CBCT imaging and orthodontics

An interview with Dr. Sameshima and Dr. Tong at the Herman Ostrow School of Dentistry at USC

By Myat Htut, DDS 2013

The orthodontic research activities at Herman Ostrow School of Dentistry of University of Southern California are focused on several areas: using Cone-Beam Computed Tomography (CBCT) to determine the exact location of teeth in the alveolar bone before and after orthodontic treatment, studying of root resorption caused by orthodontic tooth movement, evaluating accuracy of three-dimensional model scanning and evaluating treatment claims.

Dr. Glenn Sameshima, director of the Advanced Orthodontic Program, emphasizes that the research currently being headed by Dr. Hongsheng Tong, a graduate of both the orthodontic and craniofacial PhD programs at USC, is the most active area right now.

Tong has a visiting scholar from Beijing, Dr. Maria Xin, a number of orthodontic residents (Dr. Garrett Fong, Dr. Thao Nguyen, Dr. Nathan Coughlin, Dr. Bita Moalej), as well as a few predoctoral students, working with him. They are using three-dimensional DICOM image that is generated by our CBCT machine at the Redmond Imaging Center to study the exact location of the roots for all the teeth in occlusion.

The accuracy of CBCT is very high, and it can adequately provide vital information such as temporomandibular joint disorders, skeletal problems, periodontal disease and other pathologies.

With current advanced technology, radiation generated by CBCT are becoming lower and are within the therapeutic range, while providing important information.

The accuracy of cone-beam computed tomography is changing some areas of orthodontics.

Photographs by Alice Yoo, DDS 2013

NewCon Symposium: ‘How Teeth Really Move’

April event takes place in New York

By Eric J. Ploumis, DMD

We are constantly bombarded with advertising that promotes the next great piece of hardware to effortlessly move teeth. Little or no consideration is given to how teeth really move. We will review the fundamental biology, physiology, histology and mechanics of tooth movement. If you understand these, it doesn't matter what appliance you use. If you ignore them, you do so at your own professional peril.

The NewCon Symposium is designed to re-acquaint the orthodontist with what really happens when we place brackets and wires. Our panelists will explore the immutable biological laws that govern tooth movement, review current research and technology that is enhancing our ability to move teeth, and look at emerging concepts that may one day create an entirely new tooth-movement paradigm.

Seminar participants will come away with an enhanced understanding of how to better move teeth and obtain favorable dental and bony responses. In the true NewCon format, we will separate myth from fact and provide attendees with something to take to their offices every Monday for the rest of the year.
Will right-brainers be the future leaders of orthodontics?

Part I

By Dennis J. Tartakow, DMD, MED, EdD, PhD, Editor in Chief

Orthodontic education is at a crossroad as are many other dental specialties. The world is increasingly inter-connected, employment is changing rapidly, the economic upheavals roll on, and now we must ask: (a) Have we as educators kept up with this evolution of global consciousness? (b) Have we considered the possibility that the status quo no longer meets the challenges of today’s world? (c) If necessary, are we prepared to transform an entire system of pedagogies and administrative infrastructures? (d) Will future clinicians have to be right-brainers as well as left-brainers in order to survive and compete in the orthodontic market?

Our left-brain is linear, logical and by-the-numbers; the right side is artistic, creative and empathetic. According to Daniel Pink (2005), right-brain thinkers are better wired for 21st-century success and anyone can tap into the right-brain mindset. Pink, who was the chief speechwriter for Vice President Al Gore, stated in his book “A Whole New Mind” that our country was entering a new era: the so-called Conceptual Age, during which right-brained skills such as storytelling and design will become far more crucial than traditionally left-brained skills such as computer programming or analytical writing. While the latter skills are freely outsourced, the ability to change with regard to creativity and empathy are crucial for a different formula of thinking, as in serving the public.

As a right-brain kind of person and orthodontist, I envision our professional future with enthusiasm and excitement as a result of our creative skills. One of the trademarks of the Conceptual Age is outsourcing traditional blue- and white-collar jobs to less-expensive overseas workers, particularly in Asia. However, creativity skills cannot be outsourced.

The skills not only keep our competitive nature at the forefront in the workplace, they also improve our lives and our world. In many professions, abilities associated with the brain’s right hemisphere, such as linear, sequential, spreadsheet kind of faculties, matter the most. They still matter today, but in order to find out that in the future, they may just not be enough to succeed in the office. Important characteristics of the brain’s right hemisphere are empathy, artistry and creativity and big picture thinking.

