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DR. RAJ KHANUJA

DDS, MPH, FAGD, FIDIA

ARTICLES PUBLISHED:

1. GUM GRAFT TECHNIQUES FOR PREDICTABLE OUTCOMES
2. COMPUTER-GUIDED IMPLANT SURGERY
3. FLAPLESS SOLUTION FOR IDEAL IMPLANT PLACEMENT

Welcome to Castlemore Dental. This journal will share with you the philosophy and culture of our clinic. Dr. Raj Khanuja received a Bachelor of Arts in Genetics and Poetry, Masters in Public Health Management and a Doctor of Dental Surgery. He is a Fellow of the Academy of General Dentistry and the International Dental Implant Association. Dr. Raj has published articles on common dental problems, is committed to social responsibility and has received many business awards and accolades. He believes the published articles will provide you with knowledge and empower you to make better oral health care decisions.

Publications by Dr. Raj Khanuja

1) Sensitivity caused by gum recession (The Journal of Ontario Dentist issue of May 2019).
This article shows the utilization of The Pinhole technique done through tiny holes: No scalpel No suture, and No tissue from roof of the mouth.

2) Loose fitting lower denture locked with two implants (The Journal of Ontario Dentist issue of December 2017).
This article address issues for patients who wear dentures. As low as two dental implants in the lower jaw can lock the denture in place making it firm and stable and replace the glue.

3) Missing teeth replacement with dental implant utilizing Computer Guided Implant Surgery (The Journal of Ontario Dentist issue of January 2017).

This article shows innovations in 3D technology where a dental implant can be placed safely and with accuracy in the area of missing tooth.

Community Service:

The cost of dental services are sometimes restrictive for residents without dental insurance coverage. Dr. Raj recognized the problem, took a leadership role and started an annual free dental clinic day in 2012 which evolved into a project called- “Doing Positive in my Backyard”.
On the free dental clinic day, we provide basic dental services such as cleanings, fillings and extractions to patients who otherwise cannot afford dental treatment.
To date, $115,000 worth of pro bono dental services has been provided.

Awards and Honours:

Dr. Raj is a recipient of the Canada 150 Medallion, which is a medal of honour for community service presented by the Member of Parliament for Dufferin-Caledon; David Tilson. Dr. Raj’s perseverance and commitment to social and community responsibility, was recognized with the June Callwood Outstanding Achievement Award for Voluntarism from the Government of Ontario presented by the Minister of Immigration and Citizenship; The Honourable Laura Albanese.

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THE ***JOURNAL*** OF THE ***ONTARIO DENTAL ASSOCIATION***

Gum Graft Techniques for Predictable Outcomes

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Periodontal Plastic Surgery: Gum Graft Techniques for Predictable Outcomes

Periodontal plastic surgery encompasses various surgical techniques that can be used to correct gum recession. The main goal when restoring health, function and esthetics of lost tissue due to gingival recession is to accomplish surgery in the most efficient way possible, with the fewest post-operative complications. This case study utilized three gum graft techniques from different eras — the free gingival graft (FGG), the sub-epithelial connective tissue graft (SCTG) and the pinhole surgical technique (PST) — in different quadrants of the same patient to obtain harmony, balance and continuity of form and smile esthetics.

Free gingival graft

The FGG is an auto-graft obtained from a palatal donor site. After transplantation to the recipient site, the graft benefits from blood supply from the adjacent tissue. This helps sustain the graft over avascular root surfaces. Since the graft is obtained from the palate, the mature graft may resemble palatal tissue. The FGG may result in an unaesthetic "patch-like" appearance, and is therefore often contraindicated in the esthetic zone (1,2).

The drawback of this procedure is the discomfort and/or pain associated with secondary intention healing of the donor site. Usually, the FGG should not be used in areas of inadequate attached gingiva when root coverage is indicated. Other techniques are more predictable and yield a more esthetic result (3). The application of an FGG for root coverage was first described by Nabers in 1966, and with few modifications, the principles and techniques described by Sullivan and Atkins in 1968 are still valid (4,5).

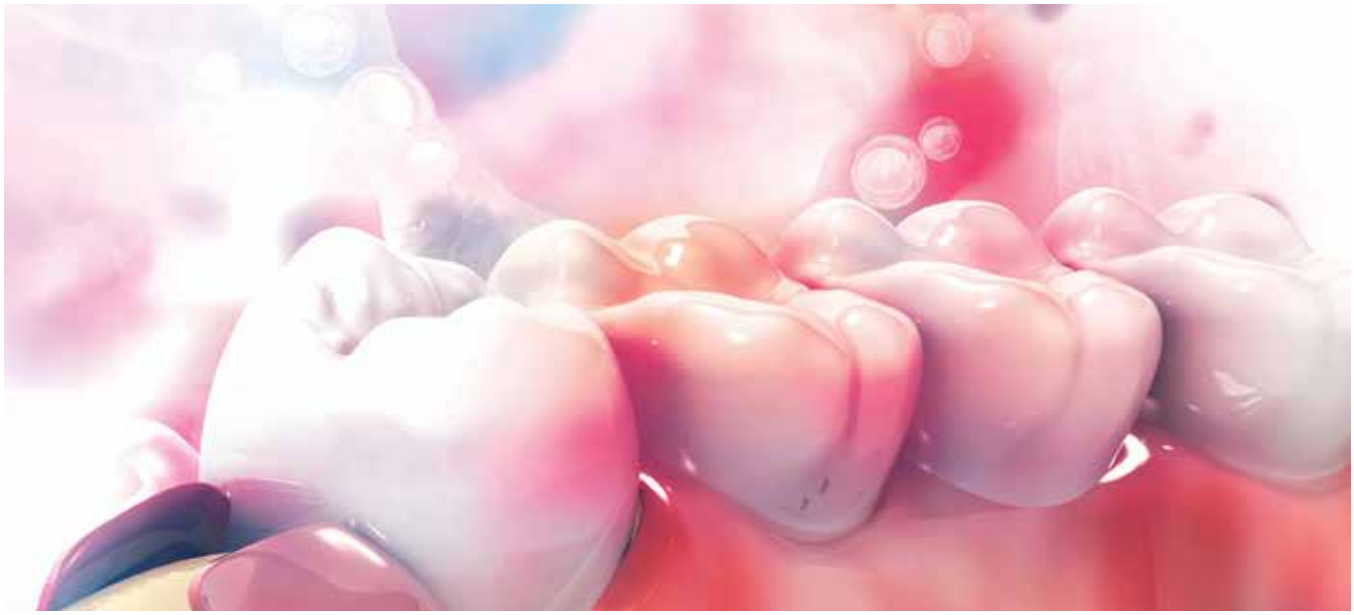
Indications:

- Increase in the zone of attached and keratinized gingiva to stop further gum recession
- Pre-prosthetic gingival augmentation for full coverage dental restorations (crown and bridges)

Sub-epithelial connective tissue graft

The SCTG is one of the most versatile and predictable periodontal plastic surgical procedures. It consists of a bilaminar reconstruction of the gingiva to preserve graft viability over denuded root surfaces (6,7), and benefits from the dual blood supply to the graft (from the underlying periosteum and the overlying flap). The results are limited by the amount of avascular root surface and the interdental periodontal attachment levels (8). Based on Miller's classification, up to 100 per cent root coverage can be anticipated in Class I and Class II defects where there is no interproximal loss of bone or gingiva, but is limited in Class III and IV defects where there is interdental periodontal attachment loss (9).

