

MODERN ORTHODONTICS

Is there a difference in how one can straighten their teeth? Is there a faster way, a less painful way? Are braces just a commodity? What are the differences in orthodontics today compared to say, twenty or thirty years ago? Over the many years, Dr. Chamberlain been asked these questions both indirectly and directly as thousands of patients and parents have passed through his office.

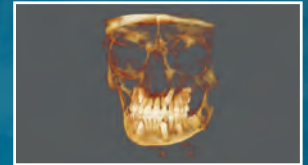
In this book, Dr. Chamberlain will first discuss advances orthodontists have made to create a more enjoyable experience for the patient. From the first phone call to the time braces are placed, to their removal and beyond in retention, many orthodontists have become ultra-focused on creating a relationship-based practice that the whole family can enjoy. The second part of the book discusses the advanced technology that has come into the profession to shorten treatment times, decrease discomfort, remove compliance problems, increase accuracy and consider whole body health.



Best-selling author (*Success Today* with co-author Brian Tracy), Dr. Chamberlain founded Chamberlain Orthodontics in October, 2002. From the beginning of his practice, he has founded his success on excellent patient relationships, quality treatment, and an extraordinary team. Dr. Chamberlain has grown his practice to include offices throughout Arizona and Utah..



MODERN ORTHODONTICS



Dr. Thomas Chamberlain

MODERN
ORTHODONTICS

MODERN **ORTHODONTICS**

Positive Changes for a
More Enjoyable Experience

Dr. Thomas Chamberlain, D.M.D.

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I would never be where I am today without the undeserved love and devotion of my wife, Tamara. She is my best friend, my confidant and my eternal companion. I would also like to thank my children, Kohler, Kelsey, Spencer, and Hailey for their support and love. I am proud of each one of my children. They have made me love my calling as a father. Finally, I would like to thank my staff. They are extremely supportive as we share the same passion of the pursuit of excellence in Orthodontics.

CONTENTS

Introduction	1
My Story	5
Orthodontics Yesterday and Today - What We Have Learned	13
Treatment Timing	14
Extractions	15
Cost of Braces	18
Dentists and Orthodontists	21
The Science of Tooth Movement	27
Public Perception and Orthodontics	31
Technology for Today and the Future	37
3D Imaging	38
3D Intraoral Scanning	41
Laser	42
Miniscrews (AKA...TADS)	44
Bracket Design	46
Pain-Free Orthodontics and the End of Migraines	51
Invisalign	52
How To Maintain Your Investment	57
Conclusion	61
Glossary	63
About the Author	73

INTRODUCTION

Is there a difference in how one can straighten their teeth? Is there a faster way, a less painful way? Are braces just a commodity? What are the differences in orthodontics today compared to say, twenty or thirty years ago? Over the years, I have been asked these questions both indirectly and directly as thousands of patients and parents have passed through my office. What I observed is that when one doesn't understand a concept or process, but still needs to make a decision regarding that concept, they will base their decision on an aspect that they *do* understand. The one common denominator that all purchasers of orthodontics do understand is price. For the uninformed, that seems to be the deciding factor in their orthodontics decision.

Over these many years, I have spent a *lot* of time attempting to educate my patients on factors beyond price that need to be considered in their decision for orthodontics. Certainly price is a factor, but there are many other elements, and with a treatment fee being similar across many orthodontists, a patient needs to be more educated on what makes one office outstanding

and another less so. I have written this small book because so many have asked questions regarding the items listed in the table of contents. Collectively, I have spent hours discussing these items and seeing that there is nothing in our community which addresses these items, I have decided to answer them in as concise a manner as I can. This is not a textbook, nor is it a novel. It is meant to address patients' questions regarding treatment decisions and to give the "non-dentite" world a better understanding of some amazing breakthroughs in the field of orthodontics.

In this book I will first discuss advances orthodontists have made to create a more enjoyable experience for the patient. From the first phone call to the time braces are placed, to their removal and beyond in retention, many orthodontists have become ultra-focused on creating a relationship-based practice that the whole family can enjoy. The second part of the book discusses the advanced technology that has come into the profession to shorten treatment times, decrease discomfort, remove compliance problems, increase accuracy and consider whole body health. Some of this stuff will sound like pixie dust or magic, and when I first was introduced to it, I was skeptical on much of it. However, I have been an early adopter in many of these advances and I have seen first-hand, how this magic has changed our profession for the better forever.

Beyond just orthodontics, however, I have written some life lessons that I hold dear. I am a devoted Christian

INTRODUCTION

and I believe this devotion permeates into everything I do, especially into my writing and my work.

My hope in writing this book is to give you information on the latest advances in our great profession and how you can make an educated decision on what is best for you and your family in regards to Orthodontic treatment. It's a lot of information, and honestly, I am not doing a good service by rushing through my explanations. This book is an attempt to help demystify the rapidly changing art and science of modern orthodontics and dispel the myths and antiquated ideas that still exist in the profession.

Lastly, I have provided a small glossary of words that can help when in the orthodontist's office. Orthodontics has developed its own language, even separate from the dental profession and many of these words might be helpful in understanding your diagnosis and treatment.

MY STORY

In order to get a full history of how and why I became an orthodontist, you must know the story of how I met my wife. Tamara Marshall is a large reason why and how I became an orthodontist. I first met the Marshall family while I was serving a mission for my church, The Church of Jesus Christ, of Latter-Day Saints. I was serving in the Fresno, California area and the last area of my mission was in the town of Merced. Because of my musical background, in each of my areas in the mission, I was asked to present a musical performance featuring the youth in the area and using the local talent. That is when I first met Julie Marshall. She is an amazing pianist and organist. While we were rehearsing, I got to know her and husband, Dr. Michael Marshall. He was the local church leader, or Bishop in the area (in the church, the geographical areas are divided into “wards” and led by lay leaders called Bishops). I really loved their family. As my mission came to a close I wrote in my journal:

“I have a strong fondness for Julie Marshall and her family. I felt something very special about her, an immediate love and respect for her and her husband. I don’t know what it is but I totally

love these two and hardly even know them. It's a strange feeling to love someone you don't know well so immediately. I'll be interested to know why they mean so much to me. They are one of the greatest families I've ever met. They are a great family to pattern my future family after."

After that last journal entry, I went home from my mission. I helped my dear mother during that entire summer because my father had passed away 6 months earlier (while I was on my mission). I loved my father and it was hard on my mom having him gone.

I began my college studies at Brigham Young University that fall and part of my curriculum was taking a religion class. I showed up the first day of class and sat on the front row. Just before class began, two girls came and sat behind me. One asked the other the only question that I would have turned around for: "So, where are you from?" "Merced, California," was her response. I turned around and said, "Hey, I served there on my mission!" We spoke for a few minutes and I quickly realized this was Julie and Mike Marshall's daughter, Tamara. What I didn't know until later, was that Julie Marshall had some long talks with her daughter, Tamara, over the summer. She was trying to encourage Tamara to find me at BYU. During those talks Tamara would rebuttal, 'How am I supposed to find a guy in a school of 29,000 students, and if I did run into him, what would I say?

Hi there! I don't know you, but my mom wanted me to stalk you and find you!" Also, Tamara had a fairly steady boyfriend at the time, and they were getting pretty serious.

The next class that week, her boyfriend missed class to buy BYU football season tickets. Seeing an opportunity, I asked Tamara if she would like to come play some music together. She accepted and we went to a quiet music room where she played the piano and I sang some musical theater songs. I was so impressed with her incredible musical ability and artistry on the piano. She was absolutely amazing! Later that week, Tamara's boyfriend approached her and shockingly said that he had never started a semester with a steady girlfriend and he wanted to, "play the field." Tamara was very confused by this sudden change in events, but when I asked her on a date for that Saturday, she accepted. We had a wonderful time on our date and I enjoyed every minute with her. The next day, her boyfriend came back and left a note of apology on her car. He stated he didn't know what he was thinking but that he wanted to get back together. She politely let him know that she thought the idea of them seeing other people was just fine, because in just one day she found someone who she thought was worth pursuing. His loss was my gain!

We ended up sitting on the other side of the classroom the remainder of the semester to avoid the "ex-boyfriend." Within 3 months of our meeting, we were engaged. Two months after that, we were married.

During our first years of marriage we were both heavily involved in activities outside of school. Tamara was a dance major and I was a musical theater major. We were separated for three of our first five months of marriage due to international performance tours. That part was really hard. But, we were having a wonderful time as we were travelling the world and performing for audiences throughout the United States and Europe. After one year, Tamara was about to graduate with a degree in dance. She and I sat down and looked at my college transcripts. As we looked she noticed that I had taken two years of school but my transcript had mostly consisted of music, dance, and theater classes, with a smattering of some science and psychology classes. At the same time, I was being taken to Los Angeles where some agents were giving me opportunities for more stage acting with Actors Equity and to begin screen acting for my SAG card. We had a heart-to-heart talk. We had to make a decision if this was the path we were to follow or if we had another path, perhaps a path with a more stable family life. With prayer and reflection, we both felt it was best for me to find a profession for which I could develop a passion. I had a passion for acting and theater, but I had a much stronger desire to gain an education. I loved school. I decided I would change majors to Psychology and start a path toward a new career in law. Law school. Why did I choose law? It was more school and I liked a philosophy class I had taken. So for the next year I took less theater roles and focused on my schooling.

