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Dr Sean K. Carlson

CEO of OrthoScience

Why caring matters more than ever

The world of technology is advancing quickly. Before mobile devices and smartphones, communication was not instantaneous. Whether you had news or just a simple greeting to convey, in the old days, you could not reach people quickly, nor could they reach you. This change is important. It affects healthcare in a big way. It affects patient expectations and it affects doctor efficiency. Never has this been clearer than with the current climate brought about by COVID-19. We have all become instantly proficient at digital and remote communication—instant communication. It is inevitable that orthodontists will be expected to increase instant accessibility and remote solutions more than ever before. However, despite what may sound like added convenience, the new world of remote communication and instant access is filled with pitfalls that will cause many doctors to stumble in this new world.

Pitfall 1: Easy access does not mean automation

You cannot phone in caring. Computer bots that provide automated responses will become frustrating for patients. Healthcare is about caring. Patients go to doctors for care, not products. When we forget this basic principle, we are no longer doing our job. An automated system may work for your cellular service provider, but it will not work for your doctor. Orthodontists should find digital communication solutions that are personal. Patients demand and deserve a personal touch. They deserve caring. Keep this in mind when seeking out your future digital solutions.

Pitfall 2: Patients are not customers

Patients are people with a disease. They are not shopping for a new hat. Although orthodontic disease is rarely, if ever, life-threatening, malocclusions still demand the attention that only a trained doctor can provide. And just like the first pitfall, you cannot phone in or automate treatment. This has never been clearer than with the experiment of automated orthodontics that is being attempted by so many direct-to-consumer tooth alignment products. These are emerging with increasing speed in the US. Without doctor supervision, the failures and shortcomings of these approaches simply cannot be appropriately managed. Patients are the ones who end up suffering. Unfortunately, since the shortcomings of these do-it-yourself orthodontic solutions are rarely life-threatening, the consequences of negative outcomes will be overlooked for a long time to come. But practising orthodontists understand that finishing orthodontic cases requires careful attention. It is not easy. When patients are treated like customers, you only need to sell the start. When patients are treated like patients, you are fully aware that you need to provide the finish—the cure to the malocclusion. This requires a much greater commitment on the doctor's part.

Pitfall 3: Thinking that technology will make caring easier

Unfortunately, the job of a doctor is difficult. Caring about your patients is difficult. Technology will not eliminate this. Making patients well—curing their disease—is burdensome. Just because some things become automated does not mean that you can offload this burden. However, technology will allow you to care better, that is, your connection to your patients will be stronger than ever. You will have the ability to control the direction of your treatment on a micro-scale. This is where technology will shine. Traditionally, doctors would connect with patients only at physical appointments. Now they can connect with them remotely far more often. This increased connection should not be viewed as added work; it should be viewed as added control. For the doctor, this means fewer physical visits, more care opportunities, better appliance monitoring, fewer phone calls, more patient touch points. All of these things, when viewed through a caring lens, will improve our practices tremendously. So how will you embrace new technology? When making your own choices, I encourage you to view your smartphone through the eyes of a patient. Imagine you have a disease and you have just employed a team of doctors to cure you. How could your smartphone help you? How would your doctor team show you that they care about you through your smartphone? How would they let you know they care about your healing and your cure just as much as you do? Once you have envisioned that scenario, you will understand clearly what your technology solutions need to encapsulate. I trust that the thing you will want to feel the most is that the doctors care.

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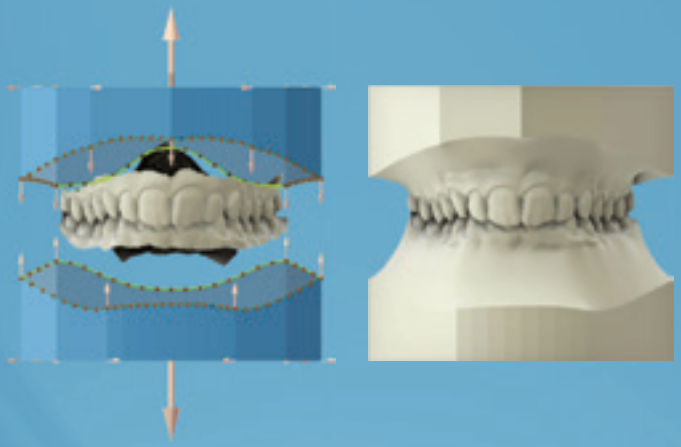

