unit including a body brazed to the bonding pad for greater flexibility, braze, for the separate curved bonding pad, and 80-gauge mesh for higher bond strength against lingual shearing forces. Two BT2s were positioned and bonded on the palatal aspects of the upper central incisors located at the incisal-third of the crowns. BT2s were the central device of a 4-component system to treat severe skeletal mandibular overclosure with deep overbite. The second component of the system included BT2s bonded simultaneously with a full Siamese twin, active self-ligating brackets to use the lower resistance in the appliance, shown in systematic review in vitro. The third component included new initial i-Arch wires with light forces that had a higher vertical dimension than horizontal dimension (for example .018” x .014”). This was used to improve moments of torque closer to the centre of resistance at the upper and lower incisors with compensating curve in the upper archwires, while the lower arches incorporated reverse curve of Spee and where both facilitated mild incisor intrusion. The fourth component of the system included 2 vertical elastics at the buccal segments, in rhomboid-patterns from the upper canines and first molars to the lower first premolars and lower second molars. These were medium 1/4”, 4.5 oz elastics for moderate buccal segment extrusion in conjunction with the BT2s. Clinical Results: The ready-made metal BT2s were found to be highly efficient chairside and effective for Rapid Bite Correction (RBC). No clinically significant root resorption was not found that was possibly associated with the biocompatible forces applied. Conclusion: BiTurbos are recommended for rapid opening of overbites for a minimum of 6 months since they raise the vertical dimension automatically and reduce muscle hyperactivity to permit extrusion of the buccal segments into the excessive freeway space.

Introduction

Experienced orthodontic clinicians often report that severe, deep overbites ranging from 75–120% are one of the most challenging orthodontic treat-
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ments. New tools to address deep overbite are desirable (Fig. 1). Research has verified deep overbites are also highly susceptible to one of the highest levels of relapse.1-6 One of the main reasons appears to be centred around increased muscle hyperactivity that has long been associated with the cause of deep overbite. However, this muscle hyperactivity is secondary to our current clinical perception. The central nervous systems (CNS) plays a higher role through CNS hyperactivity, tension, or stress that is a precursor to producing muscle hyperactivity (in conjunction with other implicating factors such as dental interferences, crossbites and TMD). Due to the primary nature of the CNS ethology, today the differentiating term CNS-muscle hyperactivity is preferred to the blended and often lost term of neuromuscular activity used in the past. The genetic CNS disposition and personality of the patient is a primary factor compared to simply muscle hyperactivity in severe overbite. A good medical and social history is vital in the diagnosis of patient disposition such as a Type A (e.g. proactive, ambitious, overachiever) for instance, prior to treatment planning and prior to retaining deep overbite long-term.

CNS-muscle hyperactivity may additionally influence the malalignment of the dentition. In vertical mandibular overclosure into the maxilla, termed VMO, found in Class II division 1 malocclusion with severe overjet, the lower incisal edge can be crowded by the cingulum of the upper incisor. In fact, lower incisal edges have been found to impinge the palatal gingiva in severe overbite (Figs. 2a & b). Secondly, VMO also provides less space for the dentition vertically where tongue space is also restricted, which can result in proclination of the lower incisors into the strong peri-oral musculature. Thirdly, it is clinically significant that muscle hyperactivity be viewed from the labial and lingual since it includes the masseter-medial pterygoid sling and temporalis, but also tongue hyperactivity associated with buccal segment intrusion. In the transverse dimension, it is not unusual to find the lateral borders of the confined tongue to be scalloped with dental impressions as it attempts to find space by spreading out and pressing onto the occlusal surfaces of the lingual cusps during swallowing and at rest, associated with further buccal segment intrusion.

Aetiology of deep overbite includes:
1. CNS hyperactivity, tension or stress
2. Masticatory muscle hyperactivity, particularly the elevators masseter and temporalis muscles
3. Facial muscle hyperactivity such as the orbicularis oris in Class II division 2 patients affecting upper central incisors
4. Skeletal restriction of the dentoalveolar growth of the buccal segments
5. Skeletal upward and forward or counterclockwise growth of the mandible at the chin (brachycephalics)
6. Dental interferences, crossbites, missing buccal dental units, TMD and severe posterior enamel wear reducing the posterior vertical support of the dentition related to CNS-muscle hyperactivity.

Several appliances have been developed to control the CNS-muscle hyperactivity including traditional removable or cemented anterior bite planes soldered to molar bands, and bondable resin or brackets on the palatal of the upper incisors or molars. The resin bite ramps were easily worn and swallowed by the patient, often requiring resin additions, and when placed at
the molars produced molar intrusion that was contraindicated. Bondable metal bracket type bite planes were more effective and efficient to apply chairside, however, they were often difficult to remove because of their solid form and design that made them rigid and uncomfortable during the debonding phase, particularly at the sensitive upper central incisors. The purpose of this clinical study was to develop and test a small bondable and curved bite plane device with a groove in the middle and whether it was more efficient and effective in application by being easier to place, had good gnathological function and was easier to debond. The second objective was to develop a system whereby the bondable BT2 device could produce Rapid Bite Correction (RBC).