Over the course of a few semesters, it was time to begin to study for the Law School Admissions Test (LSAT). We were living in Atlanta for the summer to earn money for the next year's' tuition. During that summer, as I spoke with some attorneys, I came to the realization that I would not like law at all. I had a passion for education but not for being an attorney. We had to find a new path. My father-in-law, Dr. Michael Marshall, was a successful dentist in Merced. He and his wife suggested I look into dentistry and maybe even orthodontics. "Just go observe in a dentist's office for a day or so while you are living in Atlanta," Mike told me. I found a couple of offices in Peachtree City and Jonesboro. I immediately fell in love with orthodontics. From that moment on, I had a path and vision. I loved how the dentist interacted with patients, how they were able to use science as well as art. I loved how they were their own business owner and had the capability to make their practice an extension of them. Now, I had to figure out what was needed to get accepted to dental school. I had to take two more years of prerequisite sciences classes, which I loved, and take the Dental Admissions Test (DAT). I studied well for the DAT and received a score in the 95th percentile. After visiting a few schools we decided upon Oregon Health and Sciences University. Our first son, Kohler, was born on my graduation day from BYU. Eight days after his birth, we moved to Oregon to begin our new adventure.

Luckily, we moved into an apartment complex that had many other dental students and we had an outstanding

camaraderie with the students and their wives. It was there that I met an Orthodontic resident named Alan. He introduced me to the orthodontic clinic. Being the youngest child in a household of meager resources (orthodontics and its lack of affordability was very much worse than it is today), I was never exposed to braces.

Alan invited me to join him in the resident clinic. I quickly fell in love with the profession and found myself in the clinic every Thursday afternoon that I could. Some days I would put off lab work and studies in order to observe in the clinic. I became passionate with all things dealing with facial growth and development as well as the phenomena of tooth movement. I became involved with research and accelerated tooth movement studies as well as orthodontic bonding and materials studies. What I came to realize, however, is that orthodontics is the most competitive specialty all the dental specialties recognized by the American Dental Association. Of my class of 70 students, 35 began their freshman year with plans to go into the orthodontics specialty. 2016 Dental Career Guide data show that hundreds of applicants apply each year for programs that accept between 2 and 15 residents. I found that to be considered for an interview in an orthodontic program, you needed to be ranked in the top 5% of your dental class, ranked in the 95 percentile in your dental national board exams (taken your sophomore year and senior year) and have published research while in school. I quickly realized

that the difference between a 95% on an exam and an 87%, is many hours of additional study. I owe the success I had at this time to my diligent and supportive wife. Even while having our second child, Kelsey, during my sophomore year, Tamara kept things running at home while I spent many, many long hours in the lab, hours studying and many more hours researching. Looking back, I don't believe I would have made it into my orthodontic program had it not been for her and her support.

Why am I telling you all this? Well, first because I think it is a cool story. But also, because I believe that there is a general feeling that one should wait until their schooling is complete before finding their spouse. I am a living testament that this thinking may work for some people, but for me, I'm so grateful I had Tamara by my side. Additionally, I tell this story to help shed some light on the work it takes to become an orthodontist. Each of us has our own unique tale in how we came into our profession. As orthodontists we all have our unique philosophy on how to treat our patients that has been shaped by our experience and training as well as our beliefs. The problem is that so many differing philosophies can confuse patients as to what type of orthodontic treatment they should receive or what is available to them.

I believe orthodontics is a healthy mix of both science and art and many times the beauty is in the eye of the beholder. One orthodontist may consider a certain

smile a success while another orthodontist will think it is less so. I am just one orthodontist with some of my own opinions of what makes an attractive smile. However, even with these differences in opinion between orthodontists' philosophies, there are certain natural truths about tooth movement and facial development. These truths, in the context of the professions rapidly changing technology are what I'd enlighten the consumer about. There is great amount of misinformation that is proclaimed by dentists and the general public. I hope by the end of this small book that you, the reader, will have a better understanding of what options are available to you and your family members when it comes to considering orthodontic treatment.

ORTHODONTICS YESTERDAY AND TODAY - WHAT WE HAVE LEARNED

It has been said that you don't know where you are or where you are going unless you know where you have been. For Orthodontics, this is especially true. There have been some very significant changes in our profession over the past years that have affected the way in which we treat our patients. Unfortunately, there are those in our profession who have grasped some piece of orthodontic dogma and held to it in the face of clear evidence to the contrary. As a professional, if I don't keep up on changes and be vigilant in staying abreast on the studies and the literature, if I become complacent and say to myself, "This is good enough," or, "It's been done this way for a long time, why change now?", then I am not treating my patients to the best care possible. Let's look at a few examples of some precepts that have changed over the years and need to be dispelled. This list is not exhaustive, it's just some of the changes that I have seen change our treatment for the better.

Treatment Timing

Early Interceptive Treatment

Additionally, many parents have commented that they noticed the average age of children getting braces has decreased. This is true. The timing of treatment has changed. This has to do with the changing role orthodontics has taken in the whole health perspective of the growing child. In the past, orthodontics could be related to a car body-shop mechanic. The crash has happened and the orthodontist would come in to put the car (or teeth) together as best as possible. With the newer technology that I will be writing about later, we have moved from being a mechanic to more of a crash detector to warn and prevent the crash from happening.

Listen, if we can prevent canines from being impacted with early intervention (and we can), then that prevents future surgical interventions. If we can develop arches early, then we can have full eruption of teeth and prevent the extraction of permanent teeth in the future. If we can prevent sleep interrupted breathing and possibly sleep apnea, then we may prevent adverse issues ranging from child snoring to bedwetting, to moodiness and poor school performance. There are just too many benefits to ignore early treatment and prevent certain “crashes” in the teeth that we know are coming.

Extractions

I hear this quite often: “When I was young, no one at this age got braces.” In the past, braces on children at an early age (meaning about 8-12 years old) were much more of the exception than the rule. The reasoning was that we would wait for all the permanent teeth to come in as best they could, then extract 4 teeth (one in each quadrant of the mouth) to make the space necessary to straighten all the teeth in the mouth. This, at the time, seemed like an efficient and viable treatment plan. Many of the parents I have seen had braces this way. However, we have learned a lot over the years about how this negatively affects other aspects of our health and facial esthetics.

In addition to extractions, we also would place people in contraptions called a headgear. This was used to keep the upper jaw retracted while the lower jaw was allowed to grow. For those amazing people who wore this appliance, it worked well for the teeth. However, in the longer term, it was usually correcting the good jaw (the upper jaw, or maxilla) to the problem jaw (the lower jaw, or mandible). This, in addition to the extractions had some adverse consequences on patient’s facial profiles as they aged. Moreover, recent research has also determined that it could have adverse effects on a person’s breathing ability while sleeping, contributing to snoring and some sleep apnea issues.¹

¹ Sleep apnea has many causes and can only be diagnosed by a qualified sleep physician. Obstructive sleep apnea has been related

Another major change has to do with *time*. I think time is a larger priority in people's lives today than in the past. We have so many more choices in our lives today and many more distractions to keep us busy. Either way, the value of time is a large concern and it seems even more so with braces. In years past, orthodontic treatment took not just months but years to accomplish. The end result would often be damage to the tooth surface and damage to the roots of the teeth, not to mention a very burned out patient!

Today, one should not expect to see the unsightly white spots on the teeth from prolonged wear of the brackets. Shorter treatment time along with a bonding sealant placed under brackets now protect the tooth surface from permanent demineralization. Additionally, shorter treatment also taxes the roots less. How did the profession decrease the time of orthodontic treatment to be about half that of 20 years ago? We will discuss all the advanced technology later in the book. Suffice it to say that slow, painful, and potentially damaging orthodontic treatment should all be a thing of the past. Let's keep it there!

Another aspect of time that has changed in orthodontics relates not to the total length of treatment time, but

to small airways and tongue obstruction. Although more studies are needed, some initial studies have shown that people with the extraction of permanent teeth have smaller airways and a higher incidence of snoring and sleep apnea when compared to people without extractions during orthodontic treatment. Sleep Breath. 2015 May;19(2):441-51. doi: 10.1007/s11325-015-1122-1. Epub 2015 Jan 28.

to the length of the individual appointment. Whenever I visit my general physician or my children's physician, I realize how advanced my practice is with our adherence to keeping appointment times on schedule. In today's digital office with all the advances in efficiency, there is no longer a need to consistently run behind schedule! In the past, the only time you would interact with your orthodontist may be your appointment. Today, however, many orthodontic offices have embraced the thought of being more engaged in their patients' lives. This has evolved into giving patients a more memorable experience with their braces. Patient appreciation events, sponsoring local school events and having movies, and debonding parties are part of the regalia that now comes with braces. This is all in an effort to be more involved and to create a positive experience for the patient and their families. Moreover, some orthodontic offices have also embraced the notion of giving back to the community. That can mean giving free treatment to teachers in the local schools or giving free treatment to children in need in the area. We have had essay contests run through schools and afterschool programs where children without means can write about their desire to receive free treatment. With these and other programs, we give dozens of complimentary treatment each year to kids who otherwise would not be able to afford braces. All of this is in an effort to be more relevant in our community and to give back to the people that have given so much to our office and our staff.