It has been shown that it is the underlying connective tissue that determines epithelial differentiation (1,2). Therefore, since only the connective tissue is transplanted in the "interpositional" SCTG, it results in esthetic root coverage. The connective tissue is harvested from beneath a partial thickness flap, wound healing in both the donor and recipient sites occurs mostly by primary intention. This helps expedite maturation and also reduces post-operative discomfort.



Indications:
- Root coverage with esthetic results
- Isolated wide gingival recession
- Multiple root exposures
- Multiple root exposures in combination with minimal attached gingiva

The pinhole surgical technique

The PST is an example of a recent advancement in minimally invasive soft-tissue grafting surgery that combines specialized surgical instrumentation and a modification of the tunnel technique. As a modified tunnel technique, the PST uses "pinhole" incisions made in the alveolar mucosa with a syringe needle. The number of pinhole incisions required is determined by the number of teeth that need to be treated, and the incisions are placed 4 mm above the muco-gingival junction.

Specialized instruments are then used to elevate a muco-periosteal envelope of tissue that can be coronally advanced from the original tissue level to 3 to 5 mm above the desired level of tissue coverage. Root surfaces of the teeth to be treated are mechanically debrided to remove accretions and the smear layer. After sufficient tissue release, non-cross-linked collagen membrane strips are placed into the pinhole incisions as a means of providing tissue bulk and support. After enough regenerative material is placed and the envelope of tissue has been sufficiently bulked and advanced, the procedure is finished (10).

Using the PST protocol, one study measured 85 recession sites that were Miller Class I or Class II recession with a mean follow-up time of one-and-a-half years. Defect coverage was obtained in 91 per cent of the cases and near-complete root coverage in 81 per cent of the cases. Time of the surgical procedure compared to conventional soft-tissue grafting techniques was decreased. Post-operative patient discomfort and swelling were also extremely reduced.

Indications:
- Natural teeth with two or more areas of recession in the Miller Class I and Class II ranges

Case study

The success of root coverage varies depending on the width and height of recession, biotype of gingival tissue, interdental bone loss, type of surgical technique used, and smoking status (11). The aim of this case study is to demonstrate how three different techniques — FGG, SCTG and PST — were used predictably to accomplish the desired end result.

The case presented here is a 57-year-old male with controlled diabetes (ASA 2), who is otherwise healthy. He presented with recession in quadrants one, three, and four. Pre-operative intraoral photographs of the recession were taken.

Diagnosis of recession defect

Teeth #15, #14 and #44

Class I Miller recession defect not extending beyond the mucogingival (MG) junction and no loss of interdental (ID) soft tissue and bone. Prognosis recession defect less than 5 mm favorable for complete root coverage.

Figure 1.
Pre-op symptoms: Teeth #14, #15, #16. Thermal sensitivity and food trap around the gingival margin.

Figure 2.
Six-month post-op PST. Teeth #14, #15 had 100 per cent root coverage plus partial restoration and tooth #16 had 90 per cent root coverage. Thermal sensitivity and food trap eliminated.

Figure 3.
Pre-op condition tooth #33. Class III Miller recession. Thermal sensitivity, erythema present with spontaneous bleeding and tooth looked longer than normal.

Figure 4.
Six-month post-op SCTG. Tooth #33 had 50 per cent root coverage. Thermal sensitivity, erythema and spontaneous bleeding eliminated and tooth looked close to normal size.

Figure 5.
Pre-op condition tooth #44, Class I Miller recession; tooth #45, Class III Miller recession. Inadequate attached gingiva and frenum pull present. Symptoms included food trap and potential for further recession.

Figure 6.
Six-month post op FGG. Teeth #44 and #45 gained adequate attached gingiva and frenum pull eliminated. Food trap and potential for further recession eliminated.

Tooth #	16	15	14	33	44	45
Gingival recession (CEJ to gingival margin (mm))						
Pre-op	2	3	2	4	3	5
Post-op	0.5	0	0	2	2	4
Keratinized attached gingiva (mm)						
Pre-op	2	3	3	0.5	0.5	0.5
Post-op	3	3.5	3.5	1	4	4
Unattached keratinized gingiva (mm)						
Pre-op	1	1	1	1	1	1
Post-op	0.5	0.5	0.5	0.5	1	1
Root sensitivity						
Pre-op	–	++	++	+++	+	+
Post-op	–	–	–	–	–	–
Root caries						
Pre-op	–	–	–	–	–	–
Post-op	–	–	–	–	–	–
Gingival inflammation						
Pre-op	+	–	–	++	+	+
Post-op	–	–	–	–	–	–
Mobility						
Pre-op	1	1	1	1	1	1
Post-op	1	1	1	1	1	1

Teeth #16, #33 and #45

Class III Miller recession defect extending beyond the MG junction with loss of ID soft tissue and bone apical to CEJ but coronal to the recession. The defect on these teeth was classified as Class III Miller recession due to loss of interdental tissue resulting from missing adjacent tooth. Prognosis up to 50 per cent root coverage.

The patient was presented with all options of gum graft surgery. The PST was recommended and accepted for quadrant one (teeth #14, #15 and #16) with the end result of 50 to 100 per cent root coverage, reduced thermal sensitivity and prevention of further recession. The SCTG was recommended and accepted for quadrant three (tooth #33) to achieve up to 50 per cent root coverage, reduced thermal sensitivity and bleeding, thickened gingiva to prevent further recession root coverage. The FGG was recommended and accepted for quadrant four (teeth #44 and #45) to increase the width of keratinized gingiva to prevent further recession and no root coverage was anticipated. Six-month post-operative intra-oral photographs were completed.

Teeth #14, #15 and #16

Recession: Class I Miller on teeth #14 and #15 and Class III Miller on tooth #16
Surgical technique: Pinhole
Intention: Root coverage 50 to 100 per cent
Anesthetic used: 1 x 1.8 ml 2 per cent lidocaine 1:100,000 epinephrine given as a buccal infiltration at site (#12-#17). Prepared root surfaces of #14-#16 using Cavitron and #3 round diamond bur. Irrigated with saline. Treated root surface with 17 per cent EDTA solution by Pulpdent. Treated teeth with chlorohexidine 0.12 per cent. Irrigated with saline. Pinhole made in alveolar mucosa using sterile 16G 11/2 BD PrecisionGlide needle by Becton Dickinson and Co. Pinhole made apical to teeth #13 and #25, about 4 mm below MG junction. Used instruments in coronal direction to raise full thickness flap. The interproximal extension of the flap resulted in a freely moveable flap. The flap was then positioned coronally to extend beyond the CEJ. The flap was stabilized using bio-resorbable collagen membrane Bio-Gide by Geistlich cut into 2 x 12 mm strips and soaked in saline and placed under the papillae and marginal soft tissue. Tissues pressed gently for 10 minutes. Reinforced POI.
Rx: Ibuprofen 600 mg (20 tabs). Take 1 tab q6h prn pain.