What is a BiTurbo2?

The first BiTurbo was developed in 2014 with a groove in the long-axis of the bondable bite opening device that was also curved to establish anterior guidance early in treatment. It was manufactured as a one-piece bracket and tested clinically for 2 years by one of the authors in his private orthodontic clinic in Toronto, Canada. This first generation BiTurbo was found to be effective in controlling the vertical dimension by rapid deep bite correction. As a result, new modifications were implemented by Dr Voudouris to improve the first generation BiTurbo (BT1).

The second generation BT2 was made by SIA Orthodontic Manufacturer, in Italy as a four-piece unit and included:
1. Bracket body with vertical groove (split), with incisal surface curvature
2. Braze (for flexibility)
3. Curved bonding pads to complement and adapt to the curved palatal anatomy of the upper central incisor for improved bond strength
4. Separate 80-gauge mesh for greater bond strength.

The vertical groove along the long axis of the BT2 permits the use of a periodontal probe or other instrument to position and press-bond the BT2 to the enamel more efficiently and accurately. The separate application of 80-gauge bonding mesh is used to improve bond strength against palatal shearing forces. BT2s are miniaturised in size similar to bondable buttons but with a curved, shield shape bonding pad to be comfortable for patients and to facilitate oral hygiene. In addition, side dimples were developed to permit purchase points for tweezers during positioning on the palatal of the upper incisors. BT2s are required commonly in deep overbite treatment that is associated with severe CNS-muscle hyperactivity (Figs. 2a & b).

Methods: Where to place BiTurbo2?

Clinically, BT2s are bonded on the incisal-third region of the upper central incisors in Class II malocclusions. This provides a total of 2 BT2s on the day of first bonding of a full Siamese twin, active self-ligating (SL) appliance. In addition, for each deep overbite treatment BT2s are applied in conjunction with 2 buccal box elastics (1/4", 4.5 oz, see Fig. 6b) in rhomboid patterns for Class II correction. The elastics are applied from the labial aspects of the upper canine to the upper first molar, down to the lower second molar and first premolar bilaterally to facilitate rapid bite correction.

Results: Why apply BiTurbo2?

It is well known from electromyographical studies that muscle activity of the masticatory muscles is generally reduced when the vertical dimension of the anterior lower face height is increased with overbite correction.7-9 In addition, adults with untreated deep overbite with CNS-muscle hyperactivity often suffer from generalised enamel wear that can then induce a cycle for further reductions in the vertical dimension. When the vertical dimension is reduced, muscle hyperactivity increases further. This tends to set-off the destructive cycle of mutilation and collapse of the lower anterior face height characterised by progressively greater enamel wear with age. This reduction in enamel support produces further progressive increases in muscle hyperactivity leading to progressively deeper overbite (Figs. 4a & b). Progressive deepening of the overbite in children restricts skeletal eruption of the dentoalveolar structures of the buccal segments that is maintained for life without orthodontic treatment.
mandibular overclosure is characterised by restriction of eruption, with CNS-muscle hyperactivity. Early periodontal bone loss is additionally observed. In addition, periodontal gingival recession is evident. Humans use only approximately 10% of their muscle activity for chewing (25 lbs). However, it is well known during clenching and other parafunctional activity that these forces can exceed 10 times the chewing force (250 to 300 lbs). Normal swallowing takes place approximately 600–1,000 times/day or more (including during chewing and speaking) that maintains the restriction of dental eruption in the buccal segments into adult life (Figs. 4a & b). BT2s are used in conjunction with active self-ligating appliances due to the low resistance of the appliance shown in vitro, to permit unobstructed and controlled extrusive movements of the archwires at the upper and lower buccal segments. Once the posterior vertical dimension increases and the incisors begin to develop a positive overbite relationship, the tongue generally begins to rebalance vertically into the greater vertical space and more posteriorly into a more natural tongue position. This assumes the aetiology of the deep overbite has been additionally controlled long term with an anterior bite plane to be worn for one-year post-treatment, then overnight every night.

In addition to CNS-muscle hyperactivity, deep overbites are associated with skeletal counter clockwise rotation of the mandible as part of the archial growth path of patients with brachyfacial types. This can explain why it is not unusual that as the orthodontist attempts to increase the vertical dimension in a growing child with strong anterosuperior growth of the condyles and a counter clockwise mandibular rotation pattern compounded by severe CNS-muscle hyperactivity, the deep overbite is highly resistant to orthodontic correction. This strong skeletal growth pattern is another reason deep overbites are one of the most difficult challenges, and where BT2s are valuable in controlling or breaking the pattern of CNS-muscle hyperactivity.

When to apply BT2s?

BT2s are recommended at all ages, including for both early interceptive treatment in children, and in adults (Figs. 5a–h). Prior to the placement of BT2s, all patients, particularly sensitive adults are informed most importantly, that the new BT2 technology will save several months (up to 3–4 months) of orthodontic treatment of the overbite that is the largest challenge. Sensitive patients are instructed it will possibly take 2–3 days to accommodate to the new vertical height, and to the feeling of the BT2s where wax is also provided to place over the BT2s for 3 days. Eating may temporarily be affected requiring soft foods, and they may also possibly affect speech mildly and temporarily (that is uncommon with the bulbous ends of two BT2s).

