A Clinical Roadmap for the New Orthodontics

Tom Graber originally prepared this preface but unfortunately he could not finish it. Tom’s interest was in international and not national orthodontics—with no dogmatism but looking pragmatically in all directions for methods that help solve various types of treatment problems with selective indication. This was the nature of Tom and his vision.

After Tom’s death, it was decided to dedicate this book to his memory. As originally the co-editor of the book, I have completed this preface but maintained the spirit of Tom as well the content of the original.

In what follows, essentially Tom is speaking to us. First-person references convey his own experiences, enthusiasms, and wisdom. My own interpolations will be obvious.

T. Rakosi

Nine volatile years into a millennium we are all acutely aware of many challenges that confront us in diverse fields. Every country in the world faces political, financial, and economic quicksand, and the future is less certain than anyone would wish. In a more professionally parochial survey, the field of orthodontics and dentofacial orthopedics has seen no cataclysmic events, only steady progress based on extensive research around the world. The demand for our services has encouraged the brightest minds to come into our specialty. The financial returns have attracted commercial firms to provide the armamentarium we need, and technical developments have kept pace with scientific progress. Not only are more patients being treated, but “service” is better than ever before. Long-term evidence-based assessment of treatment results is now available. We know pretty well what we can and cannot do in dentofacial orthopedics and orthodontics.

On the other side of the coin, the potential iatrogenic sequelae of our services are common knowledge both within our specialty and in the contingency-fee legal profession. The question “At what price orthodontics?” is answered now in biological, biomechanical, and risk-management arenas. Some of the most comprehensive searches in Medline emanate from law offices, as motivated young legal staff search for all possible untoward effects resulting from our services. No longer are such terms as “crescent bone loss,” “dehiscence,” “decalcification,” “fenestration,” “gingival recession,” “hypermobility,” “interseptal bone loss,” “periodontal problems,” “root resorption,” “TMD,” and “traumatic occlusion” exclusive to the professional orthodontic vocabulary!

It is imperative that we practice evidence-based orthodontics. Defensive orthodontics is imperative for both the patient and orthodontist. This, of course, means proper diagnosis and patient selection before anything else. It was to that end that Tom Rakosi, Irnrud Jonas, and I produced the widely used Orthodontic Diagnosis in the Color Atlas of Dental Medicine series (Thieme, 1993), which was printed in more languages than any other orthodontic text. “Dropping the other shoe,” so to speak, is this new text Orthodontic and Dentofacial Orthopedic Treatment. For this we have assembled an impressive group of world-class clinicians to cover those aspects that we feel are most important for rendering the highest level of service in the safest, most practice-efficient way.

Chapter 1 (Tom Rakosi) recapitulates the fundamentals of orthodontic diagnosis as previously presented in Orthodontic Diagnosis, with special emphasis on therapeutic diagnosis. Each patient visit is a diagnostic exercise, assessing what has been accomplished, possible problems, and what remains to be done in the most time- and technique-efficient manner and with the most tissue-conscious approach.

Chapter 2 (Brian Preston) is on preventive orthodontics. Not all orthodontic patients have full-blown malocclusions. Experience has shown that many problems can be intercepted early and fully corrected, thus preventing further damage or smoothing the way for full mechanotherapy later. The experienced diagnostician recognizes these patients and institutes limited procedures that have a definite cost-benefit ratio for all concerned. Some of these problems are covered in Orthodontic Diagnosis, but this chapter delineates such instances in more detail—with more of a “how-to” approach. The old saying “An ounce of prevention is worth a pound of cure” is most appropriate here. Such efforts are particularly worthwhile in the area of abnormal perioral habits, with their potential for deforming the developing dentition. The same is true for abnormal respiration. The way to approach each problem is to ask yourself “If this were my child, what would I think was best for the child?”

Chapter 3 (Jack Dale) covers interceptive guidance of occlusion and extraction: the raison d’être, the technique, and long-term results. Jack Dale’s magnificent chapters in other books, his lectures around the world, and his dedication to excellence have earned him the preeminent status he now enjoys. His service on the American Board of Orthodontics has provided exemplary guidance to a generation of young orthodontists, stimulating them to become applied biologists, not merely good mechanics, which earned him the prestigious Albert H. Ketcham Award. This chapter, like the others, must be read and re-read to appreciate the full impact of the principles and practice of the best possible combination of diagnostic acumen and therapeutic achievement.

