CBCT and CAD/CAM allow for one-day restoration of Tooth #9

By Robert Pauley, USA

Case Overview
Our office received a frantic phone call from the mother of one of our twelve-year-old patients, who stated that her daughter fell while in P.E. class and broke a front tooth. We advised her to bring her daughter to the office as soon as possible. Immediately after her arrival a periapical radiograph, I saw tooth #9 was horizontally fractured at the middle third. There was no pulp exposure evident, but the tooth did have a pinkish tint on the lingual. No mobility was noted and no periapical changes or root fractures were obvious at this time. The new American Association of Endodontists guidelines recommend taking one occlusal and two periapical radiographs with different lateral angulations for all dental injuries, including crown fractures. If cone beam-computed tomography is available, it should be considered to reveal the extension and direction of the fracture.1

Dr. Edward Mills in his presentation on Site Development and Implant Protocols Based on Etiology of Tooth Loss refers to a similar traumatic injury in which CT images revealed not only a root fracture within the bone but a fracture of the lingual plate.2 A limited field 3D scan 5cm x 5cm at 500 voxels was taken with the CS 8100 3D to rule out buccal or palatal plate fractures (Fig. 2). None were evident on the scan. While her parents were upset that she had been injured, the ability to view a 3D image reassured them that the damage appeared to be limited to the tooth’s coronal structure.

Treatment Plan
The patient’s treatment options were: 1) do nothing; 2) restore with a composite restoration, realizing that this would have a questionable long-term prognosis due to size of fracture; 3) restore with a CAD/CAM milled crown. The patient and her parents were advised that cases where teeth have been injured traumatically such as in this case, one might experience a post traumatic irreversible pulpitis at a period of time beyond the initial trauma. In some cases, this condition may be treated by endodontic treatment and crown restorations but in other cases root resorption may take place precipitating the loss of the teeth. These teeth will be monitored every 6 months over several years with periapical radiographs. Every appropriate effort to maintain the tooth in place and avoid the need of an implant until the patient reaches maturity. Dental implants in adolescent patients may affect vertical growth and development of the alveolar ridge because the osseointegrated implant acts as an ankylosed tooth. At a focus conference on Advanced Dental Implant Studies, Dr. Mills summarized that jaw growth in a young adolescent patient may compromise the outcome of the oral rehabilitation using an implant supported prosthesis even if implants successfully integrated. After presentation of the treatment plan and discussion of risks, benefits, options, and alternatives, the parents and patient elected to restore tooth #9 with a CAD/CAM crown.

The parents understand this crown will likely need to be replaced once she reaches adulthood for the best cosmetic appearance, as her teeth and face will change with further growth and development.

Tooth #9 was anesthetized and prepared for a ceramic crown. I utilized the CS 5000 intraoral scanner to scan the prepared maxillary anterior quadrant and the opposing mandibular anterior quadrant as well as obtain a bite registration (Figs 3, 4). CS Restore software was then utilized to design the anterior crown (Figs. 5-7). The CS 5000 milled the crown from an in-

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2. A limited field 3D scan 5cm x 5cm at 500 voxels was taken with the CS 8100 3D to rule out buccal or palatal plate fractures (Fig. 2).

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Figure 1

Figure 2
Porcelain laminate veneers – avoiding complications

By DCDM

D
tal Veneering is the process of covering the facial surfaces of teeth by using various types of dental materials. Most commonly used are porcelain veneers which are thin shells of porcelain that are shaped like the outer layer of the teeth and are used to cover the teeth, aiming to enhance their appearance.

Many celebrities opt for this esthetic treatment to achieve what may seem like a picture-perfect smile. This may lead people to a false expectation that everyone is a good candidate for veneers. However, from a dental clinician’s perspective preparing and planning for veneers is very challenging, and if proper analysis of the patient and proper techniques in preparing the teeth are not used, multiple complications can occur. These include gingival inflammation, chipping and breaking or even complete de-bonding of the veneers.

To decide whether a patient is a good candidate for veneers many factors should first be assessed; the condition of the patient’s teeth, habits, periodontal condition and most importantly the patient’s expectations and willingness to maintain their veneers after they are placed.

We should start by analysis of the teeth. This involves assessing their shape and proportion; diastemas, and analysis of the occlusion. Regarding shape and dimension, there should be sufficient tooth structure to retain the veneer, otherwise the longevity can be severely affected.

In teeth with small surface areas such as lower incisors, or teeth with multiple cavities and fillings which decrease the available surface for bonding, there is an increased chance of the early displacement of the veneer. In such cases full crowns may offer a better long term option (H.Serdar Cotert et al, 2009).

In terms of diastemas, if these are too large veneers can only partly reduce the space, otherwise gingival inflammation and/or recession can occur due to the bulkiness of the veneer (Weissgold and Cohen, 1981). Additionally, a tooth which is unnaturally close to its neighbour is more prone to fractures as compared to non-adjacent veneers. When assessing a diastema the clinician must establish if it is stable or increasing since the latter may indicate periodontal bone loss or a harmful habit.

Finally in tooth analysis the occlusion must be considered. For veneers to have a longer survival rate they should not have excessive biting forces on their edges as is common in patients with an edge-to-edge occlusion which can lead to chipping and breaking of the veneers. Care must also be taken in patients with missing posterior teeth, as this increases the loading on the anterior teeth. Patients’ habits and gingival health should be assessed; time grinding or heavily clenching, often related to stress, or even biting or chewing on fingernails or objects like pens, create high horizontal forces impinging on survival of the veneers at a rate 8 times higher than patients who don’t have such habits. Such forces can readily lead to fracture, chipping or total de-bonding of the veneer. We should also consider the patient’s high consumption of dark or acidic foods as well as smoking habits which can lead to dark stains around the margins of the veneers (Fig 1). Since patients with dark stained teeth will often consider veneers as a solution, habits should be identified changed after veneer placement to maintain the esthetics of their veneers (Beier et al, 2012). Marginal stains can be minimised by brushing or rinsing after smoking and consumption of dark colored foods.

