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# ortho

**international magazine of** orthodontics

**opinion**
Collaborative Treatment Intelligence:
Sharing information to help doctors grow

**clinical research**
Multidisciplinary treatment in a patient
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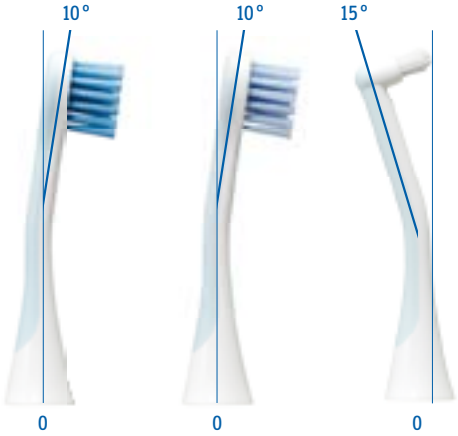


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SWISS PREMIUM ORAL CARE

**Dr Tif Qureshi**

Clinical Director of IAS Academy

Dear Readers,

Orthodontics carried out by the general dental practitioner (GDP) is one of the most controversial areas in dentistry, but I will start even more controversially by saying that I would not sit in the chair of a GDP who did not at least understand orthodontics and was not ideally able to carry out some limited objective orthodontics. Why? Because, when one understands the implications of Little's study[1] on stability and relapse of dental arch alignment and the proven effect of continued tooth movement, combined with the concept of a changing envelope of function, it helps us understand why around the world there are vast numbers of patients who, arguably, needlessly have crowns and veneers placed on repeatedly chipping anterior teeth. The problem is that the implications of Little's study are not widely understood. That is "relapse" is a red herring of a term, because the study showed that, whether patients are treated orthodontically or not, in a significant proportion of patients with some crowding, arch width and arch length will continue to shorten anyway. Instead of "relapse" perhaps we should use the term "continued tooth movement".

The only people I have come across who really seemed to have grasped the concept and understand the functional and occlusal changes that come from continued tooth movement are GDPs who have long-term relationships with patients and follow up with photography and detailed documentation. I know only a few orthodontists who are able to follow their patients for life. Now of course that is not practical, but in most European countries, orthodontics is carried out and there is little funded care or planning, or indeed education, for the GDPs who ultimately need to be able to maintain these aligned smiles.

As a result, large numbers of patients within ten years will suffer some kind of relapse. Comprehensive orthodontic studies show that ten years after retainers are stopped 70% of cases need retreatment due to relapse.[2,3] The problem is that the profession has not yet really identified what the long-term implications of relapse are. In the UK, the Department of Health and Social Care and the British Orthodontic Society described this relapse as "cosmetic only".

Most GDPs who see patients over years can testify that relapse can cause far more than just cosmetic problems. Indeed, collapse of canine width, loss of guidance, constricting envelopes of function, tooth wear, deepening bites, fremitus and bone loss are all a result of continued tooth movement. The vast number of patients I have seen over 25 years in one practice strongly underlines what Little's study outlined.

Now does this mean that GDPs should be permitted to carry out orthodontics on every patient? Absolutely not. The problem is that orthodontic companies and aligner providers have created products focused on allowing GDPs to potentially treat the whole mouth, without fully understanding the importance of a proper facial, skeletal and dental orthodontic assessment and diagnosis. Even if certain aligner systems have limited goals, it is essential that aligner companies educate dentists correctly and implement mentoring with overall assistance from specialists, so that dentists understand what they can treat and cannot treat. It is certainly possible that proper education and mentoring may help with case selection and execution, and may mean that GDPs can carry out some orthodontic treatment with limited objectives safely. And if those objectives include removing a constricting envelope of function to avoid the eventual placement of a crown in an appropriate case, then I would argue that it is essential that every dentist in the world should have this simple ability. Without it, we are, I believe, complicit in actively harming patients worldwide.

I would like to dedicate this editorial to my dear friend Dr Anoop Maini, a UK dentist who helped GDPs carry out orthodontics to a higher standard—for the right reasons—and who recently passed away at the age of 49.