The ideal recommended time of BT2 placement is at the time of the bracket placement (that are regularly positioned on the labial aspects). BT2s and active self-ligating brackets are ideal with synergistic, specialised i-Arch wires (SIA Orthodontic Manufacturer) that have a higher vertical dimension than horizontal dimension (for example .018” x .014”) for early moments of torque for control of the roots required in deep overbite correction.

The archwires, once again, incorporate compensating curve on the upper archwire and reverse curve of Spee for the lower archwire to further facilitate incisor intrusion. BT2s are worn for at least 6 months and tooth movements are facilitated by the eruption (or extrusion) of the buccal segments, where the rhomboid-shaped elastics (1/4”, 4.5 oz) are place bilaterally. No clinically significant root resorption is
found with the use of this biocompatible force system as it gradually reduces the vertical mandibular overclosure and muscle activity.

How do BT2s work?

The BT2 mechanism of action is that it increases the vertical dimension and reduces the muscle hyperactivity related to CNS tension through the hypothalamus-adrenal pathway (Fig. 6a). As the bite is opened with the application of BT2s, elastics in a rhomboid pattern (1/4", 4.5 oz) are used posteriorly to erupt the buccal segments by lifting the curved archwires occlusally, and to intrude the incisors mildly with low resistance in the brackets (Fig. 6b). In Class II correction Differential Eruption is used by placing a full dimension upper arch wire .018" x .025" stainless steel to act more as an anchorage unit and a lower dimension mandibular archwire in .016" x .022" stainless steel. This permits the lower molars and premolars to be differentially erupted upward and forward to correct the Class II malocclusion (Figs. 5f–h). In addition, this also allows the BT2s to work effectively by simultaneously increasing the anterior vertical dimension to correct the Class II malocclusion in conjunction with the rhomboid elastics bilaterally for Rapid Bite Opening (RBC).

Special procedures with BT2s and over-correction of deep overbites

In Class III malocclusions with lower incisor overclosure over the upper incisors anteriorly, BT2s are bonded to the lingual of the lower incisors to disarticulate the dentition and permit placement of the upper brackets (Figs. 7a–e). In Class III malocclusions the higher .018" x .025" stainless steel archwire is placed in the lower arch and the smaller dimension .016" x .022" stainless steel lower arch is placed in the upper arch for upper downward and forward Differential Eruption using Class III rhomboid pattern elastics from the lower canine hook to second premolar and upper canine hook to upper first molar hook.

For Class II patients with severe overjet (in conjunction with deep overbite), bonding resin may be temporarily added to the BT2s and into the vertical groove to extend them horizontally. The BT2 is roughened with a high-speed diamond bur, etched, primed with metal primer, and bonded with bonding resin. The overall objective is to overcorrect the deep overbite to within a 20% overbite for long-term retention (it is equally important not to overly open the bite because the tongue may position anteriorly long-term). It is additionally recommended that upper and lower brackets from lateral-to-lateral be bonded 1 mm toward the incisal than the customary, average centre of the long-axis crown positions to facilitate RBC.

Conclusions: Advantages of BT2s applications

A system was developed and tested for rapid bite correction. This included the use of new BiTurbos, lateral box elastics with active self-ligating brackets to provide freedom of movement of the system with recommended i-Arch wires for improved torquing moments.

The BT2 system for rapid bite correction includes:
1. Two BT2s at the palatal of the upper central incisors bonded more incisally
2. Active self-ligating appliance with NiTi clips, bonded more incisally lateral-to-lateral incisor
3. i-Arch wires with compensating curve on the upper arch and reverse curve of Spee on the lower arch to further facilitate incisor intrusion
4. Two elastics (1/4", 4.5 oz) in rhomboid-shaped patterns at the buccal segments.

BT2s are ideally applied in new super-low profile, active self-ligating brackets, with NiTi clips for light, continuous forces, completely coated for aesthetics, and with progressively lower forces from molars to
incisors. This makes use of reduced resistance in vitro and active seating of archwires for tooth control including torque (future publication).

Summary of BT2 application:
1. Metal BT2s are highly effective chairside for Rapid Bite Correction (RBC) for a minimum of 6 months
2. Efficiency chairside is gained by ready-made, bondable BT2s, that do not wear, and have bulbous rounded ends for tongue comfort in both children and adults
3. BT2s were easier to bond with a positioning instrument due to the new vertical groove (split) that made them also significantly easier to debond. The specialised curvature also developed early anterior guidance at a new vertical
4. BT2s are directly bonded to the palatal of the upper central incisors replacing prior plastic moulds of bite ramps that required packed, light-cured resin that wears and is swallowed by patients throughout treatment
5. BT2s permit differential eruption of the molar teeth and are a significant improvement to bonded molar resin supports used for vertical correction in the past. The reason is prior molar resin supports are contraindicated since they have been shown to clinically intrude molars.