Chapter 4 (Tom Rakosi) discusses the scope and limitations of functional therapy. It emphasizes the principles of differentiation and individualization. We can differentiate between functional orthodontic and functional orthopedic treatment. The principle of the functional orthodontic appliances can be that of force application or force elimination. The precondition for successful treatment is a comprehensive treatment protocol taking into account the individual requirements and peculiarities of the patient.
Chapter 5 (William Clark) takes applied biology a step further, utilizing the Twin Block appliance for posturing the mandible forward and stimulating temporomandibular joint metabolism and optimal growth response. The Bionator has the same mandibular posturing approach, and in addition utilizes a screening effect to prevent deleterious pressures on the dentition by the screening musculature. The Twin Block appliance may have started with occlusal guide planes as recommended by A. M. Schwartz, but it has come a long way and is now capable of treating three-dimensional problems (i.e., sagittal, vertical, and transverse deficiencies). The reader is referred to Dr. Clark’s excellent textbooks for a more comprehensive discussion of Twin Block therapy. Like so many of our eminent world-class authors, Dr. Clark is in demand around the world to explain his approach to Class II problems. As with other functional appliances, this does not negate the use of expansion screws or fixed attachments at one or more phases of active treatment. But the approach makes sagittal correction easier, with less potential iatrogenic damage.

Chapter 6 (Alexander Vardimon) employs most of the concepts promulgated by Dr. Clark but adds the use of rare-earth magnets to help in the mandibular propulsion. Having done major NIH-sponsored research with me at the ADA Research Institute, Professor Vardimon was able to show the tissue-conscious nature of these minuscule and powerful coated magnets, in both the attracting and repelling modes, to achieve jaw positioning as well as tooth movement (i.e., bringing down palatally impacted canines). James Moss has done the same.

A full picture of the beneficial effects of the magnets has not been completely determined, but all evidence points to faster, potentially less damaging tooth movement [1]. Use in palatal expansion appliances has proven quite successful, with less potential iatrogenic damage such as root resorption, buccal plate dehiscence, and fenestration [2,3].

Chapter 7 (Ali Darendeliler) on early maxillary expansion is authored by a truly international orthodontist who has worked at renowned universities all over the world; Istanbul, Geneva, North Carolina, and Southern California have been his fields of activity. He is now the head of the leading Orthodontic Department of Australia, in Sydney. Within a very comprehensive research program, research interests include the dental and skeletal effect of orthodontic appliances and the scope and possibilities of maxillary expansion. As well as the diagnostic preconditions of the expansion, the contents of his chapter include timing, types of maxillary expanders, forces produced with maxillary expanders, and their skeletal and dental effects. He stresses the importance of patients’ age for the indication of various procedures of expansion and gives important guidelines to the practitioner for successful maxillary expansion.

Chapter 8 (John De Vincenzo) recognizes the use of mandibular propulsion, but uses a fixed inter-arch mechanism, similar to that of Hans Pancherz and the Jasper Jumper, with reciprocal anchorage in the maxillary arch. The idea of combining maxillary molar distalization with mandibular propulsion and potential favorable condylar and glenoid fossa changes with fixed appliances was introduced by Emil Herbst in 1906 and expanded in his book of 1910. His appliances and concepts were amazingly contemporary, as many orthodontists using the Herbst appliance can attest. Whereas Pancherz and his followers (Terry Dischinger et al) feel there is more basal skeletal correction as a result of growth guidance, at least in the short run, since use of the Herbst appliance is limited to 6–7 months De Vincenzo feels that over the long haul the response is essentially dental—i.e., tooth movement. Long-term studies by Pancherz and Ruf show that actual growth of the condyle achieved by adulthood is only 1–2 mm more than normal. But two factors are operative here: One is that these appliances are worn for only a small portion of the growth period—only 6–7 months; but growth occurs over 9–15 years. Predominance of morphological pattern is likely to re-manifest itself in such cases unless subsequent growth guidance through the use of activator/bionator/twin block continues the postural propulsion to some degree. Then too, as Ulrich Paulsen shows in his excellent CAT-scan studies, the modification of the glenoid fossa posterior structure is significant, and most researchers have not measured this important area. Orthopedic surgeons correcting scoliosis or long bone deformities would never limit their guidance to 6 months and still expect a permanent change. We can learn much from medical orthopedics as we resort to growth guidance for longer periods of time, as we have done successfully with Class III malocclusions. As an often-quoted maxim has it: “It is not the tool that you use, but when, why, for how long, with how much force.”

