

# aligners

international magazine of aligner orthodontics

preview

## opinion

Accelerated aligners with photobiomodulation

## case report

Clear aligner orthodontic treatment  
of a complex malocclusion

## trends & applications

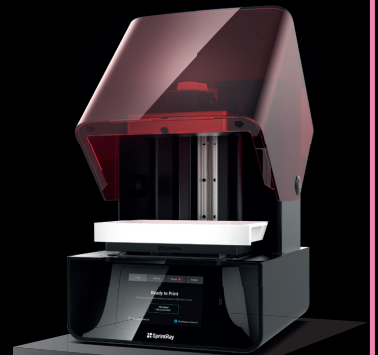
Printing clear aligners in-house—how accessible is it?



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### Dr Antonello Francesco Pavone

Private practice in Rome, dedicated to the management of interdisciplinary and aesthetic treatment in prosthodontics and implantology



In order to restore aesthetics, function and structure while respecting biology, an interdisciplinary approach is necessary, especially in adult patients. Only the synergy between various disciplines, such as restorative dentistry, prosthodontics, periodontics and in particular orthodontics, can create an adequate balance of therapeutic objectives in adult patients.

Drs Werner Schupp and Julia Aubrich correctly said in their book: “since the anatomy of the teeth cannot be changed orthodontically, then orthodontics cannot by itself create perfect occlusal patterns in teeth with native or acquired defects”.<sup>1</sup> As a restorative dentist, one can also add: since the position of the teeth cannot always be correctly modified with restorative treatment, such treatment will not always be able to rehabilitate misaligned teeth by obtaining an adequate compromise between aesthetics, function, structure and biology. Thus, it is important to understand the limits of any discipline and the importance of working together to achieve a perfect final result. The major difference between orthodontists and restorative dentists is that the latter think of teeth mainly in terms of shape and size, while the former think in terms of position and occlusion.

Orthodontic and prosthodontic issues are crowding, rotated teeth, insufficient or excessive interdental spacing, and inter-arch incoherence. When these problems exist in adult patients, restorative or prosthetic treatment cannot be performed such that a good balance between the four fundamental parameters of aesthetics, function, structure and biology can be respected and obtained. How can very rotated and overlapping teeth be adequately restored? Technically, the treatment would be very complex to carry out, and in the long term, the crowded teeth could have greater periodontal and functional problems after restoration. Inter-arch incoherence would inevitably have greater risks of functional and mechanical problems.

The advantages and benefits of orthodontics for restorative and prosthetic dentistry are minimal biological impact on tooth structure and involvement of fewer teeth, better proportion and dimension of the definitive restorations, adequate self-cleaning of the mouth, flow of food and

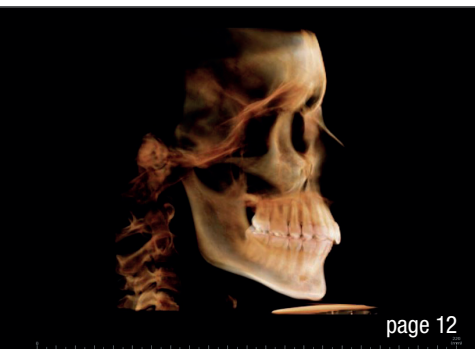
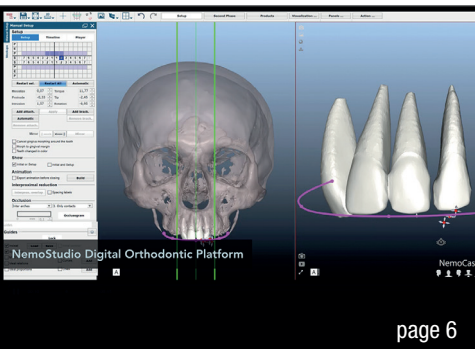
escape of food along the inlays of the correctly aligned crowns, and an occlusion that avoids temporomandibular disorder and improves the mechanical long-term result of treatment.

