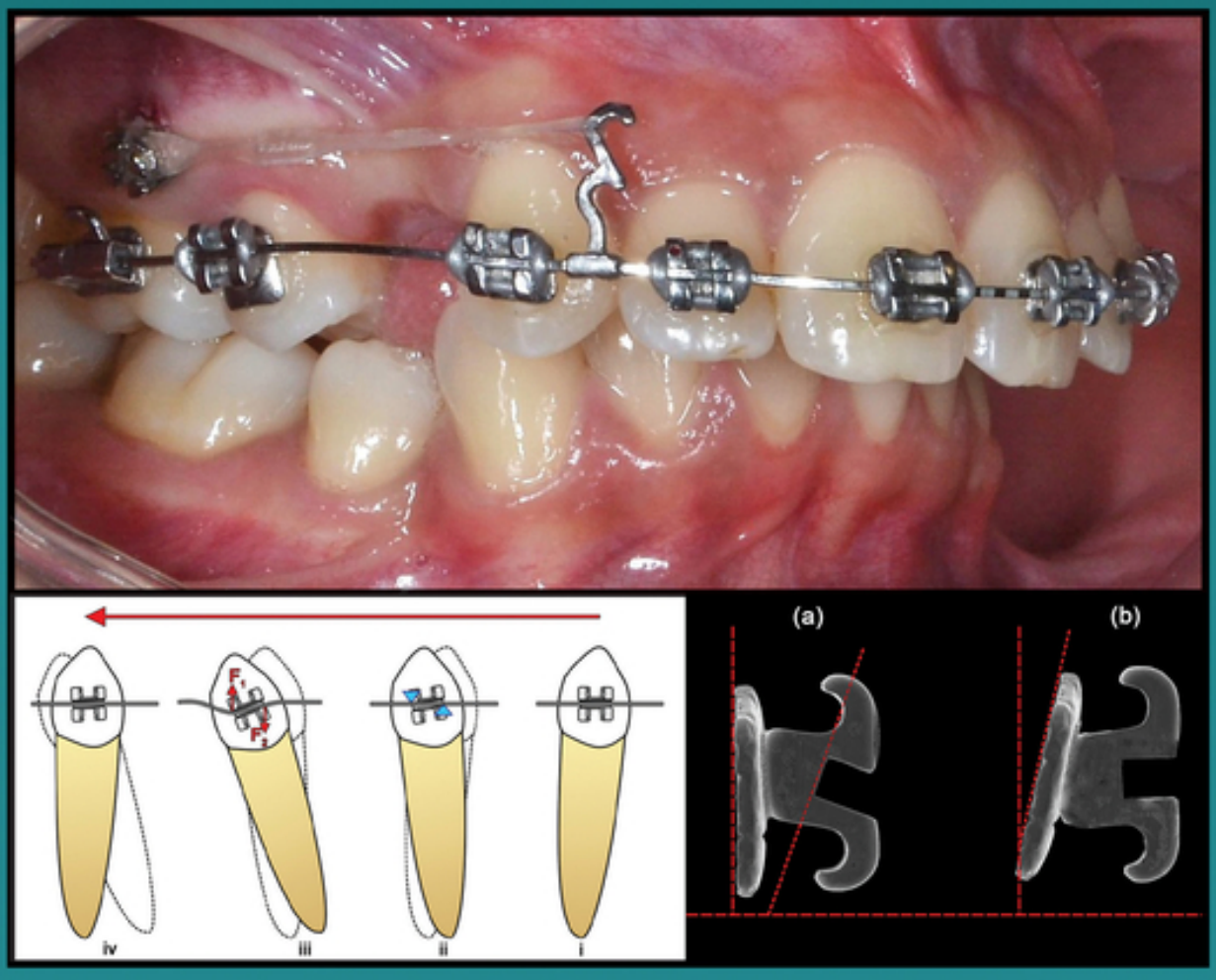
Preadjusted Edgewise Fixed Orthodontic Appliances

Principles and Practice

Edited by

Farhad B. Naini and **Daljit S. Gill**



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To our families and our profession

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Preface

'We find that the very principle upon which teeth are made to grow irregularly is capable, if properly directed, of bringing them even again. This principle is the power which many parts (especially bones) have of moving out of the way of mechanical pressure.'