These skills have become first and foremost, paralleling educational acumen, expertise and perspicuity in delivering orthodontic care. This does not mean that left-brainers will be left out of the picture, but it does mean that they will have some work to do in order to compete with right-brainers. I happen to be an extremely left-brained individual, my instinct is not to draw a picture but rather generate a chart, trying to get my right-brain muscles not to take over. This shift toward right-brain abilities has the potential to make orthodontists better clinicians in a deeper sense.

Today, machines have replaced our left-brain by performing and completing sequential, logical work. In Asia, where much of the manufacturing takes place, new generations of skilled laborers are writing computer codes for such tasks. When our needs can be reduced to a spreadsheet, a script, a formula or a series of steps that achieves results and answers, we are more successful in achieving adequate patient care? I am of the belief that, as orthodontists, we must still be wire-binders and possess hand-skills that were inspired by our forefathers.

When right-brain aptitudes are bound with left-brain thinking, the combination can result in a whole new mindset that may help us to enter the conceptual age where design, purpose, meaning and harmony will be more significant than merely formulaic thinking alone. The left-brain clinician possesses logical and linear abilities, while right-brainers are often seen as spacey, flighty or artsy-fartsy. When one synchronizes left- and right-brain to research facts and provide exceptional patient care, it becomes clear that the scales are tilting. This also suggests that such new progresses of thought must be addressed in dental school training.

My generation’s parents told their children to become a doctor, lawyer, accountant or engineer in order to provide them with a solid foothold in the middle class. As orthodontists, our approach to serving parents must not be outsourced by ignoring right-brain thinking and facts, but incorporate in our training as well. Ultimately, it is about following your intrinsic motivation. Think about the skill called Symphony, which is the aptitude for seeing the big picture, connecting the dots and combining contrasting thoughts into something new. It is a moniker of success and a signature aptitude for star performance in providing exceptional patient care.

(To be continued.)

Reference

tant information regarding the special relationship between structures of interest. Herman Ostrow School of Dentistry of USC was one of the first dental schools in the nation to acquire a CBCT machine. Sameshima explains that Tong’s short-term goal, as in any new methodology, is to prove the CBCT method is valid. This has involved testing the method on data that was generated from an in-vitro static model created by a research group from the University of Alberta, Canada. Two publications on Tong’s research have been accepted by American Journal of Orthodontics and Dentofacial Orthopedics, and one of them will be published in the May issue this year. Also, according to Sameshima, this method has already been adopted for consideration by a major imaging company for orthodontics: Dolphin Imaging.

Tong’s laboratory is currently applying his methods to study root positions in patients with different types of malocclusion and from different ethnic groups. The method will also be used to study current American Board of Orthodontics standards in regards to root positions. Another application for clinical orthodontics will be the merging of this project with our long history of investigating orthodontic root resorption.

Tong’s three-dimensional images will finally allow us to see how far the root apices moved during treatment; this will integrate with our model scanning and root resorption study currently headed by second-year resident Dr. Scott Morita under Sameshima’s supervision.

“There are a lot of questions still unanswered in orthodontics,” Tong said. “As an orthodontist, the fundamental question we are trying to ask is where exactly you want to put the teeth.”

He explains that previously root position was not a major consideration in orthodontic treatment. Perhaps one of the reasons is that orthodontists are accustomed to not being able to identify the exact location of the roots. He also gives an analogy on the importance of the root position.

“If the foundation is not in the right place, the building may not stay. The root may be the foundation of where the tooth needs to be. If you are not putting the roots in a right position, you are creating the situation that is more likely to have relapse after treatment.”

He states that currently, the only way to manage the relapse problem is to instruct the patient to wear a retainer for possibly the rest of his or her life. Placing the root in the right position doesn’t necessarily resolve the relapse issue, but it will certainly facilitate and maximize the retention to result better treatment outcomes. Despite the importance of positioning of the roots, there are unquestionably many other factors that can dictate the occlusion and relapse.

Most conventional 2-D radiographs are insufficient in providing precise position of the teeth. We now have the CBCT to solve this very problem by generating 3-D images of the teeth and the maxillofacial structures, allowing us to see the exact place of both crowns and roots and their relation to the neighboring tissues. With the help of this new technology and 3-D imaging software, diagnosis and treatment planning can be achieved in a fashion that was not possible before.
OrthoAccel® Technologies, Inc. developers of the AcceleDent™ System, an appliance to accelerate orthodontic treatment, announced this week that it has engaged Dr. S. Jay Bowman as a clinical consultant. Bowman’s clinical experience, expertise and reputation on the orthodontic lecture circuit will help advance the clinical education of the AcceleDent System from the podium in lectures given around the world.