References

about
Dr John C. Voudouris maintains teaching positions at the University of Toronto, as Associate in Orthodontics, Discipline of Orthodontics for 31 years teaching functional appliances, and at New York University, as Visiting Scholar, Division of Biological Sciences for 18 years, teaching Siamese twin active self-ligation that he developed in 1994. He is a full member of the Edward H. Angle East Society, and the recipient of the University of Toronto, Department of Orthodontics, Aaron Posen Award for Clinical Excellence. Dr Voudouris received the prestigious American Association of Orthodontist’s Milo Hellman Research Award for condylar growth modifications and glenoid fossa remodelling with Herbst appliances applying electromyographic, cephalometric, and histological investigations.

Dr Vittorio Gaveglia is a private orthodontic specialist in Rome and additionally a graduate of the University G. D’Annunzio, at Chieti, Italy, in the field of Orthodontics, Gnathology and Orofacial Pain. Dr Gaveglia is a member of SIDO Italian Society of Orthodontics, and co-inventor and developer of several innovations including the i-Arch wire system in partnership with SIA Orthodontic Manufacturer (Italy).

James John Poulos is a research student at The University of Toronto working with Dr Voudouris for over 2.5 years, and a senior in the Doctor of Dental Medicine Program at The Ohio State University, College of Dentistry, in Columbus, Ohio.
The XP line of RPE, made of medical grade stainless steel, is designed to meet the most demanding accuracy requirements, stability and comfort. Its U-shaped laser welded arms ensure high torsion and compression resistance. For an easy use by the patient, the activation hole has been designed with a generous flaring funnel. The XP line doesn’t use any chemical components for friction control to be completely safe for the patient.

Rapid palatal expander Leonardo has the best features available on the market, in order to make the users’ work more secure, easy and effective. The two parts of the expander’s body remain slotted one into the other to ensure rigidity and stability. The arms are laser welded to maximize its resistance to prevent breakage. Its anti-unscrewing system prevents any spin-back effect of the screw. At each turn a “click” sound is heard to warn that the activation is completed.

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Have fun, will brush: Improving orthodontic outcomes with effective home care

Author: Dr Dana Van Elslande, Canada

Getting braces is a time of both excitement and dread. For kids and teens, braces can be a rite of passage. For adults, it is an opportunity to invest in an improved appearance and more attractive smile. With this excitement comes a bit of worry for patients (and parents) though—how will I (or how will my child) manage oral hygiene with all this apparatus in the way?

The orthodontic provider feels the same concern. Once the braces go on, brushing becomes much more challenging, and poor brushing leaves patients at risk for gingivitis, white scars and tooth decay.1 Ensuring adequate home care is one of the biggest challenges in most orthodontic offices: unless patients adopt some of the oral hygiene practices we recommend, they are not going to attain the incredible results that are possible.

Like many practices, we are seeing more adult patients every year—currently about 25% of our patients are adults. Often, they are parents of our younger patients; through their child’s experience, parents can see how the technology has changed since they were kids. Braces are gentler, easier to manage, and often have shorter treatment time. Contemporary oral hygiene products also make it easier to get from ‘braces on’ to the end goal of ‘beautiful smile’.

A comprehensive programme

Our practice adopted Crest + Oral-B OrthoEssentials because we wanted a comprehensive programme to help encourage and motivate patients with their oral hygiene. Programme elements include an office oral hygiene visual analogue chairside scale (Fig. 1), commitment letter, communication letters for patients and parents, a ‘how to care for your braces at home’ video, and a regimen of advanced home care products: an oscillating-rotating power toothbrush; stannous fluoride toothpaste; fluoride mouth rinse; and an orthodontic-specific dental floss. These four products work together to help reduce plaque buildup and protect teeth from gingivitis, white scars and cavities.

One unique aspect of this programme is that the office oral hygiene visual analogue chairside scale interacts with our management software, allowing us to graph patients’ hygiene over time so we can show our patients (or mom and dad) how well they are doing with self-care. Together with patients, at each appointment we score their oral hygiene on a scale from 1–5. A score of ‘1’ indicates very poor oral care, whereas ‘5’ indicates excellent care. These scores are entered into our software programme, which has the ability to generate a graph where we can monitor how the oral care is progressing throughout the patient’s treatment. It is a wonderful tool to use with children and adults alike, as it provides us with a visual representation of how performance has either improved...
(meaning we need to celebrate) or declined (meaning we need to make changes before there is irreversible damage). In addition, we incentivise patients by giving tokens at each visit if they receive scores over a ‘3’. These tokens can be cashed in for merchandise or gift cards to their favorite stores or online sites. The technology helps us engage our orthodontic patients in a fun way, and not surprisingly, adults enjoy ‘seeing’ their results just as much as kids do.

### Noticeable outcomes

The OrthoEssentials kit contains four key products that work together to help achieve the outcomes we want.