As a restorative and prosthodontic dentist, I hope that aligners facilitate access to orthodontic treatment for adult patients who need to be treated and that my peers increasingly realise that proceeding without a holistic interdisciplinary approach both entails greater technical complications in carrying out the work and reduces the possibility of achieving the ideal therapeutic goals. All treatment for the adult patient today requires a complete knowledge of the masticatory system, of alternative therapies, of adequate medical diagnostics and of interdisciplinary planning.

General, restorative and prosthetic dentists should always first consider recreating arches aligned with a “U” and not a “V” shape and with an adequate anterior overjet, in order to allow aesthetic restorations in the anterior but with a satisfactory long-term prognosis. Lengthening the incisal margins for aesthetic reasons in mouths with V-shaped arches and with crowded mandibular anterior teeth means great risks of mechanical failure in the short term. This is why orthodontics truly is the key to restorative success and aligners the best way to convince our adult patients to undergo orthodontic treatment.

Many mouths today show localised wear due to misaligned teeth. Only orthodontics can allow these mouths, through adequate realignment, to be able to receive structural restoration only where needed. Wear in crowded dentition provokes asymmetrical and asynchronous loss of tissue and consequently localised and sectorial compensatory eruption. Thus, orthodontic treatment before restorative care is absolutely unavoidable. Restorative treatment without prior orthodontics is not only complex and somewhat unreasonable but also a diagnostic and planning error.

1 Schupp W, Haubrich J. Aligner orthodontics: diagnostics, biomechanics, planning, and treatment. London: Quintessence Publishing; 2016. 358 p.



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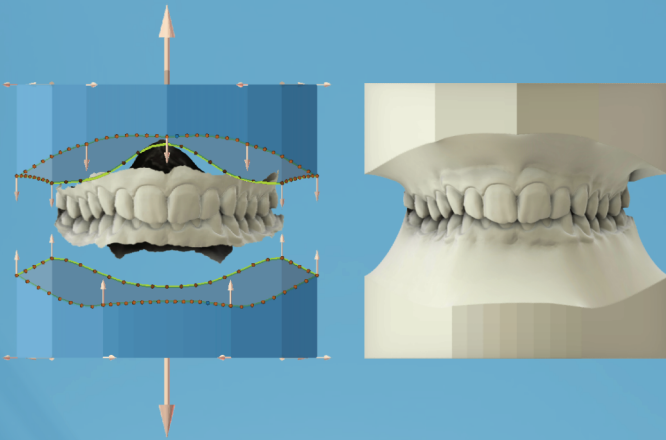
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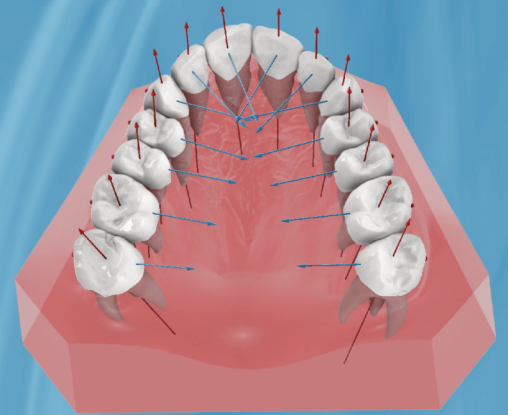


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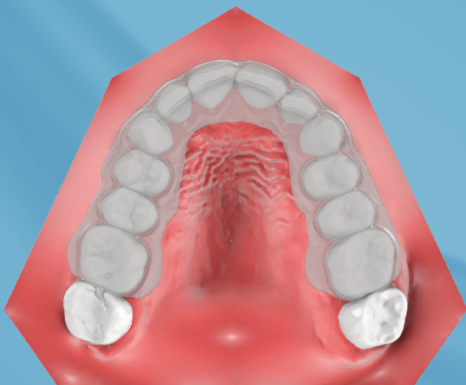
Study Models



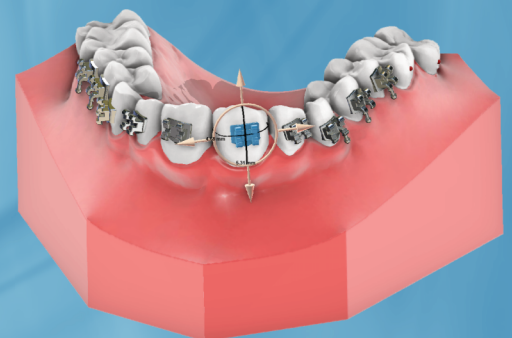
Virtual Setup



Clear Aligner



Indirect Bonding



# Accelerated aligners with photobiomodulation

Dr Miguel Stanley, Portugal

When I first heard about clear aligners in the early 2000s (the US Food and Drug Administration approved the use of clear aligners to straighten teeth in 1980), it must have sounded like science fiction. The fact that it was created in Silicon Valley by people who had nothing to do with the dental industry, in seeking solutions that do not require complicated appliances in the mouth, is really an incredible story.

