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European dental imaging equipment market in a state of change

By Sasha Stephanian & Jeffrey Wong, Canada

The market for dental imaging equipment in Europe is quite saturated and has not experienced any significant growth over the past several years. However, in recent years cone beam computed tomography (CBCT) scanners have increasingly begun incorporating 2-D capabilities into their systems, as well as offering a broad range of fields of view to provide greater flexibility. Clinical applications of CBCT systems include implant planning, root canal therapy, sinus augmentation, root canal procedures, and bony defect detection. As several of these applications are expected to increase in number, the demand and need for CBCT scanners will continue to grow considerably throughout Europe over the next decade.

Intraoral X-ray imaging device market in transition

Analogue technology is a thing of the past and while it is still declining, the transition away from these types of systems has already taken place, resulting in a more stable market situation. Companies now offer two digital alternatives: photostimulable phosphor (PSP) systems and digital sensors. Larger clinics with several rooms, especially those who only recently made the switch to digital technology, typically opt for PSP systems due to the affordability of PSP plates and the simplicity in equipment handling compared to conventional analogue film. In countries such as France and Italy, which are largely dominated by smaller clinics with only a single examination room, dentists often opt to use digital sensors instead.

Although the split between PSP systems and digital sensors is quite even, the PSP market has shown strong signs of growth, particularly in countries that were traditionally dominated by sensors, such as Spain, and will continue to be one of the main drivers in a rather stagnant market for imaging equipment as a whole. Part of this trend can be attributed to the fact that the thickness and rigidity of sensors are a greater nuisance when it comes to patient comfort, as well as the frailness of these sensors compared to PSP scanners. Furthermore, digital sensors are much more expensive than PSP scanners, and include parts that are prone to wear, such as cords that can be easily damaged, which further argues the case to switch to PSP systems.

2-D extroral X-ray imaging vs 3-D CBCT scanners

Extroral X-ray imaging systems are predominantly used for viewing a patient’s teeth relative to his or her jaw and skull. They aid in monitoring impacted teeth, temporomandibular joint disorder, and possible tumours in and around the intraoral cavity. These specific uses of extroral X-ray systems are limited to procedures performed by orthodontists, prosthodontists and oral surgeons, resulting in a relatively small market. Most professionals prefer working with a CBCT scanner, which has 3-D imaging capabilities and can perform at a much greater capacity than traditional 2-D extroral imaging systems, but are limited by the high acquisition cost of these systems. Recently, however, not only have prices of CBCT scanners dropped significantly, but it is now standard for these systems to also incorporate both panoramic and cephalometric capabilities, resulting in so-called ‘combo-units’, which has resulted in a drastic change in the market. The popularity of these CBCT ‘combo-units’ has increased significantly in recent years and is expected to continue outpacing all other market segments in terms of growth.

Consequently, the outlook of the extroral X-ray system market in Europe is negative. Already being a replacement market without much innovation, the demand for traditional 2-D systems is on the decline as consumers continue to opt for technologically superior CBCT scanners. Manufacturers have also recognised this, and as such have shifted their focus to capitalise on this trend, investing in producing combo 2-D and 3-D units with the option for future upgrades, greatly improving the marketability of these systems.

Analysis of the current situation of CBCT scanners

CBCT scanners are extremely efficient machines that are capable of performing a quick and non-invasive scan, resulting in a high level of patient comfort. It is also possible to instantly show the patient a 3-D image of their jaw and teeth structure, making it easier for dental professionals using these scanners to convince patients regarding necessary treatments. However, the biggest advantage of CBCT scanners is their low cost relative to traditional CT systems found in hospitals. While CBCT scanners are quite a bit more expensive than other dental imaging equipment, they are a much more affordable alternative for capturing 3-D images of a patient’s jaw compared to past methods.

In the European market, sales of CBCT systems have increased considerably, with growth rates surpassing that of nearly all other dental imaging devices. This will most likely continue to be the case throughout the next several years as the technology is constantly improving and prices are dropping. Although most units now offer a variety of field of views (FOVs), the most popular choice continues to be 8 cm x 8 cm, as this size is sufficient to capture the complete maxilla or mandible in one image. Anything above this size has a much more niche usage and typically comes at a greater cost, thus dentists opting to purchase a CBCT scanner are less likely to be persuaded by anything larger, as it is more of a luxury than a necessity. As such, all of the major competitors, including Carestream, Planmeca, Sirona, Dental Group, Vatech, and Cefla Group, have multiple systems with this size already incorporated into their product line. Today, smaller FOV sizes smaller than 8 x 8 scanners have essentially all been consolidated with medium FOV scanners, and large FOV scanners are extremely expensive and represent only a very minor percentage of the market.

