Virtual reality and orthodontics: A new patient 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 familiar 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 visualise 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 gyroscopic 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 astonishing 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 visualise the front desk, admire the treatment rooms or view the cleanliness of the sterilisation 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 familiarise 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 visualise a restful environment of his choosing.
here on, it is solely a matter of pref-erence, as the patient might enjoy the beach, a VR video of Honolulu, or even climbing a mountain. Any VR video is acceptable, as long as it is not detrimental to 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 treat-ment is necessary as quickly and ef-ficiently as possible.

Convincing the patient to undertake an orthodontic treatment is one thing, convincing him to follow the relevant recommendations is an-other. Obtaining patient compliance is not easy, especially in the case of younger patients. Furthermore, den-tists have an unfortunate notorious association with pain and suffering, which might induce anxiety in a pa-tient. Again, VR can be applied here to divert the attention of the most dynamic patients. Another aspect worthy of mention regarding the benefits of the intellectual retention of instructions on hygiene proce-dures, for example, which might be dependent on support. It is plausible to teach a patient verbal instructions on hygiene be 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 for-mat 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 suc-cess. For example, youngsters might remember their favourite movie line by heart, as opposed to information provided by their dentist. This is be-cause it demands less of youngsters to remember words that are con-nected 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 confer-ence on the other side of the world for logistical reasons. In the near fu-ture, 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 thera-petic technique will be easier with a VR video rather than plugging 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 techni-cal 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. Al-though 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 now just dealing with a set of teeth fixed into a bone mass append-ed 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 soft-ware, 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 en-vironment 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.

Use of diode laser in the treatment of gingival enlargement during orthodontic treatment

Case report

By Prof. Carlo Fornaini, Drs Aldo Op-pici, Luigi Cella & Elisabetta Menigo, Italy

Introduction

In recent decades, we have witnessed the substantial development and expansion of the use of fixed ortho-dontic appliances. While their appli-cation has many advantages, several problems related to the health of the soft tissue may sometimes appear during treatment. In fact, the use of fixed orthodontic appliances may provoke labial desquamation, ery-thema multisiforme, gingivitis and gingival enlargement.1 Gingival enlargement is a very com-mon complication during ortho-dontic treatment1 but fortunately, it seems to be transitory and generally resolves after orthodontic therapy, even if sometimes incompletely. Gingival overgrowth induced by or-thodontic treatment shows a specific fibrous and thickened gingival ap-pearance, different from fragile gin-giva with marginal gingival redness common in allergic or inflammatory gingival lesions.2

Several clinical studies suggest that orthodontic treatment may be asso-ciated with a decrease in periodontal health, causing a hypertrophic form of gingivitis. However, the actual pathogenesis of gingival enlarge-ment is not yet completely under-stood, although probably involves increased production by fibroblasts of amorphous ground substance with a high level of glycosaminogly-cans. Increases in mRNA expression of Type I collagen and up-regulation of keratinocyte growth factor recep-tor could play an important role in excessive proliferation of epithelial cells and increased development of...
The role of 3-D imaging systems in present orthodontics

By Dr Enrique Gonzalez Garcia, 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.

Discussion
The first laser appliance was built by Maiman in 1960, and some years later, it was successfully employed in medicine and in oral surgery with several advantages. It may provide excellent incision performance with sealing of small blood and lymphatic vessels, resulting in haemostasis and reduced postoperative oedema. Furthermore, target tissues are disinfect as a result of local heating and production of an eschar layer, which results in a decreased amount of scarring owing to decreased post-operative tissue shrinkage, allowing one to avoid the use of sutures.

General visualisations
To perform a general exploration, it is necessary to know the three anatomical planes: coronal, 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. It is necessary to know the three anatomical planes: coronal, sagittal plane and axial plane. For obvious reasons, one of the main areas to check is the dental zone. Imaging that allows 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 cranio-facial 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 one 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.