Tooth #33

Recession: Class III Miller
Surgical technique: SCTG
Intention: Esthetic root coverage
Anesthetic used: 1 x 1.8 ml 2 per cent lidocaine 1:100,000 epinephrine given as a buccal infiltration at site (#32-#34), and 1 x 1.8 ml 2 per cent lidocaine 1:100,000 epinephrine given as palatal infiltration at site (#24-#26). A sulcular incision made at recipient site (#32-#34) to create an envelope. A split-thickness flap was reflected at the recipient site (#32-#34) and the root of the tooth was flattened with a diamond high speed bur to reduce convexity, allowing easier tension-free coronal advancement. A sub-epithelial connective tissue graft was harvested from donor site (#23-#25) and immobilized to recipient bed and covering the root, with complete soft-tissue coverage of the graft achieved by advancing the recipient flap over the grafted tissue and sutured in place. Recipient and donor site closure with 4-0 chromic gut and 5-0 chromic gut sutures. Coe-Pak placed at both donor and recipient sites. Hemostasis achieved. Reviewed post-op instructions, diet, OHI.
Rx: Amoxicillin 500 mg (21 tabs) TID until finished; Ibuprofen 600 mg (20 tabs) Take 1 tab q6h prn pain; Tylenol #3 (15 tabs) Take 1 tab q4-6h prn pain.

Teeth #44 and #45

Recession: Class I Miller on #44 and Class III on #45
Surgical technique: FGG
Intention: Increase width of keratinized gingiva
Anesthetic used: 1 x 1.8 ml 2 per cent lidocaine 1:100,000 epinephrine given as a buccal infiltration

at site (#44, #45), and 1 x 1.8 ml 2 per cent lidocaine 1:100,000 epinephrine given as a palatal infiltration at site (#14-#16). Horizontal incision made at MGJ of recipient site (#44, #45) with apical dissection of partial thickness flap to expose periosteal recipient bed. Full-thickness free gingival graft (epithelium and connective tissue ~1.5-2 mm thick) tissue harvested from donor site (#15-#16) and immobilized to recipient bed, with recipient and donor site closure using 4-0 chromic gut and 5-0 chromic gut sutures. Coe-Pak placed at both donor and recipient sites. Hemostasis achieved. Reviewed post-op instructions, diet, OHI.
Rx: Amoxicillin 500 mg (21 tabs) TID until finished; Ibuprofen 600 mg (20 tabs) Take 1 tab q6h prn pain.

Conclusion

In summary, the versatility of periodontal plastic surgery procedures now allows periodontal plastic surgeons to create the framework for the perfect smile even in the most difficult and compromising conditions. Three procedures, the FGG, SCTG and PST, were utilized in different sites in the same patient. Each procedure has clear advantages and disadvantages that were evaluated according to the patient's needs. In addition, all procedures are limited by the amount of avascular root surface, the height of the interproximal papillae, and the alveolar bone. To accomplish the desired end result, utilization of a suitable or a combination of surgical techniques with proper patient communication is key.

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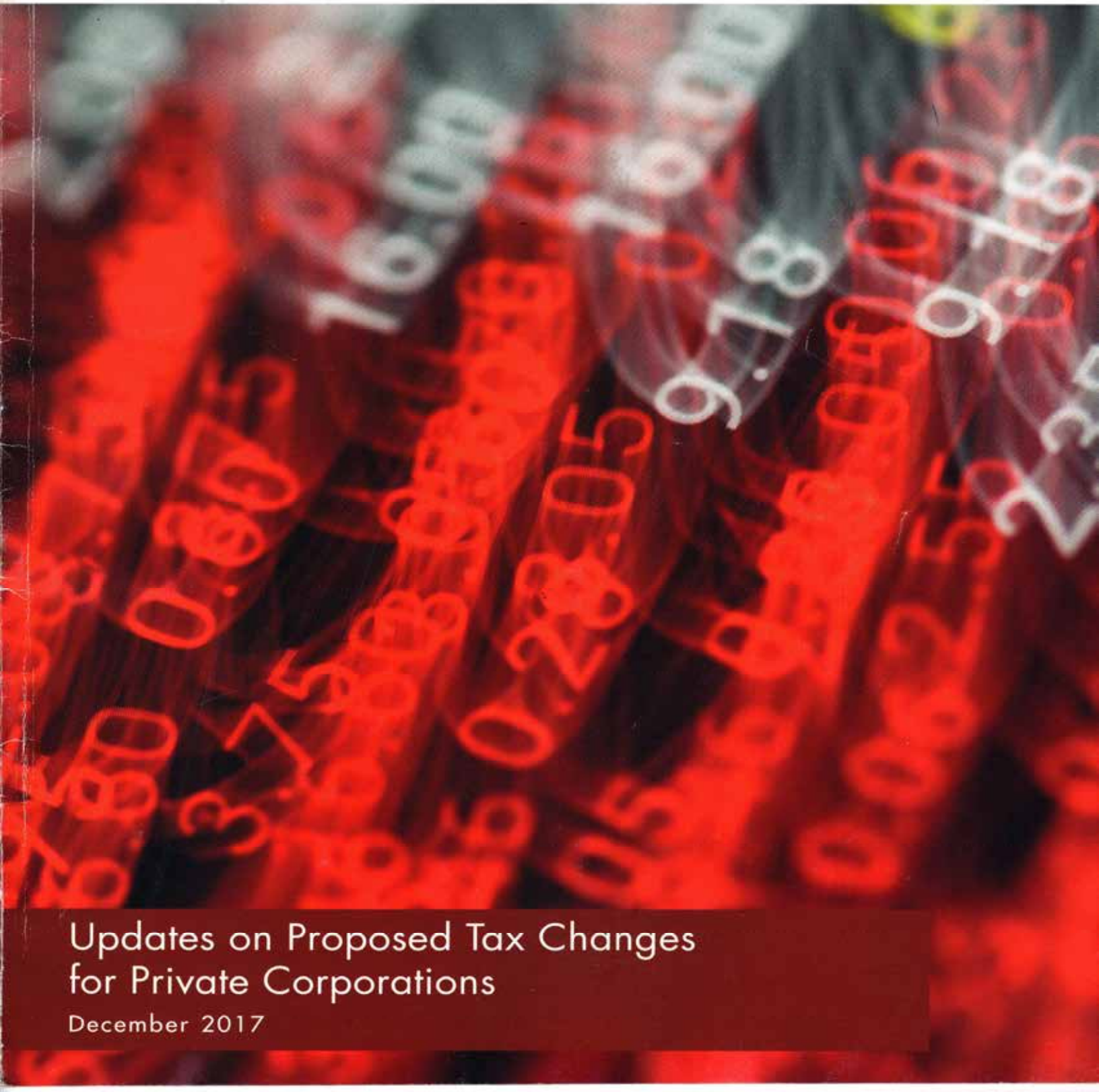

Updates on Proposed Tax Changes for Private Corporations

December 2017

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Computer-Guided Implant Surgery: Ideal Two-Implant Mandibular Overdenture

Introduction

Prior to the advent of dental implants, the traditional standard treatment for the edentulous patient was the provision of a tissue-supported conventional complete denture. The conventional complete denture has allowed wearers to speak, eat and function more easily than they could without any prosthesis. Despite this, the denture wearers frequently report problems with oral function, typically caused by retention and stability problems of the mandibular prosthesis.