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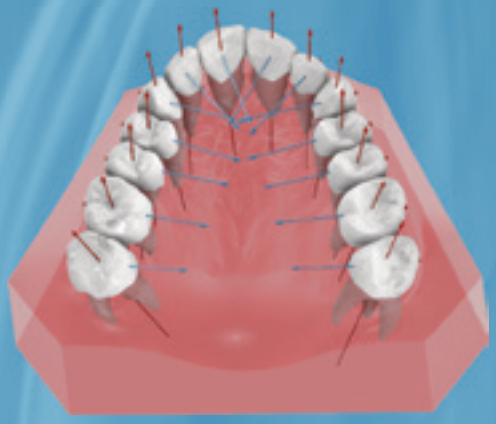

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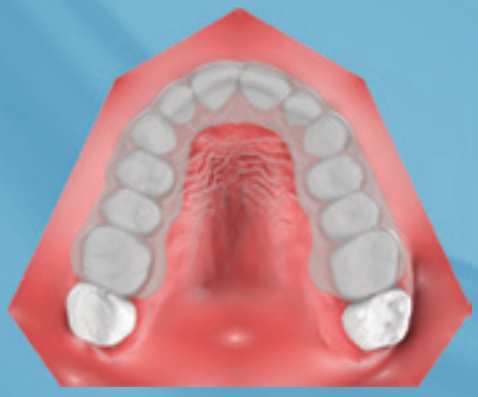

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Auto-administered photobiomodulation: A new way to make orthodontic treatment faster and more comfortable?

Drs Carlo Fornaini & Elisabetta Merigo, Italy

"Photo-biomodulation (PBM) therapy" is the universally recognised term for the wide range of laser applications with low parameters, replacing the terms of "low-level laser therapy", "biostimulation", "soft laser" or "cold laser", mostly used in the 1970s and 1980s.[1–3] This term was added in 2015 to the National Library of Medicine's controlled vocabulary thesaurus, Medical Subject Headings.[4]

The father of PBM is the Hungarian physician Endre Mester, who first observed in the 1960s the effects of a ruby laser (wavelength of 694.3 nm) he used on animal models in order to seek to understand any carcinogenic effect of laser used at low energy densities (1 J/cm^2).[5] Mester performed studies on the effect of laser phototherapy on healing processes and tissue repair in animals, on phagocytosis of bacteria by leucocytes, on synthesis of haemoglobin and on healing of ulcerative lesions non-responsive to conventional therapies.[6]

The scientific interest around PBM is due to its various properties in terms of stimulation of both wound healing (of mucosa, skin, tendon, etc.) and repair (bone, cartilage, dentine), as well as pain and inflammation.

On the basis of its effects, PBM is defined by Anders et al. as "a form of light therapy that utilises non-ionizing forms of light":[4] it is a photothermal reaction which involves endogenous chromophores resulting in beneficial therapeutic phenomena, the most important being the alleviation of pain or inflammation, immunomodulation, and promotion of wound healing and tissue regeneration".[4]

The photochemical reactions at the base of PBM can produce three different clinical results: stimulation of healing, an anti-inflammatory effects and analgesia.[5, 6] *In vitro* and *in vivo* studies on animals and humans have demonstrated the efficacy of PBM in promoting

Fig. 1: The laser device for auto-administered photobiomodulation.

physiological effects such as DNA synthesis, neoangiogenesis, keratinocyte proliferation, fibroblasts and endothelial cells proliferation, collagen synthesis and deposition, activation of macrophages, revascularisation and contraction of the wound.[7, 8]

