My complete conversion - London lingual orthodontics provider
Dr Asif Chatoo describes his navigation of digital technology

By Dr Asif Chatoo, London

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 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 is that 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 nuanced.

In order to convey how this approach differs from other treatments on offer, I compare it to the difference between an off-the-peg suit and going to a tailor in Savile Row. Many of the patients I treat at my practice are referred by leading dentists.

Their expectations are high. Sometimes orthodontic treatment is just one part of an interdisciplinary treatment that in its entirety will cost in excess of £20,000. Patients expect perfection—in so far as it is possible in an ageing dentition—and they expect a high level of service. Suresmile allows me to deliver both. Rightly for a West End practice, many of the benefits of suresmile relate to communication and the care of patients with high expectations, but there are also personal benefits for the clinician.

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.
A Practical Treatment Objective: Alveolar Bone Modeling with a Fixed, Continuous-Arch Appliance

By Thomas W. Barron & Frank Bogdan, USA

Bone is a dynamic tissue that is continuously adapting its structure via the processes of remodeling and modeling. Remodeling is the coupled sequence of resorption and formation involved in physiologic turnover. It is necessary to adjust internal architecture in response to mechanical needs, repair microdamage in the bone matrix, and to maintain plasma calcium homeostasis. Remodeling can only be observed histologically or by chemical assay of biomarkers. Modeling is a change in the size and shape of a bone that can be observed and measured radiographically. It is the net gross anatomic result of bone resorption and formation on a given bone surface in response to growth and development or mechanical load. These processes are well accepted phenomena in the field of physiology.

In the orthodontic literature, it is widely held that the alveolar bones of the maxilla and mandible are immutable—that once formed, their size and shape cannot be changed significantly with tooth-borne, continuous-arch orthodontic appliances. Attempts to do so have often been associated with root and cortical plate resorption, loss of periodontal attachment and unstable tipping of teeth. Under this paradigm, orthodontic treatment must maintain the existing size and shape of the alveolar bone. In many cases, this can only be accomplished with surgery: tooth extraction, or separation of the midpalatal suture.

In recent years, there has been a growing body of clinical evidence bolstered by studies that challenge the immutability of the alveolar bone and the mandate to treat to the existing dentoalveolar arch form.

The purpose of this article is to present a review of the literature challenging alveolar bone immutability along with clinical cases treated with passive self-ligating orthodontic brackets and low-force, low-load-force protocols that demonstrate alveolar bone modeling.

Challenging Alveolar Bone Immutability

The alveolar process is defined as that part of the maxilla and mandible that forms and supports the socket of the teeth.

Bone modeling.

Protocols that demonstrate alveolar bone and the mandate to treat to the existing dentoalveolar arch form. However, anatomy is no more fixed. New bone can be formed to accommodate an increase in the transverse dimension observed in these patients is achieved primarily through the action of the buccal shields on the appliance. The acrylic shields disrupt the equilibrium of forces acting on the dentoskeletal by removing the pressure of the buccal muscle musculature and allowing the light continuous force of the tongue to dominate. According to Frankel, when the force of the cheeks is eliminated, the teeth tip laterally in the direction of least resistance. The alveolar walls in the radicular area are likewise deformed in a buccal direction.

Furthermore, the acrylic shields extend into the vestibule exert a constant outward pull on the connective tissue fibers and muscle attachments that are transmuted to the alveolar bone by the fibers of the periosteum. Apposition of buccal bone aids in the lateral movement of the dentoalveolus. The ability of periodontal tension to induce apposition of bone on the lateral alveolus has been demonstrated in the animal studies of Altmann and Harvold in addition, a study by Treden et al. utilizing metallic implants placed in the maxillae of patients treated with the Frankel appliance demonstrated that widening of the maxilla was due to deposition of new bone along the lateral border of the alveolus rather than increased growth at the midpalatal suture.

This phenomenon of alveolar modeling, specifically lateral translation of the alveolus, achieved by disrupting the equilibrium of the inner and outer oral musculature and periosteal tension is consistent with the Functional Matrix Theory of Moss. During growth, potential of cartilage and bone, his theory holds that growth of the face occurs as a response to functional needs and neuromuscular influences and is mediated by the soft tissue in which the jaws are embedded.

The theory, simply stated, is that bones do not grow but are grown, emphasizing the ontogenetic priority of function over form. The Frankel appliance achieves a change in form by changing the function of the matrix tissues of the osseous musculature.

Load-Induced Alveolar Bone Modeling

It is commonly observed in the field of dental medicine that the continuous load of a growing odontogenic cyst can significantly model the alveolar bone of the maxilla and mandible, causing, remarkable dis-
CHILD ALVEOLAR MODELING: Pre-/Posttreatment Comparison Demonstrates Alveolar Bone Modeling

Pretreatment

Case Study 1
Child Alveolar Modeling: Pretreatment

Diagnosis

A 9-year-old male patient presented to the maxillomandibular complex with a marked maxillary hypodontia and a left primary canine malposition. The patient had a maxillary right first bicuspid and a left primary canine with a lack of space for the developing permanent canine.