John Hunter (1728–1793), Chapter VI, Irregularities of the teeth, History of the Human Teeth *(1771)*

Sustained mechanical pressure will move teeth that are not ankylosed. Needless to say, placing a fixed appliance, ligating an archwire and watching the teeth move over time may appear relatively easy to the uninitiated. However, planned and guided movement of teeth into their ideal aesthetic, functional and stable positions, whilst mitigating the undesirable effects of treatment, and achieving this in a reasonable time frame with minimum patient discomfort, is far from easy.

Dental students and orthodontic trainees in their early years will often observe their teachers assessing a patient's teeth intently, deep in thought. It is no coincidence that orthodontics has long been known as the 'thinking person's specialty', and is, in fact, the first established specialty in dentistry and one of the first throughout medicine. Orthodontics is a complex and multifaceted specialty, requiring, amongst other things, a thorough understanding of normal and aberrant craniofacial growth and development, dentofacial aesthetics and function, and the biomechanical principles and utilisation of a variety of appliances. As such, learning orthodontics requires dedication and hard work – there is no effortless path and no available shortcuts.

Most credible graduate orthodontic specialty training programmes now run over three years full-time (this has been the UK model for many years), or a part-time equivalent. In the UK, those desiring to learn more about multidisciplinary care, orthognathic surgery, and cleft and craniofacial surgery require an additional two years of full-time training and further examinations. First-year graduate trainees in orthodontics often feel like outsiders, overwhelmed by the highly esoteric and technical language being used around them, new concepts and even new instruments. Confusion is the order of the day. It takes sustained effort to assimilate and grasp the significance of all the factors required in orthodontic treatment, particularly with fixed appliances. However, over time, and usually by the middle to the end of the second year, through practice and immersion, the language becomes comprehensible, the concepts understandable, and the invisible connections between the various aspects of orthodontics become visible.

Modern preadjusted edgewise bracket designs can trace their ancestry to the original edgewise appliance, designed by Dr Edward H. Angle, and first introduced on 2 June 1925 at the Fourth Annual Meeting of the Edward Angle Society of Orthodontists. Interestingly, initially Angle did not name the appliance. The term 'edgewise' refers to the archwire, meaning that a rectangular archwire is placed into a horizontal bracket slot via its narrower edge, such that it has a larger buccolingual dimension compared with its occlusogingival dimension. A number of important advances in orthodontics followed; however, from a technical perspective, the next notable advance was the introduction, by Dr Lawrence Andrews, of preadjusted brackets to be used with straight wires. Added to this was the development of the acid-etch bonding technique and its subsequent application in orthodontics, together with developments in archwire materials, all of which have advanced fixed appliance therapy significantly.

Preadjusted edgewise orthodontic appliances provide the clinician with the unique ability to control tooth movement reliably, in the three planes of space and round the three axes of rotation. This three-dimensional control over tooth movement requires expertise, discretionary judgement and finesse, and is subject to misapplication in untrained hands.

Didactic teaching of orthodontics can only be delivered in segments, each of which, metaphorically speaking, is analogous to the fragments of a jigsaw puzzle. No matter in which order the segments are presented to the student,

until all the segments have been positioned accurately, the full picture will not be apparent or completely coherent. The purpose of this book is specific: it is to cover comprehensively the information required to understand and use preadjusted edgewise appliances. It is our intention that having read all the chapters in this book, together with practical chairside training, the reader will view the whole picture of preadjusted edgewise fixed appliance treatment with complete clarity.