**Dr Tif Qureshi**

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


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THE INTERNATIONAL COLLEGE OF DENTISTS
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# Celebrating the first 100 Years

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# Digital orthodontics

Dr Anna Hajati, Sweden

## Introduction

Digitalisation is the most revolutionary change in human existence of all time. It will have a more fundamental impact on our daily lives than the letterpress, invented by Johannes Gutenberg in the mid-fifteenth century, or the industrial revolution, begun in the UK in the second half of the 1700s. At this point, we are just about to see through the door to humankind's future. But what impact will digitalisation have on orthodontic care? Looking back, we have already been using digital administrative systems and images for decades, but it was not so long ago that digital orthodontics was implemented in the treatment process, through which we could create a virtual patient from 3-D data, simulate a treatment plan, and design and manufacture tailored appliances. These capabilities are still employed by the minority of orthodontists. However, digital orthodontics embraces the full digital patient process, which is far more than a single digital treatment process resulting in a bracket system or a specific appliance. It incorporates an ecosystem that is far more complex and includes 3-D image acquisition; registration of different image sets and formats; segmentation of the anatomic structure of interest; simulation of bracket placement, occlusion, function and smile; online monitoring of the treatment course and hygiene; and design and manufacture of appliances. In essence, digital orthodontics is a matter of communication, using and transferring information.

## Digital communication and influence

Back in history, individuals with power over information, or the most influential, were the oldest and most experienced, and after the letterpress, this power shifted to the most educated (Figs. 1a–c). In the digital age, influential power belongs to those who know how to write and communicate to a target population via the Internet and social media. Today, we see a full ecosystem of influencers—family and friends, co-workers, customers, bloggers, fans, vendors, publishers and celebrities—and together they have an impact on the information, insights and knowledge we take in. The closer the relation (like family and friends), the greater the influence, and if you invest greater resources or have many followers or fans, the wider the reach of your communication becomes (Fig. 2). Most industries, including dentistry, employ this ecosystem to build their brand to target the end-consumer directly. According to market research and advisory company Technavio, the top five key players in the dental CAD/CAM market are Danaher, Planmeca, Zimmer Biomet, Dentsply Sirona and Align Technology.[1] They all use strategic communication in their marketing approach that is focused on creating and distributing valuable, relevant and consistent content, in order to attract and retain a clearly defined target group. It can be described as a buying funnel, where the first part is aimed at attracting and creating awareness and continues on to build trust and then a desire that leads to customer action (Fig. 3).

I will give a real-life example of how we have all been influenced. Back in 2009 when OrtodontiAkademin was founded, awareness of invisible orthodontic appliances as a treatment for adults was low. Adults searching for a better smile tended not to consider buccal orthodontic appliances that would be fully visible on their teeth. Many

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**Figs. 1a–c:** Influential power has been transferred from the oldest (a), to the most educated (b), to those who can communicate successfully to a target audience (c).


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**Fig. 2:** An influencer is a person with the ability to influence potential buyers of a product or service, by promoting or recommending the respective item or service.


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**Fig. 3:** The marketing funnel is a system of stages consumers or purchasers pass through to eventually make a buying decision.

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**Fig. 4:** Veneers used to be a common means of treating misaligned teeth before there was increased public awareness of invisible appliances.

"Orthodontic patients have been an important target population for strategic digital communication, as have general dentists and orthodontists. In an era of social marketing and big data, professionals need to be aware of what the product or service is. A lifestyle? A bracket system? Equipment? Software?"

saw "instant orthodontics" as the only alternative (Fig. 4). The American television show *Extreme Makeover*, featuring the cosmetic dentist Dr Bill Dorfman, was so popular that awareness of cosmetic dental care and the desire for it started to grow—so too did the number of providers of cosmetic dentistry. Public awareness of adult orthodontics and invisible appliances, however, was still very low, and the clear aligner alternative, Invisalign (Align Technology), was disappointing.