An alternative to the conventional denture would be implant-supported fixed bridges, hybrid prosthetic dentures, and removable over-denture prostheses. An implant-supported over-denture is a conventional acrylic denture retained by attachments to implants (1). Oral rehabilitation by means of an implant-retained mandibular overdenture is known to improve oral function, as suggested by several studies (2-6).

For example, Wismeijer (2) evaluated the three different treatment strategies for such a prosthesis: a mandibular over-denture supported by two implants with ball attachments, two implants with an interconnecting bar, or four interconnected implants. Before treatment, most patients had complaints about the retention of their mandibular denture. Sixteen months after treatment, almost all patients were generally satisfied with their dentures. Since no significant difference was found between the three treatment strategies, it was concluded that simple implant treatment such as an over-denture retained by two ball attachments is sufficient. Van der Bilt et al. (3) suggested maximum bite force and masticatory performance significantly increased after implant treatment and remained unaltered after a 10-year period. Thus, implant treatment can greatly improve oral function for a long period of time. A study by Turkyilmaz (4) suggested implant-supported dentures, including either complete overdentures or a hybrid prosthesis, significantly improves the quality of life for edentulous patients compared with conventional removable complete dentures. Awad et al. (5) compared elderly patients' satisfaction and oral health-related quality of life with mandibular two-implant overdentures and conventional dentures. The results suggested that a mandibular two-implant overdenture combined with a maxillary conventional denture provides better function and oral health-related quality of life than conventional dentures. Finally, the McGill Consensus Statement (6) on the two-implant overdenture is based on a change in the current state of knowledge and was developed by a panel of expert clinicians and scientists who presented information in a symposium focused on overdentures. This statement indicates that, as a minimal treatment objective, the mandibular two-implant overdenture (as opposed to a conventional denture) should be considered as a first-choice standard of care for the edentulous patient.

The case

The case presented here is a 73-year-old female with controlled diabetes/blood pressure who is otherwise healthy. She presented with a severely atrophied mandible and maxilla and existing upper and lower complete dentures. Over a 30-year time period, she had five sets of lower dentures but was never able to function with them. She reported that, most of the time, the lower dentures sat in her purse, as they would move around during masticatory function, leaving her with ulcers and pain that would last for days. A panoramic radiograph showed a severely atrophied maxilla and mandible (Figure 1).

After considering options with two or more implant-supported prostheses, the patient had opted for a conventional maxillary denture and a two-implant supported mandibular denture. A Cone-beam CT (CbCT) was prescribed to evaluate quality, buccal-lingual width and height of bone to place implants. The case was

Figure 1.
Panoramic radiograph showing severely atrophied maxilla and mandible.

Figure 2.
Mucosal M-guide with three (2mm) sleeves to place retention pins, and two (regular M-guide) sleeves to place implants.

performed using Computer Guided Implant Surgery (CGIS). The flap design for this case was the punch and flapless technique through intact tissue, as CbCT scan data offered a broad flat ridge with no osseous re-contouring indicated. This technique, when conditions permit, is the most conservative and results in the least bone loss (7). CGIS was performed using computer software coDiagnostiX® (IVS Solutions AG, Chemnitz, Germany) to analyze CbCT scan data for sites #33 and #43 (left and right mandibular canine). Virtual implants were placed that took into account the inter-implant distance, parallelism between the two implants, buccal-lingual width of the mandibular ridge and mental nerve, as well the path of draw for the attachment of the locators to the denture. The CbCT scan data of the finalized implant position was utilized to fabricate an M-guide mucosal surgical template (8) from the existing lower denture and was used to perform surgery in conjunction with an M-guide surgical kit (9).

The implants were ideally positioned to accommodate the following key principles for success: The final prosthetic form and tooth position was determined first by fabricating a lower denture. Two access windows were made to pick up retention housing and repaired with acrylic. A minimum 7mm of restorative space in inferior superior dimension was confirmed to accommodate the height of abutments, retentive elements and adequate thickness of the acrylic. The two implants were placed in the canine position parallel to each other. The most ideal implant position is determined between tooth position and available bone (7).

This final prosthetic housing and equator position was determined prior to implant placement. The M-guide surgical template (Figure 2) held the surgical planning information and was utilized to perform the surgery. The surgical protocol for implant placement in sites #33 and #43 was as follows:

- The patient's medical history was updated. She had controlled diabetes and hypertension and was classified as ASA 3. The patient was given 2gm of Amoxicillin prophylaxis. Inform consent was discussed in detail and signed. The patient's B.P. measured at 147/89.

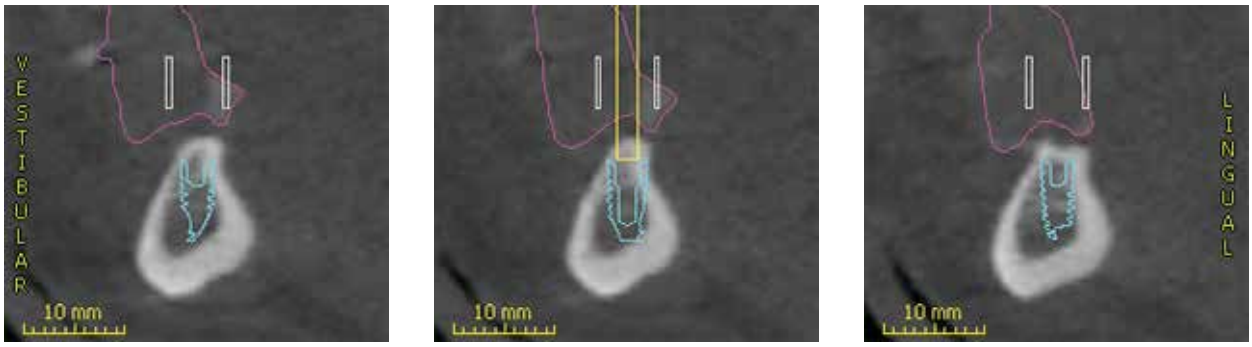

Figure 3.
CbCT for #33 site with virtual implant placed in ideal position in relation to buccal-lingual width and height of the bone.

