

HUMAN BRAIN

THE MOST ADVANCED AND IMPORTANT
3D TOOL IN DIGITAL WORKFLOW



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“It must be the ambition and determination of every orthodontist, to treat each of your patients in a way that will produce the best possible results with the least inconvenience for both.”

Harold Dean Kesling

Kesling¹ is considered to be the father of clear aligners, at least of the most important concept behind the technique that is most evident in Dentistry worldwide and which has been responsible, to a large extent, for all the good and bad in the profession over the last two decades. Kesling’s conviction, which we vehemently share, can be seen already in the title of his classic 1946 article, published in *American Journal of Orthodontics and Oral Surgery*¹ — “*Coordinating the predetermined pattern and tooth positioner with conventional treatment*”. Taking into account the scientific evidence and therapeutic devices available in the post-war period, for the visionary Kesling only 15% of what we do is what actually contributes to the final result of our treatments. That is, an incredible 85% of the time, expenditure, and our efforts are in theory wasted on unnecessary adjustments, diagnostic errors and planning, lack of patient cooperation, among others.

What Kesling realized with great mastery and, which has changed little after eight decades, is that the greatest dilemmas of Orthodontics are the difficulties posed by the challenge of abstracting² how to move the teeth in order to obtain a stable, functional dental rearrangement and in harmony with the aesthetics of the smile and face, considering the significant individual morphological variations both of the skeletal bases, as well as of the soft tissues and teeth³.

To “pour gasoline on the flames”, theories that demystify the classic paradigms of Orthodontics have recently gained strength, which often “force” us to try to fit results into arbitrary norms that were randomly determined, based on intangible ideals and little found in the nature in part influenced by the sectarian theories of Eugenics, notoriously related to the ideals of the Nazi Party² in 1930s Germany. The new “Quality of Life Paradigm”³ frees the orthodontist from the curse of supposedly having to treat “bad” occlusions as if they were “diseases”, a concept that in fact would be better defined as: individual morphological variations, subject to genetic and environmental factors with greater or lesser impact on the lives of individuals. In other words, what must be “treated” are the negative impacts of such “bad” occlusions and this varies greatly, as it is no longer possible to exclude from this equation the socio-emotional issues and the expectations of each person regarding the treatments.

1 *American Journal of Orthodontics and Dentofacial Orthopedics.*

2 Abstraction is a type of thinking that allows us to reflect on things that are not present in space and in the current moment. It also allows us to reflect on general concepts and principles, both in our daily lives and in a more academic or professional environment.

3 It is known from experience that mechanics applied to dentofacial biology is something of considerable complexity, as it is not about moving a “free element in space” from point A to point B linearly on a flat surface, but to move three-dimensionally several dental elements “trapped” in their alveoli, which in turn are “grasped” in their dental arches that are dependent on the positions of their skeletal bases, one fixed (maxilla) and the other mobile (mandible), which adds an even more destabilizing difficulty factor, which are the relationships between the heads of the mandible and the joint fossa, having between them the soft tissues that form the TMJs, such as the ligaments, cartilages, connectives, muscles, vessels and nerves. All this, occurring many times during the process of growth and development.

But what was Kesling’s ingenious “ace in the hole”? What is the most important concept behind the transparent aligners that imposes itself on its well-known use for the manufacture of aligners?

The “pre-determined pattern” in the title of his article of 1946 is nothing more than what we know today as an orthodontic “setup”⁴.

Praising the role of setup in the therapeutic decision process and planning of orthodontic treatments is without a doubt one of the greatest contributions that the specialty has received throughout the 20th century, comparable to Angle’s edgewise appliance concept and to the development of the pre-adjusted appliance of Andrews.

The setup is a prerequisite for making transparent aligners, whether done in an “analog” manner or, more recently, digitally after Align Technology launched the Invisalign® device on the world market in 1999⁴. However, the value of this “tool” is inestimably greater than simply serving as a software algorithm to be used in order to generate sequencing of models for 3D printing and subsequent thermo-plastic stamping.

On the one hand, the possibility of increasing the unprecedented level of health care offered to clients, placing the professionals in their prominent and relevant place, as the original manager of the diagnosis, therapeutic decision, and planning process. And on the other, frightening, and growing threat of total profession robotization aggravated by the declining levels of academic training in Brazil. As such, it is vitally important that new generations really understand the value of that “natural algorithm” that we all have access to 24/7, which is contained in the most important “3D tool” of all.