Today, the public has become more aware of the invisible alternatives. Many orthodontists began to offer lingual appliances with the launch of Incognito (TOP-Service für Lingualtechnik) and general dentists began to offer clear aligners. Since then, the global invisible orthodontic market has grown considerably. According to Technavio, it will continue to increase in years to come.[2] Furthermore, market forecasts from meticulous research indicate that the orthodontic market will be dominated by removable appliances up to 2023.[3] The expected key drivers in these reports are the target population, adult orthodontic patients desiring improved smiles. The reason behind the current increased awareness, desire and demand from the population is the nature of modern communication, how we as professionals have been using it, as well as strategically consistent digital communication by the industry. One can clearly perceive a direct association between the increased use of the Internet, including social media, and the increased interest in invisible orthodontic care by the adult population.

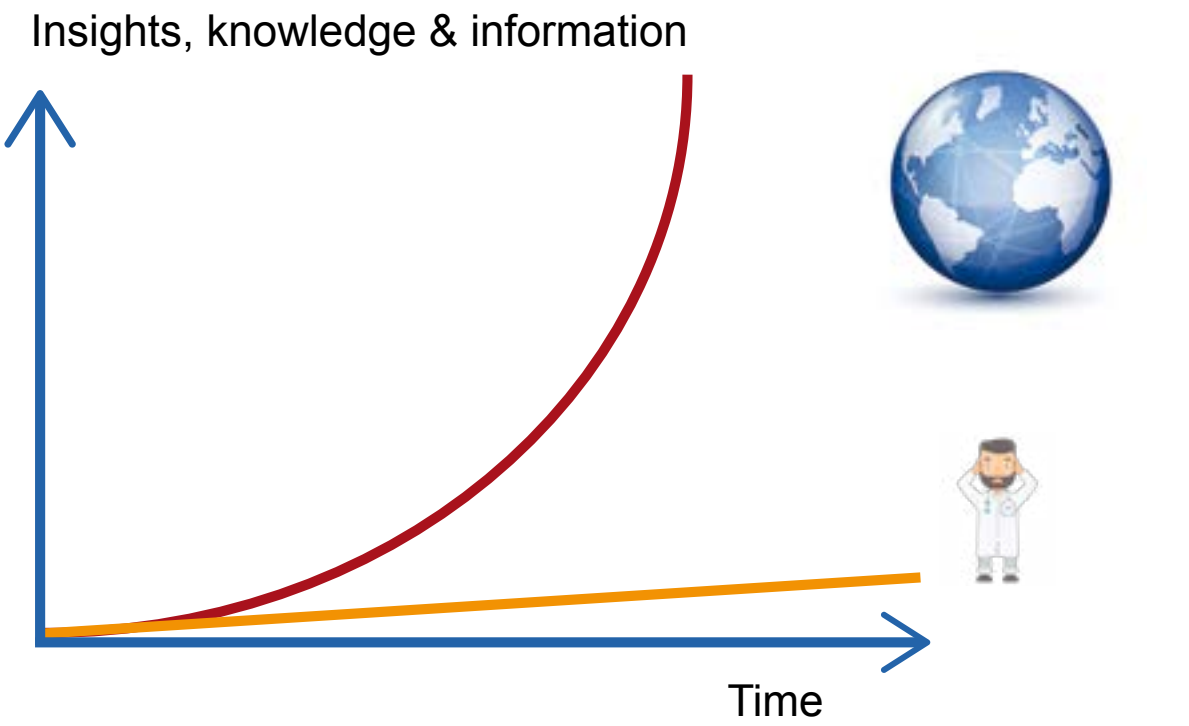


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**Fig. 5:** The amount of gathered insights, knowledge and information increases over time at a global and individual level.

Orthodontic patients have been an important target population for strategic digital communication, as have general dentists and orthodontists. In an era of social marketing and big data, professionals need to be aware of what the product or service is. A lifestyle? A bracket system? Equipment? Software?