The Oral-B PRO 5000 Smart Series Power Toothbrush with bluetooth technology with ortho brush head is a cornerstone of the kit. The Ortho brush head is specifically designed to clean around brackets and wires, which can be very challenging to manage without additional tools (Fig. 2). The toothbrush’s built-in technology enhances compliance with good brushing habits.7 Patients begin use by downloading a free app onto their mobile device (usually a phone), then sync their power brush to the app. Every time the patient brushes, the app receives brushing data, and the patient gets immediate feedback on the mobile device screen. Using the built-in 2-minute timer, patients can see how long they have been brushing, and a red light ‘alert’ lets them know if they are using excessive force. On the mobile screen, the app provides information about the brushing mode, battery status, and a reminder to change the toothbrush head. To keep the user experience fresh—and to keep kids checking in—the app also incorporates news, weather, and oral care tips. Additionally, the Focused Care feature can be customised to show areas of the mouth that need special attention, so the patient can brush those areas again after the regular 2-minute brushing is complete.

Crest Pro-Health toothpaste contains stannous fluoride—an active ingredient well-known to protect against plaque, gingivitis, cavities, dietary acid erosion, and sensitivity.4 Regular use of this paste has been clinically shown to inhibit plaque build-up between brushings.5 The Crest Pro-Health Advanced with Extra Deep Clean Mouthwash offers additional anti-cavity fluoride protection. Oral-B Superfloss has a stiffened end floss threader that helps patients (particularly kids) easily thread floss under the braces wires.

The four components of the OrthoEssentials Kit work together to keep the teeth and gums protected and healthy. We recommend that patients brush in the morning, after lunch if possible, and then thoroughly before bed. The most important session is a very careful brushing right before bed (with, of course, no food or drinks afterwards). The combination of mechanical brushing and flossing plus chemical paste and rinse action helps to reduce plaque build-up and protect against cavities. This regimen of oral hygiene provides excellent care for patients without braces as well.

### Enabling compliance

Compliance with a proven oral care regimen is essential to successful orthodontic outcomes. If a patient is not able or willing to maintain good oral care, the braces may have to be removed and treatment delayed until he or she is able to comply, so we do everything possible to set patients up for success. Technique is very important; we show our patients from the very beginning how to use each component in the kit, and we review their technique whenever we see that oral hygiene is slipping.

If a patient has certain areas they are struggling with, we can use the built-in technology to programme these areas into a diagram on their mobile device app. By working with a cell phone and the Bluetooth-enabled toothbrush, the app provides immediate feedback during home care. With these tools, the patient can continue to work on trouble areas between scheduled appointments and receive feedback on their progress.

### Supported by clinical evidence

As a practitioner, I am very evidence-based, so I feel comfortable recommending ‘proven products’ to my patients that involve the most cutting edge technology available. Some patients appreciate knowing about the clinical data behind the products we recommend. For patients who are not ‘wowed’ by clinical evidence, they usually just want to know what products I use at home. I would not recommend the programme if I did not personally believe in it.

### Conclusion

In the end, orthodontic treatment is not just about positioning the teeth and improving looks, it is also about better functioning and oral health. Patients are expecting a certain ‘look’ when their braces are removed—beautiful, white, shiny teeth and tight pink gums—and their routine oral hygiene directly affects that outcome. We know that kids and adults are busy—so we have implemented a programme that fits into the busiest of schedules. The OrthoEssentials programme has been a game-changer for our practice, directly leading to better outcomes for our patients.

Editorial note: A list of references is available from the publisher.
“With 4-D printing we will be able to provide much more precise treatments”

Interview with Dr Sherif Kandil, experienced practitioner, CEO of K Line Europe GmbH

We all heard about 3-D printing, what does 4-D stand for?
Yes, that is true that we have been hearing lately only about 3-D printing, nowadays 4-D represents the dimension of time. 4-D refers to additive manufacturing or printing of special materials that have certain memory characterisation built in a specific layering system on a 3-D printer, yet was designed or using CAD on a software that dictates the material reshaping and response to stimuli by time.

Can you tell us more about your recent activities in concern to 4-D technology?
After I patented the idea of 4-D printing in orthodontics, I moved on to applying this technology in our R&D labs in K Line Europe in Düsseldorf, Germany. 4-D printing technology has been shifting engineers’ opinions and even many in the medical field on the possibilities and chances that have been unleashed after the introduction recently of this technology. I have been focusing on applying this science to clear aligners and also on orthodontic wires using advanced 3-D printers and re-engineered Meta-materials.

Since I would consider myself as an experimenter, I am currently applying the 4-D printing concept of therapy on my own teeth to manufacture clear aligners, I am strictly recording all details as I will be publishing results in a scientific study after treatment completion.

How does 4-D change medicine in general and orthodontics in particular?
I believe in the next two years 4-D printing will be changing many approaches we currently use to treat our patients. If you search online for 4-D you will find so many results and can even discover how medicine in particular will have the first and biggest impact with this technology. Bioengineers, for example, are trying to apply 4-D printing technology in replacing some tissue parts or even manufacturing implants and splints that are placed in our body. This could save many people’s lives due to the fact that the 4-D printed objects can change their shape inside the body to conform to what exactly needs to be replaced without the need for multiple surgeries.

