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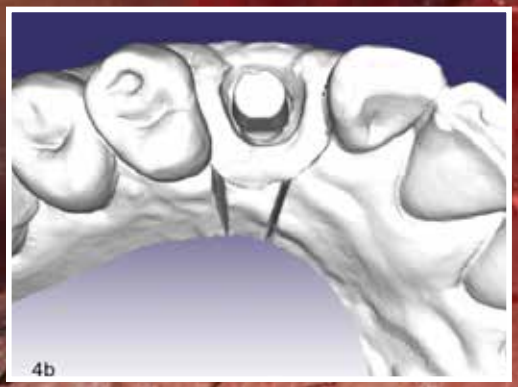
Perserving the Buccal Plate



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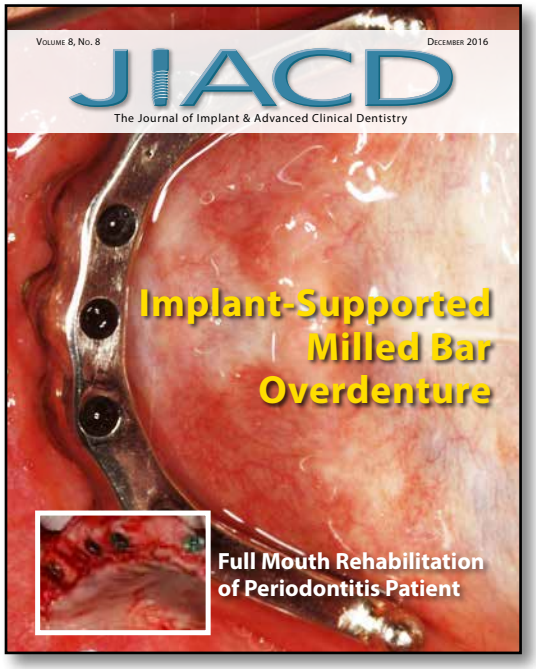

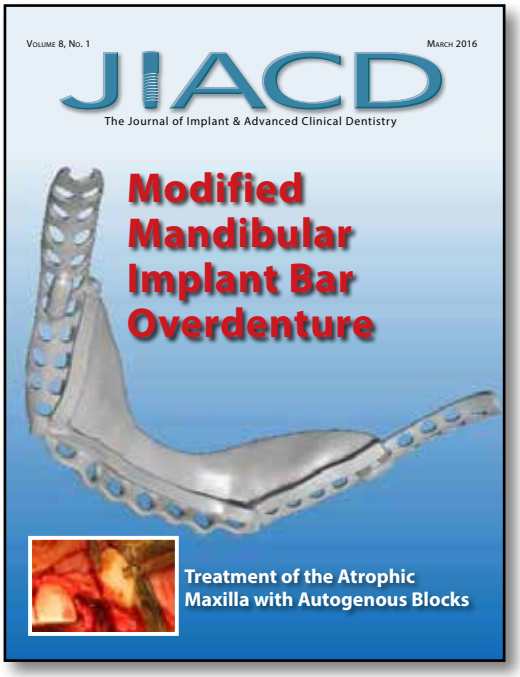

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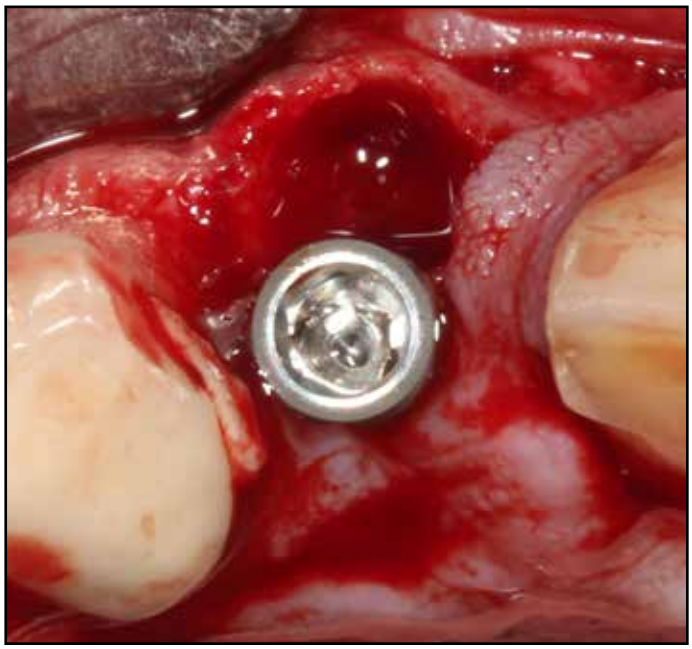

