Ten facts about dental implants

By Sebastian Saba DDS, Cert. Pros., FADI, FICD, Editor in Chief

Dental implant marketing often emphasizes “simplicity,” underplaying an inherent complexity in the product, procedure — and patient. Prosthetic dentistry is not simple. And patients rarely have simple problems. Potential complications can be far from simple to correct. To ease your learning curve with implant dentistry, following are some core variables that can be managed based on proven research.

1. Implant surface design: Choose implants that have micro-topography and bioactive surfaces that enhance bone contact and have macro-topography (overall shape) that better stabilizes bone profiles with little or no crestal bone loss.

2. Abutment connections: Internal connections have simplified abutment insertion. And if the abutment-implant margin is kept shy of the implant outer surface, a connective tissue zone will develop. The result is improved bone preservation at the crest. Abutments should be torqued to position and have specifically designed abutment screws that support long-term stability.

3. Provisionalization phase: Once thought optional, today this step is a critical diagnostic and management tool used to verify osseointegration, occlusion, esthetics, soft-tissue management, hygiene, prosthetic design and abutment selection.

4. Prosthetic options — screw versus cement. Some companies emphasize a “simpler” and familiar cement-only option. But irretrievability — presence of subgingival cement — can be problematic. Plan your design to minimize complications.

5. Earlier osseointegration and restorative phases: Improved implant surfaces and shapes support primary stability in bone and enhanced osseointegration. Early loading is becoming more feasible — choose cases carefully.

6. Soft- and hard-tissue management: Timely placement of provisionalals can influence the support and contour of tissue. Advances in bone grafting and tissue preservation help preserve soft tissue, maintain anatomical bone contour and improve gingival esthetics.

7. Enhanced marketing: Implant dentistry is aggressively promoted. However, costs remain high for average-income patients. It’s critical that benefits a patient realizes far outlast any corresponding debt.

8. Technological improvements: Zirconia ceramics and CAD/CAM have created an explosion in design, customization and improved esthetics. Zirconium is doing for esthetics what titanium did for osseointegration.

9. Computer-guided implant therapy: You can’t deny the value of 3D software that helps measure and locate vital structures such as the mandibular nerve, sinus cavities and nasal floor. But most practices still rely primarily on conventional radiography.

10. Long-term studies: Implant companies provide education, solid research and ongoing support to customers (you). Incorporating up-to-date knowledge into the clinical variables you’re managing on a daily basis will enable you to achieve a predictable approach in your decision-making with dental implants.

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CBCT zones of the jaw
Bone quality related to implant location

By Souheil Hussenmi, Dubai

The causes of early implant failures during the osseointegration process include poor quality and quantity of bone and soft tissue, the patient’s medical condition,1–8 undiagnosed patient habits (frequent, heavy long-term smoking, poor oral hygiene, others),9 required pre-existing information relative to the surgical anatomy and technique,10–12 inadequate prosthetic analysis and technique,13–15 suboptimal implant design and surface characteristics,6–8 implant position or location and unknown factors.

This article attempts to further investigate implant location as one of many factors in early stages of diagnosis that improves success rates in implant dentistry procedure. Predisposing factors to implant complications in different jaw regions are discussed.

CBCT Zones D1 to D5 is formulated to better analyse implant dentistry procedure during the diagnostic phase based on the location that has a logical sequence during examination of the alveolar ridge of both maxilla and mandible to have pre-existing information regarding the demands and the clinical requirements in different zones of the jaws. This article identifies the Hounsfied units (HU) of different alveolar jaw regions, according to which dental implants can be inserted with better understanding of what to expect.

Five CBCT zones are identified in this article in a logical sequence: the discrete zone D1 being the anterior mandible, the danger zone D2 being the posterior mandible, the death zone D3 being the anterior maxilla, the demand zone D4 being the posterior maxilla and the delicate zone D5 being the posterior maxilla that requires sinus lift procedure.

Zones D1 to D5 are related to the bone quality classification of Laliberté & Zarb16 D1 known as an interferential area in which a careful diagnosis should be made during the following procedure, bone density is very high and the osteotomy drills could hurt the bone, irrigation implant could facilitate healing response, dullness of the drills during osteotomy should be counted for; tap drills are required, arterial supply in the symphysis area should be considered and this area is utilized as a donor site for the chin (symphyseal) bone graft; D2 includes six anterior superior incisions and two canines. A thin alveolar process in this area necessitates implant diameter selection of the osteotomy drills associated with bone formation (four to seven weeks), immature bone formation (four to eight weeks), mature (muscular) bone development (eight to twelve weeks), and bone stabilisation stage (twelve to sixteen weeks) or about four months).9–10 Post extraction bone resorption is always three-dimensional, with the greatest loss of bone in the buccal-palatal or horizontal direction (the width) and occurring mainly on the buccal side of the alveolar ridge.17 Schepmann et al reported that two thirds of the horizontal bone loss occurs within three months and one third takes place within the remaining nine months of the first year post extraction.