Final thoughts

All in all, the market for dental imaging equipment in Europe is relatively static in terms of growth, but it is in a state of transition. Companies are continuously improving the technology in their products, and the stiff competition is placing intense pressures on prices. Consequently, a growing demand for CBCT scanners is neutralized by the falling prices, and in the end, the companies that will be the most successful are the ones who provide the greatest value with their products. The intraoral X-ray imaging sector has almost completely transitioned into a digital market, but is now split between digital sensors and PSP scanners. With new entrants in various segments of the market, the future of this market seems promising and exciting, with many new opportunities on the horizon.

Sasha Stephanian is a research analyst at iData Research and was the lead researcher for the 2016 European Dental Equipment Market Report. She has been heavily involved with the company’s dental division throughout his tenure. As a research analyst, she led several research projects on the global dental markets, including dental prosthetics, digital dentistry, CAD/CAM materials, dental implants, bone graft substitutes, hygiene, dental imaging and dental lasers.

Jeffrey Wong is the strategic analyst manager at iData Research and has been heavily involved with the company’s dental division throughout his tenure. As a research analyst, he led several research projects on the global dental markets, including dental prosthetics, digital dentistry, CAD/CAM materials, dental implants, bone graft substitutes, hygiene, dental imaging and dental lasers.
A 28-year-old male patient presented to our practice with an asymptomatic clinical picture of chromatic alteration of tooth #11 (Fig. 1). He had a history of dental trauma during childhood. Clinical and radiographic examination found traces of pulp necrosis (Fig. 2), for which he was referred for endodontic treatment.

After the initial consultation with the patient, anaesthesia was given, followed by establishment of absolute isolation. Subsequently, coronary access was achieved and the presence of pulp necrosis confirmed. A crown-down disinfecting instrumentation was performed using 2.5% sodium hypochlorite as irrigation agent and odontometry by radiographic method (Fig. 3), owing to not being able to use a foramen locator under these anatomical conditions, as its accuracy may have been influenced.

A manual preparation technique (step-back) was performed, using third-generation K-Files (DENTSPLY Maillefer) and 2.5% sodium hypochlorite as irrigation agent for the purpose of widening the entire root canal system. At each instrument encounter, passive ultrasonic irrigation was performed with flat inserts (Fig. 4) in order to enhance the cleaning effect. Complementing the intra-channel decontamination process, two biweekly exchanges of UltraCal calcium hydroxide (Ultradent) were performed (Fig. 5), also with the purpose of analysing quality of cleaning through the radiopacity of the filling observed radiographically (Fig. 6).

After the removal of the intra-canal medication and drying, the apical plug was prepared with MTA REPAIR HP (Angelus; Fig. 7) and inserted through the direct technique using previously measured endodontic condensers (Fig. 8). The aim was to fill and subsequently seal the apical 4 mm (Fig. 9). After 24 h, a root canal filling was performed with Tagger’s hybrid thermomechanical technique using an MTA-based sealer (MTA-FILLAPEX, Angelus). Radiographically, ideal sealing of the entire root canal area was observed (Fig. 10). The patient showed no postoperative complications. A follow-up examination was conducted after six months, which revealed new bone formation in the apical region (Fig. 11).

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Apexification treatment with MTA REPAIR HP

By Dr Fábio Duarte da Costa Aznar, Brazil
Applying evidence-based practice in oral hygiene education

By Rachael England, UAE

I have worked as a dental hygienist for the last 11 years, since qualifying in the Royal Air Force in 2006, and have practised throughout the UK in a whole range of settings, military, NHS hospital and private practice. I have also served in dental units of humanitarian initiatives, such as a mobile clinic in Kenya. Currently, I am working in a private practice in Dubai and delighted to be a key opinion leader for Philips. Throughout that time, I have consistently recommended one brand to my patients and anyone else asking for help choosing an electric toothbrush. Clinically, I have seen an improvement in oral health when people begin using Philips Sonicare toothbrushes and most recently toothbrushes from the DiamondClean range.

Philips Sonicare has reinforced its commitment to patient and professional partnership by continually developing new products, which undergo rigorous testing and clinical trials to demonstrate their safety and efficacy. Philips is committed to improving the lives of three billion people a year by 2025, through its ongoing collaboration with scientific experts, research scientists and dental professionals.