Cost of Braces

The other day I was at the car wash with my daughter. While we were watching the cars go through the wash I noticed a card display with all the years going back 50-60 years. I was intrigued and so I looked up my birth year (1970 if you must know). The card was a 10 page pamphlet of what life was like that year. It told of who won the World Series, the Super Bowl, the best movies and TV shows of the year etc. It was also interspersed with ads from magazines. One page was interesting. It was the average prices of items that year. It listed gas, a home, a car etc. I was shocked to think we had that much inflation in my young (a'hem) lifetime. So I got to thinking ... what would be the differences in prices of some items when comparing orthodontics over the years? It was quite a surprising discovery. I couldn't find a lot of the different fees of items from over 40 years ago, but I did discover the prices of different esthetic and functional procedures today that people choose to help themselves look, feel, and function better in their lives. They range from face lifts, implants, full mouth rehabilitation, to orthopedic appliances. These items can cost tens of thousands of dollars and can be very traumatic. Here are some costs for procedures in 2017:

- Broken Arm = \$8,000 - \$17,000
- Lasik = \$3,800 (both eyes, basic service)
- Dental Implant/Crown = \$3,000 per tooth
- Breast Augmentation = \$7,000 - \$12,000

- Facelift = \$16,000
- Full mouth Rehabilitation (Implant crowns throughout the mouth) = \$45,000 - \$60,000.
- Full orthodontic treatment = \$4500 - \$5500

You might think that, with the dollar being 8 times less valuable today than in 1970, that the cost of braces must have been very cheap. Wrong! A comprehensive orthodontic treatment in 1970 cost about \$2000. Moreover, most families didn't have insurance to help defray the cost. Thus, in today's context, braces are a sliver of the price compared to income and other expenses in the same time frame. Other health care costs may be skyrocketing, but orthodontics has moved less than inflation over the same period of time.

When I look at the fees for braces over the years and the fees for braces today, it seems like such a bargain. Of course all of these items are, hopefully, a once in a lifetime investment. However, when you look at the value you receive from orthodontic treatment, i.e., dental health benefits, self-confidence benefits, and all the psycho-social benefits, it becomes one of the best investments you can make.

DENTISTS AND ORTHODONTISTS

While I was in dental school I had a professor say to our class, “We are preparing you all to be able to ‘crawl’ by the time you graduate from dental school. The walking and running will come after you graduate.” None of us cocky dental students wanted to believe that at the time. However, we soon came to realize how true that statement was after graduation and we were exposed to all sorts of new information, research, techniques, brands and companies vying for our attention.

In dental school, students are trained to restore and replace worn, broken or decayed teeth. In addition, each student is exposed to the nine recognized dental specialties in dentistry. This introduction to the specialty allows every student who desires, to pursue each specialty further in a post-graduate program. Dental students gain a quick appreciation for these specialties and how competitive each program is to be accepted. It is common knowledge in dental school that orthodontics is one of the most competitive residencies available. I’m not saying that some general dentists are not at the top of their respective classes. My father-in-law was an excellent general dentist and graduated at

the top of his class at St. Louis University. He was given an acceptance into an orthodontic residency program but turned it down because of his love of dentistry and restorative work.

Let's look at the different specialties that are officially recognized by the American Dental Association.²

- **Dental Public Health:** Dental public health is the science and art of preventing and controlling dental diseases and promoting dental health through organized community efforts. It is that form of dental practice which serves the community as a patient rather than the individual. It is concerned with the dental health education of the public, with applied dental research, and with the administration of group dental care programs as well as the prevention and control of dental diseases on a community basis.
- **Endodontics:** Endodontics is the branch of dentistry which is concerned with the morphology, physiology and pathology of the human dental pulp and periradicular tissues. Its study and practice encompass the basic and clinical sciences including biology of the normal pulp, the etiology, diagnosis, prevention and treatment of diseases and injuries of the pulp and associated periradicular conditions.

² Council of Dental Education and Licensure. "Definitions of Recognized Dental Specialties". *ADA.org*. American Dental Association. 6 June 2016. Web

- **Oral and Maxillofacial Pathology:** Oral pathology is the specialty of dentistry and discipline of pathology that deals with the nature, identification, and management of diseases affecting the oral and maxillofacial regions. It is a science that investigates the causes, processes, and effects of these diseases. The practice of oral pathology includes research and diagnosis of diseases using clinical, radiographic, microscopic, biochemical, or other examinations.
- **Oral and Maxillofacial Radiology:** Oral and maxillofacial radiology is the specialty of dentistry and discipline of radiology concerned with the production and interpretation of images and data produced by all modalities of radiant energy that are used for the diagnosis and management of diseases, disorders and conditions of the oral and maxillofacial region.
- **Oral and Maxillofacial Surgery:** Oral and maxillofacial surgery is the specialty of dentistry which includes the diagnosis, surgical and adjunctive treatment of diseases, injuries and defects involving both the functional and esthetic aspects of the hard and soft tissues of the oral and maxillofacial region.
- **Orthodontics and Dentofacial Orthopedics:** Orthodontics and dentofacial orthopedics is the dental specialty that includes the diagnosis, prevention, interception, and correction of malocclusion, as well as neuromuscular and skeletal abnormalities of the developing or mature orofacial structures.

- **Pediatric Dentistry:** Pediatric Dentistry is an age-defined specialty that provides both primary and comprehensive preventive and therapeutic oral health care for infants and children through adolescence, including those with special health care needs.
- **Periodontics:** Periodontics is that specialty of dentistry which encompasses the prevention, diagnosis and treatment of diseases of the supporting and surrounding tissues of the teeth or their substitutes and the maintenance of the health, function and esthetics of these structures and tissues.
- **Prosthodontics:** Prosthodontics is the dental specialty pertaining to the diagnosis, treatment planning, rehabilitation and maintenance of the oral function, comfort, appearance and health of patients with clinical conditions associated with missing or deficient teeth and/or oral and maxillofacial tissues using biocompatible substitutes.

Orthodontics is the oldest specialty in dentistry and as such has more research literature than any other specialty in dentistry. As residents, one of our primary functions was to read a large amount of studies. From biomaterials, to facial growth, biomechanics, TMJ, surgery and retention, to arguments about extraction or non-extraction orthodontic treatment, we had to read it, summarize and present it each week. More important, they evaluate, diagnose and plan treatment for orthodontic patients and then treat those patients.

They present each patient case in a resident group setting along with the orthodontic instructors who give experience and insight into the case presented. This presentation process allows residents to review hundreds of cases in a relatively short period of time. This, along with the extensive reading and comprehensive background allows the orthodontic resident to understand the nuances of almost every conceivable orthodontic problem. It is one of the most important items that an orthodontic resident takes with them upon graduation. Additionally, they complete rotations through oral surgery, craniofacial abnormalities, periodontics, pediatric dentistry and prosthodontics.

Finally, students are able to take part one of the American Board of Orthodontics exam, covering the breadth and depth of all they had learned over the course of their residency. At the end of their training they are awarded either a certificate in orthodontics or a master's degree in biology. After graduation, they have options to buy a private practice, begin a practice on their own, or join a group practice. Any of these choices present a whole new series of learning and growing experiences. I have had the opportunity of experiencing each of these options over the years and have learned so much from each situation. Joining a busy orthodontic practice is a daunting experience. In residency, eight to twelve patients are typically treated each day. However, in private or group practice, an orthodontist can typically see 60 patients or more in a

day. Although this change is quite daunting, it is very rewarding and it creates a major education in efficiencies! It is this day to day practice on so many patients that orthodontists master their craft. They learn from mistakes, correcting missteps and getting out of troubling situations, handling parents and motivating teenagers. The rewards come in reveling in beautiful smiles and seeing the positive changes that occur in the people they treat. It is the best education of our professional career!

I contend that the orthodontist is the best trained, most expert, and highly qualified individual to understand the nuances of the art and science of orthodontics and dentofacial orthopedics. When you compare the hours of training of a general dentist interested in orthodontics to the thousands and thousands of hours of training and treatment experience, you can truly see the difference between the specialist and the non-specialist. This is the why most general dentists have their children treated by orthodontists.