## Communication via 3-D images

Regarding digital orthodontics, we also need to address the impact of 3-D imaging systems on market development. A direct prerequisite for the development of CAD/CAM-supported orthodontic appliances is the improved accuracy and increased use of intra-oral scanners and availability of CBCT units. Since 3-D image equipment has been a natural part of patient-centred communication, planning and manufacture, we have experienced an explosion of 3-D image capturing devices. According to Data Bridge Market Research's forecast, almost 100% growth is expected from 2017 to 2024.[4] Three-dimensional image acquisition and processing have become fundamental for the entire patient process in modern orthodontic care.

Owing to the huge amount of data processed, equipment and platforms have become smarter and more automated. Today, the fastest intra-oral scanners are based on machine learning and artificial intelligence (AI), which are essential for customer demands on speed and size.

## Communication, big data and AI

As we continue to communicate, all the resulting information forms part of big data, and systems gain control over it from mass input. Never ever has the collected knowledge, insights and information been as huge as today, and the size of data sets is continuously increasing exponentially over time (Fig. 5). According to a report by data storage company Seagate Technology, the amount of digital data will grow from 33 ZB in 2018 to 175 ZB by 2025.[5] Individuals or even a group of professionals, like orthodontists, can only learn new data to a minimal extent, so we become a little bit less knowledgeable every day in relation to the exploding amount of data being generated. This means that even orthodontists know less and less relative to big data. We should not under-estimate "Dr Google", who is taking advantage of all our communications and growing increasingly more knowledgeable and intelligent as we continuously share our insights, knowledge and information. The platforms learn from all the data we generate. FAANG—the acronym for Facebook, Apple, Amazon, Netflix and Google—is combining our information out there, as FAANG regards us as all the same, whether a company, an orthodontist or a patient. FAANG does

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**Fig. 6:** Robot creating artificial intelligent interface.

not care whether you are a general practitioner, a certified specialist, or not even a dentist. It is creating a standard for what we can do and not do.

## Digital orthodontics in the future

There is one thing that is certain: big data, machine learning and AI are here to stay and have already gained significant influence over orthodontics. Every aspect of the process which can be digitalised and automated will be (Fig. 6). In response, you may well say that it is all over for traditional orthodontics. I would say, no, it is not. In fact, it is just a new beginning. Being an orthodontist has never been more exciting and challenging at the same time. The profession is undergoing a fundamental transformation and we need to learn about this shift and position ourselves to best exploit it. Every one of us has a responsibility to transfer our insights, knowledge and information to coming generations. If we do not do this, others, with much less expertise and experience, will exploit the opportunity to provide incorrect information to patients and young orthodontists.

The orthodontic market is changing fundamentally, because the value of any product or service today is directly related to how insights, knowledge and information can be controlled, collected and transferred to machine learning and AI. Therefore, each and every one of us needs to consider what information we need to share, whether it is state-of-the-art treatment plans, treatment outcomes or accurate information that guides prospective patients in the consumer process. Each one of us can consistently act together as influencers in a most powerful way if we do so with intention, intelligence and ethics.

Digital orthodontics is going to fundamentally transform our professional role. Digitalisation challenges our clinical skills, requiring us to be more knowledgeable and more precise in risk assessments than previously. But the most fundamental change is to communication. It has never been more important that orthodontists communicate. The product will not be a bracket, equipment or even a platform. It is our knowledge that is collected and added to the big data, machine learning and AI. It is essential that you and I share it, for the patients and coming generations of orthodontists.

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

## about

**Dr Anna Hajati** is the founder and owner of OrtodontiAkademin, an orthodontic practice in Stockholm in Sweden, and has been employing digitally supported treatment processes since 2009 to improve treatment outcomes and the patient experience. She obtained her DDS and PhD from Karolinska Institutet in Stockholm and her certification in orthodontics from the Centre for Orthodontics and Paediatric Dentistry in Linköping in Sweden.

Dr Hajati is a member of the World Federation of Orthodontists, American Association of Orthodontists (AAO), European Orthodontic Society, Swedish Association of Orthodontists, and Dental and Craniofacial Bionetwork for Image Analysis. She is an elected ambassador for the AAO in Sweden.