The patient’s oral hygiene must also be assessed, which leads us to the last key point of gingival health. Veneers should not be prepared on bleeding inflamed gingiva, which indicates poor oral hygiene. If this is done, complications which arise include placing the veneer margins too deep due to gingival enlargement, and bleeding during preparation and bonding leading to poor marginal seal and marginal staining after veneer placement. Eventually gingival recession or worsening inflammation will result. Good oral hygiene and gingival health should be achieved before veneers are started. All of these factors need to be considered during the initial assessment to avoid complications.

Additional complications can arise during the preparation of teeth. There are two common approaches to placing porcelain veneers, one is done without altering the natural teeth - bonding the porcelain veneers to unprepared teeth. This might seem a conservative choice avoiding alteration to tooth surfaces, but it inevitably creates a bulky over-contoured appearance and increases the risk of the veneer de-bonding and gingival complications. Alternatively teeth are prepared for veneers by changing external contour, removing less than a millimetre of the facial surfaces and around 2 mm of the incisal edges, thus porcelain replaces the tooth structure removed, ensuring the porcelain is seated properly onto the tooth with enough bulk of porcelain at the edge to minimise chances of chipping and breaking. Studies have shown that the overall success and survival of the first method is much lower than the second method. The commonest complications with veneers are breaking and chipping (H.Serdar Cotert et al, 2009)(Laxon and DPull, 2013) (Akoglu et al, 2011).

A study analyzing the overall survival rate of porcelain veneers over a 20 year period concluded that the estimated survival rate over a 5 year period is at 95%; at 8 years is 94%; at 10 years is 86% and at 20 years is 85% (Beier et al, 2012). It should be noted that these were veneers placed after adequate tooth preparation.

The clinician must consider all these factors before choosing to place veneers if complications are to be minimised and patient satisfaction achieved.

References are available from the authors.
Case report surgical correction of a class III malocclusion in an adult

By Dr. Fabien Depardieu

This case report describes a successful orthognathic treatment of a skeletal Class III malocclusion with mandibular prognathism in an adult individual. The patient with Class III malocclusion, having mandibular excess in sagittal and vertical plane was treated with orthodontics, bilateral sagittal split ostotomies. The surgical-orthodontic combination therapy has resulted in near-normal skeletal, dental and soft tissue relationships, with marked improvement in the facial esthetics in turn, has helped the patient to improve the self-confidence level. The interdisciplinary approach is the treatment of choice in most of the skeletal malocclusions (1).

Keywords: Class III malocclusion, decempanation, Orthognathic Surgery, Bilateral sagittal split ostotomies, surgical orthodontic treatment.

Introduction

The Skeletal Class III malocclusion is characterized by mandibular prognathism, maxillary deficiency or both. Clinically, these patients exhibit a concave facial profile, a retrusive nasomaxillary area and a prominent lower third of the face. The lower lip is often protruded relative to the upper lip. The upper arch is usually narrower than the lower, and the overjet and overbite can range from reduced to reverse.

The effect of environmental factors and oral function on the etiological factors of a Class III malocclusion is not completely understood. However, there is a definite familial and racial tendency to mandibular prognathism. For many Class III malocclusions, surgical treatment can be the best alternative. Depending on the amount of skeletal discrepancy, surgical correction may consist of mandibular setback, maxillary advancement or a combination of mandibular and maxillary procedures. After surgical correction of the skeletal discrepancy, the occlusion is usually finished orthodontically to a Class I relationship. However, if surgical treatment is not performed, and the final molar relationship is Class III or Class I, there are challenges specific to the static and functional Class III occlusion that must be considered. Sometimes a Class III relationship is caused by a forward shift of the mandible to avoid incisal interferences. This is a pseudo-Class III malocclusion. In these cases, it is important to establish the inter-occlusal relationship with the teeth in the retruded contact position.

In this paper, the surgical orthodontic treatment of a young adult patient with a Class III malocclusion is illustrated.

Diagnostic and Etiology

The patient was a 28-year-old man who had a Class III facial type and slight crowding with a complete Class III relationship. His chief complaint was an esthetic facial and uneven bite. His medical history showed no contraindication for orthodontic therapy and orthognathic treatment. No one in his direct family had a skeletal Class III features.

The pretreatment extra-oral photographs showed symmetric facial structures (Fig 1). The patient had a concave profile, a decreased nasolabial angle and a protusive lower lip. The intra-oral photographs (Fig 2) showed a Class III occlusion on each side with an anterior crossbite and without apparent crowding. Overjet was -2.0 mm, and overbite was -3.5 mm. His maxillary anterior teeth were prognathic, with inadequate display when smiling. The mandibular dental midline was deviated 2.5 mm to the right, although the maxillary dental midline was coincident with the facial midline. There were no signs or symptoms of temporomandibular joint dysfunction. Mandibular movements, such as maximal opening and lateral and anterior displacement were within normal limits. No deviation and pain were discovered during the border movement of the mandible. A cephalogram and a panoramic radiograph were taken before treatment. The cephalometric analysis and its tracing showed that the mandible protruded relative to the cranial base (SNB angle, 82°; ANB angle -3°). The panoramic radiograph showed no other abnormal signs. After the analysis of the photographs, the casts and radiographs, it was decided to approach his problems as a skeletal Class III malocclusion with an anterior cross bite and a lower deviated midline (2).

Treatment Objectives

The treatment objectives (5) were to obtain a harmonious facial profile by decreasing the protrusion of the mandible, improve the occlusion, including correction of the anterior crossbite, establishment of ideal overjet and overbite, achievement of a functional molar relationship; and place the dental midlines in the middle of the patient’s face. We planned:

• To set back the mandible to correct the prognathism and the midline deviation.
• To relieve the proclined maxillary incisor position and to relieve the dental compensations.
• To relieve the dental compensations by straightening the mandibular incisors to an upright position over basal bone.

