Ormco Unveils Symetri™
Clear ceramic twin bracket system

New Bracket Incorporates Advanced Manufacturing Technologies in Polycrystalline-Alumina to Forge Next-Generation of Ceramic Brackets

By Ormco

ORANGE, Calif.—Ormco Corporation, a leading manufacturer and provider of advanced orthodontic technologies and services, today announced the next generation of aesthetically pleasing ceramic twin brackets: Symetri™ Clear. Adding to Ormco’s expansive product portfolio of both lingual and self-ligating bracket systems, Symetri Clear is a refined, aesthetic bracket system incorporating design features that apply expert clinical advice and analysis, end-user feedback and technological advancements and achievements of the company.

“Over the past 30 years, ceramic materials have evolved to bring more sophistication to manufacturing capabilities, and to deliver an appearance that meets the aesthetic interests of patients. Ormco has been keen on developing proprietary technologies and manufacturing products that leverage the advancements in materials, and also serve clinical demands,” said Matt Turner, president of Ormco. “Backed by over seven years of research and development, we’re pleased to bring our latest innovation, Symetri Clear, to the conventional twin market.”

Boasting a low profile and ample torque and tie-wing strength, Symetri Clear addresses and minimizes the challenges that may come with leveraging a ceramic system—bracket breakage, wire notching and difficulties while debonding. Symetri Clear is designed to debond in one piece without fracturing requiring minimal forces. Initially offered in the McLaughlin, Bennett, Trevisi® prescription, Symetri Clear was designed with upwards of seven years of dedicated research and development, focusing on clinical analysis, end-user feedback and Ormco’s proprietary development of technological advancements in ceramics. Serving the needs of doctors and patients, the twin bracket is designed with round surfaces and edges, creating enhanced patient comfort and greater radii on sliding surfaces.

Combining state-of-the-art manufacturing technology and the latest in ceramic materials, Symetri Clear provides the benefit of aesthetics and offers easy, non-destructive, single-piece debonding. Its noteworthy clinical features include:

- **Torque and Tie-Wing Strength.** To better manage treatment flexibility and prevent bracket breakage, Symetri Clear is made of polycrystalline-alumina using a small particle size and is designed to withstand clinically applied forces. The material, combined with advanced processing, promises tie-wing and torque fracture resistance allowing clinicians to confidently treat effectively and efficiently, especially when steel ligatures are needed.

- **Low Profile:** Up until now, a lower profile bracket may have been associated with limited bracket strength or compromised performance. Symetri Clear changes that. With optimized in/out dimensions and a design that angles tie-wings inward on the lower incisors, Symetri Clear is less likely to interfere with opposing occlusions.

- **Advanced Aesthetics:** Symetri Clear has been designed with more rounded surfaces that diffuse light better than a flat surface. This enhances the bracket’s ability to blend with tooth enamel, adding to its aesthetic appeal for patients.

- **Ease of Debonding:** Ormco’s patented laser-etched pad technology allows for a precise, controlled surface that results in reliable bonding and safe, easy, non-destructive single-piece removal.

To learn more about Symetri Clear, please visit www.ormco.com/products/symetri/ or connect with your Ormco sales representative directly.

### Digital Orthodontics Symposium 2019

**Save the date:** 12 April 2019, Dubai, UAE

**DUBAI, UAE:** The event is open to all orthodontists and general practitioners interested in the latest orthodontic progressions in the digital era. The event will attract delegates from across the Middle East, Africa and Asia.

The event will gather top key opinion leaders with a focus on the latest trends and developments in digital orthodontics. Digital dentistry can assist us in many ways, by assessing space and measuring the amount of crowding in cases, predicting treatment outcomes, assisting patients’ communication, but also storing models digitally and treatment planning. With the introduction of 3D printing in dentistry, the opportunities in orthodontics have expanded from digital impression taking, to developing virtual treatment plans and 3D printing of dental models. The Digital Orthodontics Symposium will illustrate the necessity for orthodontists to look into and highly consider digitalizing their working ways to save time, money and provide more efficient and effective treatments for the patients.

