

DOP Dentistry: digitally embracing orthodontics and paediatric dentistry

PRESENTATION

This column walks us through technological developments, innovations in materials and tools, as well as new operative trends in paediatric dentistry of today and tomorrow. The goal, rather ambitious, is to explore, with a very practical approach and a broad clinical vision, which "avantgarde" actions we can implement to take care of our little patients. We want to promote solutions, not only for treatment and achievement of specific therapeutic goals, but for the well-being of children and their families where, more often than not, "how" is more important than "what".

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ABSTRACT

Background The aim of this paper is to illustrate the concept of DOP Dentistry (Digital Ortho Paediatric Dentistry) in daily practice.

Clinical report DOP Dentistry is a new concept introduced by the authors to express the perfect integration between two disciplines that for a long time have been separated: paediatric dentistry and paediatric orthodontics. In modern dentistry it is increasingly important for the paediatric dentist to have skills and abilities that embrace both of these disciplines. To these we have to add a third element, represented by new digital technologies, as well as new bioactive ionic resin composites and biocompatible technopolymers to perform fully digital, integrated paediatric orthodontic treatments.

Conclusion Based on the DOP Dentistry concept, that definitely changes the paradigm of taking care of children, new and fascinating scenarios open up, that will lead us to a more integrated management of our little patients, their needs and those of their family with a new, more ergonomic, efficient and tailor-made approach.

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KEYWORDS

DOP Dentistry, CAD-CAT, Digital paediatric dentistry, Digital paediatric orthodontics, Biocompatible technopolymers, Bioactive ionic resin composites, IOS, DIFOTI, Ozone, Rapid palatal expander, Slow maxillary expander, Zeroexpander, Orthodontic inlay

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Introduction

The concept of DOP Dentistry (Digital Ortho Paediatric Dentistry) is a new approach introduced by the authors to indicate the perfect integration between paediatric dentistry and paediatric orthodontics, thus defining a new standard in the care for the young patients. In effect, in modern dentistry it is increasingly important for paediatric dentists to

have skills and abilities that embrace both these disciplines, which have remained divided and disconnected for too long [Federici Canova and Beretta, 2021]. To these a third element, which unites and completes both, must be added: the new digital technologies [Federici Canova, Oliva, Beretta, Dalessandri, 2021], that together with new bioactive ionic resin composites and biocompatible technopolymers, such as PEEK or PA12 [Beretta et al., 2021], enable us to perform



FIG. 1



FIG. 2



FIG. 3



FIG. 4

FIG. 1, 2 Dental assessment with DIFOTI technology and minimally invasive cavity preparation.

FIG. 3, 4 Full digital palatal space maintainer, made of PEEK, and two steps bioactive molar sealing in a patient at high risk of caries.

FIG. 5, 6, 7 Digital set up and CAD-CAT for automatic palatal expansion using ZeroExpander®, made of printed PA12 and bonded on deciduous molars by means of a new bioactive cement.



FIG. 5



FIG. 6



FIG. 7

fully digital, integrated paediatric orthodontic treatments. The starting point is an approach that we could define as "paediatric dentistry first", which is based on early prevention or early diagnosis of caries of primary teeth. Modern transillumination techniques allow to promptly diagnose small initial lesions, avoiding more invasive and uncomfortable x-ray examinations, and have a really important motivational effect on the patient's parents or caregivers, who can see the caries in real time (Fig. 1, 2) by means of Digital Fiber Optic Transillumination (DIFOTI). Early diagnosis aims at intervening on small cavities, which is also a guarantee of a perfect marginal seal and a long duration over time, especially when new bioactive ionic resin composites are used [Sauro et al., 2019; Beretta, Federici Canova et al., 2022]. Early intervention is therefore simpler, more predictable, effective, efficient and comfortable for the child. Once the primary teeth have been correctly restored or, even better, treated to prevent the caries on the basis of their individual caries risk, they can be used as anchorage units for paediatric orthodontic devices [Lanteri, Beretta et al., 2018; Beretta, Federici Canova et al., 2021; Levrini et al., 2021; Beretta, Federici Canova, Gianolio and Zaffarano, 2022] (Fig. 3–7).

