Chapter 1

Introductory Chapter: Innovations in Orthodontics

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Additional information is available at the end of the chapter

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1. Innovations in orthodontics

In the present day, orthodontic treatment not only meets the demand for functional harmony in occlusion and the improvement of the esthetic appearance but also should be completed in the most efficient time accepted by the patient and the orthodontist. Living in a fast-paced world leads to a great interest in the techniques decreasing the orthodontic treatment duration.

Various clinical techniques were introduced for accelerated orthodontic tooth movement, including local injection of cellular mediators [1], physical or mechanical stimuli [2], and surgically assisted orthodontics [3, 4]. The rate of orthodontic tooth movement is under the control of molecular mechanisms regulating cellular behavior in the alveolar bone and in the periodontal ligament [5–7]. Therefore, it is essential to identify and control cellular regulators to safely shorten the duration of orthodontic treatment. In addition to the local injection of cellular mediators, with the rise of advanced technology in biomedical engineering and medicine, gene therapy will be a promising method in the future for accelerated tooth movement.

The common physical methods used in the present day are vibratory stimulus, low-level laser therapy, and low-intensity pulsed ultrasound.

For surgically assisted orthodontic techniques, the current surgical methods being practiced are periodontally accelerated osteogenic orthodontics, piezocision, and micro-osteoperforations. Micro-osteoperforations have emerged as a new, minimally invasive, easy-to-use, reproducible, and effective method that eliminates some of the disadvantages of surgery such as the requirement of corticotomies, cuts in cortical bone, raising split-thickness flap, and decorticating the bone [7].

Today, multidisciplinary treatment procedures are taking more place in orthodontics. The treatment of skeletal discrepancies requires orthognathic surgery in combination with orthodontic treatment to improve malocclusion, function, facial, and smile esthetics. The improvement in

orthognathic surgical techniques provides easier, comfortable confident treatments in patients with facial deformations. Nowadays, the latest trends in orthognathic surgery besides the basic techniques are tomographic assessments that provide 3D evaluations of facial proportions rather than 2D cephalometric radiographs. Additionally, 3D scanning of the teeth integrated with tomography provides to perform operation in virtual environment and also to print out 3D splints as well as the individual titanium plate screw fixation systems which eliminate surgical splints. Other advancements in orthognathic surgery are the use of piezoelectric surgery, which supplies bloodless and neurosensorial deficit-free operations rather than rotary instruments and surgical saws. It is expected that in the future a robotic surgery may take place [8].

In the past 10 years, surgery-first approach (SFA) created a broader interest [9–11]. The surgery-first approach is an alternative method that may be more satisfying for orthodontist and the patients by shortening the duration of the treatment. In the beginning of the treatment, surgery is performed without orthodontic preparation, and the orthodontic treatment is applied after the surgery. With this approach, patients benefit with the early correction of facial esthetics and psychosocial outcomes of improved body image at the beginning of the treatment [11–13] instead of worsening the facial appearance because of the presurgical decompensation of incisors as it is done in contemporary orthognathic surgery [11, 14].

Another field of orthodontics is the treatment of cleft lip and/or palate (CLP), which requires interdisciplinary care by centralization of treatment. Orthodontics is the core element of the overall treatment process in cleft patients. Alveolar bony defect is the main limiting factor for orthodontic treatment. Alveolar bone grafting is the essential implementation that necessitates a combined orthodontic and surgical involvement [15, 16].

The other interdisciplinary management in orthodontics consists of obstructive sleep apnea (OSA) syndrome patients. Sleep-related breathing disorders decrease sleep time and/or quality, which leads to excessive daytime sleepiness, fatigue, and lack of concentration, and finally decrease the life quality. In severe cases, morbidity and mortality may be observed. Orthodontists, who specialized in dental sleep medicine, can see the early symptoms of these diseases and may be effective in the treatment of snoring and mild-to-moderate obstructive sleep apnea by applying oral appliance [17, 18].

The chapters in this book provide rich information to the readers starting with the ceramic brackets. It continues with the methods in accelerated orthodontics; the role of cytokines, gene therapy, and molecular biology aspect and surgical methods such as corticotomy and microosteoperforations are addressed. Stability of diastema closure after orthodontic treatment is presented according to updated research. The book goes on with the current approaches in multidisciplinary treatments involving orthognathic surgery, alveolar bone grafting in patients with cleft lip and palate, and obstructive sleep apnea syndrome.

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