Treatment Alternatives

The first alternative was orthodontic treatment with extraction of 4 premolars. Through the retraction of the mandibular anterior teeth, the anterior crossbite and Class III molar relationships would be corrected and the concave facial profile would be camouflaged. Nevertheless, the mandibular incisors were not suitable for much distal movement because of the thin trabecular bone in the mandibular anterior area that could damage the periodontal tissues by gingival recession, fenestration or dehiscence.

The second alternative was combined surgical and orthodontic treatment. The anterior crossbite would be corrected with a single-jaw surgery; a mandibular setback. The concave profile would be improved...
as well. It was decided to extract the upper second premolars to relieve the dental compensations by repositioning the upper incisors.

The third alternative was to correct the class III malocclusion by miniscrew-assisted mandibular dentition distalization. However we decided that the skeletal problem was too excessive and required orthognathic surgery.

After we discussed the three alternatives with the patient. He chose the second option.

Treatment Progress
The preoperative orthodontic preparation began on December 2011. Before the levelling and alignment procedures (4), the maxillary second premolars were extracted to decouple the maxillary incisor inclination and to reduce the acute nasolabial angle.

Pre-adjusted 0.022-in edgewise brackets were bonded to all teeth. The preoperative orthodontic treatment was achieved in 12 months, ending with 0.018 x 0.025 stainless steel surgical archwires for the maxillary and mandibular arches.

The orthognathic surgery involved a set back of the mandible with a bilateral sagittal split osteotomy. This was performed to improve the mandibular projection and establish an Angle Class I canine position with ideal overjet and overbite.

After the surgery, the patient was placed in interimaxillary fixation for 2 weeks. Two months after surgery, finishing was performed with maxillary and mandibular 0.016 x 0.022-in titanium-molybdenum alloy archwires. The appliances were removed after 18 months of active treatment. Bonded lingual retainers were fitted to the lingual surfaces of the anterior teeth in both arches. Maxillary and mandibular essix retainers were delivered with instructions to wear them full time for two weeks and then night time.

Treatment Results
The post treatment photographs (Fig.5) showed that facial aesthetics were improved, and ideal occlusion was achieved with proper overjet and overbite. The maxillary and mandibular midlines coincided with the facial and mandibular midlines.

The occlusion was finished to a therapeutic Class II.

Discussion
The decision for surgical orthodontic treatment for this patient was based on the fact that his primary concern was his facial profile.

Before the single-jaw surgery: a mandibular setback, preparative orthodontic treatment, including decoupling, was determined to compensate for the malocclusion, is necessary.

The dental decompensation was performed with intention to retract the proclined maxillary incisors to a normal axial inclination. Lack of optional dental decompensation compromises the quality and quantity of an orthognathic correction.

The patient’s teeth were decoupled and adjusting the upper second premolars and levelling the mandibular arch. This phase was achieved in 12 months.

Conclusion
This case report describes the surgical orthodontic treatment of a young adult man with dental and skeletal class III relationships. The orthognathic treatment was the best option for achieving an acceptable occlusion and a good esthetic result. An experienced multidisciplinary team approach ensures a satisfactory outcome.

Presurgical orthodontics removes all the dental compensations and suggests the extent of the skeletal discrepancy. Normal skeletal base relationship is achieved by osteotomy and setback of the prognathic mandible, postsurgical orthodontics guides the normal occlusal rehabilitation by correcting any emerging dental discrepancies (2).

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Dental implant competitors shake things up amidst economic uncertainty

By Kristina Vidug, USA

In 2015, the global dental implant market—composed of the sale of dental implant fixtures, final abutments and other devices—was valued at over US$3.7 billion. The European market, valued at nearly one-third of the global market at close to US$1.2 billion, contracted through 2014, as uncertain economic conditions continued to reduce procedure volumes and as more low-cost competitors entered the market, driving down prices.

These factors hampered the expected economic recovery and resumption of growth projected for 2015. As a result, the dental implant market will continue its decline before stabilising in 2015. Only then will the European market slowly begin to recover. Factors such as low gross domestic product growth and high unemployment continue to render dental implant procedures—which are primarily paid out of pocket by patients—cost prohibitive, while alternatives, such as bridges and dentures, that are perceived as more affordable will represent attractive options.

Dental implants were invented in Sweden; as a result, it is not surprising that a great number of premium manufacturers are based in Continental Europe. In the past, premium manufacturers, such as Straumann and DENTSPLY Implants, were able to rely on their long-standing reputations in the market and the high quality of their products to command higher prices than did some of their competitors.

More recently, however, some of the premium competitors have employed strategies to appeal to increasingly cost-conscious consumers. For instance, Straumann has reduced the price of its titanium implants by 15 per cent in Austria, Germany and Switzerland. While the price change only came into effect in the first quarter of this year, the strategy appears to have been effective because the company reported a 6 per cent rise in first-quarter revenue compared with a 6 per cent decrease in the same period last year.

The price reduction has come at a perfect time: while economic conditions begin to slowly improve, consumers are still extremely price sensitive. These price cuts therefore allow dental professionals to offer premium implant products to their patients at a reduced rate.

Straumann’s price reduction is not its only foray into the value market. In the first quarter of this year, the company purchased US$30 million worth of bonds from low-cost South Korean dental implant manufacturer MegaGen. The investment, which will be converted to shares in 2016, will help bolster Straumann’s revenue while allowing it to participate in both the premium and value segments, thus appealing to a wide range of practitioners and patients alike.