Chapter 9 (Michael Marcotte) is essential for anyone seeking to understand the biomechanics of orthodontic therapy for both fixed and removable appliances. Advertisements for new exotic wires and complex brackets may create the impression that they are largely automatic, but that is far from true. Orthodontic biomechanical principles were pretty elementary when I finished my specialty training. Learning by experience was not always pleasant, as so-called anchorage units moved as much as the target teeth. Fundamental concepts stressed appliances that produced so much friction that heavy forces were required to overcome the resistance and, in the process, they produced damage in too many patients. We were handed an edgewise bracket and a series of three or four archwires, leading to a 0.022 × 0.028 wire that snugly fit the bracket. But even heavy elastics had difficulty moving teeth. The degree of force and length of treatment almost always produced some root resorption and soft-tissue damage.

With leaders in the field such as we have now, our specialty is well founded in biomechanical aspects, with the emphasis on the “bio.” Much credit for this revolution goes to the orthodontic department at Indiana University, to sage clinicians like James Baldwin and Charles Burstone, and to their bright young students like Michael Marcotte and Thomas Mulligan, who are teaching generations around the world the basics of moments, couples, and vectors and of control without the severe attendant damage we produced before the Indiana influence on the specialty. Not only has Indiana been the font of biomechanical knowledge (all those mentioned above and many more are outstanding clinicians), but these eminent leaders have made what appears to be a complex aspect of physics very understandable for all. Without this background, no clinician deserves to call himself an orthodontist. Admittedly, reading this chapter for the first time may confuse some novice orthodontic students, but like a sacred text, it must be read again and again! With the information gained, the clinician can understand the raison d’être of all appliances—the advantages and disadvantages of specific problems. Too many or-
thodontic “pied pipers” who never really understood the underlying principles of the appliances they used, the “set-up” they applied to all patients, or the “rules of use,” have tooted their horns to attract willing followers. This is the ugly side of our history.

Unfortunately, this lack of understanding still pervades our specialty. In addition, many nonspecialists read only the advertising claims and learn the hard way by misuse and iatrogenic damage. With those eager-beaver legal vultures circling overhead, we can no longer afford the luxury of learning by trial and error, burying corrected dentitions under permanent retainers. To me, this is the most important chapter in this book for orthodontic students. There are many roads to Rome, many appliances that can accomplish the same result, but only one set of fundamental tissue-conscious principles. Read and understand and don’t feel handicapped if it takes three readings to get the full meaning and implications. Try to take short courses given by these leaders if possible. Most graduate orthodontic resident programs have “in-house” teachers of biomechanics: Robert Isaacs, editor of *The Angle Orthodontist* and long-time department head at Minnesota, California, and Virginia; leaders like Ravi Nanda at Connecticut, Rohit Sachdeva of Baylor, Andrew Kuhlb erg of Connecticut, Steven Lindauer of Virginia, among others—and I know I have left out some names. Most schools don’t have these biomechanical gurus on staff, but if you go to Illinois, for example, you will have all the leaders giving seminars and guiding clinical units, from James Baldwin and Bill Hohlt, through Charles Burstone, Michael Marcotte, Thomas Mulligan, and Bob Isaacs. Learn these principles early, and all appliances will make more sense, or nonsense, to you. No short cuts here!

Chapters 9 through 11 assiduously apply the principles of the biomechanical Bible given in Chapter 9. The early chapters in this book also do, of course, but the guidelines are more important for full fixed mechanotherapy. At least 75% of your practice load will be in this category, perhaps more, as you apply fixed appliances to fine-tune growth guidance cases. As you read the chapters by Marcotte, Kuhlb erg, and Alexander, make it a point to return to the prose illustrations in Chapter 9 to help you understand their implications.

If you need further indoctrination, go to the outstanding chapter by Burstone in the Graber–Vanarsdall graduate orthodontic text [4], to the books by Burstone, Marcotte, and Mulligan, and to the short courses offered by all of them.

Chapter 10 (Andrew Kuhlb erg) on the segmented arch technique deals with the culmination of biophysical and biomechanical design developed by Burstone and his staff. It is a popular choice, particularly in the Connecticut area. Marcotte and Kuhlb erg were products of this environment and learned the advantages of the segmented arch approach. They will often modify it with continuous arches at various stages of treatment. This chapter gives you a fine description of the technique, its biomechanical justification, and examples of the correction potential if the technique is handled properly. Again compare these cases with those of the other fixed-appliance chapters and judge for yourself whether this is your “cup of tea.” The segmented arch technique may be the most biomechanically oriented approach.