In fact, some of the greatest leaps in medicine have come from people outside of the medical industry. We live in an era in which technology powered by incredible software is completely redefining our industry. Having been in dentistry for 22 years, I have never felt so excited about the future. The reason why so many companies continuously develop new technologies and software is based on one simple factor. Humans want faster, better, cheaper, not just on the patient side but on the practitioner side as well.

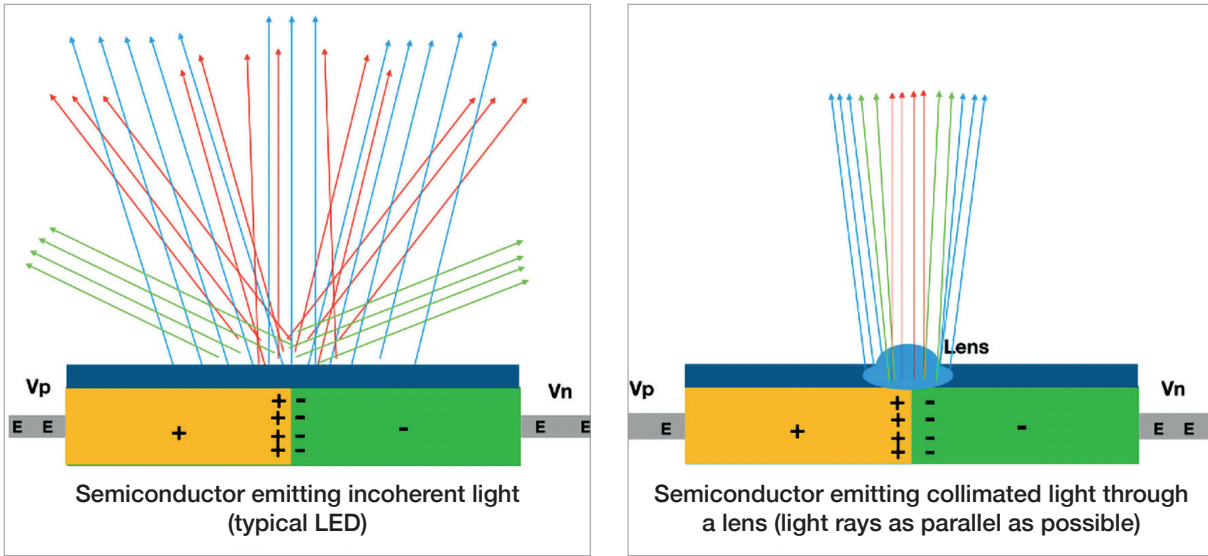
Pierre Fauchard, a Frenchman with an obvious passion for straight teeth, is credited with inventing modern orthodontics in the eighteenth century. However, evidence shows that the topic of tooth straightening goes back to ancient Greece. There is also evidence of the Etruscans using straightening and space maintaining devices. So, evidently, for the longest time, people have given importance to their occlusion and smiles.

I remember going to the dentist when I was 10 years old and having a removable palate expander fitted, which cost my mother a fortune. I lost it in the first week and thereafter had a guilty relationship with orthodontics to such an extent that I never pursued studying it. I never showed any real interest in developing my skills, but always understood the importance of pretreatment orthodontics in complex cases and not just the classic straightening of teeth in teenagers. I was very lucky to have had some amazing mentors in the beginning of the millennium who inspired me to always do the right thing and take the long road when facing complex treatment plans.