THE SCIENCE OF TOOTH MOVEMENT

I couldn't write a book on orthodontics without discussing, at least in general, the science of how teeth move. I realize this may not be a chapter many read, except the engineer parents and such. Also, this chapter is hardly an exhaustive discussion of orthodontic movement. But it will give the reader a basic summary of what we know and, hence, why we use some of the items that we use when in braces.

Sometimes we may forget that the teeth are not a static item in our body. They are as dynamic as every other function our bodies undergo. We lift weights and our bodies respond with building stronger muscles in direct relation to that stimulus. We eat too many grapes for dinner and our body will let us know a few minutes later, with a dash to the restroom. Our body is constantly changing according to the stimulus that is given to it and so it goes with the teeth.

Teeth move when there is a constant pressure placed upon them. The type of pressure is important in determining the speed of that movement and the pain associated with that movement. Multiple studies have shown that a light pressure produces faster and

more pain free movement of the teeth. Many people want to make their teeth move faster and will ask me to put the hardest, tightest wires and elastics on their teeth so they will move faster. Their thinking is that some pressure is good, but more pressure must be better. Admittedly, that is the intuitive way of thinking. However, when we look at what is going on in cells within the bone during tooth movement, we soon discover that it is the opposite of intuition.

When a heavy pressure is placed on the tooth the side with the pressure has the root of the tooth squeezed up against the bone in the tooth socket. The pressure can be so overpowering that the blood supply to the bone is cut off. It's kind of like pressing your finger into your skin and it blanches the skin white, or tying a tourniquet on your leg to stop bleeding. Blood flow stops with heavy pressure. We know what happens when we stop blood flow to an area of our body. Things die. They necrose. That is exactly what happens with heavy orthodontic pressure. The bone around the area eventually dies and breaks down. When that happens the tooth moves into the necrotic tissue. Yes, it does move. But only after the tissue dies, which takes time and causes some discomfort. You see, our bodies are equipped with cells that naturally move and reshape our bones. The cells that build up bone are called *osteoblasts* (osteo = bone, and blast = forming). They naturally delve into areas where bone is in tension or is building. On the other hand, there are the *osteoclasts*

(osteo = bone, clast = break) that will break down bone in areas where there is pressure. A problem occurs with a heavy pressure on the bone. Heavy pressure cuts off the blood supply and these osteoclasts are unable to enter the area and do their job. This creates heavy pressure, necrosis, and slower movement. When light, constant pressure is placed on a tooth, the osteoclasts easily enter the bony area under pressure and begin to do their job, removing the bone. Also, the osteoblasts are on the other side of the tooth doing their job in the area of tension, forming bone. This light, constant pressure creates faster and much more comfortable movement. This orthodontic science hasn't always been understood and even today, it is not used as well as it should. It's likely because of the fact that it is not intuitive. General dentists and even some orthodontists do not completely understand the phenomena of light, constant force and how useful it is in creating bone.

This same phenomena is used in other areas of medicine. In malformed limbs or face, science has used a technique called *distraction osteogenesis*. It is where a bone can be cut, or distracted and then tension is placed in the distracted area of the bone. The bone then recruits osteoblasts to form new bone in the area.

Now that we understand principles of how bone is resorbed and formed, then we look at ways to speed up this process even more. I will discuss how we can now accelerate the movement process in an upcoming chapter.

PUBLIC PERCEPTION AND ORTHODONTICS

One of my favorite things I love to do as an orthodontist is to give back to our community. In my previous book, “Success Today,” with renowned author and speaker, Brian Tracy, I discussed some of reasons why giving can have such a powerful effect on your life and your business. In that book I wrote of our practice to hold essay contests among our local high schools and afterschool programs including the Boys and Girls clubs of America, ICAN and the YMCA.³ In our contests we have children who otherwise could not afford braces write why they would like to receive treatment. I’ve included one letter from Jessica (not her real name) below. She writes:

Being able to get free braces would change so much, not only my smile but also my self-confidence. I would like to tell you a little about myself. I have been told by many dentists that I desperately need braces. One look at my smile and it's obvious. That's the thing that gets me. My teeth are so bad

³ Tracy, Brian. Chamberlain, Thomas. *Success Today*. Winter Park. Celebrity Press Publishing. 2015. Print.

that I hate smiling or even laughing in front of people, even my friends and family who love me regardless of my crooked teeth.

My teeth are so bad that I have changed the way that I smile. I don't smile wide. I dislike the bottom and top of my teeth and here's why. On the top, my two front teeth pop out. My peers would call me "rabbit teeth" growing up. Unfortunately, I believe that people still call me names, but the only thing that has changed is that they do it behind my back and not straight to my face. I also have a tooth that grew out on top of my other teeth. My bottom teeth are overlapping badly.

In elementary school, this was the time of my life where I got teased the most. This brought down my confidence and my self-esteem. It was mostly the boys that called me "rabbit teeth". Being called that every day at school made me more and more insecure about myself. Also, being name-called always made me feel like I was left out of many things. Whenever there was a group activity or project, I felt like no one wanted me in their groups because who would want "rabbit teeth" in their group? Nobody.

A new smile would make me feel like a new person. I feel like I wouldn't need to remember being called "rabbit teeth" anymore and I could create new memories. A new smile would raise my

confidence and my self-esteem. I would actually be able to have a good smile whenever I take a picture. I have friends that love to smile so wide ... and then there is me, always with a closed mouth in every picture. I don't want to be that person anymore. I want to smile with straight teeth by the time I am a senior in high school or when I am in college. I want to look at my yearbook and not be embarrassed about how I look.

Winning this contest will help me by making me feel better about myself. Earning a new set of braces would help my family as well. Braces are something everyone in my family knows I need, but would rather pretend it's not a problem because of how much it would cost. I feel like if I asked for braces from my aunt, I would be putting pressure on her to choose between myself and other important things to pay for. My aunt would save so much money and it would relieve the pressure and stress on her.

I would be so grateful to have braces, It would change my life in so many ways. Thank you for reading my essay and for giving kids like me a chance to smile straight.

This is just one letter out of hundreds that I have received that generally say the same thing. Kids want to be accepted and treated well and they perceive straight teeth to be helpful in doing so. This doesn't just

stop with kids, however. A recent article on ABC news told of a survey taken from Match.com.⁴ The survey asked a question to 5,500 single adults age 21 years and older. The survey asked, "What do you judge most in a person of the opposite sex?"

Here are the results:

Ten things on which men judge women most:

- 1 *Teeth* - 58 percent.
- 2 *Grammar* - 55 percent.
- 3 *Hair* - 51 percent.
- 4 *Clothes* - 45 percent.
- 5 *Having/not having a tattoo* - 40 percent.
- 6 *Nails/hands* - 37 percent.
- 7 *Accent* - 19 percent.
- 8 *Shoes* - 18 percent.
- 9 *The car they drive* - 13 percent.
- 10 *Electronic devices they carry* - 9 percent.

Ten things on which women judge men most:

- 1 *Teeth* - 71 percent.
- 2 *Grammar* - 69 percent.
- 3 *Clothes* - 58 percent.
- 4 *Hair* - 53 percent.

⁴ Abby, Jennifer. "Top Qualities Single Men and Women Seek in the Opposite Sex". *ABCnews.com*. Good Morning America. 5 February, 2013. Web.

- 5 *Nails/hands* - 52 percent.
- 6 *Having/not having a tattoo* - 34 percent.
- 7 *Shoes* - 29 percent.
- 8 *The car they drive* - 24 percent.
- 9 *Accent* - 22 percent.
- 10 *Electronic devices they carry* - 10 percent.

Now, I'm not exactly sure why a cell phone is a judgment criteria for dating someone, but the number one answer for both males and females is the same. People like to see a nice smile with nice teeth.

You may be saying to yourself, "that is so shallow." Yes, it may be. However, until someone finds out all the amazing qualities on the inside of a person, that is how they generally judge them on the outside.

Another way to think about this is to consider two applicants for a job. You have to hire one of the two today. Both have similar skills, resume and job qualifications. Both are equally engaging and you can see both as someone whom you wouldn't mind having around the office. One, however, has a big space where a tooth once was and other teeth are overlapped and pushed forward. It just looks like a tangled mess in there. The other has a beautiful, white smile. Both candidates are the same except for this one small aspect. Which one is more likely to be hired?

TECHNOLOGY FOR TODAY AND THE FUTURE

In case you hadn't noticed from previous chapters, orthodontics has changed dramatically in the last 20 years. No longer should someone accept routine practices of extracting teeth, headgear, long treatment times, uncomfortable bands around many teeth, routinely shoving alginate material in the mouth, many old-style retainers and awkward appliances to wear, and high radiation x-ray equipment.

So now that we know what we don't use any more, what about all the new technology that we do use and what do we see on the horizon that will change orthodontics in the future? This is by no means an exhaustive list of items. Technology is moving so fast that we can hardly keep up. Also, we are living in an age of disruptive technology and those unknowns have potential to change entire industries. Orthodontics is certainly not immune to that phenomenon. However, the list that follows is what I have seen change the way I practice over the last 15 years.