Delegates will have a sneak peek at the latest technologies at the exhibition area where the dental industry will present its latest research, development, equipment and solutions to serve better the dental professionals.

**CAPP EVENTS**

Tel: +971 4 347 6747
Mob: +971 5 5424 3072
E-mail: events@cappmea.com
Web: cappmea.com
Incisal apical root resorption evaluation after low-friction orthodontic treatment using two-dimensional radiographic imaging and trigonometric correction

By Fabio Savolli, Stefano Bonetti, Domenico Dalessandri, Gualtiero Mandelli, Conrado Paganielli, Italy

Abstract
Background: Root resorption shall be an undesirable consequence of orthodontic treatment. The identification of possible root resorption is an important step in the orthodontic treatment planning and in the follow-up appointments.

Aim: To evaluate the severity of apical root resorption of mandibular incisors after low-friction orthodontic treatment using the combination of panoramic and lateral radiographic imaging and trigonometric correction.

Settings and Design: A retrospective study in the orthodontic department of the University of Brescia in 2000.

Materials and Methods: Ninety-three subjects (53 females and 40 males) with a median age of 14.3 years, were consecutively treated from the beginning of treatment (Fig. 1-6). The calculation was carried out using the following formula: \( \alpha = \sqrt{\frac{\beta^2 - 4 \mu_1 \mu_2}{\mu_2}} \). The mean treatment duration was 2.1 years, with patients showing marked clinical improvement to a new position at the beginning of treatment (Fig. 8).

Statistical Analysis: The changes in length were investigated using the Student’s t-test for paired values (p<0.05).

Results: Maxillary central incisors showed no changes (0.0%, 0.0%), whereas mandibular incisors showed a small increase (2.4%, 1.8%) that was attributed to root resorption during the completion of development in younger patients, mandibular central and lateral incisors showed a small increase (1.3%, 1.3%) that was statistically significant to the root resorption of the mandibular incisors but not for the maxillary ones.

Conclusion: In patients with mild crowding and consequent low amount of root movement, a low-friction orthodontic treatment can lead to apical root resorption, mainly involving lower incisors. The use of a trigonometric correction in the panoramic radiographic analysis may reduce the limitations of this 2D evaluation.

Introduction
With the exception of cases that involve desiccated teeth, root resorption is an undesirable and unpredictable consequence of orthodontic treatment, which leads to shortened root lengths. It tends to occur when pressure on the roots results in over-resorption of the innermost cellular structures. Root resorption starts adjacent to hyalinised tissues and is associated with the removal of this zone of sterile necrosis. As orthodontic force are usually concentrated at the apex of the tooth, the resulting resorption typically travels from the root tip to the coronal surface.

Multiple patient-specific factors are associated with apical root resorption during orthodontic treatment, including morphological features such as root shape, or oral habits, biological and genetic factors, endodontic treatment, sex, age, and anomalies in dentition such as malocclusions. Moreover, treatment-specific variables include treatment with extractions, mechanical factors, treatment duration, amount and direction of the orthodontic force applied, and the amount of type of tooth movement. For example, it appears that the intrusion of teeth causes approximately four times more root resorption than extrusion; however, it has also been demonstrated that extrusive movement is not without risk. Consequently, root resorption may depend on the orthodontic technique used, since different orthodontic techniques can generate different forces and tooth movements.

Low-friction mechanics are now commonly used, and previous clinical investigations have analysed their biomechanical properties. However, differences may exist among different low-friction clinical protocols. The purpose of the current study was to evaluate the amount of root resorption using a specific low-friction treatment protocol, integrated Straight-Wire (ISW). The amount of root resorption was investigated in a retrospective study involving patients treated by the same orthodontist. Furthermore, because of the limitation existing in the evaluation of the root resorption using panoramic radiographs, we combined the analysis with lateral cephalograms and application of a trigonometric correction.