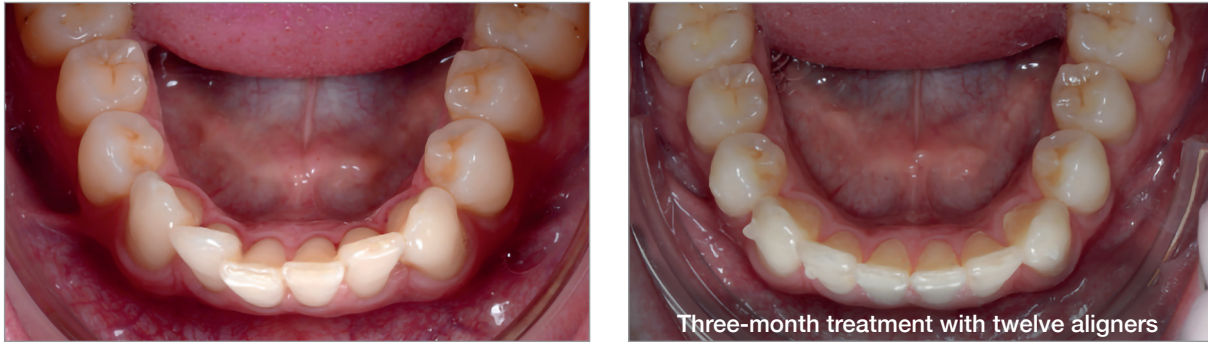
When I opened my first private practice in late 1999, I realised that this area, orthodontics, needed to be developed in my clinic, so I started working with a colleague in

early January 2000, using the classic brackets with the elastics and the regular monthly visits that became the classic cash cow for both the clinician and the practice. I did not really pay much attention to this, as I was so focused on my implant and cosmetic dentistry practice. This was how everybody else was doing it back then in Portugal. This colleague was trained to extract first premolars in almost every single overcrowding case with teenagers, a practice that I now find quite reductive, because I do not think you should ever generalise, and we now know many cases can be treated without extractions.

In 2001, I started working with a new orthodontist, trained classically in Italy, and she has been running my orthodontic department ever since. Our focus has mostly been on using the Damon system and Invisalign. We started using these systems as early as 2005. We were one of the first clinics in Europe to start working seriously with these systems, and I am proud to say that our almost 18-year working relationship has been an incredible success, there having been no tooth lost owing to aggressive movement and not one case of root resorption so far. Meticulous planning is the key of success. Furthermore, the prediction of the length of the treatment proposed has almost always been correct. We found out very early on that patients like to know when their treatment will be finished, and a well-trained professional, with the right tools and good experience, can achieve within a few months a time frame which is almost always as planned. There are several reasons for this success. The first is that, back in 2004, we invested in a digital dental panoramic machine (orthopantomogram) with a cephalometric arm in order to obtain lateral cephalometric radiographs for a complete analysis. This allowed us to do proper treatment planning without having to outsource. Another reason was that I made my orthodontist, even though she really enjoys general dentistry as well, focus her practice exclusively on orthodontics. This was not a common practice in Portugal back then. Orthodontics was generally performed by general practitioners. The same was the case for implant dentistry and prosthodontics. The general thought was, why share the profits when I can do it myself? I somehow implicitly understood that having somebody focused only on this area would



**Figs. 1a & b:** Differences between (a) a typical LED and (b) the ATP38. Vp = Positive voltage; Vn = Negative voltage; E = Energy.



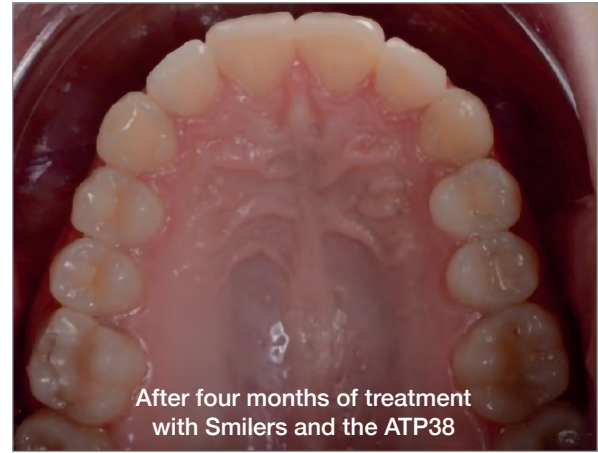
**Fig. 2:** Before (left) and after (right). The case was solved over three months with 12 clear aligners (Smilers) and photobiomodulation therapy (with the ATP38), applied every week for six minutes every time aligners were changed.