The associations between oral and systemic health are being discovered year on year, including serious conditions, such as diabetes, atherosclerosis, preterm or low birth weight babies, Alzheimer’s disease, chronic kidney disease and certain cancers. We know that gingival inflammation and periodontal disease are initiated by the complex microbial biofilm, and the destruction of the supporting tissue, including the periodontal ligament, bone and cementum, is mainly caused by the host-mediated innate and adaptive immune response. Periodontal disease is the most prevalent ailment affecting humankind globally, and severe periodontitis is responsible for the absolute majority of tooth loss and edentulousness in adults. Clinicians are thus constantly on the lookout for the most reliable and evidence-based aids to enable their patients to manage their oral health.

With the publishing of the latest research carried out by Philips in a special issue of the Journal of Clinical Dentistry, I can be sure that the advice I am giving patients is evidence-based. High on the evidence pyramid are systematic reviews with meta-analyses, which provide reliable conclusions because they integrate all the relevant evidence. This meta-analysis comparing the effectiveness of manual versus high-frequency, high-amplitude sonic powered toothbrushes showed that plaque removal was increased by 20% and gingivitis was decreased by 10%, thus reducing the systemic inflammation and improving the patient’s oral and general health.

In order to encourage patients to swap from a manual to an electric toothbrush, I tell them it is like comparing riding a bicycle with a motorcycle: one is much more efficient and doing the work for them. This is confirmed by studies comparing gingivitis reduction using a Philips Sonicare DiamondClean versus a manual toothbrush. After just two weeks, the DiamondClean realised a 52% reduction in gingival bleeding compared with only 17% using a manual toothbrush. After four weeks, the Sonicare achieved a 57.4% reduction in gingival bleeding compared with 19.1% using a manual toothbrush.

Results of this comprehensive meta-analysis showed that high-frequency, high-amplitude, sonic-powered toothbrushes decrease plaque and gingivitis significantly more effectively than manual toothbrushes in everyday use, in studies lasting up to three months.

 Patients often ask which model they should buy, as there are so many. The high-frequency, high-amplitude technology used in all Philips Sonicare brushes is

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**Study 1**

Comparison of Gingivitis Reduction and Plaque Removal by Philips Sonicare DiamondClean and a Manual Toothbrush


<table>
<thead>
<tr>
<th>Products</th>
<th>Subjects</th>
<th>Design</th>
<th>Results - Percent reduction at Week 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Philips Sonicare DiamondClean vs. MTB</td>
<td>141</td>
<td>Randomized, parallel, single-blind</td>
<td>Gingivitis: 57.4% vs. MTB: 19.1%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bleeding: 31.4% vs. MTB: 8.0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Plaque: 10% vs. MTB: 2.0%</td>
</tr>
</tbody>
</table>

Key conclusion

Twice daily brushing with Philips Sonicare DiamondClean is significantly better than using a manual toothbrush for reducing plaque and improving gingival inflammation and gingival bleeding within just two weeks, persisting to four weeks:

*Brush head formerly called AdaptiveClean

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**Study 2**

Comparison of Plaque and Gingivitis Reduction by Philips Sonicare FlexCare Platinum with Premium Plaque Control Brush Head and a Manual Toothbrush


<table>
<thead>
<tr>
<th>Products</th>
<th>Subjects</th>
<th>Design</th>
<th>Results - Percent reduction at Week 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Philips Sonicare FlexCare Platinum vs. MTB</td>
<td>143</td>
<td>Randomized, parallel, single-blind</td>
<td>Gingivitis: 45.79% vs. MTB: -0.71%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bleeding: 58.36% vs. MTB: -3.14%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Plaque: 46.55% vs. MTB: -1.58%</td>
</tr>
</tbody>
</table>

Key conclusion

Twice daily brushing with Philips Sonicare FlexCare Platinum with Premium plaque control brush head is significantly better than using a manual toothbrush for reducing plaque and improving gingival inflammation and gingival bleeding within just two weeks. Statistically significant differences in all metrics persisted until study completion at Week 6.