Straumann is not the only company shaking things up in the world of dental implants. Zimmer Dental recently announced its acquisition of rival Biomet. While both companies are better known for their orthopaedic products, they are fairly significant competitors in the dental industry as well. Lay-offs are not uncommon when companies merge, especially when the companies in question offer the same types of products. This can have a negative impact on sales in the short term, as the newly conjointed companies’ sales force decreases, leading clients to switch to other competitors.

However, this will not be the case with the Zimmer-Biomet merger, at least not in the short term, as the sales teams from both companies are expected to be retained through the merger. The cost of retaining both sales teams has been estimated at US$400 million. While the effect of this acquisition on the market remains to be seen, the fact that the sales force will not be decreasing bodes well for the newly merged companies, likely resulting in an increased market share in the dental implant segment.

There is discussion of merger and acquisition activity among other companies in the segment too, with Nobel Biocare reportedly in talks to sell to private equity firms and strategic buyers. While these talks are still in the very early stages, what is certain is that there has been a great deal of activity in the competitive landscape in the past several years.

This, combined with the aforementioned economic factors, is turning the once stable and mature market into a dynamic, action-filled space. With the dental implant market set to rebound in Europe and with revenues expanding in other countries—particularly in the rapidly developing BRIC and Middle Eastern markets—the global industry is poised for even further change, and the competitive landscape could look entirely different a few years from now.

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SameDay Dental Implants® & Teeth
A Surgical & Prosthesis Protocol

By Costa Nikolopoulos Oral & Maxillofacial Surgeon (S.A.) & Petros Yvacoglu Specialist Prosthodontist (U.S.A.)

The original Branemark protocol advocated the use of a two stage surgical approach where the turned (smooth) implants were buried for several months under the mucosa. With the advent of surface enhanced and tapered implants the protocol later evolved into a one stage approach.

Several clinicians then proceeded to immediately load these one stage implants with good success provided good primary stability (more than 45Ncm) was achieved at time of implant placement and provided micromovements could be limited to 100µm. Ample reports have been published on immediate loading of dental implants showing an initial unloaded period of 5 - 6 months is not necessary. From a patient's point of view the reduction of treatment time between implant placement & installation of a functional prosthesis leads to increased patient satisfaction & treatment acceptance. The gain in time the patient implies an economical benefit especially for professional and/or socially active patients.

High treatment acceptance and patient satisfaction are the most important advantages of immediate loading and immediate function.

Surgical Protocol
The surgical protocol of immediate loading of dental implants with same day teeth is based on the following principles:

Avoid Bone Grafts
This is in line with Prof. P.I. Branemark’s philosophy of “Lesser Surgery to Treat More Patients” (Fig 1).

With increased costs and patient morbidity due to bone grafting, an increased patient resistance to implant treatment has been noted. An alternative method of treating implant patients who have suboptimal bone volume without bone grafting is made possible by using:

1. Angled implants in a tilted manner placed into available bone anterior and posterior to the maxillary sinus (Fig 2).
2. Wider and appropriately shaped implants placed into immediate extraction socket molars thereby avoiding socket or sinus grafting (Fig 5).

High Primary Stability
An important factor for immediate loading success is high primary implant stability (greater than 45Ncm) which can be achieved by using a surface enhanced tapered implant design to enhance lateral compression of bone.

By underprepping, high insertion torque and primary stability can be achieved even in cases of decreased bone density such as is often the case in maxillary alveolar bone and as well as in osteoporotic patients. Primary stability can easily be measured during implant placement with a torque wrench (Fig 4).

If 45Ncm insertion torque is not achieved, the implant should be removed and without further bone preparation a 1mm wider implant is placed.

This usually results in adequate primary stability of 45Ncm for immediate loading. If 45Ncm insertion torque is still not achieved then again the implant can be removed and replaced with an even wider diameter implant if the available bone width permits. This progressive results in adequately high insertion torque and primary stability to achieve primary stability (more than 45Ncm). If despite this, adequate primary stability is not achieved then immediate loading is not recommended.

Prosthesis Driven Implant Placement
By using a silicone key of the facial surfaces of the existing teeth (Fig 5) or a silicone key of a diagnostic wax up (Fig 6), it is possible to place the implant in the correct position and angle so that the screw access hole can exit in the correct place to allow for screw retention.

In order not to loose significant orientation, extractions are not performed all at once prior to implant placement but are rather performed one at a time followed by implant placement so that the silicone key can direct the implant surgeon (Fig 7).

It is very often necessary to use an implant with a build in angle of 12°, 24° or even 56° so that the case can be screw retained.

Screw retention is an absolute requirement for biological reasons (to avoid risk of inflammation due to excess cement) as well as the ease of handling of immediate loading in a surgical environment.

Bite registration is started prior to extraction of all the teeth in the maxilla/mandible case so as not to loose the centric relation and vertical dimension (Fig 8).

If this registration is then performed, further implants are placed and the bite registration is completed with addition of bite registration material onto the remaining healing caps.

One Abutment One Time
After bone milling to remove any interfering bone, any multunit abutments are placed in the implants and torqued to 45Ncm at the time of surgery. These abutments are placed and screwed through a “clean” implant platform with no interfering bone or soft tissue and are never disturbed during the “stability period.”

Scientific research shows less bone loss, better bone levels and peri-implant soft tissues when the transmucosal abutments are placed at time of surgery and never removed (Fig 9).

Healing caps are then placed on the multi-unit abutments (Fig 10). After abutment placement, at the same surgical appointment, the impression is taken at abutment level and provisional acrylic screw retained fixed teeth are placed in the same day as the implant surgery.

In single implant cases the healing abutment is placed directly at implant level. An implant impression is taken and six hours later a full ceramic/zirconia screw retained crown is then connected and torqued to 45Ncm directly on to the implant without an intermediate/transmucosal abutment (Fig 11).

No multi-unit abutment is included or placed in the single implant case as the multiunit abutment has no anti-rotation feature.