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Dr Enrique González García is a member of the World Federation of Orthodontics, Academia Mexicana de Ortodoncia and Colegio de Ortodoncia y Ortopedia del D.F. Has specialised in the interpretation and handling of images in the areas of Maxillofacial Surgery, Orthodontics, Implants, Prosthodontics and Endodontics. Professor of Imaging for Postgraduate of Restorative Dentistry and Prosthodontics at UNITEC. Invited professor of the Facultad de Odontología División de Estudios de Posgrado and Investigación de la UNAM, Programa de Ortodoncia de la UABCS Campus Méxicali and Posgrado de Ortodoncia de UNITEC. Author of many scientific articles and magazines in Mexico, Spain and USA. Author of the books: “Tomografía Cone Beam: Atlas de Aplicaciones Clínicas” 1st and 2nd edition and “Oclusión Práctica: Conceptos Actuales” and the 3rd chapter of the book “Ortodoncia y Micoclases” Advisor for KaVo Kerr Group in the areas of imaging and for Cedirama Digital. Currently runs his exclusive practice of Orthodontics and TMJ Dysfunctions in Mexico City and is a national and international speaker.
Can we treat patients in fewer visits?

By Dr Skander Ellouze, Tunisia

“We live very far away, in the Congo, but we come to Tunis twice a year, in December and August. We would like you to be our children’s orthodontist, and sincerely hope that you will accept them as your patients.”

After a review of the patient’s records and a brief period of reflection, I decided to begin treatment for T., aged 13 (the youngest sibling required no treatment at that time). The patient would be seen only twice a year, during his holidays in December and August.

What was the total length of treatment?
The treatment lasted 22 months and required 5 visits, including the bonding and debonding appointments. In modern orthodontics, we are continuously striving to adapt to a changing world and to respond to emerging needs (comfort, esthetics, hygiene, etc.). Minimizing time commitments during the treatment process (shorter treatment duration, fewer visits) is an important part of this development. Aligner treatments have already started to embrace this trend, sometimes limiting patient visits to those required to begin and end treatment!

Is it possible to monitor long-distance patients undergoing multi-band treatments?
The light, passive force of the Damon System brackets has helped to move the industry forward in this direction. In fact, with the Damon System, increasing the time between appointments is strongly recommended during the alignment/levelling phases. This enables the force system to act “gently” on the periodontal complex.

This raises two key questions:

Is it possible to take this concept even further?

Imagine being able to provide treatment to patients in just a few appointments, with the added benefit of:

• enabling patients (children and adults) to reduce the number of visits to the office to just 4 to 5 over the course of their treatment.
• reducing wait times as well as the number of calls and reminders managed by office staff.

How do we keep this approach from having a negative impact on the quality of treatment?

This article offers ideas and provides a starting point. It introduces the possibility of rethinking the appointment schedule for orthodontic treatments, which—in addition to saving time—opens up new opportunities for practitioners, by more easily offering them a greater choice of practitioners (Patients would no longer have to choose a less favorable practitioner based simply on the proximity of his or her office in order to make it to monthly appointments).

• for practitioners, by enabling them to more confidently take on a growing number of long-distance patients.

Codifying these new fixed appliance treatment modalities could establish an entirely new standard.

My thoughts
We now have the possibility of managing our offices based on this “spreadout” scheduling, with fewer visits to the chair. It can be implemented in the majority of cases, with a few minor exceptions such as those involving impacted teeth. Without this possibility, we would be forced to turn away patients, with whom a good relationship had already been established, and to make sometimes risky patient referrals.

Such a treatment is typically completed in 4 to 6 appointments spread over 6 to 12 months, without having a negative impact on the final outcome. In fact, these long breaks between visits can even be beneficial in terms of tissue integrity.

CASE NO 1
T.F. was 13 years old at the time of his first visit

Diagnosis
Class I incisal-canine crowding in both arches
Class II long face syndrome, hypodivergent
Retrusive chin
Presence of wisdom teeth buds

Treatment Plan
Non-extraction treatment
Alignment – levelling
Obtain a functional occlusion and accentuate the smile arc.
VISIT NO 1
Both appliances bonded on the same day.
SAP bracket placement

Torque Selection
Maxilla: Super low torque on the incisors – super torque on the canines.
Mandible: Low torque on the incisors – super torque on the canines.