Accelerated Orthodontics

In the past we have been limited in the speed of tooth movement. Move teeth too fast, and you risk damaging roots and causing excessive pain. Move too slowly and treatment takes forever. Today, there are some nice alternatives to speeding up the movement process without causing any harm to the teeth. The first is completely non-invasive and causes stimulation of the bone by vibratory force. Studies have shown that at a certain frequency, cells will respond with greater activity to a vibratory force, causing teeth to move faster while also inducing less pain in the process. A simple device created by AcceleDent, gives the teeth a vibration for 20 minutes each day. Studies have shown that teeth can move 30 - 50% faster. A second method for increasing the rate of movement of teeth is by introducing a small vent, or hole in the bone around the teeth that we want to move faster. These small vents heal easily and completely, but in the process, they introduce more cellular activity to move the teeth faster. One to two procedures to create these vents in the bone is usually sufficient to move the teeth 50% faster. No home use of any appliance is necessary and most times, only a topical anesthetic is needed to create the bony vents. For those looking to move teeth more quickly, either option can bring the results you want faster.

3D Imaging

In the past, orthodontics has used x-ray technology to look at unerupted teeth, tooth and root positions, 3rd

molars and the like. Over the years, as a profession, we have created algorithms of normal individuals and jaw relations and used those to adjust and move our patients' teeth into those "norms." In the early 2000's a new type of technology had developed that used cone beam computed tomography (CBCT). It took our two-dimensional x ray of the teeth and put it into a three-dimensional pattern. These first scans of the face used large computers that slowly pooled all the data together to create the image. It was costly and used a lot of radiation. Of course with time comes technological advancements, and today we have 3D technology that is user friendly, safe, and accessible.

CBCT uses x-rays to create cross-sections of a physical object that can be used to recreate a virtual model (3D model) without destroying the original object. We are able to manipulate the 3D images. We move them about, cut them up, and look at different angles of the jaw. By doing this, we are much more accurate in our analysis of tooth position and relation. We can assess positions of impacted teeth and 3rd molars. We can better predict eruption patterns of permanent teeth. We can look directly at a patient's temporomandibular joint (TMJ) and assess the health of the joint and if there is damage happening in that area. A new and amazing area opening up in orthodontics is the assessment and treatment of soft-tissue airways. With CBCT, we can view the size and shape of a patient's airway and assess whether it is smaller than it should be. With this

information we can treat to expand the airway and reduce the prevalence of sleep apnea or snoring in the future.

In the past, two of the biggest drawbacks of a digital 3D x ray machine was its cost and the radiation exposure. Although the cost has decreased significantly, they still cost about the same as a nice Ferrari. What really had me and the rest of the profession finally buying into 3D imaging is the reduction in radiation. To put the radiation of a single scan into perspective, let's consider the typical radiation dose of some everyday activities. The typical radiation dose of natural background radiation for one day is 10 microsieverts. A round trip airplane ride from New York to Los Angeles is 200 microsieverts. A mammogram is 3,000 microsieverts and the lowest possible dose of radiation related to a possible increase in cancer is 100,000 microsieverts. To put into perspective, the dose of a 3D image from CBCT today from the latest i-CAT FLX machine is 19 microsieverts. The benefits of this technology far outweigh the radiation dose.

The machine I currently use is the i-CAT FLX CBCT (the only machine on the market with this low of radiation dose). With this machine, I am able to image all of my patients with exceptionally clear, three-dimensional and highly diagnostic scans using less radiation than single traditional panoramic x-ray. With these amazing images, I can visualize the jaw joints (TMJ), jaws, teeth, sinuses, airway, and other structures. It's difficult for me

to think of how I was ever able to practice without this transformative technology. My patients and I have both benefited from it and I would never, ever go back to two-dimensional orthodontics again.

3D Intraoral Scanning

For those who have ever had a crown, a bridge or braces in the past, you have likely had an experience with an impression. The purpose of an impression is to get an accurate replica of the dentition. Alginate or polyvinyl siloxane material is placed in the mouth for 1 minute to 5 minutes depending on the material to create a negative impression. This likely leaves the patient gagging and feeling pretty terrible. Definitely a “negative” impression! The impression is poured up in plaster and removed from the negative. Voila! There is the model of the teeth.

Today, for most progressive orthodontic offices, the days of the above process are disappearing rapidly. The advent of 3D wands that take progressive scans around each tooth are then turned into data and laced together by complex computer algorithms to create one cohesive set of teeth digitally. No bad taste, no gagging and/or throwing up! No feeling like slimy material is oozing down the throat trying to choke your life away. Honestly, when I tell parents that we have done away with impressions and that their children will be getting an intra-oral scan to make a digital model,

jaws drop and I either hear sigh of relief, or a claim that the children will never know the hardships that they experienced when they were their age!

You see, some impression material, like alginate, which sets up fast in the mouth, was also prone to warp and distort over time. If the material was not poured up in plaster quickly, it could lead to ill-fitting appliances and frustration the next time the patient was in the chair. 3D intraoral scans are a major shift toward a better orthodontic experience and better accuracy of the teeth.

Laser

Another amazing technological advance in recent years has been the use of a diode laser. You may ask what a laser has to do with moving teeth. This piece of technology in our office has done so much to advance our patient care and create a more esthetic result than any other one piece of equipment. How so? Lasers allow us to speed up treatment in cases that would otherwise be waiting for a tooth to erupt. In the past we would be completed with all other aspects of an orthodontic case, but would be waiting on the eruption of an upper cuspid. The patient and parents didn't want to go to an oral surgeon to surgically expose the tooth and the tooth itself just seemed to be right under the tissue, seemingly teasing us with the notion that it will erupt any day. Month after month we would

wait for the eruption. Today, we don't play that game. If we see an erupting canine under the tissue and we are progressing with treatment, but the tooth doesn't want to play with us. Well, we just pull out this little laser and remove the top tissue and put a bracket on it. No blood, no injections for anesthetic (most times, some topical anesthetic over the tissue is all that is needed), no pain and no trouble. The fact that the laser doesn't cause any bleeding is key because it allows me to place a bracket on the tooth immediately. A tooth needs to be relatively dry in order to bond a bracket to it. If blood is in the area, chances are that the tooth will become wet or contaminated and the bracket will come off soon after it was bonded. Lasers prevent this from happening because it prevents any bleeding.

This type of procedure is done routinely in modern orthodontics offices, and not just with canine teeth. We are able to easily and painlessly remove tissue from behind molars that have not erupted fully. This allows us to place helpful appliances in mouth at the appropriate time.

Laser assisted orthodontics is about removing tissue in order to place a bracket or an appliance on a tooth. There are times when we complete a case and the dental result is great. Teeth are lined up and the bite looks ideal. However, when the patient smiles, there just seems to be too much gum tissue covering the teeth. It looks like only half of the tooth is showing. In

the past we would either say, “Well, that has to be good enough.” Or we would have to refer to a periodontist to take a scalpel and cut away the tissues in a painful and expensive gum surgery. Today, we can pull out the laser and, again, with some topical gel over the gum tissue, safely, cleanly and painlessly remove that extra tissue, allowing the beautiful teeth to fully express themselves. Wow! That makes such a difference in the esthetics of the case. My staff, the patients, and their families love seeing the difference that that procedure makes. Gum recontouring has taken a satisfied patient and created a raving fan of their smile...and our office!

Miniscrews (AKA...TADS)

Miniscrews are yet another new advantage to the modern orthodontist. But, to get a feel for their advantage, you need to first understand a little about the movement of teeth between the jaws and Newton’s third law of Physics (I promise this won’t be too painful). This law states: All forces in the universe occur in equal but oppositely directed pairs. There are no isolated forces; for every external force that acts on an object there is a force of equal magnitude but opposite direction which acts back on the object which exerted that external force. In the case of internal forces, a force on one part of a system will be countered by a reaction force on another part of the system so that an isolated system cannot by any means exert a net force on the system as a whole. A system cannot “bootstrap” itself

into motion with purely internal forces - to achieve a net force and acceleration, it must interact with an object external to itself.

When I was a scout leader, each year we would take our scouts to Geronimo Scout Camp near Payson, AZ. During the week we would have a tug of war with other troops. This year, the other troop had a large anchor. He was a 200-pound husky scout that was pitted against our 140-pound scouts. It was pretty obvious who was going to win that tug of war. In a similar way, when we are moving teeth we are pitting small incisors against large three-rooted molar anchors. The small incisors will move much further than the large molars. Sometimes that is to our advantage but in other instances, depending on where we need to move the teeth, it becomes a large hindrance.