Chapter 11 (Wick Alexander) is a good place to turn next. Dr. Alexander is a pioneer in light-wire techniques and has devoted his life to teaching others. He, too, has constantly made changes in his philosophy and appliance units as his experiences and those of his students and disciples point the way to even better control. There is a common thread in the remaining chapters, though: light forces, the lowest possible level that moves teeth. We all have learned the hard way that with too much force we cause hypermineralization, stop cellular activity by frontal assault, reduce metabolism, retain catabolic byproducts, and move the tooth or teeth only by undermining resorption mechanotherapy.

Read it in Graber and Vanarsdall [4]. There are other chapters of value, but this is an absolute must for periodontics, etc. Their work is, in my opinion, unexcelled, though European researchers are not far behind. Starting with Sandstedt of Norway in 1904, through Oppenheim of Austria, Noyes of Chicago, Sich er and Weimann of Austria and the USA, Kaare Reitan, Per Rygh and Birgit Thilander and Annika Isberg of Norway and Sweden, we have a fine heritage of research scientists that matches any field in the world.

The long-term results of Alexander, as well as those of other authors in the light-wire chapters, are bound to be impressive, but standing the test of time is paramount. A balanced occlusion is essential: balanced in contact with the opposing teeth, with the neuromuscular envelope, with function and parafuction, and with facial esthetics. This is not an easy assignment with the myriad of facial types we encounter. Study of the case reports should be afforded concentration and considerable time. Look for criteria of stability, look for tissue health as well as esthetic achievement.

Chapter 12 (Magdalena Kotova), authored by a well-known, leading orthodontist of the Orthodontic Department of the Charles University Prague; deals with implants in orthodontics. Czech orthodontics has had some internationally well-known representatives such as Miroslav Adam, Frantisek Kraus, Ferdinand Skaloud, and Bedrich Neumann. During World War II and the following Iron Curtain period, communication with the West was interrupted and it was difficult to obtain even the scientific literature, let alone equipment or material. As soon as the Iron Curtain dropped, the new generation made up for the lost time. They worked enthusiastically, studying the new literature, visiting famous universities, organizing courses with leading orthodontists and so on, aiming to lift Czech orthodontics to an international level. Two of the exponents of this new generation are Magdalena Kotova and Milan Kaminek. Proof that Czech orthodontics has come abreast of the times is found in Dr. Kotova’s research topics. Implants are one of her research priorities and she has many years of experiences in this field, publishing and lecturing on the subject. The quality of her contribution to this book demonstrates her reputation as an expert in the field.

Tom Graber was always building bridges between nations and orthodontists all over the world. He would be happy and proud to have this contribution in his “Memorial Edition.”

Chapter 13 (Rainer-Reginald Miethke) describes treatment with the Invisalign system. Professor Miethke holds the chair of the Charité University, Berlin. He was the first in Germany and one of the first in Europe to include the scope and possibilities of treatment with the Invisalign system in his comprehensive research program. He contributed to improvement of the efficacy of the treatment with new ideas such as “led tooth” or ways of using the attachments. He is active across the world, publishing, lecturing, and teaching treatment with Invisalign.
The death of Tom Graber left a gap in the editorship of the *World Journal of Orthodontics* (WJO). Dr. Efthimia K. Basdra, who took on the editorship in the first phase, has since passed the position on to Dr. Miethke, who is now Editor-in-Chief of the WJO. Open-minded, pragmatic, social-minded, and communicative, he is exactly the right successor of Tom. He is an experienced editor, being the Editor-in-Chief of the Quintessenz journal *Kieferorthopädie*. He has widespread connections, for example, in his capacity as a former visiting professor of the Louisiana State University, New Orleans, and the Royal Dental College, Aarhus, or as the Past-President of the 100 Years EOS congress in Berlin. Thanks to his editorship the journal will continue to be managed in the spirit of Tom Graber.

As with any publication or lecture by Rainer-Reginald Miethke, both the content and the didactic quality of his chapter make an excellent contribution for the practitioner on how to manage the invisalign treatment.