Treatment Summary

Pretreatment

The maxillary right first bicuspid was extracted, and a combination of passive self-ligating brackets and light, low-modulus nickel-titanium springs were used to achieve the desired alignment. The patient was instructed to use a low-friction Damon System.

POSTTREATMENT

The patient was evaluated for posttreatment outcomes, including orthodontic appliances and the use of a combined treatment regimen.

CASE STUDY 2
Child Alveolar Modeling: Posttreatment

Diagnosis

A 9-year-old female patient presented with a maxillary right first bicuspid and a left primary canine malposition. The patient had a maxillary right first bicuspid and a left primary canine with a lack of space for the developing permanent canine.

Treatment Summary

Posttreatment

The maxillary right first bicuspid was extracted, and a combination of passive self-ligating brackets and light, low-modulus nickel-titanium springs were used to achieve the desired alignment. The patient was instructed to use a low-friction Damon System.

POSTTREATMENT

The patient was evaluated for posttreatment outcomes, including orthodontic appliances and the use of a combined treatment regimen.
in the size and shape of the maxil-
lar and mandibular alveolar bone
observed in adolescent, adult and
children treated with a passive self-
ligating, continuous arch appliance and Damon low-friction/low-force
For patients with a large
archwire and a continuous archwire, the
direction of force. Furthermore, the
ability to move bone with a light,
continuous load applied to the teeth
resulting from compression
forces acting on the alveolus and
dentition. These cases, along with
the growing body of evidence,
challenge the immutability of
the alveolar bone and the axiom of treat-
ment protocols as described in the
case reports above.
In addition, future CBCT analysis
should consider the voxel size and
resolution of the machines used in
making alveolar bone determina-
tions as well as the time period in
which the posttreatment assess-
ments are undertaken to allow ad-
equate time for completion of sec-
ondary mineralization.

Conclusions
This article presents case reports
demonstrating a change in the size
and shape of the alveolar bone in
child, adolescent and adult patients

treated by a continuous-arch, self-
ligating appliance. These cases, along
with a growing body of evidence,
challenge the immutability of
the alveolar bone and the axioms of treat-
ing to the existing arch form. It is the
authors’ considered opinion that
Melvin Moss’s Functional Matrix Theory is correct and the change in
alveolar form induced by this low-
friction, low-force treatment ap-
proach provides an opportunity to
recapture the full genetic potential
of the patient’s alveolus.
Furthermore, alveolar bone mode-
ing is a practical treatment objective

CASE STUDY 2
PERIODONTOID ALVEOLAR MODELING:

Pretreatment

Diagnosis
A 11-year-old female patient
presented with a Class I jaw relationship and severe tooth size/arc length
disparities with 9 mm of crowing
in the maxillary arch and 15 mm
of crowding in the mandibular arch.
Her mandibular incisors were up-
right at 8° to the mandibular plane
and the exhibited normal circum-
oral muscle tonus and competent
lips. Her parents wanted to attempt
a nonextraction treatment plan. In-
formed consent was obtained and
a therapeutic diagnosis was initi-
ated with a reassessment planned
for approximately 6 to 9 months
to determine if the nonextraction

treatment would be required.

Treatment Summary
Damon protocols were employed with initial .032" Copper Ni-Ti wires and
NiTi open-coil springs activated
eight weeks of treatment. Retention
included bonded lingual wire retain-
ers and clear, vacuum-formed Essex-
tyle removable retainers to be worn
while sleeping. Sizecorrected lower
occlusal photographs taken at initial
duration of 3 months. The change
in the size and shape of the
mandibular alveolus induced by
passive self-ligating treatment. By
the three-year posttreatment follow
up appointment, teeth #8 and #9
had been crowned and the bonded
maxillary lingual wire had been re-
moved. The patient reported infre-
quent removable retainer wear and
the alveolar modeling obtained had
remained remarkably stable.

3 YEARS POSTTREATMENT

PERIODONTOID ALVEOLAR MODELING:

Results

The authors’ considered opinion that
Melvin Moss’s Functional Matrix Theory is correct and the change in
alveolar form induced by this low-
friction, low-force treatment ap-
proach provides an opportunity to
recapture the full genetic potential
of the patient’s alveolus.

Furthermore, alveolar bone mode-
ing is a practical treatment objective
Virtual reality and orthodontics: A new patient experience

By Dr Yassine Harichane, Canada

Imagire the following scenario: your patient arrives, both relaxed and calm, at your practice. Although the patient is visiting the practice for the first time, he is comfortable with it and knows its interior well. Without further introduction, the patient takes a seat in the dental chair, and the orthodontic procedure is performed quickly and comfortably with patient compliance. There are no complications or tension, and the treatment is easily achieved. Imagine such a soothing and comfortable environment in which to treat patients. Now imagine this very same scenario through the eyes of the patient. One can see that it could actually be a comfortable experience.