Now, imagine we tied our 140-pound scout to one of our large spruce trees that grow in the area. There is no amount of pulling that 200-pound scout could do to move our boy. That is what happens when we tie a tooth to a miniscrew, often called a temporary anchorage device, or TAD. We call this absolute or complete anchorage because we know that the tooth tied to the TAD will not budge. Now we can work around Newton's third law of physics. I was fortunate to be one of the first users of TADs in the area and treated my first case (my son), back in 2006. Since then, I have been an advocate of using this technology when it is needed. They are simple to place and often only need topical

anesthetic gel to be comfortable. When I've completed the movements, they are simply removed and the bone heals quickly and completely. With TAD's, we can move large teeth forward and close spaces that previously would have been impossible. Yes, it still takes time and the rate of movement can be slow. However, we have figured out ways around that with accelerated orthodontics. Again, we will be talking about that in a subsequent section. For now, suffice it to say, that with TAD's, we can move teeth in directions previously thought impossible...up, down, forward and backwards in the mouth.

Bracket Design

Today in orthodontics there is much discussion about the type of bracket that is used. Several companies have tried to say their brackets are unique or that they use less force than another company. As a profession, it can be difficult to know which claims are true and which are manufactured just to sell more of their brackets. Unfortunately, there is little regulation in the profession for companies who do their own studies and come to conclusions about their bracket being superior to another, either by less friction or less discomfort etc. Over time, however, independent, university studies are conducted which help lift the fog of confusion and ambiguity. Such third-party studies often contradict the "paid-for" conclusions of the bracket company. Advance time even further and more research appears

that take multiple studies and creates a *meta-analysis*. This meta-analysis, becomes a conglomeration, or a review of studies that show evidence for, or against a claim, or hypothesis. That has been the case with many bracket systems today that claim superiority. In a previous chapter we have discussed the advantages of light forces on teeth and how they move through bone easier. This advantage has led to many bracket systems that claim faster movement and less painful movement than a traditional bracket. The idea is that friction is created with the elastic which holds the wire to the bracket. The wire is creating the force to move the bracket. Today, most orthodontists use light-force wires. The controversy lies in the bracket. Does a self-ligating bracket truly produce less force and faster movement, with less discomfort than a traditional bracket? As much as I'd like to answer yes to the question, the studies (and I mean study after study including meta-analyses) show the answer to be to the contrary.^{5,6,7} However, are self-ligating brackets worthless? That answer is also no! I currently use a self-ligating bracket on most of my patients. It is state of

⁵ Padhraig S. Fleming and Ama Johal (2010) Self-Ligating Brackets in Orthodontics. The Angle Orthodontist: May 2010, Vol. 80, No. 3, pp. 575-584.

⁶ Stephanie Shih-Hsuan, et al. June 2010. AJO-DO. Volume 137, Issue 6. Pages 726.e1-726.

⁷ G.E Read-Ward, et al. A comparison of self-ligating and conventional brackets. 1997. Brit J of Orthodontics. Vol. 24, Issue 4. Pages 309-317.

the art in its design, its bond-strength (how it adheres to the tooth) and its accuracy (when thousands and thousands of brackets are mass produced there is a certain amount of inaccuracy depending on whether it is being milled or machine produced). Why would I use a bracket that is more than double the cost of other brackets? I do so for a few reasons. First is hygiene. It has been shown time and again that the self-ligating brackets produce less plaque around the bracket than a bracket with an elastic around it. So, if I see a patient that could have trouble with keeping their teeth clean, then the bracket of choice is the self-ligating bracket. The second reason I use a self-ligating bracket is that it combines the most advanced computer modeling and individualized bracket design in the world and, when properly used with that technology (see Insignia below), produces the most efficient and the most predictably excellent outcomes I've seen. Additionally, and I believe most importantly, many studies have ignored the different mechanics of passive self-ligation (PSL) brackets versus traditional orthodontic bracket mechanics. You simply cannot place PSL brackets and use traditional mechanics. If so, there will be no difference between the two. PSL mechanics encompass an entire light force system with many nuances that, if altered, can disrupt the system and negate the positive effects of their mechanics. I'm not saying all the studies concerning PSL are totally wrong. I'm saying that further study is needed with those who use and know the PSL system. I believe, in time, we

will see a difference between the mechanics of PSL and traditional braces. I've seen the difference in my own practice and in case studies of my friends and colleagues. From what I've seen, PSL works well. So my argument for passive self-ligating brackets is that, combined with the latest technology and integrated with sound mechanics, they can produce excellent outcomes with quicker treatment results and maintain better hygiene. With all arguments put aside, I will use the bracket or system that I believe is best for the patient. Truly, I have seen amazing cases and results by so many different brackets and systems, when it comes down to it, as the treating orthodontist, I ultimately use what I am most comfortable and confident using in my hands. That being said about brackets, there are still some very exciting things happening with regard to braces.

Suresmile

Suresmile is a system in which computer aided design is used and teeth are moved virtually right before the patient's eyes. Brackets are placed on the patient and a digital scan is made of the teeth. The teeth are set up as a 3D rendering on the orthodontists' computer. The teeth can be maneuvered digitally into place to the perfect position according to the orthodontist treatment plan. After acceptance of that treatment, a series of custom wires are formed specific to the placement of the brackets. The customized wires are

made and the orthodontist places them on the teeth. Over time, the custom wires are switched out and the teeth gradually move into the position that was planned on the computer. If you are familiar with a product called *Invisalign*, you may find these processes similar. The main difference, of course, is *Suresmile* uses typical brackets. The similarities are that they both use computer aided design to move the teeth virtually. *Suresmile* uses custom wires and *Invisalign* uses custom trays.

Insignia

Insignia is similar to *Suresmile* except the Orthodontist takes the digital scan before any brackets are placed on the patient. The digital model is created and teeth are moved into position virtually according to the orthodontist's treatment plan. Custom molds holding the brackets are sent and placed on the patient's teeth exactly as they were virtually. Similar to *Suresmile*, the custom wires are made and move the teeth into position similar to the virtual model. This bracket is the most technically advanced system in Orthodontics. For the best efficiency and predictability of a quality result, this is *my* bracket and system of choice.

Incognito

Incognito is a system where, again, a virtual model is created from a digital scan of the patient. But instead of brackets on the front of the teeth, facing outward,

brackets are placed on the inside of the teeth facing the tongue. Custom brackets and wires are created and placed on the teeth and move the teeth into position similar to the virtual position. *Incognito* is the most inconspicuous form, and the most costly form, of moving teeth. Some disadvantages of *Incognito* have been discomfort, speech issues and difficulty in some tooth movements. However, in an experienced orthodontist's hands, *Incognito* can be a very effective and unseen way to move teeth.

Pain-Free Orthodontics and the End of Migraines

It is a bold claim to say the least. At least 3% of our population experience migraines consistently and over 20% of the population has chronic tension headaches. Anyone who has experienced this knows it can be quite debilitating. If you are a chronic head pain sufferer, you are three times more likely to have depression. You are also more likely to experience anxiety, fatigue and trouble sleeping. Most sufferers take pills to help alleviate the symptoms. However, this is temporary and doesn't treat the root cause of the pain. Additionally, medications only work for about 40% of the people who take them. Even then, they only reduce the frequency of episodes by an average of 50%. Triptans are a typical pain relievers used to treat migraines. These medications are recommended to be used twice per week in order to prevent side effects and reduce the likelihood of causing recurring medication overuse headaches.

When chronic migraines or headaches aren't responding to treatment, they deserve a closer look. A great number of migraine headaches are caused by inflammation and tension from the muscles and skeletal structures in the head and neck. Your jaw is one of the most complex and delicate joints in the human body and imbalances in the way that it moves can cause pinched nerves and inflammation that leads to headaches. Just like an old sports injury or bad back, over time the imbalanced area can radiate pain to the surrounding tissue, often causing chronic migraine-like symptoms. With pulse technology and cold-laser therapy along with specific physical therapy to the jaws, the muscles can relax and heal which, in turn, relieves the headaches, usually for good. It truly is life-changing treatment for those who suffer chronic headaches.

Additionally, the same technology can be used on patients who have just had braces placed. The first few days of braces can be uncomfortable or downright painful, depending on the individual. With the system we have in our practice, this no longer has to occur. A single treatment of the pulse and cold laser therapy can prevent those first few days of soreness while in braces.

Invisalign

The idea of moving teeth with plastic aligners has been around for decades. In the late 1940's, dentists would

take impressions of the teeth, cut the teeth out of the plaster model and replace them back on the model in a corrected position with hard wax. From this they would form plastic over the top of them and then attempt to move the teeth. It worked but it was so time consuming and cumbersome that it never gained any footing in the mainstream dental world.

In the 1997, two students at Stanford University, Zia Chishti and Kelsey Wirth, noticed that each time Zia didn't wear his clear plastic retainer, his teeth would move. However, when he would put it back in, they would move back into place. From this observation, and with the help of a lot of venture capital from Silicon Valley, he and Kelsey launched Align Technologies to the public in May of 2000. Align Technologies, or *Invisalign*, used computer aided design to move teeth sequentially.