Materials and Methods
Our retrospective study investigated the orthodontic records of 93 patients (53 females and 40 males), who were selected from the orthodontic department of the University of Brescia in 2001. In order to analyse the degree of root resorption, panoramic and lateral radiographs were evaluated using the Nemorex NMX software. The change of inclination of maxillary and mandibular central incisors was then measured (with reference to the long axis of the tooth, from the incisal edge to the root apex).

Measurement techniques
In order to analyse the degree of root resorption, panoramic and lateral cephalometric radiographs were examined before and after orthodontic treatment. Each subject had his/her pre and posttreatment panoramic and cephalometric film taken by the same radiology technician using a standardized procedure. Each film was assessed by the same expert as a jpeg file and cephalometric analysis of pre and post-treatment lateral radiographs was performed using the Nemorex NMX software. The change of inclination of maxillary and mandibular central incisors was then measured (with reference to the long axis of the tooth, from the incisal edge to the root apex).

Pre and post-treatment panoramic radiographs were evaluated using Adobe Photoshop CS6® (Fig. 7). The initial and final tooth lengths of maxillary and mandibular incisors (with reference to the long axis of the tooth, from the incisal edge to root apex), as well as the change in mesio-distal diameter of the crown of the mandibular right first molar was measured in pixels, and then all the measurements were converted using this value as the specific unit for each patient. This procedure ensured the normalization of the data for intra-patient comparison, assuming no changes in the periodontal, coronal diameter, despite the changes in the root length. Two different clinicians performed each measurement.

In order to ensure that the shortening of the long axis (Fig. 8) that showed in the frontal plane was not a result of the change of inclination of the teeth in the sagittal plane (Fig. 9), the values of the pre-treatment teeth lengths were adjusted using the following formula: \( L_{\text{OPT}} = \frac{L_{\text{OPT}} - L_{\text{OPT}0}}{x_{\text{OPT}}} \). Once this trigonometric correction was adopted, it was possible to compare the values of pre and posttreatment teeth lengths. The same amount of correction was adopted.
the inter-rater absolute agreement through intraclass correlation coefficient (ICC), using two-way ANOVA with mixed-effects average measures (ranging from 0 to 1, with 0 indicating no consistency and 1 indicating a perfect consistency among raters).

Results
Each pre- and post-treatment average tooth length was calculated. Then, depending on the differential inclination, the respective trigonometric correction was applied to obtain a pre-treatment length that was comparable to the post-treatment length without an inclination bias (Table 3). Table 3 summarizes the outcomes of our measurements. The values of the pre- and post-treatment measurements were normally distributed in both the Kolmogorov–Smirnov and Shapiro–Wilk tests (p>0.05) as taken as significant. Then, a two-tailed Student’s t-test was used for paired values to evaluate the differences between the pre- and post-treatment measurements (p<0.05) taken as significant. (Figure 1 and Table 2). The data sets for the tooth measurements were normally distributed in both the Kolmogorov–Smirnov and Shapiro–Wilk tests (p>0.05) as shown in Table 2. Using Student’s t-tests, we found no statistically significant difference in the lengths of the mandibular bicuspids between the pre- and post-orthodontic treatment values for the central, lateral, and both sides (p>0.05). On the contrary, there was a statistically significant difference in the shortening of the mandibular bicuspids between the pre- and post-orthodontic treatment values for the central and lateral, and on both the left and right sides (p<0.001).

Discussion
This clinical retrospective investigation analysed root resorption after a low-friction orthodontic treatment. Tooth length measurements were performed on panoramic radiographs that are the standard radiographic exams required by orthodontists at the initiation and end of treatment, patients did not need to undergo further radiography. As a result of difficulties in discriminating the crown from the root on panoramic X-rays, our measurements involved the whole tooth, assuming the absence of changes in the tooth crown and assigning any possible shortening only to the root. As panoramic radiographs are not suited for the qualitative evaluation of the root shape, and periapical radiographs were not available for all patients, we limited our evaluation of resorption on length measurements. X-rays were in digital format and direct comparisons with other X-ray examinations, the intra-tooth comparison. However, this method is based on a theoretical trigonometric formula, and further studies would be useful to evaluate its accuracy and biological cost-effectiveness. Additionally, as shown in our current study, a comparison between 2D and 3D methods is worth of interest in the orthodontic treatment planning, especially when multiple evaluations are needed.