Clinical report

Palatal expanders with deciduous anchorage allow a predictable expansion with a spontaneous correction of permanent molars. Among these devices, a prominent place is certainly occupied by the palatal expander (RPE or SME) [Di Ventura et al., 2019; Quinzi et al., 2020; Cossellu et al., 2020; Serafini et al., 2022], which today is redesigned by new technologies. In recent years digitalisation has changed the classic design of the expanders. The initial impression can be taken with an intraoral scanner even on the first visit, so the speed of taking the impression, the minimum invasiveness and the absolute comfort make these procedures extremely

acceptable for young patients, according to the principles of Spa-Inspired Oral Care, a modern approach of the authors that mixes medicine, humanity and technology [Beretta et al., 2022]. In this way the band test can be avoided, thus saving an appointment for the patient and his/her family and also preventing the discomfort of gingival compression caused by traditional bands. Therefore, with the first initial scan it is possible to go directly to the CAD-CAT (Computer Aided Design-Computer Aided Technofabrication) fabrication of the device, that will be cemented in the following session. In addition, the perfect adaptation of the expander makes the bonding procedures much less difficult, more comfortable and faster than for the classic interdental bands.

We suggest an adhesive procedure with enamel etching (37% orthophosphoric acid for 60 seconds) and new bioactive ionic materials in the cement formula [Deepika et al., 2022; Lardani et al., 2022]. Another advantage of the digital workflow is the treatment of caries of deciduous teeth concurrent to the cementation of the device: a true perfect integration between orthodontics and paediatric dentistry, that also introduces the concept of orthodontic inlay (Fig. 8–13).

The procedure is described as follows.

- Pre-operative evaluation of carious lesions, which must be minimal, localised at the level of the interdental space E-D and without significant loss of tooth substance.
- Design of the customised bands increasing the design of the band inside the cavity to obtain the "orthodontic inlay".
- Before cementing the device, selective caries removal procedures and, when possible, application of ozone should be performed [Beretta and Federici Canova, 2017; Lieberman et al., 2020].
- Etch the cavity and the surfaces of the teeth on which the device will be applied with 37% orthophosphoric acid.
- Apply the adhesive system.
- Fill the prepared cavity with a bioactive cement, to be spread also on the bands, place the expander and light-cure.



FIG. 8



FIG. 10



FIG. 12



FIG. 13



FIG. 9



FIG. 11

FIG. 8-11 Digitally designed and laser sintered orthodontic inlay bands for caries management and simultaneous application of a palatal expander using bioactive cement and adhesive procedure, protecting the interdental papilla with Teflon.



FIG. 14

FIG. 12-14 IOs, digitally designed and printed orthodontic inlay hemibands for caries management and simultaneous application of ZeroExpander® by means of lightcuring, single-component glass ionomer cement with continuous fluoride release and adhesive procedure in a special need patient under relative analgesia.



FIG. 15



FIG. 16

FIG. 15, 16 Digital space maintainer made of PEEK in the lower arch, bonded on 7.5 using a new bioactive cement and adhesive procedure, maintained till the eruption of tooth 3.4.

Discussion and conclusion

We wish to underscore that nowadays dentists who take care of little patients should have both paediatric dentistry (how to prevent, treat more or less complex caries, decide which teeth to treat or extract), and paediatric orthodontics knowledge (whether or not to intervene on a malocclusion, whether to treat a primary tooth based on the type of anchorage chosen, whether or not a space maintainer is needed after an extraction). These two fields, which for too long remained almost separate in the clinical daily practice, are today even more united by new technologies, that amplify our diagnostic and therapeutic capacities, which are within the reach of many and not just a few, starting from hi-tech, comfortable and safe diagnosis procedure, as intraoral and face scan. The above can be integrated, if needed, with CBTC for assessment and treatment planning [Zecca, Fastuca, Beretta et al., 2016; Beretta, Federici Canova, Gianolio and Zaffarano, 2022], that can be directly translated in the CAD-CAT design of customised devices to be applied using innovative bioactive restorative materials, direct sintered metals and technopolymers (Fig. 15, 16).

The digital revolution is today and opens up to a new era, redesigning classic orthodontic devices and leading us to a world where we have to simultaneously “think and act Orthodontic and Paediatric”. It’s the DOP Dentistry!

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