I was in my residency training in Oregon during this period of time and was one of the first residents in the country to try *Invisalign* on a patient. My first patient? It was my wonderful and patient wife. She had braces as a teenager and had some relapse. To be blunt, the treatment was an utter disaster! The teeth didn't move as it was predicted on the computer. It was like two completely different mouths, the computer's virtual mouth and the patient's actual mouth. However, that is how technology occurs in our world today. Something comes out to the public. It isn't very good, but over time with lots of trial and error, it just keeps getting

better and better. Next generations of aligners were developed from *Invisalign*. Attachments were created to bond to the teeth. Orthodontist consultants were hired, then computer design engineers. The predictions keep getting better and the results are now acceptable for many cases. However, as *Invisalign* has found out, and many general dentists, it's not just about putting some plastic over the teeth and watching them magically move into place. Orthodontic principles and mechanics still apply. There are still movements that *Invisalign* cannot overcome due to the design of the appliance. Severe rotations, extrusions (moving upper teeth downward, or lower teeth upward) and extensive root movement through bone have not been successful with aligners. Nonetheless, *Invisalign* has been able to be very successful in moving many other types of occlusion to where today, 80-90 percent of teenage (with adult teeth) and adult cases can be treated with *Invisalign*. When the aligners are delivered, the patient is instructed on how to wear the appliance, how to remove it, and how to take care of it. The aligners are changed out usually every 2 weeks. When *Invisalign* is combined with accelerated orthodontics mentioned earlier, the aligners can be switched out every 4-7 days.

The benefits of *Invisalign* are many. They can be removed to eat, or for special occasions, like wedding or school pictures, so they don't get too much in the way of life. Since they are clear, they are not nearly as conspicuous as metal braces, and even clear braces.

Brushing and flossing are much easier to accomplish as there are wires and brackets between and on the teeth to hinder their cleaning. Some tooth movements can be done easier with Invisalign than with traditional braces, which would lessen the time needed in treatment. Insurance coverage is the same for both traditional braces and *Invisalign*.

With all this, there are some disadvantages of *Invisalign*. My wife didn't like the constant bother of having to remove and put in the aligners each time she ate. Going out to lunch with friends can be burdensome and some teens have admitted to forgetting to put them back in after lunch because it was awkward to do so without going to the restroom. Some people have also reported that their speech is significantly changed, especially in their own head. Additionally, *Invisalign* has a high lab fee. Although we don't pass this entire fee on to our patients, there is an increased cost of *Invisalign* when compared to metal braces.

In my opinion, I think *Invisalign* is a welcome and wonderful product that will continue to advance and be more predictable. It will be here for the long-term and will continually be an increasing component in my practice.

HOW TO MAINTAIN YOUR INVESTMENT

You've heard this scenario many times before. Maybe this story is even about you! You have spent two or more years and thousands of dollars of investment into creating a beautiful smile that you are proud of. People compliment you at school and at church. You are on top of the world. Your orthodontist gives you a little plastic tray to wear over your teeth and at first, you are oh, so obedient. After a couple of weeks you have a late night watching a movie and stumble to bed exhausted. One night of missing your retainer won't hurt, right. You wake up the next morning and jump into your day. That night you remember that you had forgotten your retainer the previous night. Timidly, you put it on for the night and, although a little tight, it still fits. Phew! A few more nights go by and another night is missed. No worries, it still fit before. Within a few weeks you're only wearing it every other night.

Then the family plans a trip to California for a week.

Disneyland, the beach, Six Flags ... it's all so much fun. You get there and it's not until the third night of the

trip that you realize you had left the retainer at home. Not to worry, it's always fit before. At the end of the fabulous week you return home. That night before you go to bed you pull out the retainer and try it in. But this time, it doesn't fit. You push harder and it just pops out. You look in the mirror and to your dismay, a tooth on the top and two teeth on the bottom, right in front, have moved!

You're too embarrassed or too afraid to tell anyone and you think it might get better.

It doesn't.

Soon, after a few hard conversations with parents or others, you are heading back to the orthodontist for something to help bring the teeth back to where they used to be. You are offered to keep them there with a new retainer, more braces or maybe Invisalign. All of this costs more money and heartache.

Orthodontists have tried for decades to create what is called in Orthodontics, Stability. Stability is defined in the dictionary as 1. Firmness of position, 2. Continuance without change; permanence.⁸ Stability in Orthodontics is the ability of teeth to remain in their exact position after braces or aligners are removed.

In life and in Orthodontics there is no such thing as stability. Our bodies are constantly changing entities.

⁸ "Stability". *Dictionary.com*. 2016. Web.

As we age, our hair thins, our eyesight gets longer, our skin sags, our bones change shape and shorten and we get wrinkles. Oh what lovely thoughts! I often comment to my patients, “Wouldn’t it be nice to have some sort of retainer to keep the rest of our bodies from changing? I would wrap myself up in that each night if it could ensure that I always looked like I was 16!”

Fortunately for us, we can do just about that with our teeth. It’s called lifetime retention.

You may be asking, ‘what about that cousin I have that wore braces and never wore his retainers and his teeth are still perfect?’ The answer is good ole’ fashioned luck. At this time we cannot determine who is prone to “relapse,” or teeth moving back after braces, and who is not. The vast majority of people are not so lucky and over time, everyone will have some change in their teeth without retainers. Even those who never had braces will not have the same teeth and alignment after twenty or thirty years as they have now.

So let’s get back to this term called lifetime retention. The easiest way to keep retainers for life is to have them permanently placed onto the back of your teeth. They are called bonded retainers. Bonded retainers are placed on both the upper and lower incisors. Additionally, because I truly believe in lifetime retention, I also make an additional removable retainer for upper and lower teeth to be worn at night to help the other teeth from moving and as a backup in case the

bonded retainers break and the patient can't get in to get it repaired for a few days. The removable retainers look a lot like Invisalign aligners. They are clear and comfortable. However, they are thicker than Invisalign aligners and when worn at night, can last several years. Clear aligners also have coverage over all the teeth in the mouth with helps guard the teeth from nighttime grinding. Sometimes mild jaw pain from grinding can be alleviated from the retainers themselves.

Think of braces as similar to getting a facelift at the age of sixteen. It would be ridiculous to think that your face would be the same twenty years later. We still age, grow and are exposed to the pressures of the outside world. Our bones are constantly moving in response to pressure and pressure is always present in the mouth. The cheeks press inward and the tongue presses outward.

I hope you have it in your head that wearing a retainer for your entire life (or as long as you want to keep your teeth straight) is a requirement. Please don't listen to any other voice of unreason stating that since you've been out of braces for 2, 5, 15 years, you don't need retainers. Teeth will move without retainers. It's just a matter of time and a product of physics. Don't be that statistic.

CONCLUSION

I hope you have enjoyed this short expedition through the field of Orthodontics. You are a much more informed and prepared consumer of orthodontic treatment and you may know more now than friends, family and even some of the staff members in some Orthodontic offices. The purpose of this book was to help you make informed decisions in Orthodontics and to make you aware of all the changes that are making Orthodontics safer, faster, and more comfortable.

GLOSSARY

The following are some helpful terms as you read through this book and other literature in Orthodontics. It is a good foundation that should help you become more versed in the language of the profession. A majority of this glossary was compiled by my friend and colleague, Dr. John Graham, DDS, MD.⁹

A

a-lastic ties. Small latex or non-latex elastic rings used for holding an orthodontic wire into twin brackets or braces.

acid etch. Mild acid used to prepare a tooth surface to more readily adhere to orthodontic adhesive.

activator. See **functional appliance**.

anchorage. Resistance to unwanted tooth movement using a tooth, a group of teeth, or an intraoral or extraoral appliance.

angle classification. Categorization of an individual's bite according to the relationship of the molar and canine teeth.

⁹ Graham, John. The Truth About Orthodontics. Salt Lake City. Sugarhouse Publishing. 2014. Print.

ankylosis. The fusing of a tooth to the jaw-bone.
A pathologic condition that generally requires surgical removal of the fused tooth.

anterior. Front or forward.

appliance. Anything placed in the mouth, either fixed or removable, that assists in tooth and jaw movement.

arch. Upper or lower jaw.

archform. The general shape of either the upper or lower jaw.

archwire. A metal alloy wire attached to brackets to generate forces that move teeth.

B

band. A metal ring that is placed around a tooth with either a bracket or appliance connected to it.

banding. The act of cementing bands or bonding brackets to the teeth.

bionator. See Functional Appliances.

bonding. See Banding.

braces. Generic term for small metal or clear appliances that are glued to teeth.

bruxism. Grinding of the upper and lower teeth.

buccal. On the cheek side of the back teeth.

buccal tube. A small metal tube attached to a band or bonded to a tooth to provide a housing for an intraoral or extraoral appliance.