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**Study 3**

The Effectiveness of Manual versus High-Frequency, High-Amplitude, Sonic-Powered Toothbrushes for Oral Health: A Meta-Analysis


<table>
<thead>
<tr>
<th>Products</th>
<th>Subjects</th>
<th>Design</th>
<th>Results Percentage change after everyday use</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-frequency, high-amplitude power toothbrushes vs. MTB</td>
<td>1,870</td>
<td>Randomized, controlled clinical trials</td>
<td>More plaque removal 20%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Greater decrease in gingivitis 10%</td>
</tr>
</tbody>
</table>

Results of this comprehensive meta-analysis showed that high-frequency, high-amplitude, sonic-powered toothbrushes decrease plaque and gingivitis significantly more effectively than manual toothbrushes in everyday use, in studies lasting up to three months.
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Study 4
An Assessment of Gingivitis Reduction and Plaque Removal by Philips Sonicare DiamondClean with Premium Plaque Control Brush Head and Oral-B 7000 with CrossAction Brush Head


**Results - Percent reduction at Week 6**

<table>
<thead>
<tr>
<th>Products</th>
<th>Subjects</th>
<th>Design</th>
<th>Sonicare</th>
<th>Oral-B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gingivitis</td>
<td>284 Mean age 38.6</td>
<td>Randomized, parallel, single-blind</td>
<td>45.68%</td>
<td>26.83%</td>
</tr>
<tr>
<td>Bleeding</td>
<td></td>
<td></td>
<td>75.81%</td>
<td>58.76%</td>
</tr>
<tr>
<td>Plaque</td>
<td></td>
<td></td>
<td>37.58%</td>
<td>20.70%</td>
</tr>
</tbody>
</table>

**Key conclusion**

Philips Sonicare DiamondClean with Premium plaque control brush head is statistically superior to Oral-B 7000 with CrossAction brush head and SmartGuide accessory in reducing gingival inflammation, gingival bleeding and surface plaque.

*M Brush head formerly called AdaptiveClean

Study 5
A Study to Assess the Effects of Philips Sonicare AirFloss Pro, when Used with Antimicrobial Rinse, on Gum Health and Plaque Removal

J Clin Dent 2017;28(Spec Iss A):A36-44.

**Results - Percent reduction at Week 4**

<table>
<thead>
<tr>
<th>Products</th>
<th>Subjects</th>
<th>Design</th>
<th>MTB + AirFloss Pro + rinse</th>
<th>MTB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gingivitis</td>
<td>286 Mean age 35.6</td>
<td>Randomized, parallel, single-blind</td>
<td>8.52%</td>
<td>1.10%</td>
</tr>
<tr>
<td>Bleeding</td>
<td></td>
<td></td>
<td>36.79%</td>
<td>4.03%</td>
</tr>
<tr>
<td>Plaque</td>
<td></td>
<td></td>
<td>22.41%</td>
<td>5.70%</td>
</tr>
</tbody>
</table>

**Key conclusion**

Daily use of Philips Sonicare AirFloss Pro with antimicrobial rinse as an adjunct to manual toothbrushing was shown to improve gum health and reduce plaque significantly better than manual toothbrushing alone. Moreover, a non-inferiority test showed AirFloss Pro to be similar to string floss in reducing plaque and gingivitis.

eliminating plaque is critical to ensuring ongoing oral health. After two weeks of using a Philips Sonicare DiamondClean with a Premium plaque defense brush head, participants recorded a 38.68% reduction in plaque compared with just 18.28% using an Oral-B 7000 with CrossAction brush head. This trend continued after six weeks of use, with the Sonicare achieving a 37.58% reduction and Oral-B 80.70%.

I am sure all dental professionals will agree that gaining patient compliance regarding daily interdental cleaning is one of our greatest challenges. Patients cite difficulty flossing or interdental brushes that bend or break as the main barriers. The Philips Sonicare AirFloss Pro offers an effective and easy-to-use alternative. When filled with an antimicrobial rinse and used daily, it is as effective as flossing. In a study, after two weeks of use, floss achieved a 26.90% reduction in gingival bleeding, compared with 24.61% using an AirFloss Pro and BreathRx mouthrinse. After four weeks, this remained consistent at 43.51% for floss and 36.79% for the AirFloss Pro and BreathRx.

Dental health is a basic human right. I believe that as dental professionals and public health professionals it is our duty to ensure our patients, friends and family are using the most effective aids to fight the global epidemic of oral disease.

Editorial note: This article originally appeared in Dental Tribune Middle East & Africa No. 4/2017. A list of references is available from the publisher.

Conflict of interest: Rachael England is a key opinion leader for Philips Middle East.

Rachael England is a dental hygienist and clinic manager in Dubai, UAE.