A mean reduction of the width of the ridge has been reported to be 5 to 7 mm within six months period or 50 per cent during the twelve months following tooth extraction.18 The loss of bone height is smaller, reported to be about 1 mm within the first six months post extraction.19 If a bone grafting and implant treatment approach is not considered soon after trauma, the atrophy of the alveolar process of the anterior maxilla continues with time. Resorption of the buccal plate compromises the anatomy of the edentulous alveolar ridge and makes it difficult to place an implant in the prosthetically favourable position.20 Even when a dental implant is placed, its strength is diminished without the presence of a buccal cortical plate. Using a two-dimensional finiteelement model for stress analysis, Czeldin and associates demonstrated low stresses and high strains surrounded the implant for the all-ceramic (lack of cortical plate) bone model.21 When a layer of thick cortical bone was added to the model, it had a significant impact and improved stresses and strains on the implant.

D1 is related to first and second premolars in the maxillary region and rarely first and second molars. Although this area is not considered the maxillary anterior teeth, it is still a prime concern for the patients during conversation and smiling. In addition to two anterior premolar teeth, second posterior molars are not considered as a separate class in this group if sinus lift is not required due to their common bone quality. These implants once restored are the longest support in front of maxillary sinuses. Park, Hye-Sang et al reported that the cortical bone density of the maxilla ranged approximately between 800 and 1580 HU at the alveolar bone except for the maxillary tuberosity (443 HU) at the buccal and (451) HU at the palatal alveolar bone, and between 835 and 1133 HU at the basilar cortical bone except for tuberosity (542 HU).22 The cortical bone density of the mandible ranged between 800 and 1350 HU at the alveolar bone except for the mental triangle (948 HU) at the buccal side and (793) HU at the lingual side.

Table 1

<table>
<thead>
<tr>
<th>Average HU of different areas in the mouth</th>
<th>Zones (D1–D5)</th>
<th>No. of Cases</th>
<th>Avg. HU per zone</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>14</td>
<td>655</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>33</td>
<td>599</td>
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<td>5</td>
<td>3</td>
<td>213</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>100</td>
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</tbody>
</table>

Another traumatic event in the life of the alveolar ridge is a tooth loss. A tooth extraction, or periodontal disease also leads to bone resorption. The progression of healing after a tooth extraction goes through certain resorptive stages of fibrin clot organisation (first four weeks), immature (woven) bone formation (four to eight weeks), mature (muscular) bone development (eight to twelve weeks), and bone stabilisation stage (twelve to sixteen weeks) or about four months).9–10 Post extraction bone resorption is always three-dimensional, with the greatest loss of bone in the buccal-palatal or horizontal direction (the width) and occurring mainly on the buccal side of the alveolar ridge.17 Schepmann et al reported that two thirds of the horizontal bone loss occurs within three months and one third takes place within the remaining nine months of the first year post extraction.

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veolar bone and 1,350 and 1,650 HFU at the basal bone. The highest bone density in the maxilla was observed in the canine and prime anterior areas, and maxillary tuberosity showed the lowest bone density. Density of the cortical bone was greater in the mandible than in the maxilla and showed a progressive increase from the incisor to the retromolar area.

D5, known as the sinus zone, is a bilateral zone of the alveolar ridge of posterior maxilla located at the base of the maxillary sinus from the second premolar to the pterygoid plates. There are certain common features of replacement of missing tooth or teeth (rarely two premolars and commonly one or two molars) with dental implants in this zone. It often relates to the degree of sinus pneumatization and vertical bone deficiency that may require supplemental surgical procedures in the subantral area in order to place endosseous implants.

This bilateral maxillary posterior zone that extends from the second premolar to the pterygoid plates is located at the base of maxillary sinuses (antrum of Highmore). Embryologically, the hard palate and the alveolar process of the maxilla form the barrier between the maxillary sinus and the oral cavity. The bone height between the floor of the maxillary sinus and the alveolar crest is routinely measured in oral implantology when posterior maxillary implants are contemplated. An increase in sinus volume or sinus pneumatization after a loss of posterior tooth/teeth often necessitates vertical bone augmentation with a sinus lift procedure. The bone of this region is also known to have compromised bone quality (types 3 and 4) that can increase an implant failure rate. The main blood supply to the posterior maxilla derives from the posterior superior alveolar artery, the greater and lesser palatine arteries (all from the maxillary artery), the ascending pharyngeal branch of the external carotid artery, and the ascending palatine branch of the facial artery. An injury to the posterior superior alveolar artery during the lateral approach for substantial augmentation can cause haemorrhage that may require coagulation.