AcceleDent is a simple, removable appliance that an orthodontic patient wears in the mouth for 20 minutes daily to accelerate orthodontic tooth movement. A randomized, controlled clinical trial conducted at the University of Texas Health Science Center at San Antonio under the guidance of Dr. Du-bravo Pavlin demonstrated, with statistical significance, that tooth movement could be safely accelerated by 38 percent to 50 percent during space closure and even more so during the alignment phase. Bowman’s background and educational lectures are particularly relevant to OrthoAccel’s focus as is his experience running three private practices in Portage, Kalamazoo and Paw Paw, Mich.

Michael Kaufman, vice president of business development and marketing of OrthoAccel, commented: “We are always looking for effective ways to teach other clinicians about the clinical benefits of AcceleDent for the patient and the ensuing benefits to the orthodontic practice. Dr. Bowman is recognized as a preeminent educator among his peers. "His keen understanding of the supporting science and the clinical outcomes associated with AcceleDent will help accelerate the educational awareness throughout the orthodontic community.”

Bowman said, “For several years, I’ve been intrigued by the concept of vibrational acceleration of tooth movement and, specifically, the developments at OrthoAccel.”

OrthoAccel has been selling the AcceleDent system outside the United States since October 2009. FDA clearance is pending based on application submitted earlier this year.

About OrthoAccel Technologies
Based in Houston, OrthoAccel Technologies, Inc. is a privately owned medical device company currently engaged in the development, manufacturing and marketing of products to enhance dental care and orthodontic treatment.

NYU College of Dentistry to name Elliott M. Moskowitz Orthodontic Wing in honor of $1.2 million gift
Moskowitz Give A Smile fund also created

Myat M. Htut
About the author
Myat M. Htut, Class of 2013 Dental Student, Herman Ostrow School of Dentistry of University of Southern California, 1001 N. Stanley Ave. #8B, Alhambra, Calif. 91801. (888) 466-5492 or e-mail mtkt@usc.edu.

In the future, Tong envisions his method of seeing all the roots and crowns in occlusion will be useful to other areas of dentistry, including implantology, oral surgery, and restorative dentistry.

Dr. S. Jay Bowman

The New York University College of Dentistry (NYUCD) will name the Dr. Elliott M. Moskowitz Orthodontic Wing in recognition of a $1.2 million gift from Dr. Moskowitz to help transform a 21st century clinical and research environment to reflect 21st century technology, design and function.

NYUCD has also created the Elliott M. Moskowitz Give a Smile Fund, which will build on Moskowitz’s gift to secure the additional resources required to achieve this goal.

Moskowitz, an alumnus of the NYU College of Dentistry and an internationally respected orthodontist, researcher, author and editor for more than 40 years, is also a longtime faculty member of the NYU Department of Orthodontics and a distinguished alumni leader, having served both as president of the NYU Dental Alumni Association and the NYU Orthodontic Alumni Society.

According to Moskowitz, “The past several years have seen immense strides by the NYU Department of Orthodontics in education, research and patient care, including the creation of the Consortium for Translational Orthodontic Research, or CTOR, which functions as a nucleus for the integration of basic science, clinical science and industrial resources in the field of orthodontics.”

“The department has also expanded the scope of its community services, which each year includes care for thousands of medically-illigent youngsters and adolescents suffering from a wide range of orthodontic conditions. Excitement and enthusiasm among faculty and alumni have never been greater, facilities, however, have not kept pace with these advances. I made my gift in order to give something meaningful back to my department, for me, that means providing the seed money to build physical facilities that are commensurate with the department’s increasingly visible role in the profession and the community.”

Dr. Charles N. Bertolami, dean of the NYU College of Dentistry said, “Dr. Moskowitz’s great generosity testifies both to his extraordinary devotion to his alma mater and the future of his specialty area and to his sense of giving something back as an integral part of contributing to society. We are honored to name the Elliott M. Moskowitz Orthodontic Wing in recognition of his thoughtful and generous gift and hopeful that others will join him in ensuring the ability of the NYU Department of Orthodontics to continue to fulfill its leadership potential.”