PBM may increase the activity of macrophages and neutrophils and has a specific and preferential modality for certain mediators of inflammation. PBM inhibits the catabolic mediators of inflammation, such as inhibitors of collagen synthesis and cell proliferation; reduces the influx

of neutrophils to the level of inflamed tissue and stimulates the production of anti-inflammatory metabolites such as cyclo-oxygenase 1 (COX-1) and 2 (COX-2). PBM also seems to contribute to the reduction of oedema.[9]
The mechanism underlying the analgesic effect of PBM has not yet been fully clarified and is probably quite complex: one of the most accredited hypotheses is related to the increase of the nociception threshold with a neural block, specifically with inhibition of A delta and C nerve fibres mediated by alteration of axonal flow or by inhibition of neural enzymes. Furthermore, there appears to be an increase in the production of endorphins due to changes in opioid receptors. PBM can also mimic the effects of anti-inflammatory drugs by attenuating the level of prostaglandin E_2 and by inhibiting COX-2.[10]

PBM results in the reduction of acute and chronic pain through a conduction block and alteration of A delta and C nociceptive nerve fibres, action occurring at the level of the central nervous system through ascending and descending transmission.[9] Primary reactions to PBM occur in the irradiation zone, but a secondary systemic response related to the transport of photoproducts such as prostaglandins, enkephalins and endorphins mediated by the lymphatic system and with a persistent effect for several hours or weeks is thought possible. This is the main reason why it is important in the design of experimental studies and in the interpretation of the results to consider the use of protocols in which there is an internal control.[11]

Thanks to the use of parameters characterised by low energy density, PBM can be considered free of possible side effects compared with higher laser powers correlated to damage and tissue destruction.[12, 13]

The application of PBM in the orthodontic field has seen in recent years increased scientific production, initially in *in vivo* studies in animals and subsequently in clinical trials aimed at investigating the effect of the application of laser protocols at low energy on the acceleration of tooth movement with a simultaneous analgesic potential.[14] The stimulatory effect of the proliferation and differentiation of the cells involved in bone metabolism, in particular osteoblasts and osteoclasts, is the basis of the results obtained. At the maxillary and mandibular level, this results in the reduction of the time needed to finalise orthodontic therapy. This type of application, free from side effects, especially regarding the periodontium, defines a beneficial effect in the prevention of carious disease and a simultaneous improvement of the pain symptoms often related to the active phases of orthodontic movement.[15]

Systematic reviews and meta-analyses of existing literature on PBM and the acceleration of tooth movement in the Cochrane Library, PubMed Central, Embase, Scopus and Web of Science showed a statistically significant difference in the acceleration of tooth movement between treatment with PBM and non-laser treatment.[16, 17] Several *in vivo* randomised controlled clinical trials evidenced that

Fig. 2: Auto-administered photobiomodulation for the treatment of temporomandibular disorder.

Fig. 3: Auto-administered photobiomodulation just after orthodontic bonding.

photobiomodulation is effective in alleviating the intensity and duration of pain experienced by patients after the engagement of alignment archwire.[18, 19]

Studies in the literature, in particular, on protocols at different times of administration of PBM (weekly, every other day, with monthly precise doses) report more striking effects for low fluence values (between 5 J/cm^2 and 8 J/cm^2) compared with values above 20 J/cm^2.[20]

Unfortunately, a limiting factor of this kind of treatment is that the patient needs to attend therapy at least two or three times a week for treatment, and this may negatively influence patient compliance.[21] To allow the patient to receive treatment without visiting the therapist, there recently appeared on the market a new family of devices that, owing to their Class II classification by the American National Standards Institute, may be used directly by the patient without the need for protective goggles in a very simple way, thanks to the preset parameters.[22] Device size and cost are reduced and contra-indications and the risk of side effects are absent; nevertheless, evaluation of the patient by a specialist is mandatory (Figs. 1–3).[22]

At-home laser use has been described for temporomandibular disorder, for example, using preset devices and therapies determined by the therapist, limiting the discomfort of repeated appointments and obtaining good results in terms of pain.[23] Some case reports have also described laser use for the treatment of neurological face diseases, also provoked by a wrong insertion of intraosseous implant for prosthetic rehabilitation,[24] as well as diabetic leg vascular lesions treatment.[24, 25]

We think that orthodontists might today consider these new opportunities as an easy way to minimise the treatment time and to reduce or eliminate pain during the first step of the therapy, thereby increasing patient compliance.

about

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