In orthodontics, we will be able to provide patients a much more precise treatment that exactly meets their needs through customising the clear aligners or the orthodontic wire to change its shape when placed in the oral cavity to the requested final result. So it is crafting the final result with much more precision and with a smaller amount of clear aligners or wires so that only 1–2 aligners or 1–2 orthodontic wires are needed for the whole treatment.

What are the challenges that current clear aligners and fixed braces face in the market?
Currently, I believe there are three main challenges we face in orthodontics when it comes to clear aligners or fixed orthodontics. First is the manufacturing process, as there are many steps
when manufacturing clear aligners, thus rendering the final result less accurate, more expensive, more time consuming and more control required. Second is the complexity of applying the exact designed forces on the software for manufacturing the clear aligners, you might need accessories, more attachments on the teeth, etc. to overcome the limitations of clear aligners. Third, is the comfort of the patients as with clear aligners or braces patients need numerous amounts of aligners or wires to be changed throughout the treatment.

How will 4-D technology tackle these problems?

4-D technology promises to solve the aforementioned points and more. A short explanation of how this works is as follows. Teeth are normally 3-D scanned, then through the 3-D CAD software, aligners or orthodontic wire is made as a negative replica of the model stage representing the corresponding movement that shows where and how teeth need to be moved. The software allows you to put in joints and layers that allow contraction at one side and expansion on the other, and thus on the 3-D software we could stage all the aligner or wire shapes that will be self-morphed by the material. The object (i.e. aligner or wire) is 3-D printed using special Meta material that is responsive to the built-in software joints and layers. When the object is placed in the mouth there are fortunately the two most effective stimuli for the material to change its shape which is salivation (i.e. fluids) and 37 degree body temperature (i.e. heat).

So simply, the patient wears an aligner or wire on brackets that keeps changing its shape gradually to reach the final form through applying light continuous forces on teeth. Each aligner or orthodontic wire can be worn for over 5 months depending on the movements that were programmed on the software from the initial planning stage.

How would you describe the advantages that will be implemented in orthodontics using the 4-D concept?

The advantages are quite clear, as patients will enjoy a more friendly treatment where they don’t have to visit their orthodontist as regularly as they used to as this coincides with the recent approaches of distant treatments applied in orthodontics nowadays. Also many treatments won’t need the refinements as they did before, such as the clear aligner treatments, which has had negative experiences. Most of all, the precision of force application and distribution is way more precise as with the software, the exact force, amount and time will be controlled; furthermore the aligner thickness can be altered depending on the need and can be controlled throughout the whole treatment to keep the force and anchorage distribution absolutely stable and avoid the variability that was experienced with previous clear aligner systems.

When do you think this technology will be available on the market?

We hope we can bring this technology into light very soon, yet a rational expectation would be to expect it to enter the market in 2019 and change many applied current treatment concepts in orthodontics.

Technology is shifting really quickly these days, how do you see it evolving in the next few years in orthodontics?

I see 4-D printing and augmented reality to be one of the game changers in medicine in the upcoming years.

How could we get more information and even follow up this upcoming high technology?

Currently, the internet contains many approaches in 4-D tech, yet for orthodontic application you could follow up more on the following webpage www.kline-europe.de/4dortho

Thank you for the valuable input and we hope to hear even more about the new inventions soon.

Thank you for this opportunity and I hope that this advanced technology can bring more welfare to our patients.

Editorial note: This interview has been prepared in collaboration with the K Line Europe GmbH dental coordination team.

Dr Sherif Kandil
DynaFlex is a world class manufacturing and distribution company located in St. Louis, Missouri (USA) offering a full range of high-quality Orthodontic products. DynaFlex is actively seeking International Distributors for their product line and looking to expand distribution opportunities worldwide.

DynaFlex has developed key products used worldwide in the Orthodontic field, such as their CS3, Class II and III Corrector. The CS3 spring is manufactured with an exclusive Nickel-Titanium material that far surpasses other spring systems on the market. The CS3 Spring offers instant load force and remains extremely consistent throughout treatment. The benefit is a smoother, more constant force that performs better and lasts longer throughout treatment. The CS3 System is one of the most successful Class II and III chairside appliances used in the world today due to its simplicity, effectiveness and value pricing as compared to other systems in the orthodontic industry. With its ease of use, value pricing and outstanding results CS3 is going to become your system of choice for Class II and III correction.

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Align extends Invisalign offering for GDPs

With its Invisalign system, Align Technology provides one of the leading solutions on the clear aligner market. The company has now introduced Invisalign Go, a new aesthetic tooth-straightening product, with which it aims to make the solution accessible to more clinicians in the UK.

Designed specifically for general dentists, Invisalign Go can treat mild crowding, spacing, orthodontic relapse and other aesthetic tooth misalignment cases. It will be available for single-arch or dual-arch treatments, ranging from £655 to £875, making it a realistic treatment option for GDPs, the manufacturer said.