C

CT or CBCT. Computed tomography or cone-beam computed tomography. A series of cross-sectional x-ray scans made along a single axis of head. The scans are then used to construct a three-dimensional image of that structure. The new standard of care for diagnosis in orthodontics.

c-chain. A stretchable series of connected rings used with braces to move teeth and close spaces.

cephelometric x-ray. Side-view x-ray of the head.

class I bite. A bite that has the proper molar and canine tooth relationship when biting.

class I malocclusion. A bite that has proper molar relationships but has spacing or crowding that prevent some or all of the teeth from meeting properly.

class II bite. A bite in which the upper teeth are too far forward and the lower teeth are too far back when biting.

class III bite. A bite just opposite class II, in which the upper teeth are too far back and the lower teeth are too far forward.

crossbite. A bite in which any of the upper teeth are inside the lower teeth when biting.

crowding. A spacing issue in which the upper or lower teeth don't have enough room to erupt into the mouth straight and harmoniously.

D

DDS/DMD. Doctor of Dental Surgery and Doctor of Dental Medicine, respectively. Equivalent degrees. Yes, they mean the same thing. All orthodontists educated in North America will have the abbreviation of one of these degrees after their names, plus an additional two to three years of specialty training beyond their dental degrees.

debanding/debonding. The removing of orthodontic appliances.

deep bite. A bite in which the upper teeth cover or nearly cover the lower front teeth.

dentition. The teeth.

diode laser. A contact laser that removes gum tissue either for facilitating tooth movement or cosmetics.

E

e space. The difference in size between the primary second molar and the permanent second bicuspid. Since the second bicuspid is generally smaller than the primary second molar, there is additional space available upon permanent tooth eruption.

ectopic eruption. A condition in which a tooth erupts into an improper location or position in the mouth.

elastics. Small rubber bands used during orthodontic treatment to move groups of teeth. These may be latex or non-latex based.

eruption. The growth of the teeth into the mouth.

expander. Any appliance used to expand either the upper or lower jaw.

extraction. Removal of a tooth or teeth.

F

facemask/facebow. An appliance, used outside of the mouth, that attaches to appliances inside the mouth to facilitate forward movement of the upper jaw and teeth while restricting the forward growth of the lower jaw.

fiberotomy. A surgical procedure to sever fibers of the tooth socket around the neck of the tooth. Usually used in an attempt to decrease post-orthodontic relapse or movement.

fixed appliances. A common way of describing braces that are glued or otherwise attached to the teeth.

frenectomy. The surgical release of a band of tissue (frenum) associated with either the lip or the tongue.

functional appliance. One of a number of appliances that, when inserted in the mouth, causes the jaws to move into a desirable relationship. Can be either fixed (cemented) or removable and is removed when the desired relationship between the jaw and the teeth is achieved.

G

gingiva. Gum tissue.

gummy smile. A smile that displays a large amount of gum tissue. May have several different causes.

H

happy. What you will be after you complete your orthodontic treatment.

headgear. An appliance, used outside of the mouth, that attaches to appliances inside of the mouth. Used to retract the position of the upper jaw and teeth.

herbst appliance. See functional appliance.

I

impaction. A tooth that doesn't erupt into the mouth when expected.

impressions. Using a gelatinous substance to capture the shape of the teeth either to have models made for study or for appliance fabrication.

interceptive orthodontics. Phase I orthodontic treatment.

interproximal reduction (IPR). Removal of small amounts of enamel, either to facilitate tooth movement or to improve aesthetics.

L

labial. On the surface of the front teeth that faces the lips.

ligation. The act of holding a wire against the brackets.

ligatures. Either small elastic rings or segments of wire used to hold the archwire into the brackets.

lingual. On the tongue side of the teeth.

lip bumper. An appliance attached to molars that used the lip forces to move posterior teeth in a backward direction and inhibit a lip biting or sucking habit.

M

malocclusion. A condition in which the teeth do not fit together properly.

mandible. Lower jaw.

maxilla. Upper jaw.

mixed dentition. The developmental stage in children in which there is a combination of primary and permanent teeth in the mouth.

mouthguard. An appliance designed to protect the teeth and lips during athletic activities.

N

nance holding arch. A retainer designed to hold upper molars in position until all permanent teeth have erupted.

nightguard. An appliance worn during sleep, designed to decrease the negative effects of grinding.

O

open bite. A malocclusion in which the upper and lower teeth do not overlap, allowing the tongue to rest on the teeth when the jaws are closed.

orthodontics and dentofacial orthopedics. The dental specialty that includes the diagnosis, prevention, interception, and correction of malocclusion, aesthetic smile design, and the improvement of neuromuscular and skeletal abnormalities of the developing or mature orofacial structures.

P

palatal expander. A fixed or removable device used to expand the upper jaw. See also **expander**.

panoramic x-ray. An x-ray that rotates around the patient's head and captures a two-dimensional image of the jaws, jaw joints, and teeth.

plaque. A colorless, sticky film of bacteria, food, and saliva that constantly forms on the teeth. Plaque combines with sugar to form an acid that damages teeth and gums. Plaque is responsible for tooth decay and gum disease.

posterior. Back or rearward.

R

retainer. Any appliance worn in the mouth to prevent teeth from moving.

rubber bands. See elastics.

S

separator. An elastic O-ring or small wire loop placed between the teeth to create space for the placement of bands.

serial extraction. Extraction of certain primary teeth or permanent teeth over a period of time to create room for permanent teeth.

space maintainer or spacer. An appliance, usually fixed, intended to hold space in the mouth to allow for the eruption of permanent teeth.

supernumerary tooth. An extra tooth that generally needs to be removed.

T

tongue thrust. Abnormal positioning of the tongue behind the teeth during swallowing. Forces generated by the tongue can move the teeth and bone and may lead to anterior or posterior open bite.

t-rex. A common type of palatal expander that combines expansion with the distalization (rearward positioning) of the maxillary molars.

ABOUT THE AUTHOR

Best-selling author (*Success Today* with co-author Brian Tracy), Dr. Chamberlain founded Chamberlain Orthodontics in October, 2002. From the beginning of his practice, he has founded his success on excellent patient relationships and quality treatment. He attributes much of his success to his extraordinary staff and his practice has grown to include two offices in Chandler with two affiliate offices in Phoenix.

From the beginning of his professional career, Dr. Chamberlain has placed an emphasis on continuing to educate himself and his staff. They regularly attend continuing education courses and have become proficient in all aspects of orthodontics care. His office has advanced the knowledge of accelerated orthodontics, which speeds up the treatment times of braces by 50%. Additionally, he has incorporated sleep friendly orthodontics into his practice. This involves helping many in our community with snoring and sleep apnea problems. Recently, Dr. Chamberlain and his staff have gone through extensive training to become one of few Orthodontists in the Phoenix valley who has learned the techniques to remove chronic migraine and tension

headache sufferers from pain, without medication or surgery. Dr. Chamberlain considers continuing education one of the most important aspects of his practice. By this he is able to give the best care possible. The most fulfilling aspect of his career is to be able to change people's lives for the better. Whether that be straightening teeth, improving a smile, increasing one's self-confidence, ridding them of chronic pain due to headaches or helping someone breathe better at night without the use of an oxygen mask or other device.

Dr. Chamberlain originates from Reno, NV. He graduated from Brigham Young University (BYU) with a BS in Psychology and a minor in musical theater. Professionally, Dr. Chamberlain received his Doctor in Dental Medicine Degree from Oregon Health and Sciences University (OHSU), in Portland, Oregon, graduating with high honors, qualifying for the Omicron Kappa Upsilon National Dental Honors Society. He immediately entered his post-doctoral residency in Orthodontics and Dentofacial Orthopedics at OHSU. He received his certificate in Orthodontics and Dentofacial Orthopedics in 2002 and has been in private practice in the East Valley of Phoenix. Each year, Dr. Chamberlain receives awards from the community such as the Best of Chandler in Orthodontics, Best of East Valley in Orthodontics, and Best of Phoenix in Orthodontics. He is on the "Who's Who" list as one of the top orthodontic clinicians in the United States.

ABOUT THE AUTHOR

- American Association of Orthodontics and Dentofacial Orthopedics
- American Dental Association
- Arizona Dental Association
- American Academy of Dental Sleep Medicine
- American Sleep and Breathing Academy
- Omicron Kappa Upsilon National Dental Honor Society
- Smiles Change Lives
- Graduate of McLaughlin 2-Year Orthodontic Program
- Ortho X Elite Member

In his younger years, Dr. Chamberlain's music and theater experience sent him around the U.S.A. and Europe as he toured with musical theater groups. He is married to Tamara Marshall Chamberlain, from Merced, CA. They have four children together (Kohler, Kelsey, Spencer and Hailey) whom they adore.

Chamberlain Orthodontics believes in giving forward. Over the course of many years, Chamberlain Orthodontics has had the privilege of giving to soccer teams, baseball teams, candidates in talent and beauty pageants, cheer squads, school music programs, boys and girls clubs, boys and girls scout troops, high school football teams, volleyball teams, dance teams, etc. The list continues to grow as we seek to help others in the community. Recently, Chamberlain Orthodontics has

developed a program to provide free orthodontic treatment to all teachers, as well as students in need, in the Chandler/Gilbert/Tempe Communities. The entire staff at Chamberlain Orthodontics feels honored to give back to those who do so much for our valued youth.