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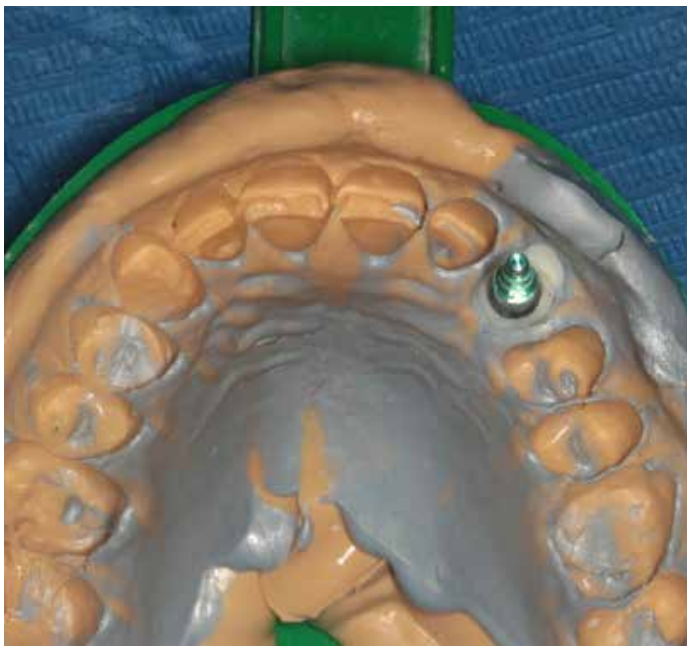

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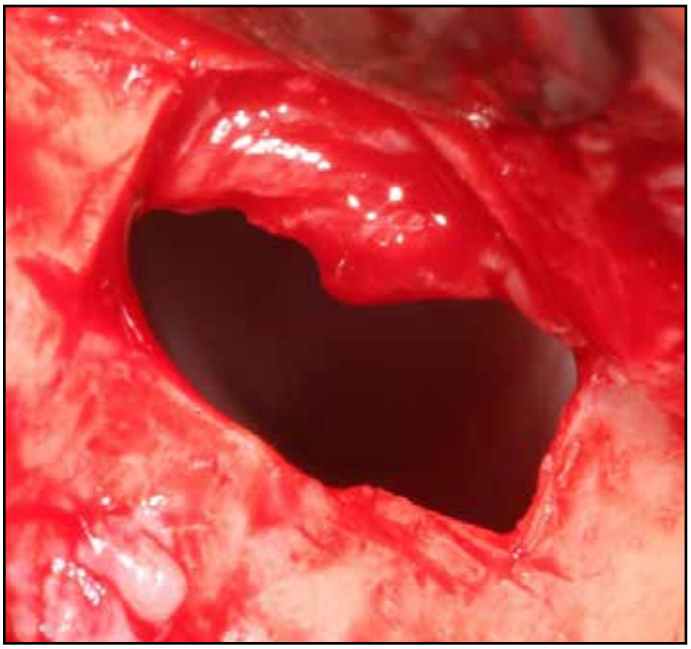

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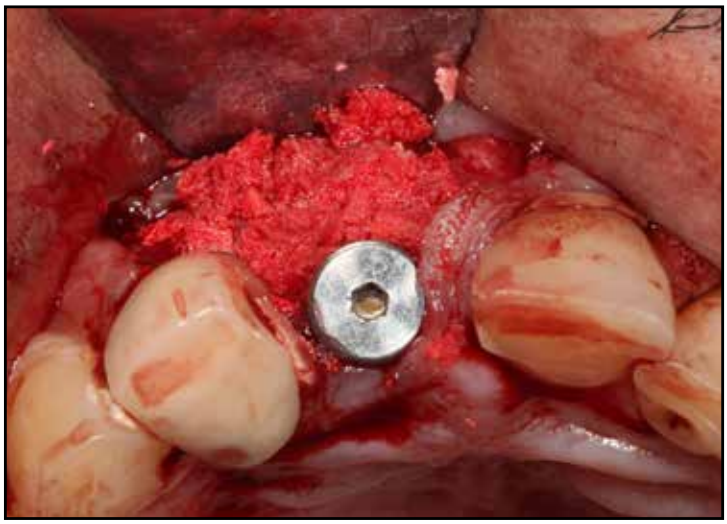
Preserving the Buccal Plate with a Novel Bone Graft Material for Immediate Implants in the Esthetic Zone

Lanka Mahesh, BDS, MBA[1] • Gregori M. Kurtzman, DDS[2]
Praful Bali, MDS[1] • Varun Raj Kumar, MDS[1]

Abstract



Implant placement into immediate extraction sockets can present with clinical challenges especially in the esthetic zone. Preservation of the buccal plate is critical to maintaining the position of the gingival tissue so that recession does not compromise esthetics. Position of the implant with respect to the buccal plate is important to allow sufficient thickness of bone, which in the extraction socket will result in a gap between the buccal socket wall and the implant. Grafting of this void aids in maintaining the crestal bone level in its position and the gingival crestal position. This article discusses a novel osseous graft material for use on filling the socket void at implant placement.

