Virtual reality and orthodontics: A new patient experience

By Dr Yassine Harichane, Canada

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. 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. From
here on, it is solely a matter of pref-
ence, as the patient might enjoy the
beach, a VR video of Hiroshina, or
maybe even climbing a mountain.
Any VR video is acceptable, as long as it
promotes the message and engages 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-
fectively 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 is 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 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, younger patients
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 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 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.
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 only just dealing with a set
together 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
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, Dr Aldo Op-
peo, 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
provide labial desquamation, ery-
thema multifiliforme, gingivitis and
gingival enlargement. Several clinical
studies suggest that orthodontic treat-
ment may be associated 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

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Fig. 1: Clinical view showing gingival
enlargement, just before the debond-
ing procedure.

Fig. 2: Application of a topical amanethic.

Fig. 3: Surgical laser-assisted treatment via laser gingivectomy.

Fig. 4: Clinical view just after surgery.

Fig. 5: Healing five days after surgery.

Fig. 6: One-month follow-up.
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 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 postoperative tissue shrinkage, allowing one to avoid the use of sutures.

Diods, the last generation of laser used in dentistry, have several advantages, such as reduced cost and size, and offer the operator the possibility to work both in continuous and chopped mode. Based on our experience, we can confirm that this technology may represent a new approach to the resolution of gingival enlargement during orthodontic treatment, with better comfort for the patient during and after surgery.

General visualisation

To perform a general exploration, it is necessary to know the three anatomical planes of a sagittal plane and an 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 from back 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 speciaist a complete exploration of the 3D anatomy. The result is a deeper knowledge of the anatomy of the patient or, 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.
Temporomandibular joint

The TMJ is, by definition, a ginglymus diarthrodial complex joint. Thus complexity is reflected in the knowledge and importance that each professional gives it. There are a number of specialists for whom 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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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.
- for patients (children and adults) to reduce the number of 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.

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.

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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.
VISIT NO 5: 21 MONTHS

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), undoubtedly 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.

VISIT NO 6: POST-RETENTION PHOTOS +12 MONTHS

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

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- Facial Scanning
- Orthognathic Patients
- Digital Analysis & Treatment of sleep apnea cases

KEYNOTE SPEAKERS

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