lead to better results. Looking back, it was a smart decision. In the past decade, the practice has grown and we have become a globally recognised centre for complex cases. When it comes to orthodontics, we always try to solve complex issues without surgery when possible. It is amazing what you can do with a highly skilled orthodontist who works calmly and has an in-depth knowledge of biology and mechanics.

Notwithstanding, as the clinical director of a leading dental centre, part of my job is to bring in new technologies and techniques that can improve the workflow at the practice. I spend a great deal of time attending congresses around the globe, speaking to very clever people, and over the years, I have learned how to filter the noise from the facts. I thought it would be useful to share what we have discovered over the past year and a half about a relatively new system on the market that combines clear aligners, obviously a software-driven technique, with advanced photobiomodulation. This is in effect a non-invasive method for an accelerated orthodontic treatment.

What has happened in the last two decades around the concept of clear aligners and the associated technology has truly rocked the foundations of the dental world, and without a doubt, the race for the best system has been one that is only paralleled by the implant industry. If you look at things from a larger perspective, very few companies have recently gained so much press in social and traditional media as industry giants Invisalign and Smile-DirectClub, two of the few companies that have promoted their products directly to the final consumer. I have always been a big fan of anything that brings dentistry to mainstream media. These companies have done a great deal to inspire people to straighten their teeth and fix their smiles.

Obviously, in the case of direct-to-consumer aligner companies, there is always a disclaimer that the patient must have a clean bill of oral health before receiving orthodontic treatment. However, publicly traded companies are usually highly focused on profits, like most large businesses should be, and perhaps the focus on acquiring new clients is a little too financially driven, and in a clinical



**Figs. 3a & b:** Upper jaws, before (left) and after (right). The case was solved over four months with 16 clear aligners (Smilers) and photo-biomodulation therapy (with the ATP38), applied every week for six minutes every time aligners were changed.

setting, there are not enough medical and diagnostic barriers between the problem and the solution. There is absolutely nothing that can replace a quality check-up done by an experienced dentist with the proper diagnostic tools.

We all know that this trend of direct consumerism for orthodontic treatment has created substantial push-back from the dental community. I believe that the issues raised are valid, and they give rise to a greater question: can orthodontics be a direct-to-consumer product? I have my thoughts on this, but I guess the simplistic answer is no. The risk of poor orthodontics, planned by technicians or artificial intelligence alone without any radiographs or CBCT scans, is in my opinion a health risk. Poor treatment planning can lead to periodontal and occlusal issues that can scar a person for life and lead to massive health and financial issues as well. Therefore, orthodontics should never be taken lightly, no matter how simple the case seems to be. Every single orthodontic treatment should be planned by a well-trained orthodontist with in-depth knowledge of biology and mechanics, backed up by CBCT scans and/or panoramic radiographs with a cephalometric study. Notwithstanding, there is, in my opinion, a major role that software companies can play in improving the quality and speed of these treatments.

Many patients around the world looking for clear aligner options recognise very famous brands and of course are quite impressed when they discover clinics in the area that hold a certain member status, as providers of these brands. This obviously creates the impression that they are somehow better than the other providers of exactly the same service, when in fact the only difference is the volume of cases sold, which indicates nothing about the quality of care but everything about their capacity to sell treatments. It took me many years to understand that we