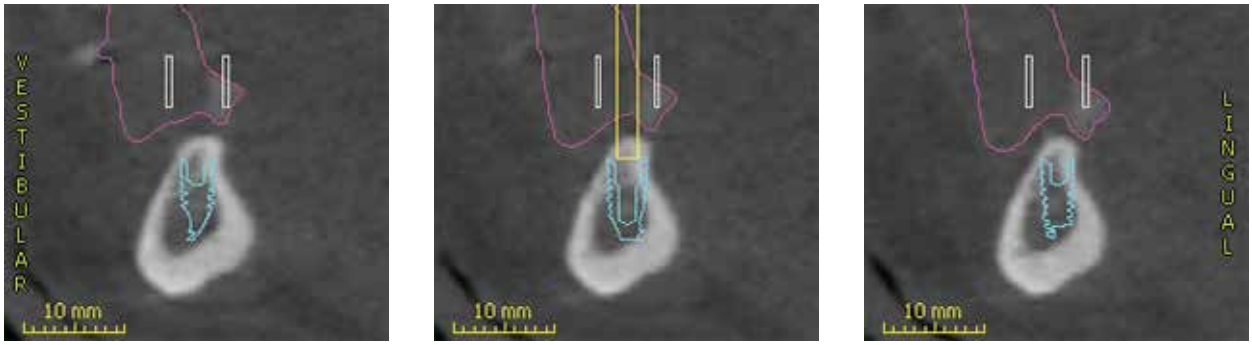

Figure 4.
CbCT for #43 site with virtual implant placed in ideal position in relation to buccal-lingual width and height of the bone.

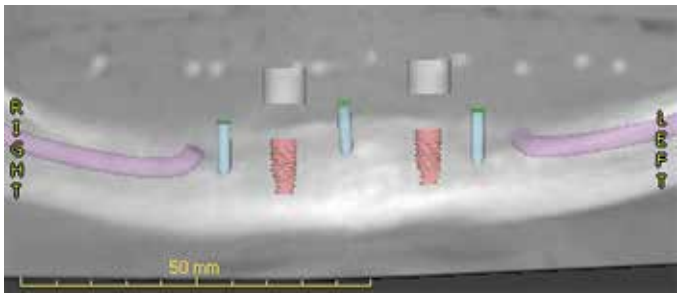

Figure 5.
Panoramic view showing implant plan and retentive cylinder pin plan. Retention in sites #34 and #44 stabilized the guide. No retention pin placed in site #31 during surgery, as two pins stabilized the M-guide.

- The mucosal M-guide was seated on the ridge to confirm fit. A putty index was made with the existing upper and lower denture. The upper denture remained in the mouth and the index was used with the surgical template (made from the lower denture) to confirm seating. The patient was anesthetized with topical benzocaine 20 per cent for two minutes in the vestibule. Infiltration injections was given with 2 x 1.8 ml of Ultracaine® 4 per cent with 1:100,000 epinephrine on the buccal and lingual of implant sites.
- A flapless approach with a tissue punch was utilized since the patient presented with a flat, broad ridge and no osseous re-contouring was needed (Figure 3 and 4). The bone quality in sites #33 and #43 was D2 to D3. The following landmarks were identified prior to surgery: mental nerve, buccal-lingual width and height of the ridge (Figure 5).
- To stabilize the mucosal guide, the patient was asked to bite in CO with the index between upper denture and surgical template. The drill 8mm x

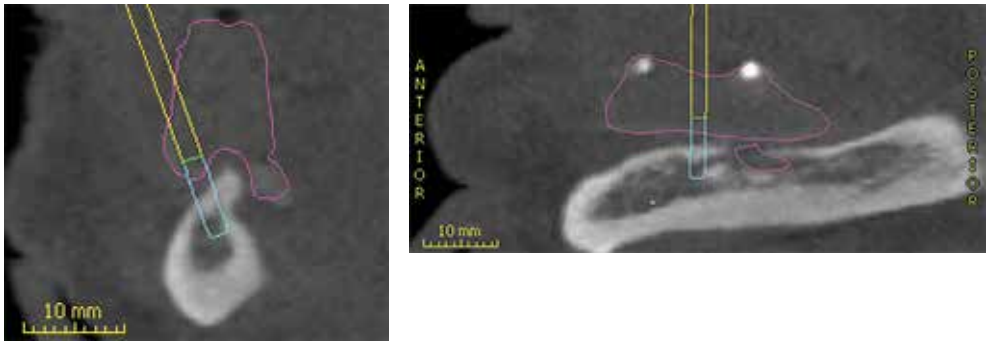

Figure 6.
Site #34 CbCT plan for retentive test cylinder 8x2mm.

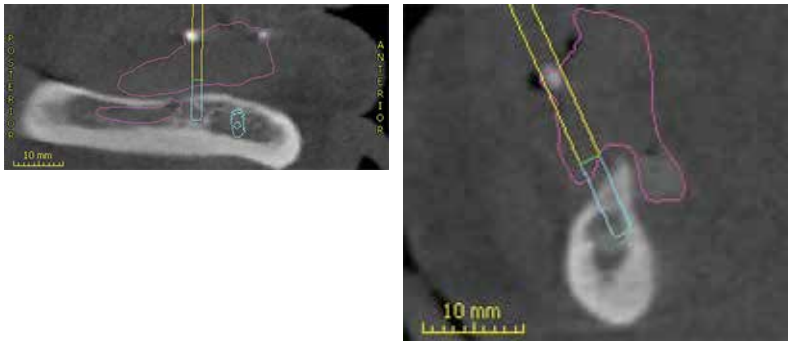

Figure 7.
Site #44 CbCT plan for retentive test cylinder 8x2mm.

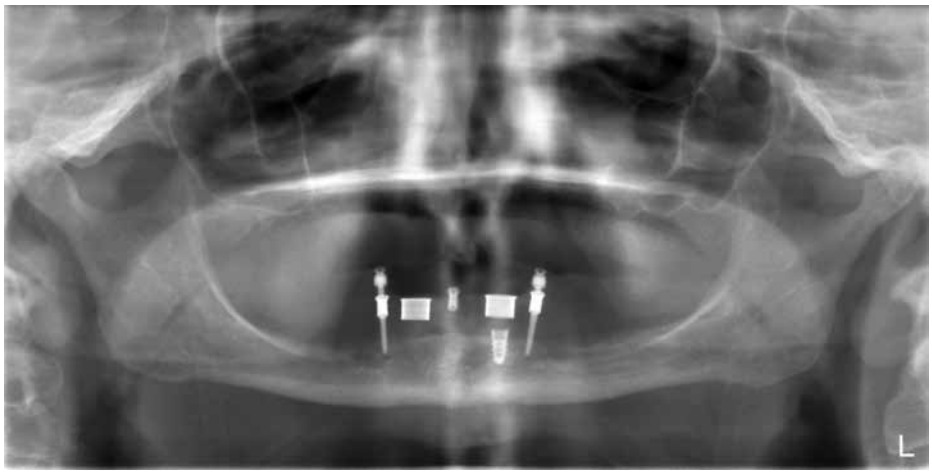

Figure 8.
Panoramic radiograph showing mucosal guide stabilized with two-retentive screws and implant placed in #33 site.

2mm was used to perform the osteotomy through retention sleeves in #34 and #44 sites. Two retentive pins were screwed in manually. This stabilized the mucosal guide in the ideal position with little chance of deviation (Figure 6, 7 and 8).