Studies that use panoramic radiographs to measure changes in root lengths between pre and post-treatment values do not take modification of the initial inclination into account should consider this potential bias.

Our group of patients was selected with a mild grade of crowding, because our aim was to evaluate the most representative sample concerning a non-extractive orthodontic protocol by means of a specific straight wire, low friction technique. In order to allow a qualitative comparison, if our results were transferred onto the scale of Malmgren (grade 0 to 4), the maxillary bicuspids would be represented by grade 0 or 1 and the mandibular bicuspids by no more than grade 2, none of our patients had grade 3 resorption. Although previous studies found that the overall percentage of root resorption of 4% SD = 6%, milder degrees of root resorption could be the result of many variables, including lower amounts of root movement for this reason, our findings could be less...
evident than the results reported by the literature. As reported by other authors, a slight increase in root lengths was shown in the mandibular lateral incisors (1.4 ± 1.8%), although this was not statistically significant in our study (p = 0.05). This could be attributed to the completion of root development in these teeth, which would be in accordance with the median age of our sample (15 years) and with the root completion sequence.

Limitations

Even though we followed a stand- ardized protocol during the X-ray exams, a different level of distortion may exist between pre and post-treatment radiographs. This bias was reduced by measuring the mesiodistal diameter of the crown of the mandibular right first molar and using it as a baseline unit for all the other measurements on the same X-ray, in order to normalize the intra- patient comparison. However, a certain degree of distortion may be present.

To distinguish between the left and right central incisors on the cephalometric radiograph is a difficult task, we therefore selected the most inclined teeth in the maxillary and mandib- ular arches, then applied the ob- tained correction to both the central and lateral incisors. Even though our estimate was specific for the central incisor, this was useful for the laterals but less effective. Therefore, the lat- eral incisors values reported in our results may be less realistic than the values related to the central incisors. Further researches including different amount of crowding and comp- arisons with other X-ray examinations, e.g. high accuracy CBCT linear measurements [16], shall assess the re- liability of the methods used in this preliminary study.

Conclusion

In patients with mild crowding and consequent low amount of root movement, a straight wire low-friction orthodontic treatment can lead to a significant decrease of mandibular central and lateral incis- or root lengths on both the right and left side approximately of 3%. However, our analysis on panoramic radiographs found no evidence that resorption involved the mandibular incisors. The use of a trigonometric correction may reduce the limita- tion of the 2D radiographs, but fur- ther studies are needed to assess its accuracy.

Acknowledgements

Any paid support received from JKDR in preparation of the manu- script. We would like thank Dr Linda Sangaali for her exemplary dedica- tion and precious contribution to this article, and Dr Maria Clara Pic- cicco from JKDR for her contribution to the taking of measurements.

We also acknowledge the service of Oxford Science Editing Ltd. in the preparation of this manuscript.

References

13. Roscoe MG, Meira JB, Cattaneo M, Kawata T, Matsuda Y, Terao A, et al. Adjunct Assistant Professor, Department of Orthodontics, Dental School, University of Brescia, Brescia, Italy.
14. Gualtiero Mandelli, Italy
15. Stefano Bonetti, Italy
16. Alessandro Sciascibello, Italy
17. Adjunct Assistant Professor, Department of Orthodontics, Dental School, University of Brescia, Brescia, Italy.
18. Corrado Paganioli, Italy
19. Director and Professor, Department of Orthodontics, Dental School, University of Brescia, Brescia, Italy.

Figure E3

Page E3

ORTHODOENTRIC TENDENCIES: Orthodontics and Dentofacial Orthopedics...