should be more focused on acquiring a status based on the final radiographs or CBCT scan and the final position of the teeth and final occlusion. This would make more sense. I would love to see companies award these different statuses based not on volume of sales but on successful cases treated without any biological interference. If you look at it from a larger perspective, it is almost a kind of marketing, as it creates the illusion for the consumer that one provider is better than another based on the quality of care when that is not the case. I am sure that these companies will say otherwise, and to be fair, clear aligner companies provide a service that is founded on the information given to them by the dentist. They do not claim to do the diagnosis, and they thus rely entirely on the accuracy and authenticity of the information provided. It really is up to each doctor to ensure that a comprehensive diagnosis and examination have been performed. If these companies were concerned with compliance with the rules and ethics, then they might not have a business, as we all know many dentists cut corners on time and costs when they can. I have seen in my career so many patients come into my clinic with aligners or traditional orthodontic appliances with conditions such as caries and much worse, such as infections in the bone, that were clearly there before orthodontic treatment was started. In my opinion, the main reason is that a lot of orthodontists do not receive payment for general dentistry or prophylaxis, only for their orthodontic work. This leads to a corruption of care. We must all be aware of the fact that there are many clinics that cut corners for a multitude of reasons. Another important factor is the time it takes to do a proper diagnosis, and in many cases, dentists do not get paid to pursue this in depth. Critical thinking is not financially rewarded. This is the main *raison d'être* of slowdentistry.com. Therefore, to be able to outsource all of this analysis is awesome for many, who simply send the basic information and accept whatever is sent their way from the company's





**Figs. 4a & b:** Upper jaws, before (left) and after (right). The case was solved over two months with eight clear aligners (Smilers) and photobiomodulation therapy (with the ATP38), applied every week for six minutes every time aligners were changed.

technicians without even looking. The patient knows no difference between these aligners and those fabricated by a team that spent hours analysing and discussing the case with peers after all appropriate diagnostic tools were utilised. The box looks the same, the steps look the same, and in many simple cases, the results might be good. I doubt however that this will be the case with complex cases or cases with underlying problems such as thin biotype and bone loss, that can only be visualised with a digital CBCT, combined with a good perio probing, when only an intra-oral scan was sent in.

We live in a world where things are rapidly changing and consumers are becoming more aware of their rights. This is why I believe that systems that do treatment planning using the largest amount of data possible, always using radiographs or CBCT scans, and that are focused on understanding the situation at the end of care and not just the beginning will be the most successful in the future. Hopefully things will change soon in this regard and the public will understand that, in orthodontics, it is the final result, not the volume of sales, that should define success. We are physicians of the mouth. If we do things properly we can dramatically improve our patients' lives. It is time to slow down and remember what our job is all about. We should not be in a rush to make money before taking care of our patients.

Let us get back to understanding what has happened in the industry over the past decade or so. In recent years, I have slowly started to understand that there has to be more to orthodontics than just fixing teeth. I, and many leading dentists around the world, have for quite some time been using aligners as a pretreatment requisite in order to establish a minimally invasive treatment protocol. One of the first to make this possible was the Digital Smile Design (DSD) methodology, which was pioneered by Dr Christian Coachman, a Brazilian dentist and dental

technician, and really took the dental world by storm. It initially started with planning full-arch smiles and then reverse-engineered the treatment steps, thanks to an interdisciplinary software program, NemoStudio. This was very well received around the world, by the dental industry and by patients, and has now become a household brand. DSD is, in effect, an architect of smiles. It is no longer necessary to explain what a new smile will look like or to use complicated manual mock-ups; everything is software-driven using 3D printing. That is why I believe Invisalign made a move to collaborate with the DSD brand, and they have been doing a good deal to promote this concept of treatment plan acquisition. My team and I were one of the first in the world to employ DSD planning in treating a case in order to tell Invisalign what we wanted based on the final anatomy of the veneers before we had even started the treatment. We started to work on the case in early 2018, and the results were incredible.<sup>1</sup> (We have published a few articles on this matter.)

It is with great pleasure that I am seeing more dentists using DSD and of course clear aligners as a pretreatment for large, complex cases that will later involve prosthodontics with or without dental implants, regardless of the fact that it adds to the cost and to the timing of each procedure. For me, it is no longer acceptable to grind healthy enamel simply to fix the tooth position so that you can place your ceramic restorations fast. We owe it to our patients to be as minimally invasive as possible. We all know that a natural, healthy tooth is the best kind of tooth and I argue with my patients that want "same day" veneers and try to convince them for a slower approach with aligners, bleaching, saving them enamel and cash as well.

I must give credit to the biomimetic groups around the world and to the Facebook page Style Italiano, for their work, which really boosted the concepts of minimally