014 CN archwires were placed along both arches, from the 1st molar to the 1st molar, without stops.
Bite turbos were bonded to 13 – 23 in order to unlock the occlusion, promote leveling, and protect the brackets on the lower arch.

VISIT NO 2: 4 MONTHS
The patient returned 4 months later. The arches showed excellent initial progress in terms of leveling.

New 014 archwires were placed to continue the leveling-alignment process. Anterior stops were placed on both arches.

VISIT NO 3: 10 MONTHS
Ten months into the treatment, the 014 archwires were kept on, and both arches showed excellent progress in terms of leveling-alignment. Crowding was fully resolved.

A panorex was done to confirm the proper placement of the initial brackets.

Only the maxillary central incisors (whose roots showed significant proclination) were rebonded with standard torque brackets.

Both arches were fitted with 16x25 CN archwires, and the bite turbos were gradually reduced.

VISIT NO 4: 14 MONTHS
It was as if time was doing the work for us. After just 2 visits over 14 months, a remarkable correction was observed in all 3 orders.

Nonetheless, 13 was repositioned to provide a more gingival placement and to correct tipping (see the panorex taken 4 months earlier, which shows an excessive tip-back of this tooth).

For the maxillary arch, the 16x25 CN archwire was replaced with an 18x25 CN archwire, and the mandibular arch was fitted with a 17x25 TMA archwire. The patient was also required to wear vertical intercuspation elastics on the upper canines.

The bite turbos were removed completely during this appointment.
Seven months later, the family returned to the office over the summer break. A long appointment was scheduled to—if all went well—remove the appliances and put a retainer in place. The day of the visit, the decision was made to proceed. When I announced that the treatment would be completed that day, the patient and his parents had quite a memorable reaction: “Already? It went so fast! Thank you! He is going to have the best summer break!”

The results, although not perfect, were remarkable. The end-of-treatment records clearly show good tissue quality (periodontal and root integrity), undoubt
edly thanks to the use of minimal force with long rest periods, a minimal number of archwires, and bonding which allowed for continuous improvement throughout the entire treatment, from beginning to end.

That same day, we began treatment for the youngest sibling, using the same protocol.

Today, 37% of my patients fitted with multibracket appliances are non-residents, meaning they live in another country, or even on another continent. These treatments would be impossible without this new flexible scheduling.

Even with these new treatment modalities, a certain level of precaution and organization is required in order to ensure continuous improvement (the promise touted by each new system on the market today):

- An appropriate prescription for the anterior torques.
- A SOLID bonding protocol (brackets and bite turbos) that eliminates the risk of bond failure almost entirely.
- Extremely precise brackets placement, reducing the need for repositioning.
- Biomechanical foreplanning: sufficient wire supply for leveling – proper placement of stops – lasting activation devices (coils, for example, rather than power chains) – anticipating biomechanical effects with the use of mini-screws, etc.

CASE NO 2
This patient, aged 15 years, was treated in 5 visits spread over 31 months. These photos show the treatment stages and the intervals between appointments. A Damon System was used to treat this case of a Class III malocclusion, with incredible results observed in the teeth and facial features.

CASE NO 3
This “spread-out” scheduling approach can also be applied to treatments involving extractions. In this case, the patient moved to Canada in the middle of her treatment (at 11 months), still with several spaces left to be closed. Having already undergone an initial 3 year treatment (see photos), the patient wanted to remain with the same orthodontist and agreed to travel from Canada every 6 months to continue her treatment.

After moving away, she was seen just 3 more times, including the debonding appointment.
Digital Orthodontics Symposium

04 May 2018
Madinat Jumeirah Conference Centre
Dubai, UAE

Topics to be discussed:

- Digital Photography
- Radiography in Orthodontics
- Digital Workflow in Orthodontics
- Intraoral Scanning / Digital impressions
- Treatment Planning
- Design of Ortho appliances
- Manufacturing of aligners, braces, wires
- Digital Models
- Facial Scanning
- Orthognathic Patients
- Digital Analysis & Treatment of sleep apnea cases

Contact Us
Mobile: +971544601843