Flapless/Minimal Flap Surgery
In extraction cases no mucoperiosteal flap is reflected. The integrity of the extraction socket walls is inspected and assessed with a 15mm or 20mm periosteal probe placed into the extraction socket (Fig 12) and this is completed by good vision with magnifying loops and light illumination.

In healed sites where possible the “punch” technique is used (Fig 15).

Alternatively minimal flaps are raised where indicated. This flapless/punch technique/minimal flap approach results in minimal or no soft tissue changes thereby allowing the restorative dentist/prosthodontist to proceed with the provisional acrylic screw retained teeth in the same day and permanent ceramic screw retained teeth in 1 week in the case of multiple implants.

In the case of the single implant the permanent full zirconia screw retained tooth can be delivered in 6 hours on the same day.

Number of Implants
In edentulous cases 4 to 6 implants (lips 14 & 15) are placed per arch depending on:

1. Bone volume & quality (A-P spread)
2. Implant length & diameter
3. Implant distribution (A-P spread)
4. Patient’s age
5. Patient’s finances (cost to benefit ratio)

Prosthodontic Protocol
The prosthodontic protocol of SameDay Dental Implants® & Teeth is focused and designed around the patient’s needs. It’s fast, efficient and doesn’t compromise quality. The patients are never left without teeth for more than six hours. As a result treatment acceptance is high.

All implants with good primary stability (≥45Ncm) are immediately loaded with screw-retained teeth. For single implant cases, the final all ceramic screw retained tooth is fabricated and delivered to the patient within six hours. For single or multiple implants cases, temporary screw retained acrylic teeth are fabricated with.

No multi-unit abutment was in order placed in the single implant case as the multiunit abutment has no anti-rotation feature.

Immediate Loading Dental implants either should be loaded the earliest possible (never exceed ten days after stability) or alternatively two months after placement. This is because the so-called initial stability (mechanical stability) that an implant has, starts to drop gradually and the implant may become susceptible to failure if forces are applied. Fortunately, simultaneously a “secondary stability” (Osseointegration) starts to build up. The sum of the two “stabilities” which is demonstrated on the stability graph (Fig 16), gives us the “total stability.” As a golden rule implants ideally should never be disturbed during the “stability dip” period.

Preoperative Preparation
In order to achieve this protocol, preoperative screening and detailed surgical and prostho-

Fig 1. Dr. Costa and Dr. Petros in line with Prof. Branemark’s philosophy of “Lesser Surgery to Treat More Patients”.
Fig 2. Angled implants placed into available bone anterior and posterior to the maxillary sinus.
Fig 3. Immediate molar replacement implants.
Fig 4. 45Ncm Primary Stability measured during implant placement.
Fig 5. Silicone key of the facial surfaces of the existing teeth.
Fig 6. Silicone key of a diagnostic wax up.
Fig 7. The silicone key can direct the implant surgeon.
Fig 8. Bite registration is started prior to extraction of all the teeth and continued with addition of bite registration material onto the remaining healing caps.
Fig 9. Good peri-implant tissues with “One Abutment One Time” approach.
Fig 10. Healing caps placed on abutments.
Fig 11. The single implant with a Zirconia screw retained crown.
Fig 12. Pulpation of the extraction socket walls with a periodontal probe.
Fig 13. In healed sites where possible the “punch” technique is used.
Fig 14. All-On-4
Fig 15. G.O. On 6-4
Fig 16. Healing caps placed on abutments.
Implant treatment planning is imperative. Fitted the prosthetic point of view, each patient's smile, mouth and occlusion are evaluated with the help of photos and videos (dynamic picture). Impressions are taken and the diagnostic models are mounted. If needed, the digital smile design (ISD) (Fig. 17) concept is used in order to proceed with a diagnostic wax-up. From the waxed models, "silicone keys" of the buccal/lingual surfaces of the teeth, are fabricated, which will be used during the surgery to guide the implant placement.

Impression During Surgery
An impression of the implants is taken during the surgery, either at implant level for single implants or at abutment level for multiple implants. It’s imperative to make sure that the impression copings are seat-ed all the way onto the implants (peritaperical x-rays can be used for verification).

For digital impressions, the open tray technique is recommended with the use of very hard additions and silicon impression material. At the end of each surgery, pre-operative impressions, impressions of the implants and bite registration are provided to the dental lab (Fig. 18). The dental technician mounts the implant models and starts the fabrication of the implant prosthesis.

Single Implant Reconstruction For single implant cases the permanent, screw retained, all ceramic zirconia teeth are fabricated immediately with the use of prefabricated zirconia cores (Fig. 19). They are available in different sizes and shapes, according to the prosthetic platform of the implant in use and the available prosthetic space, between the adjacent teeth. While the patient is waiting in the recovery room the dental technician grinds and shapes the zirconia core and eventually bakes the porcelain on to it. Four to six hours later the permanent tooth is placed into the mouth of the patient and the prosthesis is cements. A periapical x-ray helps to verify the perfect fit (Fig 5) on the implant (Fig. 20). Occlusion is checked and verified with the help of 0.01" thick "schimstock" articulating paper. The prosthetic access hole is obliterated with a crown/overlay filling (tellon tape + opaque composite resin) to allow easy access for retrievability in the future but simultaneously excellent esthetics in the long term.

Two months later upon maturation of the soft tissues and osseointegration, an additional x-ray is taken and if needed modifications are made to the prosthesis.