This is not some hypothetical futuristic utopia; this is actually happening now, and the aforementioned points are some of the many benefits of virtual reality (VR). VR is a process that entails immerging the viewer in a 360° environment. By turning his head left, right, up or down, the patient can visualize a real or an artificial environment in which to treat patients. Now imagine this very same scenario through the eyes of the patient. One can see that it could actually be a comfortable experience.

Imagine the following scenario: your patient arrives, both relaxed and calm, at your practice. Although the patient is visiting the practice for the first time, he is comfortable with it and knows its interior well. Without further introduction, the patient takes a seat in the dental chair, and the orthodontic procedure is performed quickly and comfortably with patient compliance. There are no complications or tension, and the treatment is easily achieved. Imagine such a soothing and comfortable environment in which to treat patients. Now imagine this very same scenario through the eyes of the patient. One can see that it could actually be a comfortable experience.

This is not some hypothetical futuristic utopia; this is actually happening now, and the aforementioned points are some of the many benefits of virtual reality (VR). VR is a process that entails immersing the viewer in a 360° environment. By turning his head left, right, up or down, the patient can visualize a real or an artificial environment. The spectator could be immersed in the Caribbean Sea surrounded by corals or in a Canadian forest (Fig. 1). The operation is simple: the participant wears a lightweight and comfortable headset in which a smartphone is inserted (Fig. 2). Owing to the gyrosopic sensors, the smartphone will project a matching image corresponding to the movements. If the patient raises his head, he will see the sky or the ceiling, and if he lowers his head he will see his feet. This technique is made possible by a 360° shot using a dedicated camera (Fig. 3) and simple editing software (Fig. 4). The result is simply astounding as we find ourselves projected into a place that may vary from actual tourist sites to virtual scenarios as in video games. The applications in orthodontics are numerous and at present we are exploiting only a tiny part of its potential functions. The possibilities might be endless. Hence, it might become possible for the patient to visit the dental office from his home, where he can visualize the front desk, admire the treatment rooms or view the cleanliness of the sterilization room (Fig. 5). The aim is to offer a virtual visit of the practice to allow the patient to choose a quality clinic, as well as familiarize himself with the space before his first appointment. Once physically seated in the chair, the patient can wear the VR headset during the treatment and visualize a restful environment of his choosing. From here on, it is solely a matter of preference as the patient might enjoy the beach, a VR video of Honolulu, or maybe even climbing a mountain. Any VR video is acceptable, as long as it achieves its purpose: calming the patient during a treatment session. Thus, everything becomes less tense, and the patient is relaxed. This might also be convenient for the dentist, as he can then execute whatever treatment is necessary as quickly and efficiently as possible.
Convincing the patient to undertake an orthodontic treatment is one thing, convincing him to follow the relevant recommendations is another. Obtaining patient compliance is not easy, especially in the case of younger patients. Furthermore, dentists have an unfortunate notorious association with pain and suffering, which might induce anxiety in a patient. Again, VR can be applied here to divert the attention of the most dynamic patients. Another aspect worthy of mention regarding the benefits is the intellectual retention of instructions on hygiene procedures, for example, which might be dependent on support. It is plausible to assume that verbal instructions on hygiene may be forgotten once the patient has left the clinic. Most orthodontic practices provide only leaflets, but few patients retain these or follow their recommendations. A VR video featuring the practitioner or team members might have a much greater impact on follow-up care at home. The message could be pre-recorded and viewed on demand by the patient. The aims of this format is that it can provide different intellectual integration between information, which is connected to a stream of visual and auditory stimuli. The clinician might wish to promote the patient retaining the provided information in an easier way to achieve greater clinical success. For example, youngsters might remember their favourite movie line by heart, as opposed to information provided by their dentist. This is because it demands less of youngsters to remember words that are connected with pictures.

For the health practitioner, VR may yield an unexpected, but welcome, advantage in terms of professional education (Fig. 6). Many of us have not been able to attend a conference on the other side of the world for logistical reasons. In the near future, it will be possible to attend an orthodontic congress and listen to international speakers while sitting comfortably at home. Similarly, the demonstration of a new therapeutic technique will be easier with a VR video rather than plunging into a detailed explanation in an article without any illustration. The trainer can record his or her procedures with a 360° camera to allow the student to learn through immersion the technical movements and ergonomics of the technique being taught.

It would be an understatement to claim that VR provides an alternative to conventional styles of learning. Although it is far from perfect, it allows a wider spread of knowledge and a totally immersive pedagogy. VR is changing the way we work, learn, and treat our patients. We have seen over time an evolution of orthodontic care by improving patient comfort. We are not just dealing with a set of teeth fixed to a bone mass append to a skull, but with a person whose positive experience will inevitably lead to clinical success. Similarly, orthodontic education has evolved over time, since the transmission of knowledge is no longer done with a Kodak Carousel slide projector, but with sophisticated presentation software, incorporating photographs and clinical videos. VR is paving the way to a higher degree of evolution regarding how to understand our environment, whether it is an environment of care or work. As with tourism or cinema, VR offers many opportunities in the field of health. Orthodontics is entering into a 360° revolution focused on the patient experience.

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