For more information on the Elliott M. Moskowitz Give a Smile Fund, call (212) 998-9920.
Dr. Eric Howard discusses benefits of SureSmile’s new diagnostic tools

Since October, Dr. Eric Howard has planned more than 50 cases using the latest release of SureSmile software, SureSmile 6.0. The software is the first tool that enables orthodontists to plan orthodontic care with information about root position within supporting bone. He answered a few questions for Ortho Tribune:

First, can you tell me about SureSmile and how care is improved using its diagnostic tools and archwires?
SureSmile provides a fully customized approach to orthodontic care. It begins with 3-D imaging of teeth and, now, supporting bone. A dynamic model is created that allows you to virtually position teeth, design an occlusal scheme and evaluate the outcome based on your own standards or those defined by the ABO. Finally, a series of computer designed, robotically fabricated archwires are produced to help achieve the plan.

We’ve heard that the new SureSmile software is “groundbreaking.” What will most excite an orthodontist about the new release?
Among the most significant updates in SureSmile 6.0 is the ability to visualize and virtually treat teeth within supporting bone. Static 3-D images give us important information about the quality and quantity of bone, but the ability to plan tooth movement within the context of the bone support provides unparalleled diagnostic clarity. This ability to model the surface layer of bone and the position of the roots within the alveolus is going to change the way we think about orthodontics, both in planning care and when evaluating our treatment results. In previous versions of the software, I could see the patient’s crowns and roots, but now, with bone modeling, there is a more complete representation of each patient’s anatomy. This is an absolutely amazing advance that provides a new level of diagnostic power.

For what case types have you found SS 6.0 to be most useful and why?
I learn something valuable from each case that I plan using SureSmile 6.0. Patients benefit from a 3-D visual prediction of each step in their care. This provides an ideal tool for communication with both patients and their families and with our referring dentists. There are several interdisciplinary planning and communication enhancements in 6.0. In one patient, where a Bolton discrepancy prevented space closure in the upper anterior, I used the virtual restorative features to estimate the size of the restorations and provide a visual prediction of the restorative treatment outcome. I conveyed this information to the patient’s dentist in an online meeting in order best visualize the dynamic 3-D images.

In another recent case, I sat chairside with an OMS colleague planning a complex two-jaw surgery. While we’ve always collaborated on these cases, much of the conversation involved crude manipulation of plaster models to estimate surgical outcomes. This time, we sat together in front of a computer monitor with a 3-D model manipulating jaw positions on the screen. We could rapidly test multiple virtual treatment strategies in 3-D. While surgical predic-

Virtual articulating paper and tooth roots.
(Photos/Provided by SureSmile)
SureSmile is a new feature that adds modeled bone, which clearly elevates our ability to plan and interact professionally and visualize clinical outcomes. Can you give an example of how you might approach a case differently using SureSmile 6.0?

I’ll give you two examples. An exercise that opened my eyes to the value of an individualized approach to care was when I simulated treatment in a straight-forward orthodontic case that I thought could be treated well with straight wires and a stock prescription. When I virtually imposed the tooth movement by the fully-expressed bracket prescription, the lower anterior tooth roots violated the boundary of the labial cortical bone. For this patient with a Class I malocclusion, it appeared a popular stock prescription did not adequately position his lower teeth.

In one patient, we were planning to extract a patient’s lateral incisor and replace it with an implant. The patient brought a periapical radiograph to his consultation, which suggested absence of bone support for an upper lateral incisor. After 3-D imaging and bone modeling, it was apparent that labial bone support is present. In addition, simulating the bite with the virtual articulator in the SureSmile software allowed us to visualize trauma to the lateral incisor during function and devise a plan to protect this tooth early in treatment.

How does this technology impact the future of orthodontic treatment? We are being challenged in the way we think, plan and deliver care. The ability to clearly visualize tooth position with supporting bone at the beginning of treatment is a huge advance in planning care. The future will provide important information about the appliances that we use and their impact on each patient as we compare pre- and post-treatment images.

Is there anything else you would like to add? It is clear that our profession is at a crossroads. On one hand, we have colleagues practicing with one-size-fits-all approaches to orthodontics with stock bracket prescriptions and archforms. In contrast, there is a growing list of companies that provide a patient-specific appliance with the goal of individualized care. 3-D imaging and bone modeling are going to have a significant impact on our profession as research is conducted to validate some of our methods and discredit others. In the end, this will lead to better understanding of orthodontics and, most importantly, better care for each of our patients.

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By OrthoTech Global

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