- The M-guide surgery kit was used to perform osteotomy. The direction is guided by the drill guide, and placed with a self-stopper so that the drill only goes in as planned.
- Two 3.75 x 8mm MIS Seven implant (MIS MF7-08375 LOT W15008828) were placed using the surgical template and motor implant carrier with primary stability of 30Ncm. The cover screws were placed on the implants. The patient had achieved good hemostasis. A post-operative panoramic radiograph was exposed (Figure 9). The patient was discharged with normal vital signs and the following Rx: Amoxicillin 500mg, 21, 1 tid 1 week, Percocet, 12, 1q6 hour prn pain, do not drive.

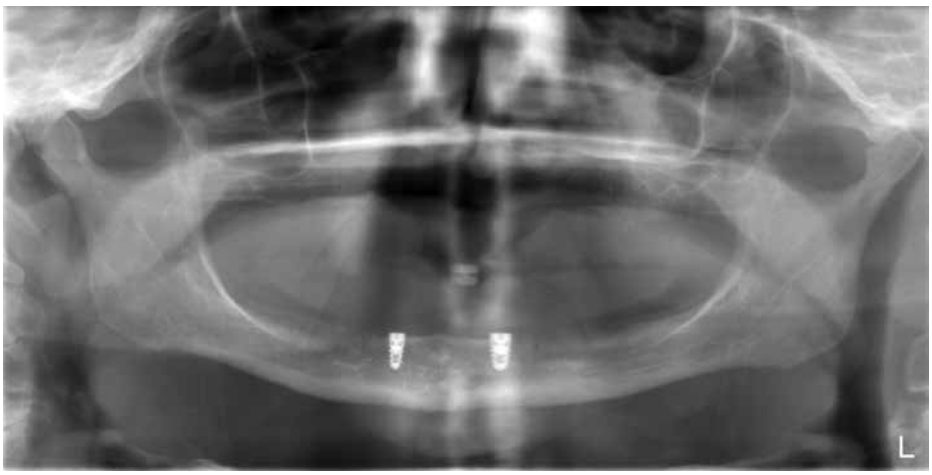

Figure 9.
Panoramic radiograph showing implants placed in site #33 and #43.

Figure 10.
Mucosal guide used to access implants to place OT-equators.

Figure 11.
Mandible showing OT-equator denture attachments torqued to 30Ncm on implants in site #33 and #43.

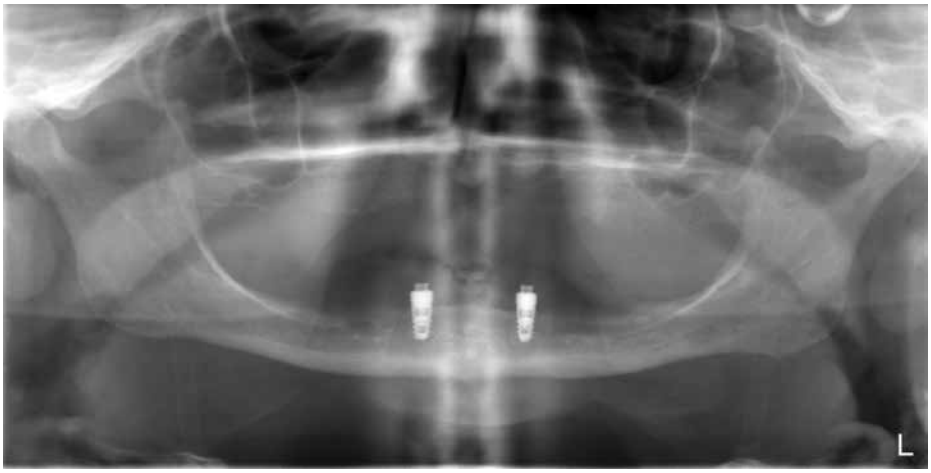

Figure 12.
Panoramic radiograph showing implants in sites #33 and #43 at three-month post-op with OT-equator placed.

Figure 13.
Complete lower denture with OT-Equator metal housing and standard retention cap.

The patient presented three-months post-operatively. The mucosal M-guide was used to access the submerged implants (Figure 10) and OT-Equators placed and torqued to 30Ncm (Figure 11). A panoramic radiograph was exposed to confirm seating (Figure 12).

OT-Equator connects the implant to the denture

The OT-Equator denture attachment was used in the above case. The OT-Equators are low-profile overdenture and removable denture attachments. OT-Equator attachments feature a Titanium Nitride (TiN) coating for maximum resistance to wear, a small-scale metal housing and replaceable nylon caps suitable for various retention levels. Retention caps can be replaced easily (9).

Access cavities within the denture base, above the implant sites were created. Cavities were approximately 6mm in diameter, and 4mm deep (manufacturer's guideline), leaving a space of 2mm around the attachment housing. The OT-Equator attachments correlated with implant type and diameter, and extend approximately 1mm above tissue height. The plastic disc was placed over the active segment of the attachment. This prevented excess acrylic resin from locking against the attachment. The pink self-curing acrylic resin was mixed and filled in prepared cavities within the denture base. The denture was then placed in the mouth and patient bit down all the way. Once the resin was completely cured, the denture was polished and inserted (Figure 13).

Conclusion

CGIS allowed the fabrication of a mucosal guide that offered a solution to placing two implants parallel to each other with precision, predictability and safety. The placement of OT-Equators on the existing lower denture was predetermined prior to placement of the corresponding implants. CGIS gives the clinician critical information that allows for a flapless approach with the appropriate size implants. CGIS allows the creation of a retentive denture with just two implants, making it an affordable alternative.

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SPECIAL COMMEMORATIVE ISSUE

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Computer-Guided Implant Surgery: A Flapless Solution for Ideal Implant Placement

Introduction

Traditionally, dental implant surgery has been completed through raising flaps. The size of implant is determined by bone mapping and two-dimensional assessments of radiographs, such as panoramic and periapical views, which may not always be accurate. To determine alveolar bone width in the maxilla or mandible, a caliper (e.g., Vernier) can be employed to map the width of the ridge (combined soft tissue and bone thickness) at the crest and then every three mm up to the vestibule[1]. The major challenges with this approach include ideal buccal-lingual torque, mesial-distal angulation and depth of implant, while appreciating the vital anatomy around the site of placement and roots of adjacent teeth. Computer-Guided Implant Surgery (CGIS) has opened possibilities to perform implant placement surgery with a minimally invasive approach.

The advantages of CGIS utilizing a surgical template have been documented by several authors,[2-6] and include:

1. Considerably increased accuracy of implant placement.
2. The clinician has control over the angulation and depth of the implant based on a virtual treatment plan.
3. The osteotomy drills are guided by the sleeve in the template.

Figure 1.
Tooth #22 with vertical root fracture.

4. Allows for a flapless surgery, which entails less bleeding, less swelling, decreased healing time and postoperative pain.
5. Aids in the preservation of hard and soft tissue and maintains blood circulation to the surgical site.
6. Helps to avoid vital structures.
7. Shorter period required for surgery.