Multiple Implants Reconstruction
1) Temporary Teeth
For multiple implant cases (three unit bridges to full mouth reconstructions), the temporary screw retained teeth are fabricated by the in-house dental lab within five to six hours and are placed on to the patient on the same day. Providing the temporary teeth are immediately not only a great service to the patient but is also the best “diagnostic tool” for the prosthodontic dentist to record all necessary information for the fabrication of the permanent teeth. If needed modifications are easily made to the acrylic teeth either directly in the mouth or in the dental lab. The patient should be evaluated for esthetics, phonetics and occlusion. Midline, plane of occlusion and buccal corridors are established. The "S" and "I" sounds are checked. The occlusal scheme is adjusted. For extensive cases the “mutually protected occlusion” (Fig 21) is established which means that in centric occlusion, all teeth are touching but the posterior teeth have slightly heavier contacts compared to the anterior and on lateral and protrusive movements the anterior teeth are touching/guiding and there are no "posterior working" or "non-working" interferences (anterior guidance). X-rays are taken in order to verify the passive fit of the prosthesis.

Once all necessary modifications are made and the patient is satisfied, we need to convey all newly established parameters to the final prosthodontic technician. This is achieved by:
1) taking photos and videos to record the esthetic result, in the mouth and
2) using the so-called “Clinical Remounting Procedure”, in the laboratory.

Alginate impressions and bite registration are taken from the temporary teeth, which are removed from the mouth and remounted again on the articulator. From the newly remounted temporary teeth the dental technician fabricates:
1) a series of silicon keys which will guide him to fabricate the permanent teeth and ii) an "An- terior Custom Made Guiding Table" (Fig 22) which will allow him to reproduce the occlusal scheme of the temporary teeth to the permanent teeth.

Two months later the temporary teeth are placed again in the mouth of the patient and the prosthetic access hole is closed down to 20 Ncm. He is instructed not to bite hard onto the acrylic teeth and he is given, extra instructions are provided to him.

2) Permanent Teeth Fabrication
With the help of:
1) the interchangeable implant and temporary models, ii) the silicon keys, iii) the anterior custom made guided table, iv) the photos and v) the videos starts to fabricate immediately the permanent screw retained porcelain teeth.

The permanent teeth need to be ready in one-week’s time and should have perfect fit onto the implants. This is one of the most important prerequisites for optimal implant longevity.

The material of choice, used by our dental lab, for the past 20 years, is porcelain fused to metal. The fabrication of the metal ceramic prosthesis involves a series of technique sensitive procedures. Inevitably in each step, small "5 dimensional inaccuracies" are introduced into the final prosthesis. The sum of these inaccuracies is never zero. As a result, at the end of the fabrication procedure, the final prosthesis will never have a perfect fit onto the implants.

The use of "the Passive Abutment" (Fig 23), which is a titaniu

nium machine-cut interfacial component/cylinder, offsets all the 5D inaccuracies, provided that the implant model is accurate. The passive abutment is cemented by the dental technici- an onto the fitting surface of the prosthesis, in the lab. The master implant model is used as a blueprint for the cementation. Based on our experience over the past 15 years of using pas-sive abutments, the metal try in procedure is not necessary, but speeding up the fabrication of the fit is possible.

5) Placement of the Permanent Teeth
One week after the implant surgery the patient returns for the placement of the permanent teeth.

The temporaries are removed, the prosthetic platform of the implants is cleansed, desiged and immediately the permanent teeth are screwed onto the implants.

There is a big benefit having to work only with "one piece screw retained" (Fig 24) prostheses. There are no multiple custom abutments to be positioned first, the reproducibility of the "one piece prosthesis" makes adjustments much easier, there is no excess cement to deal with, saving cementation that can cause significant complications if left accidentally under the immu- nity tissues.

Fitting of the prosthesis is assessed on the chair with the help of the temporary teeth all parameters (esthetic, phonetics, occlusion) are checked and adjustments are made. The prosthetic screw is torqued down to 52Ncm and the prosthetic access holes are obturated. A night guard is provided and the patient is instructed to use it every night. Oral hygiene instructions are demonstrated and their importance is emphasised.

Follow up
Two months later the osseointegration of the implants is radiographically and mechanically evaluated. In case of soft tissue recession, a pick up impression of the prosthesis is done. A new soft tissue model is fabricated and the dental technician can add porcelain accordingly (Fig. 25). The patient is followed up every six months for the first two years and thereafter according to his/her oral hygiene level.

Complications
The most frequent of the prostho-dontic complications are porcelain fractures/chipping. These are easily repaired by removing the teeth and relaying the porcelain.

Conclusion
By using tapered angled implants as well as wide immediate molar replacement implants in a prosthetically driven fashion it is possible in most cases to avoid bone grafts, achieve high primary stability and treat patients with implants and passively fit screw retained teeth all in the same day (Fig 27).

This reduction in treatment time, immediate function and cost saving leads to high patient satisfaction and increased treatment acceptance by patients.

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used to etch the fitting surface of each veneer for 60 seconds as recommended by the manufacturers to obtain a clean ceramic surface for durable bonding.

Empress ceramic primer Monobond-S was used as a silane-coupling agent for one minute and then air dried for five seconds according to the manufacturers instructions. One layer of Excite bonding agent was applied on the fitting surface of each veneer for 60 seconds then air thinned for 5 seconds Fig 10.

Tooth structure surface treatment:

Transparent strips were used on the proximal surface of adjacent teeth to avoid etching effect. Phosphoric acid 35 % was used to etch the enamel margins of the tooth preparations for 30 seconds and 15 seconds for the dentin areas. Copious air water spray was used to remove the acid for 20 seconds. One layer of Excite bonding agent was applied on the tooth structure and air thinned for five seconds, LED light curing unit was used for curing.

Vario-link Veneer light activated resin cement was used for cementation of the two laminate veneers. Optra Sticks were used for holding the labial surface of the veneer for better handling processes during cementation. Initial polymerization was made and excess cement was removed with a sharp tip of a probe, Dental floss was used to ensure that there is no trapped cement in between the embrasures. Final polymerization was completed.

Intra oral proximal strips were used for better smooth proximal margins Fig.11.