The book comprises 22 chapters separated into four sections. Although most of the chapters can be read independently, the ideas have been presented in an order chosen with some care. Section I (Principles) covers the principles of treatment planning, orthodontic biomechanics, anchorage, consent and dentolegal considerations. Section II (The Preadjusted Edgewise Appliance) provides an in-depth description of the appliance systems, including bracket design, bracket placement, bonding, debonding, archwires, the use of orthodontic auxiliaries, mini-implants (temporary anchorage devices) and care of fixed appliances. Section III (Stages of Treatment) provides a comprehensive, step-by-step account of the four stages of treatment, with separate chapters on alignment and levelling, controlled space closure, finishing and retention. Section IV (Management of malocclusions) covers the treatment of each major category of malocclusion, with separate chapters on the management of Class II malocclusions, Class III malocclusions, deep bite malocclusions, anterior open bite malocclusions, and malocclusions with transverse problems. The two appendices at the end cover orthodontic instruments and orthodontic elastics.

Many of the authors invited to contribute chapters to this book are internationally renowned leaders in orthodontics. The contributing authors have provided comprehensive and practical chapters, analysing the scientific literature and providing their technical expertise, all complemented with sound judgement. They have described the rationale for their decisions based on up-to-date evidence and long-term clinical experience. The editors' desire is that the chapters in this book will be used by the spectrum of clinicians, from junior trainees through to qualified orthodontists at all levels.

There is a simple rule for clinical practice: excellent clinicians produce consistently excellent results, and 'bad workmen blame their tools'. There is a vast array of bracket designs and fixed appliance systems, and proponents of each extol their virtues whilst trivialising the limitations. This is to be expected in the marketplace, but has no place in a scientifically based clinical endeavour such as orthodontics, where the dominating value is the ability to achieve reliably excellent results for consecutive patients. The development of orthodontic materials and refinements in techniques will no doubt continue, but none will replace sound clinical judgement based on a comprehensive understanding of biological principles, the biomechanical foundations of fixed appliance treatment, and the arduous task of obtaining and cultivating technical ability and thereby gaining legitimate experience. The best clinicians are those who can identify the problems, judge and plan the appropriate treatment together with the patient, and apply selectively the appropriate appliance and mechanics to deal with the patient's presenting problems.

Orthodontics is a beautiful specialty. Unlike most of medicine, our patients do not just need treatment, they desire it, making the ability to undertake orthodontic treatment for patients a distinct privilege.

Farhad B. Naini and Daljit S. Gill

Acknowledgements

The influence of great teachers always remains with their students. We owe a debt of gratitude to our teachers in orthodontics. We were very fortunate to undertake our specialty training at a time when our teachers were at their peak; many were pioneers in the introduction, development and use of preadjusted edgewise appliances in the UK. Most are now retired and some are, sadly, no longer with us, but their influence remains through their students and the continuing excellence of their departments.

Thank you to the staff at the Archives Center, National Museum of American History, Smithsonian Institution, Washington, DC for the superb picture of Dr Edward Angle that appears in the Introduction. Our sincere thanks also to Professor James L. Vaden, Mrs Bonnie Shewairy and the Charles H. Tweed International Foundation for Orthodontic Research and Education for the picture of Dr Charles Tweed, which also appears in the Introduction.

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Farhad B. Naini and Daljit S. Gill

To my parents and brother, who introduced me to the importance of attempting to understand the world, with gratitude, admiration and love.

As ever, I am indebted to my wife, Hengameh, for her unyielding support. As well as being a graphic designer, Hengameh is a consultant in animal behaviour and welfare and head veterinary nurse in a busy veterinary surgery in Kent, the 'Garden of England'. This book was completed during the time of a global pandemic. During this difficult time, she refused to stay away from work, and worked tirelessly to care for sick, injured and vulnerable animals. Yet, she made time to create the illustrations for my chapters. I am forever humbled by her intellect, compassion and dedication. She demonstrates, every day, that it takes a lot more courage and strength of character to stand against the crowd and show that kindness and compassion to non-human animals, with whom we share this small planet, are far more important than antiquated attitudes, unjustifiable habits and the excuse of 'tradition'. This book would not have been possible without her enthusiasm and commitment.

Farhad B. Naini

There are a great list of people and institutions who I would like to thank, ranging from the National Health Service, which has provided the opportunities and infrastructure to learn orthodontics, Universities and individual people who have inspired me with their teaching, dedication and love

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Daljit S. Gill

We are donating the royalties for this book to animal welfare charities chosen by Hengameh Naini.

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