In the field of orthodontics, the torque and angulation Rx built into the bracket aligns the tooth in its ideal position. The CGIS allows the creation of a surgical template with a built in Rx for buccal-lingual torque, mesial-distal angulation and a depth stopper to place the fixture in the intended position with high accuracy and precision. When properly used, the system does not allow deviation from the original plan, with total commitment to the intended implant position.[7] According to a study by Fortin et al., with CGIS, patients experience less pain and for shorter periods of time.[8]

The case

CGIS was performed using computer software coDiagnostiX® (IVS Solutions AG, Chemnitz, Germany) to analyze CT scan data for site #22 (left lateral incisor). A virtual implant was placed that took into account the floor of the nose, the roots and apices of adjacent teeth, a buccal defect in the bone in site #22, as well the final crown. The CT scan data of finalized implant position was utilized to fabricate an M-guide surgical template and was used to perform surgery in conjunction with an M-guide surgical kit.[9]

The case presented here is a 63-year old female with controlled diabetes and is otherwise healthy. She presented with an abscess of tooth #22. A periapical radiograph showed a PBM crown with cast post, root canal and vertical root fracture rendering the tooth non-restorable (Figure 1).

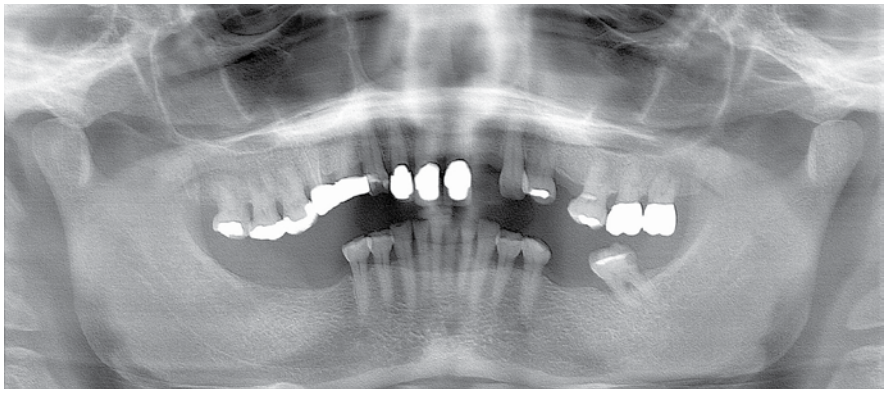

Figure 2a.
Panoramic radiograph.

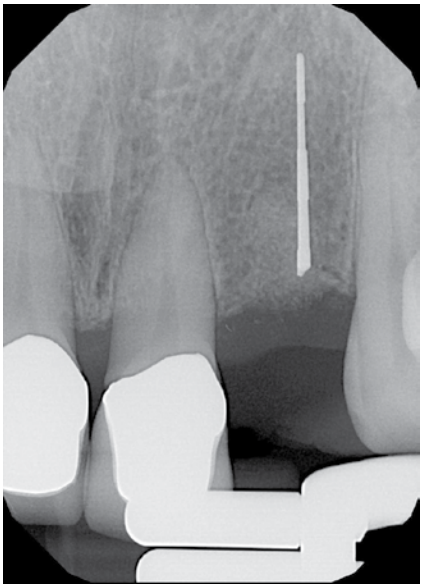

Figure 2b.
Periapical radiograph.

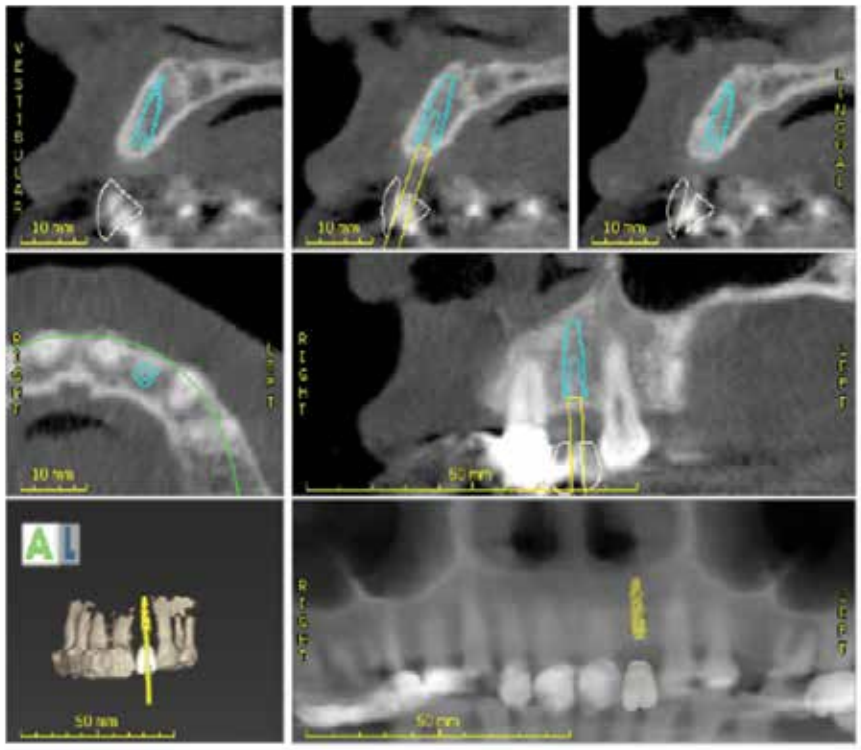

Figure 3.
CbCT for site #22.

The patient was presented with all options to replace the tooth following extraction. Implant, bridge and a partial denture were considered. The patient chose an implant. Socket preservation following extraction was advised and accepted.

Alginate impressions were made to fabricate a transitional partial denture. The tooth was extracted under local anesthesia using two percent lidocaine 1:100,000 epinephrine. The site was cleared off granular tissue and curetted thoroughly. The socket was preserved using allograft bone particulate.

A six-month post-operative panoramic (Figure 2a) and periapical (Figure 2b) radiographs were completed. A piece of probe was placed inside the sensor cot for calibration purpose. A Cone-beam CT was prescribed, as the patient had high esthetic expectations and there was a slight buccal defect remaining in site #22.

A Cone-beam CT scan was completed for site #22.[10] Implant placement was planned using coDiagnostiX® (IVS Solutions AG, Chemnitz, Germany) (Figure 3). Due to a buccal defect a 3.3X 11.5 MIS Seven implant was chosen that was three mm from the adjacent teeth. The final prosthetic was virtually placed using the software and the implant was placed to accommodate the most ideal position for the site. The implant had to be positioned in a manner that was tipped lingually due to the buccal defect. Since this was known, a 15-degree compensation was made in the final abutment to compensate the lingual tipping of the implant.

This allowed the final prosthetic to be in an ideal buccal position. Now the goal was to replicate the #22 implant and prosthetics avatar in the patient. The M-guide surgical template (Figure 4a, 4b) held the surgical planning information and was utilized to perform the surgery.