Align promises that patients can achieve Invisalign smiles in as little as seven months with Invisalign Go. Users will be able to easily identify suitable patients for treatment with new case assessment software that can be fully integrated into an existing digital dental workflow and works both with polyvinyl siloxane impressions and Align Technology’s intra-oral scanner, the iTero Element, as well as 3M True Definition and CEREC Omnicam (Dentsply Sirona).

As part of the new Invisalign Go system, dentists are provided with an appointment plan that gives task-level guidance with specific and detailed processes to be performed at each appointment. Owing to a progress assessment tool, the technology furthermore allows clinicians to upload new intra-oral photographs and receive confirmation of whether the case is progressing as planned at any time during treatment.

A specially set-up website at www.invisalign-go.co.uk provides more information for those practitioners interested in signing up for the system. Invisalign also offers a training program, available to users and non-users of the system, that includes both online and live sessions that provide hands-on tips and techniques on Invisalign Go digital photography, impressions, interproximal reduction and attachments. Furthermore, the company gives clinicians access to an extensive continuing education program that is aimed at supporting them throughout their Invisalign Go treatments.

The Invisalign product family includes Invisalign, Invisalign Teen, Invisalign Lite, and Vivera Retainers. In addition to the Invisalign System, Align Technology manufactures and markets 3-D digital scanning products and services for orthodontic and restorative dentistry, including the iTero including the iTero element intraoral scanner and OrthoCAD software. For additional information, please visit www.invisalign.com.
Topics

- The alveolar envelope as the limit to orthodontic tooth movement
- Surgically-assisted orthodontic tooth movement
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www.eos2017.ch
Henry Schein symposium addresses most progressive topics in orthodontics

Last autumn the orthodontic division of global dental supplier Henry Schein held its second European Carriere Symposium. The event evolved around the Carriere system, which consists of the Carriere SLX self-ligating brackets and the Carriere Motion appliance, and its implications for the future of orthodontics. From 22 to 24 September 2016, about 200 people attended the event, which was held at the famous five-star seaside hotel W Barcelona in Spain.

The Carriere Motion appliance is a device that mimics the body’s natural processes using a non-invasive technique to stimulate distalization of the entire buccal segment as a unit. It was developed by Dr Luis Carrière based on Dr José Carrière’s treatment protocol that operates on the premise that achieving a Class I relationship before correcting individual tooth positions is of strategic importance in simplifying nonextraction treatment of Class II cases. It has been shown that the appliance can resolve posterior segments of Class II malocclusion in three to five months, reducing the treatment time by up to 40 per cent.

Kicking off the symposium’s scientific program on 23 September, Vice President of Sales and Marketing at Henry Schein Orthodontics Ted Dreifuss said: “It is part of our mission to expand the opportunities that are available for patients and educate orthodontists about these new technologies and techniques.” The symposium, which drew hundreds of participants, speakers and business partners from about 20 countries, including Australia, Japan and the US, therefore provided an exclusive opportunity to learn more about the applications of the Carriere system and other relevant topics from the experts in orthodontics.

Keynote speaker Dr Luis Carrière focused on how facial, skeletal and dental harmony can be achieved using the appliance. Using cases treated at his practice, the Spanish orthodontist demonstrated that orthodontic treatment is a favorable alternative for patients with facial disproportions who would otherwise have to undergo invasive surgery.

“Orthodontists should claim their position as facial-aesthetic specialists. We do not only deliver straight teeth, but provide renewed confidence, new looks and consequently new lives to patients,” said Carrière. “In my opinion, the orthodontist should be the first professional to be consulted when it comes to oral and maxillofacial treatment planning,” he concluded. In his presentation, Dr Sean Carlson, Adjunct Assistant Professor of Orthodontics at the University of the Pacific Arthur A. Dugoni School of Dentistry, demonstrated how 3-D imaging technology can help improve the way orthodontics is studied, taught and practiced. He focused on the visualization of the airway in particular and showed how orthodontic treatment can improve outcomes in patients with temporomandibular disorders or obstructive sleep apnoea.

Also elaborating on the implications of new technologies in orthodontics, program chairperson Dr David Paquette pointed out: “Technology and the opportunities that come with it are changing so rapidly that the knowledge a dental student acquires in his or her first year might be outdated at graduation already. The future of the profession will therefore depend upon how well orthodontists can adapt to change.” Furthermore, the speakers discussed combination with Invisalign braces, accelerated orthodontics and injectables to render treatment even more efficient, among other interesting topics addressed.

Taking stock after the event, Dreifuss concluded: “The second European Carriere Symposium far exceeded our expectations. The feedback from the clinicians attending has been consistently positive with regard to the speakers and topics covered. We were able to show again that the combination of great speakers, topics and destination is the golden formula. All these factors create an environment that is rich and rewarding in every sense. We couldn’t be happier.”

The next European Carriere Symposium will take place from 28 to 30 September 2017 in Barcelona.
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With a 23 per cent growth in exhibitors and a 37.5 per cent increase in attendees, the fifth edition of the Association of Orthodontists (Singapore) Congress (AOSC) in February was undoubtedly the most successful so far, the organisers stated. Over the course of the three-day event, 938 orthodontic specialists from around the world gathered to acquire new knowledge, exchange ideas and foster closer ties within the ASEAN orthodontic community.