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By Dental Tribune MEA

U nder the high patronage of his Excellency the President of the Parliament of Lebanon Mr. Nabih Berry, Lebanese Dental Association known by its yearly BIDM (Beirut International Dental Meeting) has organized the 24th BIDM 2014 in collaboration with the Saudi Dental Society at BIEL in Beirut on 11-15 September 2014.

Pre-congress courses and workshops took place on September 10 at “USJ” - University St. Joseph - Faculty of Dentistry which was managed by Professor Ghassan Yared and Professor Carina Mehanna, under the supervision of Prof. Nada Naaman, Dean of Faculty of Dentistry.

On the first day of the event the attendees witnessed the ribbon-cutting ceremony followed by a tour of the exhibition exploring the latest dental technologies, equipment and services displayed by numerous key industry leaders and dental manufacturers.

The BIDM 2014 not only opened the doors to open-discussions and learning for the region but allowed the participants to build their skills and use the opportunity for networking by up-to-date knowledge and sharing experiences in the application of technology throughout the event.

President of Lebanese Dental Association, Prof. Elie Maalouf discussed during the opening ceremony: “With the theme “Planning for the Future” we encourage all Lebanese living in Lebanon and abroad, as well as all Arab and foreign dentists to attend this highly regarded meeting, in an effort to plan for a better future, not just scientifically, but culturally and politically.”

Prof. Maalouf further announced, “We should all denounce terrorism and extremist behavior. Attending this meeting and especially in this dire time will tell the world that we are strong together and will show them that no matter how hard they try to separate us we will always find a platform to meet. Lebanon is a small country but it has always reflected to the world a sense of modern civilization and openness to all cultures and religions. Lebanon does not tolerate extremist behavior and will not allow negative media to taint its reputation. Holding ambitious annual dental meetings with world renowned international and local speakers will show the world that we are competing with first world countries regarding scientific achievements.”
The general secretary of LDA, Dr Walid Khattar further declared during the ceremony: “Efforts exerted leading to this conference were colossal, we did very important team work as council members, committee members, professional and competent employees, to accomplish this conference. I hope that you will benefit from interesting scientific topics aiding therefore to dental medicine a new scientific cornerstone.”

The conference further proved to be a vital platform for the participants to share ideas, explore the potential of new advances in technology and foster closer ties. The BIDM 2014 gathered under one roof of 6,000 square meters more than 4,500 dental professionals in the dental field.

The scientific conference brought together more than 2,500 dentists registered to the event program from Lebanon and the region and more than 1000 have been registered as visitors to the exhibition area. This year, despite the difficult situation in the region, the event gathered 36 highly esteemed guest speakers from 16 countries around the world (USA, India, France, Germany, United Kingdom, Italy, Bulgaria, Libya, Greece, Spain, Lithuania, and from the Arab countries Kuwait, Sultanate of Oman, Egypt, Kingdom of Bahrain and KSA) in addition to an interesting panel of Lebanese talented lecturers will attempt to clarify during 3 exciting days some of the most important issues and dilemmas arousing today. They highlighted on areas of ongoing developments and frontiers of research challenges in treatment planning, clinical performance and sustainable measures that are essential for a long-term treatment success. The event also received sponsorship by major market players and dealers in the region and the world leading companies, more than 137 companies were part of a unique huge space offered this year.

The event came to a conclusion with 13 lucky draws sponsored by Lebanese Dental Association during the closing ceremony. Overall, The BIDM 2014 was a resounding success with nothing but positive feedback from the visitors. The courses this year covered a variety of topics including: Endodontology, restorative dentistry, pediatric dentistry, laser in dentistry, Surgery and implant loading. Each course received specific continuing education hours in collaboration with CAPP (Center for Advanced Professional Practices) which is an ADA CERP recognized provider.
Saliva and Oral Health

By Michael Edgar, Colin Dawes & Denis O’Mullane contributed to by Mahesh Navazesh

Excerpt from Saliva and Oral Health: An Essential Overview for the Healthcare Professional


The presence of saliva is vital to the maintenance of healthy hard (teeth) and soft (mucosa) oral tissues. Severe reduction of salivary output not only results in a rapid deterioration of oral health, but also has a detrimental impact on the quality of life for the sufferer.

An understanding of saliva and its role in oral health helps to provide an important foundation for oral health care professionals of the problems arising when the quantity and nature of saliva are decreased; this awareness and understanding is important to the choice of patients for oral health care and treatment of the condition.

There is an extensive body of research in the area of saliva fluid. It has been used to indicate an individual’s susceptibility to developing caries, it has also been shown to be an important physiological and pathological changes which are mirrored in saliva. The beneficial benefits of saliva as a diagnostic fluid is that it is easily available for evaluation and analysis. It can be used to monitor the presence and levels of harmful microorganisms and ion.

The following article provides an overview of oral complications associated with salivary gland hypofunction. The focus is on the epidemiology, diagnosis, clinical implications and management of xerostomia.

Xerostomia and Salivary Gland Hypofunction

Saliva plays a significant role in the maintenance of oral-pharyngeal health. Subjective complaints of a dry mouth (xerostomia) and functional impairment, such as difficulty swallowing, chewing, and talking, are common conditions, particularly in medically compromised older adults. They can result in impaired food and beverage intake, a sundry of oral disorders, and diminished host defence and communication. Persistent salivary gland hypofunction can produce permanent oral and pharyngeal disorders and impair a person’s quality of life.1

Global estimates of xerostomia and xerostomia associated disorders are difficult to ascertain due to varying study design, differences in diagnostic criteria, usage of the term xerostomia and salivary gland hypofunction interchangeably, utilization of different diagnostic criteria and salivary collection methods, and small sample sizes. However, overall, the prevalence of xerostomia and salivary gland hypofunction increases with age and affects approximately 60% of people aged 65 years and older.