The surgical protocol for site #22 was as follows:

- ✔ HHx: NC ASA 2. Controlled diabetes.
- ✔ Premedication: None
- ✔ Inform consent discussed and signed for implant surgery and bone graft if needed in site #22.
- ✔ Pre-op B.P: 122/65
- ✔ Anesthetic: Topical benzocaine 20 percent for two minutes in vestibule. Ultracaine four percent, 1:100,000 epinephrine, two carpules. Infiltration B/L of involved teeth.
- ✔ Incision: None
- ✔ Tissue reflection: None
- ✔ Tissue punch drill used through M-guide surgical template for flapless implant surgery (Figure 5a).
- ✔ Tissue was discarded (Figure 5b).
- ✔ Identified anatomical landmarks:
- ✔ Adjacent teeth and floor of nose.
- ✔ Bone quality: D2 to D3
- ✔ Osteotomy: The M-guide surgery kit was used to perform osteotomy. The direction is guided by the drill guide, and placed with a self-stopper so that the drill only goes in as planned (Figure 6).
- ✔ A 3.3x11.5 MIS Seven implant was placed using the surgical template and motor implant carrier (Figure 7).
- ✔ Reference: MIS MG7-11330 W15004873
- ✔ Stability: Primary 30Ncm
- ✔ Healing cap: Narrow four mm internal hex MH-N 4330 (Figure 8).
- ✔ Estimated blood loss: NIL
- ✔ Post-operative X-rays: One PA

DISCHARGE:

- ✔ Post-op BP 118/71
- ✔ Pt. tolerated procedure well: Yes
- ✔ Released with vital signs WNL: Yes
- ✔ Post-op instructions and medications given: Yes

Figure 4a.
Stone model showing buccal defect.

Figure 4b.
M-guide surgical template.

Figure 5a.
Tissue punch through the M-guide.

Figure 5b.
Discard tissue.

Figure 6.
Osteotomy performed.

Figure 7.
Implant placed.

RX:

- ✔ Amoxicillin 500 mg four tab. Take two gm PO, Ibuprofen 600 mg, 20, 1 q6 hr prn pain.

Patient presented three-months post-operatively. An impression coping was placed and periapical exposed (Figure 9). A cast final abutment was placed and torqued to 35N fabricated by Orthodent (Figure 10). A final PBM crown by Orthodent was cemented (Figure 11-13).

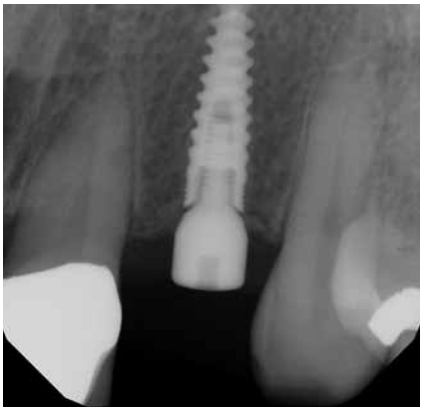

Figure 8.
Healing cap placed.

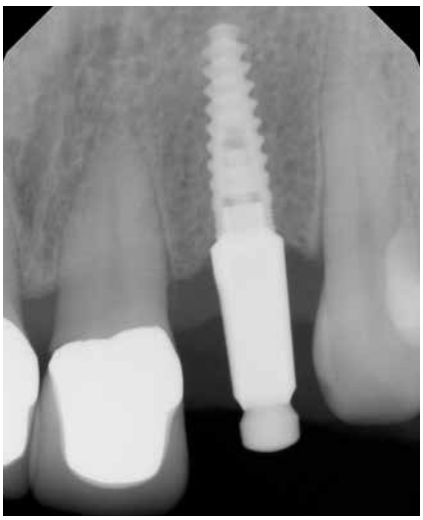

Figure 9.
Impression coping.

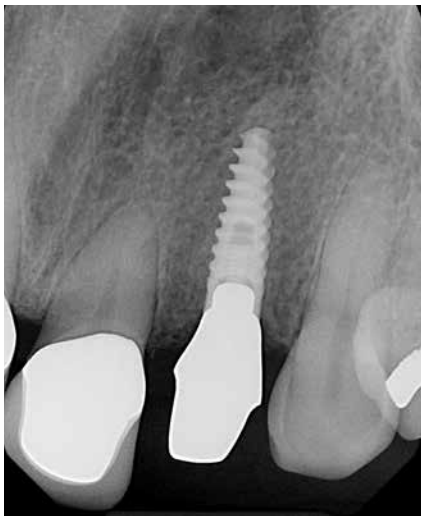

Figure 10.
Final abutment placed.

Figure 11.
Crown cemented.

Conclusion

CGIS offered a flapless solution to placing an implant with precision, predictability and safety while preserving keratinized gingiva, leading to an excellent profile and no recession. The patient had virtually no post-operative pain the following day. This may be the future of implant surgery.

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Figure 12a.
Pre-op following extraction before implant placement.

Figure 12b.
Post-op following implant placement.

Figure 13a.
Final crown, healthy gingiva, no recession.

Figure 13b.
A three mm keratinized gingiva.

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Dr. Raj Khanuja Receives Business and Community Awards

In 2017, Dr. Raj Khanuja's corporate dental practice, R. Khanuja Dentistry, has been recognized locally, and for a national Business Excellence Award. The award, presented to Dr. Khanuja in an October ceremony, is designed to recognize businesses from all industries that demonstrate a strategic approach toward achieving goals and successfully improving business performance.

Dr. Khanuja's charitable endeavours also earned him a Canada 150 Medallion, presented by David Tilson (MP Dufferin-Caledon, Ont.) At the presentation ceremony, Mr. Tilson said, "It was truly an honour and privilege to present a commemorative Canada 150 Medallion to 150 individuals representing Dufferin and Caledon who've demonstrated exemplary service and dedication to Dufferin-Caledon."

After practising for a few years, Dr. Khanuja said he started to realize that a significant number of people who came into the office with their children, often forgo their oral health because the cost of dental services is sometimes restrictive for residents who don't have dental insurance. To address the issue, six years ago he launched a project he calls "Doing Positive in My Backyard," which offers one free day of dental services per year to help those in need. This project has helped more than 250 individuals and has donated more than $60,000 in free dental services.

Dr. Khanuja has also received the Community Influencer Award at the 7th Annual Business Excellence Awards, presented by the Toronto Region Board of Trade. This award recognizes a company demonstrating a long-term desire to build diverse, inclusive and balanced communities — one making a sustainable and tangible impact in the region, whose commitment to social responsibility is an integral part of their strategy and success.

Winning this award, he says, endorses his vision of having a full-time community dental clinic for those in need.

Left to right: Brenda Whitteron, RCMP, Dr. Raj Khanuja and David Tilson, MP (Dufferin-Caledon).

The two sides of the Canada 150 Medallion presented to Dr. Raj Khanuja.

The Government of Ontario invested Dr. Raj Khanuja with a June Callwood Outstanding Voluntarism Award for his exceptional leadership, creativity and innovation in his service to his community. The award was presented by The Honourable Laura Albanese (Minister of Citizenship and Immigration).


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