The process of carrying out the virtual, quick, and accurate re-arrangement of teeth enhances that exercise of abstraction that we all have to do for each clinical case, allowing the possibility of choosing between several scenarios to define

together with clients the best clinical alternative. These insights that occur naturally in the dynamics of the digital setup allow the definition of a logical sequence of steps, in order to increase both the effectiveness and efficiency of treatments. In other words, it is much simpler to determine tangible goals with the additional possibility of detailing the design of the devices, whether they are fixed labial, lingual or plastic plates (aligners), additionally to auxiliary devices such as the new MSE⁵ and anchoring tools, as mini-implants with the possibility of clinical transfer of the positioning of these devices through transfer guides printed in 3D.

However, as the saying goes, “there is no free lunch”. The learning curve to master these new tools, especially the multiples softwares and systems that are available today, can be long and is dependent on several factors, such as the quality of the machines

In other words, the setup value is directly related to the search for better results, in the most convenient way for both clients and professionals, as Kesling said the advent of computer graphics combined with new intraoral scanning equipment represents the biggest watershed that Dentistry has ever faced.

that will be configured to run these programs, in addition to other variables that involve information technologies. In addition, the need to make these investments implies choosing the best program and/or system that meets the needs of each clinical context, which can range from the exclusive practice of Orthodontics to comprehensive clinics with an interdisciplinary approach that requires additional

resources such as access to CT images, PACS and eventually other features such as face scanners.

Besides the factors described above, there is an even greater challenge, which is the temptation to outsource ad aeternum this primary responsibility to a manufacturer that, in general, makes us mere spectators of the process. We agree that initiating the new digital flow in the clinic by hiring a supplier that is able to offer a well-built digital platform that allows the submission of cases online, through an intuitive interface (front-end), a planning center that is run by orthodontists, and a final product with certified quality makes perfect sense and is preferable for those just starting out.

⁴ Setup is the way in which something, especially an organization or equipment, is organized, planned, or arranged.

⁵ MSE - Maxillary skeletal expander.

However, as the learning curve evolves, investing in a good software can be extremely valuable for anyone who wants to remain in the profession independently with success, financial return and maintaining the status of a higher-level health professional.

The alternative is to become one of the many “delivery boys and girls” that are serving the corporate interests of large publicly traded multinationals, whose “commitment” to Dentistry is directly related to the value of their shares on stock exchanges⁵. Delegating the essence of the profession, which is our freedom of conviction to indicate each therapeutic resource and our competence to carry out the planning of each clinical case, is something that puts the future of Orthodontics at risk⁶, and is creating a growing generation of zombies, fulfilling tasks. This scenario is even more delicate, especially at a time when science is under attack and meritocracy, a currency that has unfortunately lost its value. Those who set the rules today are the CEOs of large companies that use social media KOLs⁶ very well selected to redefine the meaning of success in OUR profession.

Pay homage to the true thinkers of Orthodontics, meritorious par excellence for the great contributions given to the specialty, is something that imposes itself. Among countless valuable brains, some already mentioned here, it is also worth knowing the incredible stories of two pioneers who honor us a lot: Henry Isaac Nahoum⁷ and John Joseph Sheridan⁸. Nahoum, a professor at Columbia University, before being the first to use thermo-plastic stamping in 1959 to make a liner, fought in World War II as a Lieutenant in the 109th Regiment of the 28th Infantry Division and helped free Jews from Concentration Camps of Nazi Concentration in 1945. Sheridan besides developing the well-known Essix[®] System in 1993, was Captain of the United States Marine Corps as a fighter pilot, a chapter in his life that shaped many of the personality traits of the United States, a chapter in his life that shaped many of the personality traits for which he was justifiably known and highly respected. It is to these true heroes of our profession that I pay my respects.

⁶ The idea of Key Opinion Leader originated in the 1940s by communication theorist Paul Lazarsfeld. He established a concept that people could change their opinions and preferences much more because of “trusted figures” in their networks than because of the more conventional forces, like advertising or scientific evidence about something.

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