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Editorial

Special Issue on Recent Developments in Orthodontics on Craniofacial Orthopedics

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This Special Issue was proposed with the aim of highlighting the recent developments in orthodontics on craniofacial orthopedics. In this regard, all the works respected the proposed theme and made significant contributions to the development of knowledge in the sector [1–6].

Most of the papers dealt with the issue of maxillary expansion, confirming the clinical importance of the posterior crossbite from maxillary transverse deficiency in children [1,3,4]. As reported in the literature, rapid maxillary expansion (RME) of the maxilla is the best-known technique that allows you to correct these problems and prevent the development of skeletal complications such as mandibular deviation [7]. The rapid palatal expansion also allows increasing the volumes of the nasal and upper airways, reducing nasal resistance and improve breathing [8]. Many authors have proposed different expansion methods, differing in technical and biomechanical characteristics and in the type of modifications produced, using different clinical protocols [9,10]. Many studies have shown that rapid and slow expansion protocols are clinically effective on the primary outcome, i.e., the resolution of the crossbite with a significant increase in the transverse skeletal dimension in subjects with maxillary transverse deficit [10]. The type of appliance based on its ability to resolve jaw constriction is no longer the main selection criterion, and the choice of the orthodontist should, therefore, be based on a "patient-oriented" device, which minimizes side effects.

Recently, the clinical efficacy of the expander characterized by Ni-ti leaf springs has been confirmed by studies that have shown significant changes in the maxillary transverse diameters, when acting in younger subjects, with sutures still active [11].

Martina R. et al. [12] comparing fast and slow maxillary expansion, based on low dose CT observations, stated that RME is no more effective than slow maxillary expansion (SME) in correcting posterior crossbite. In the meta-analysis proposed by Zhou et al. [13] on non-surgical expansions, SME proved effective in achieving maxillary expansion and can bring superior results to RME in the molar region. During SME, the maxillary intercanine diameter shows a change equal to or slightly greater than the excursion of the screw, reflecting the "fan-like" expansion of the maxilla, like what occurs in the RME. The intercanine diameter in the mandibular arch tends to increase due to spontaneous self-expansion, in accordance with the findings of Grassia et al. [14]

In recent years, the use of skeletal anchorage adopting mini screws has greatly revolutionized our clinical practice. The easier management of anchorage using such devices has meant that scientific researchers in the last decade have concentrated a lot on this issue, with the aim of providing safe application protocols and indicating the limits and risks of their use. In the present Special Issue, Nishii, Y. et al. [6] evaluated the distribution of compressive and tension stress around the roots of the teeth and the influence determined by the position of a temporary anchoring device and the length of the retraction hook during dental distalization. This new photo elastic model demonstrated that the distribution of

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compressive and tension stress during retraction of the maxillary dentition is significantly influenced by the position of the TAD and the length of the retraction hook. Relatively uniform compressive stress was found in the cervical position of the TAD with medium hook and in the apical position of the TAD with a long hook. This means that the maxillary arch could be distalized parallel to the occlusal plane. The digital photoelastic analysis method has great potential for the evaluation of orthodontic biomechanics and can also provide very useful indications for the clinician. Moreover, thanks to the introduction of new digital methods, the digital bite assessment, and the relative distribution of occlusal forces on the teeth can be evaluated in an increasingly reliable way. The concept that the bite pattern is a better indicator of function than bite strength alone is a concept that is gaining ground in the literature. AlShammery et al. [5] examined digital bite assessment systems, such as the T-Scan III, which enable computerized measurement of occlusal force distribution. The authors have shown how children with increased vertical face height have a more posterior force distribution than children with medium or short facial height in late mixed dentition. The development of digital bite analysis software has enabled researchers to measure not only the magnitude of the force, but also to map its distribution and the impact this has on the time of the occlusal cycle. The results of the study by AlShammery et al. [5] found that children with long face height had significantly greater force distribution in the posterior segments and significantly less bite distribution in the anterior segment. In addition, the study of mandibular kinematics has also undergone a major upgrade in recent years thanks to the introduction of new three-dimensional methods [15–19]. Farronato, M. et al. [2] proposed a new system for the precise determination of relative mandibular movements, using a portable motion detection device with passive marker, with excellent results in terms of reliability for most of the measurements performed both in vitro and in vivo. This work paves the way for a digital workflow for use in clinical settings that allow for the recording, analysis and dynamic visualization of mandibular anatomy and kinematics. The originality of the study consists in the fact that for the first time, the reliability of a mandibular kinematic tracking system developed using a simple, light and portable hardware with infrared cameras and passive markers and a self-developed software to put in relation the mandibular movement with the craniofacial structures of the subject. The new method allows all additional head and neck movements to be excluded from motion detection thanks to a custom designed algorithm that subtracts movements from upper anchored markers to lower markers in real time. Palla et al. [20], in their dynamic stereometry studies, used metal grafts rigidly connected with dental polymers to the dental arches and an additional external reference face bow. Calixtre et al. [21] described the reliability of a six-camera motion system with fifteen individual markers capturing at 120 Hz. The advantage of all the aforementioned systems is that it could be applied to patients in different contexts and conditions and in the near future used as a diagnostic tool in the TMD scenario.

Future research investigated the advantages produced by the introduction of new technologies in our daily practice should be advised, and although the present Special Issue has been closed, more in-depth research in recent developments in Orthodontics, especially regarding craniofacial orthopedics technologies, is expected.

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Short Biography of Authors

Prof. Cinzia Maspero is a professor and researcher in Orthodontics and clinical tutor at the Department of Biomedical Surgical and Dental Sciences, University of Milan, Italy. She is involved in the participation and organization of different research projects concerning the use of CBCT in orthodontics and the current methods of investigation into morphofunctional alterations of the stomatognathic apparatus. Her main research interest is focused on dentofacial orthopedics, i.e., maxillary expansion treatment and functional appliances. During the last years, her research was centered especially on three-dimensional imaging such as CBCT and MRI.

Dr. Andrea Abate is a Postgraduate student in Orthodontics at the University of Milan, Italy. He received scholarships in Use of Computer Beam Cone Beam Tomography (CBCT) For Diagnosis and Treatment in Odontostomatology at the University of Milan, Italy. His research is manly centered on the application of three-dimensional imaging technique in orthodontics. His current research deal with the evaluation of cranio-facial alteration in patients affected by juvenile idiopathic arthritis.

Dr. Valentina Lanteri is a Researcher in Orthodontics at the Department of Biomedical Surgical and Dental Sciences, University of Milan, Italy. After obtaining a M.Scs., she received a PhD and a Research Fellow. Her research is focused on pediatric dentistry and is mainly centered in the investigations of different maxillary expansion technique. She is involved in the participation and organization in research projects concerning the assessment of the palatal expansion evaluating different protocols.