Chapter 14 (Bjørn Zachrisson) is another gem, presented late in the book to make sure you have already been exposed to the various techniques and the ways of solving tooth size discrepancies, morphological variations, re-crowding, particularly in the lower anterior segment, and so on. Bjørn Zachrisson is considered by many to be the top clinician in the world because of his frequent super-courses around the world, his thorough integrity, his open discussion of potential problems, and his masterful way of presenting his material. It is a “must” for all who can do so to attend one of Bjørn Zachrisson’s courses. His experiences in retaining treatment results, the steps he takes to prevent or correct re-crowding, and his means of retaining upper and lower arches are described in his many publications. He took on the assignment of “proximal stripping” because of the frequent need to maintain as much of the treatment correction as possible and to ameliorate situations in which adverse post-treatment changes can occur. The care he takes so as not to reduce interproximal bone or cause loss of gingival contour is important, particularly given the current Invisalign advertising, which relies heavily on technicians stripping teeth on laboratory models. This chapter again must be followed carefully. Too much stripping can produce deleterious consequences, as both Drs. Vanarsdall and Boyd, doubly qualified in orthodontics and periodontics, have shown.

Chapter 15 (John Sheridan) is again an essential for all readers. The retention problem is as controversial today as it was 30 years ago. Charles Tweed once quipped “Retention is not only one of the problems, but it is the problem.” What to do, when to do it, for how long, and in what particular types of cases? Jack Sheridan, a professor of orthodontics at LSU, as well as a developer of the Essex removable plastic appliance, has a broad range of experience and, together with Zachrisson’s chapter, offers the reader some essential information on retention. Sheridan also introduced the air-rotor stripping technique, and the reader is referred to his articles in current orthodontic literature. Here, as with Zachrisson’s chapter, timing is vital with retention procedures. The game isn’t over with the removal of “braces,” as more and more lawyers are suing orthodontists for relapsing malocclusions, claiming that it is due to the orthodontist’s incompetence. Informed consent forms must be sure to cover the natural consequences of the post-treatment settling phase, predominance of the morphogenetic pattern, lack of patient compliance with wearing of retaining appliances, the need to wear retainers indefinitely in some cases, and so on. The AAO has produced consent forms to be signed by the patient (or parent of a juvenile) to make sure these factors are explained and understood. As with the consent forms in hospitals before surgery, experience has shown that most potential relapse factors are covered even if they may not seem likely.

The final chapter (Jason Cope) could well be the first if being avant garde means anything. It is hard to believe that Ilizarov, an orthopedic surgeon imprisoned in Siberia in 1964, is the father of this amazing ortho-surgical approach to basal skeletal changes in the craniofacial complex! When I look back at my early efforts to correct skeletal malformations like cleft lip and palate problems and the limitations facing me, the indefinite retention, failures, iatrogenic damage, I say, “If only Ilizarov had been around then!” He was working on long bones, of course, and yet the amount of change he produced was quite amazing.

Orthognathic surgery in the form of LeFort I, II, and III has been around for over 30 years, and some striking changes have been produced. But the iatrogenic potential has always been there, even for the best surgeons. I published a number of orthognathic surgery reports when I was editor of the AJO-DO because it truly was and is dentofacial orthopedics that we need to correct many of the malocclusions we see. But looking at some of these patients, immediately postoperatively, with the swelling, black and blue patina, discomfort, and psychological shock, we would sometimes ask whether it was really worth it—whether we would want to undergo the procedure for what many people consider a mostly cosmetic problem. And the contingency-fee lawyers have again been circling around and quite busy: busy enough to make malpractice insurance rise exponentially to levels between $125 000 and $150 000 a year in some areas. What a breath of fresh air distraction osteogenesis has been for patients, oral and maxillofacial surgeons, and orthodontists. Jason Cope was fortunate enough to have been with Mikhail Samukhov and to have produced a book with him, and is admirably qualified to author this chapter. So the biblical saying “The last shall be first” applies in many ways to Chapter 16. Read this chapter several times, attend courses on the technique, which is fairly widespread now, and read the book by Samukhov and Cope. You will truly be “coping,” if you’ll excuse the pun, with heretofore unsolvable problems and doing so with minimal potential for untoward results.

I am sure my enthusiasm for all the chapters in this treatment book is obvious. With the *Orthodontic Diagnosis* color atlas alongside, the result will be better, faster, safer, and more pain-free care for our patients. After all, isn’t that what we all want? And those legal vultures will turn elsewhere to other fields of medicine and dentistry, where the pickings are better for them! Read enjoy, learn, profit with better, evidence-based patient care!

*PREFACE*

T. M. Graber

T. Rakosi

Vardimon AD, Graber TM, Drescher D, Bouraule C. Rare earth magnets and Impaction AJO-DO 1991; 100: 494–512