There are multiple causes of xerostomia and salivary gland hypofunction, the most common are those associated with age, and are not an age-related condition. There are various levels of xerostomia ranging from mild to severe. The prevalence of xerostomia is nearly 100% among patients aged 65 years and older.

Estimates of the prevalence of xerostomia in adult ambulatory and nursing home populations range from 16-72%.2,3 Combining the prevalence of xerostomia associated with age, the percentage of adults with these conditions who complain of xerostomia has been estimated at 50%.4 Furthermore, general estimate of approximately 50% xerostomia prevalence among adults 65 years and older.

Approximately 80% of all persons over age 65 have at least one chronic condition and 50% have at least two. Hypertension, diabetes mellitus, heart disease, and stroke are the most frequently occurring conditions among older adults. These con-

Subjective responses and questionnaires

The establishment of a diagnosis of xerostomia is usually a result of patients’ complaints and can be advanced with the use of questionnaires. It should be noted that a patient’s presenting complaint may not be dry mouth in spite of the presence of sali-
vary gland hypofunction. Therefore, lack of complaint should not be perceived as absence of adequate saliva secretion. Many of the common oral symptoms of xerostomia are associated with mealtime: altered taste, difficulty eating, chewing, and swallowing, particularly dry foods, and especially without drinking accompanying liquids. Patients may complain of impaired denture retention, halitosis, retronasal, taste, dysphagia, and intolerance to acidic and spicy food and beverages. Xerostomia is also common, since salivary output normally reach- es its lowest circadian level during sleep and may be exacerbat-

General oral examination

Extroral findings associated with salivary gland hypofunction may include dry and cracked lips that are frequently consumed with Candida species (angular cheilitis). Visible and palpable stigmata of saliva gland hypofunction occur secondary to salivary in-
fecations and obstructions (e.g., bacterial, fungal, and Sjögren’s syndrome). A swollen parotid gland can displace the tooth bearing tissues can develop erythro- mythic, and raw with an ir-

Caries and xerostomia

There are numerous introral complications associated with xerostomia. Oral mucosal surfaces become desiccated and easily friable. The tongue loses its full papillae and will appear dry, erythmic, and raw with an ir-

Value below 45% of normal level significantly greater numbers of caries-

Associated root surface caries is a particularly challenging condition to diagnose and treat and, therefore, identification of patients at risk will be essential to reduce the need to take the preventive measures to preserve the dentition.

With deficient remineralisation, dental erosion is a more frequent occurrence in patients with salivary gland hypofunction. The consumption of foods and beverages containing teeth occasionally receive great- er abrasion from brush tooth and are susceptible to dental erosion. Occlusal and incisal surfaces of the anterior and traumatic forces can also undergo greater loss of enamel and dentine where there is insuf-
ficient saliva to permit remineralisation.

Dry mouth may result from many drugs. Xerostomia is a frequent complaint of patients taking antidepressant medication. The prevalence of xerostomia among patients taking antidepressant medication is approximately 50%, and is significantly greater in women than in men. Depression and anxiety are frequently occurring conditions associated with xerostomia and salivary gland hypofunction. There are numerous causes of xerostomia and salivary gland hypofunction. It is also generally accepted that when xerostomia is associated with medications that may be in the mouth before saliva collection begins. A timer begins and the person is instructed to chew the wax or gum base at a rate of 60 chews/minute. After five minutes the person is instructed to expectorate the remaining saliva into the container. The volume is recorded gravimetrically and expressed as ml/min.

Stimulated whole saliva flow rates less than 0.5 ml/min are also considered to be suggestive of salivary hypofunction. The most commonly used technique for collecting this form of saliva is with the use of a standard piece of paraffin wax or chewing gum flavoured with a base (typically 1.2 g). A test tube or similar container with the paraffin wax base is weighed prior to saliva col-

The person is instructed to chew the wax or gum base that may be in the mouth before the saliva collection begins. A timer begins and the person is instructed to chew the wax or gum base at a rate of 60 chews/ minute. Without swallowing, the saliva is collected and the person is instructed to expectorate the remaining saliva into the container and the collection is completed. The volume is recorded gravimetrically, and expressed as ml/min.

Values below 45% of normal levels can be used to define xerostomia, the primary dental problem in patients with Sjögren’s syndrome is compared with healthy controls,5,6 which may be due to greater attention to oral health and more frequent use of professional dental services. In addition, while several studies have demonstrated significant incre-

Clinical implications of xerostomia and salivary gland hypofunc-
tion

Dental caries and xerostomia

One of the most common oral conditions that develop as a re-
sult of salivary gland hypofunc-

difficulty swallowing), and difficulty chewing food secondary to salivary gland hypofunction can lead to changes in food and fluid selection that compromise nutritional status. The speech and eating difficulties that develop can impair social interactions and may cause some patients to avoid social engagements. Dysphagia increases susceptibility to aspiration pneumonia and colonization of the lungs with Gram-negative anaerobes from the gingival salivus.10

Management of xerostomia and salivary gland hypofunction

The initial step in the management of xerostomia is the establishment of a diagnosis. This frequently involves a multidisciplinary team of health care providers who communicate effectively, since many patients have concurrent medical conditions and frequently experience complications of polypharmacy. The second step is scheduling frequent oral health evaluations due to the high prevalence of oral complications.11

Maintenance of proper oral hygiene and hydration (water is the drink of choice) are helpful. Several habits, such as smoking, mouth breathing, and consumption of caffeine containing beverages, have been shown to increase the risk of xerostomia. Limiting or stopping these habits is helpful (the drink of choice) are helpful. Several habits, such as smoking, mouth breathing, and consumption of caffeine containing beverages, have been shown to increase the risk of xerostomia. Limiting or stopping these habits is helpful.


4. Underwriting costs for this Saliva and Oral Health edition were provided by Dr. Michael Dodds and The Wrigley Company.

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