“AOSC 2017 ended on a high note for us. We’re honored by the support we’ve received from both local and international attendees,” said Dr Mohana-rajah s/o S. Senathirajah, chairperson of the Association of Orthodontists (Singapore) Congress 2017. “We’ve seen a strong increase in local attendees as well as first time participation from countries such as Cambodia, Myanmar, Croatia and Egypt. The exhibition was bursting at the seams with 83 brands represented by leading manufacturers and distributors.”

In addition to the industry showcase, the scientific programme included keynote lectures by prominent orthodontists, such as Dr Richard McLaughlin, Dr Jay Bowman, Prof. Ravindra Nanda and Dr Greg Huang. In addition, limited-attendance workshops were held on both the pre- and post-congress days—all of which were already sold out before the start of the congress.

Once again, AOSC brought together bright minds in the field of orthodontic research for the scientific poster competition. Of the 36 projects presented, three outstanding works were recognised by the expert jury. Winning the competition was Dr Laurensia Limas from the Universitas Indonesia, who was granted prize money of SGD600 (US$404). In addition, Dr Jason Chua from the National Dental Center of Singapore and Dr Emre Kayalar of Anadolu University in Turkey were both given meritorious awards.

"With the overwhelming success of this edition, plans to expand for the next edition of AOSC are already in the works. We hope to further improve both educational content and bring together more orthodontic professionals in Singapore once again in February 2019," AOSC President Dr Geraldine Lee Ping concluded.
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www.apdc2017.org

93rd Congress of the European Orthodontic Society (EOS)
5–10 June 2017
Montreux, Switzerland
www.eos2017.ch

HK IDEAS—International Dental Expo and Symposium
4–6 August 2017
Hong Kong
www.hkideas.org

FDI Annual World Dental Congress
29 August–1 September 2017
Madrid, Spain
www.world-dental-congress.org
submission guidelines:

Please note that all the textual components of your submission must be combined into one MS Word document. Please do not submit multiple files for each of these items:

- the complete article;
- all the image (tables, charts, photographs, etc.) captions;
- the complete list of sources consulted; and
- the author or contact information (biographical sketch, mailing address, e-mail address, etc.).

In addition, images must not be embedded into the MS Word document. All images must be submitted separately, and details about such submission follow below under image requirements.

Text length

Article lengths can vary greatly—from 1,500 to 5,500 words—depending on the subject matter. Our approach is that if you need more or less words to do the topic justice, then please make the article as long or as short as necessary.

We can run an unusually long article in multiple parts, but this usually entails a topic for which each part can stand alone because it contains so much information.

In short, we do not want to limit you in terms of article length, so please use the word count above as a general guideline and if you have specific questions, please do not hesitate to contact us.

Text formatting

We also ask that you forego any special formatting beyond the use of italics and boldface. If you would like to emphasise certain words within the text, please only use italics (do not use underlining or a larger font size). Boldface is reserved for article headers. Please do not use underlining.

Please use single spacing and make sure that the text is left-justified. Please do not centre text on the page. Do not indent paragraphs, rather place a blank line between paragraphs. Please do not add tab stops.

Should you require a special layout, please let the word processing programme you are using help you do this formatting automatically. Similarly, should you need to make a list, or add footnotes or endnotes, please let the word processing programme do it for you automatically. There are menus in every programme that will enable you to do so. The fact is that no matter how carefully done, errors can creep in when you try to number footnotes yourself.

Any formatting contrary to stated above will require us to remove such formatting before layout, which is very time-consuming. Please consider this when formatting your document.

Image requirements

Please number images consecutively throughout the article by using a new number for each image. If it is imperative that certain images are grouped together, then use lowercase letters to designate these in a group (for example, 2a, 2b, 2c).

Please place image references in your article wherever they are appropriate, whether in the middle or at the end of a sentence. If you do not directly refer to the image, place the reference at the end of the sentence to which it relates enclosed within brackets and before the period.

In addition, please note:

- We require images in TIF or JPEG format.
- These images must be no smaller than 6 x 6 cm in size at 300 DPI.
- These image files must be no smaller than 80 KB in size (or they will print the size of a postage stamp!).

Larger image files are always better, and those approximately the size of 1 MB are best. Thus, do not size large image files down to meet our requirements but send us the largest files available. (The larger the starting image is in terms of bytes, the more leeway the designer has for resizing the image in order to fill up more space should there be room available.)

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You may submit images via e-mail, via our FTP server or post a CD containing your images directly to us (please contact us for the mailing address, as this will depend upon the country from which you will be mailing).

Please also send us a head shot of yourself that is in accordance with the requirements stated above so that it can be printed with your article.

Abstracts

An abstract of your article is not required.

Author or contact information

The author’s contact information and a head shot of the author are included at the end of every article. Please note the exact information you would like to appear in this section and format it according to the requirements stated above. A short biographical sketch may precede the contact information if you provide us with the necessary information (60 words or less).

Questions?

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