Materials and method

From a data base of 1,154 patients who had received 4,700 dental implants from 2001 till August 2013, randomly a prosthodontist with no knowledge of these criteria was requested to select 100 files from the data base and present them for this study. The 100 files had received panoramic and cone beam computed tomography (CBCT; Table 1) during their diagnostic visit. The average HFU of the randomly selected 100 cases was calculated. All presented reports appear to agree that the CSR of dental implants is generally high and that implant location plays an important role in implant success. CSR of implants in the mandible seems to be slightly higher than in the maxilla—a difference of about 4 per cent. The success rate of implants in the anterior regions seems to be higher than in the posterior regions of the jaws, mostly due to the quality of bone: about 12 per cent difference between anterior maxilla and posterior maxilla, and about 4 per cent difference between anterior mandible and posterior mandible. On the basis of reviewed literature reports, an implant treatment in the anterior mandible appears to be the most successful. The posterior maxilla appears to be the least successful region of the jaws for implant rehabilitation.

Discussion

There are few literature reports that attempt to study implant location, among a multitude of other factors, to determine its influence on the success or failure of dental implant treatment. Becker et al. evaluated 128 implants placed in the maxillary and mandibular molar positions in a prospective study. The six-year cumulative success rate (CSR) for maxillary posterior implants was 82.9 per cent, for mandibular posterior, 91.5 per cent. He concluded that the CSR in the posterior regions is lower than usually reported for anterior regions of the maxilla and mandible due to differences in bone quality and quantity. Falkert et al. assessed 1,170 endosseous implants placed in partially edentulous jaws in a retrospective study. Fewer complications were found in implant prostheses located exclusively in the premolar region versus molar and mixed molar-premolar implant restorations. Drago investigated the location-related osseointegration of 675 implants placed in 169 patients that were observed from seven months to eight years follow- ing occlusal loading. Implant osseointegration was 89.5 per cent in the anterior maxilla, 73.4 per cent in the posterior maxilla, 96.7 per cent in the anterior mandible, and 98.7 per cent in the posterior mandible. Moy et al. analysed implant failure rates and associated risk factors, observed implant failure of 8.16 per cent in the maxilla and 4.95 per cent in the mandible. Increased age (over 60) was strongly associated with the risk of implant failure. Baez et al. evaluating 303 patients with 1,907 implants over a three-year period, assessed the success rate of implants in the maxilla at 93.4 per cent and 97.2 per cent in the mandible. Poor bone quality played the major role in implant failure with bone quantity demonstrating less importance.

Conclusion

There is a trend of escalating levels of HFU in different parts of the oral cavity. The highest being the anterior mandible, followed by the posterior maxilla, posterior mandible, anterior maxilla and posterior maxilla with sinus lift procedure respectively. Estimated HFU can assist the surgical phase, as the number of the ancillary procedures can be pre-estimated according to different areas in the mouth during the diagnostic phase.

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Fundamental misconceptions about Dental implants among patients

By Implant Magazine

Investigating patients’ knowledge and perceptions regarding implant therapy, a Chinese study has found that an alarming number of participants had inaccurate and unrealistic expectations about dental implants. Moreover, the study determined that only 81 per cent felt confident about the information they had about the treatment. In the study, the researchers investigated preoperative information levels, perceptions and expectations regarding implant therapy via a questionnaire. Responses from 277 patients were obtained during 2014 and 2015 in three different locations in China (Yixing, Songjiang, and Jiangsu). The analyses established that about one third of the participants had mistaken assumptions about dental implants.

The study, titled “What do patients expect from treatment with dental implants?” published online ahead of print on 23 March in the Clinical Oral Implants Research journal.

Increase in caries rates after Fluoridation cessation

By Implant Magazine

Community water fluoridation is a matter of debate around the globe. While it is used widely in North America, many European countries have stopped the practice. Owing to a lack of contemporary research on fluoridation cessation, however, researchers in Canada have now investigated its impact on dental caries experience.

In Canada, community water fluoridation has been in place since 1945. In examining data sets from the school years of 2004/2005 to 2013/2014, the researchers observed an overall increase in primary and 2 children using tooth surface indications of dental caries in Grade 4. However, the researchers focused on smooth surface magnitude of the increase was observed in schoolchildren in Calgary experience.

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By Implant Magazine

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