KEY WORDS: Dental implants, immediate implant, tooth extraction, guided bone regeneration, GBR

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Figure 1: Patient presented with right maxillary central incisor that was broken down to to gingival level with resulting hyperplastic gingival tissue.

INTRODUCTION

In recent years, most advanced way to replace missing teeth is dental implant, which is designed to replicate the natural tooth. This procedure preserves the gingival mucosa and bone with no damage to adjacent teeth. Conventional procedure for implant placement involves extraction of affected tooth, waiting 2–4 months for extraction socket to heal, insertion of implant, and again healing period for 3–6 months for integration of implant with surrounding bone; after this procedure, another surgery is necessary to expose the implant and to place a prosthetic abutment[1] Taking into consideration the prosthetic treatment, the patient has to wait up to 8–12 months for a lost tooth to be replaced. Because of these shortcomings related to conventional technique, strategies were developed to substantially shorten the entire treatment by placement of implant immediately after extraction of tooth.[2]

The correct placing of immediate implants in relation to the alveoli bone walls is another

Figure 2: Periapical radiograph identified previous endodontic treatment and caries at the coronal aspect with close proximity to the adjacent tooth at the distal.

paramount factor for satisfactory results. Since bone tissue suffers constant remodeling, both vertically and horizontally during the healing process, all dimensions must be carefully taken into consideration for adequate three-dimensional implant positioning.

Regarding the horizontal positioning of immediate implants (buccolingually or mesiodistally), it is common to observe a lack of adaptation to the socket walls in the cervical portion of the implant. This gap can be filled by soft tissues and thus may lead to osseointegration problems. The use of membranes and/or grafting materials

Figure 3: The residual root was extracted presenting with a thin facial osseous plate to the extraction socket.

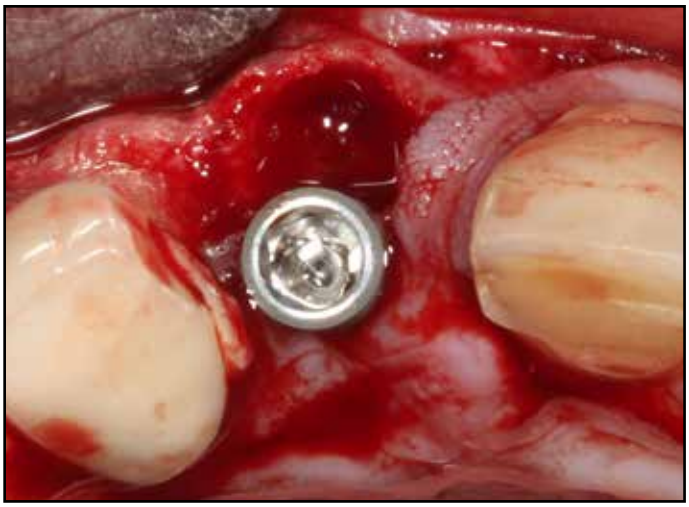

Figure 4: The implant was placed in the ideal prosthetic restorative position leaving a large gap between the facial aspect of the implant and the facial wall of the extraction socket.

to fill the peri-implant residual defects has been proposed.[3-8] Such procedures can impede epithelial invagination into these defects maintaining the necessary space for osteogenesis. Some authors associate these procedures with some complications, such as membrane exposure and delayed peri-implant bone healing.[9] On the other hand, some studies showed increased bone-implant contact after membranes were utilized.[10]

In an attempt to optimize osseointegration, many bone-replacing materials have been presented as an alternative to fill these gaps. These materials, which may be xenogeneic (osteoconductive), allogeneic (osteogenic), or synthetic (osteoinductive) exhibit properties and act as a scaffold for cell adhesion and proliferation, thus facilitating gap filing.[11-13]

Among the emerging biomaterials, Ossix bone (Datum Biotech, Lod, Israel) , is a new novel material which has shown promising results and has been presented in this case report. Ossix bone is a sterile, biocompatible bone grafting material aimed to fill, augment, or reconstruct periodontal and bony defects of the maxillo-facial complex. Ossix bone is a crosslinked collagen containing compound that is shapeable, yielding an ossifying scaffold for the growth of natural bone in periodontal and implant procedures. Its unique design makes it easy to use, has no particle migration and actively integrates with host tissue. Ossix bone is composed of 80% crystalline hydroxylapatite and 20% porcine collagen that are constructed together to form porous spongious matrix. After it is soaked in saline it has excellent handling properties. Ossix bone is an osteoconductive bone grafting material that serves as a scaffold for bone forming cells when placed into bony gaps.

CASE REPORT

A 45-year-old male reported to clinic with a fractured right central incisor (Fig 1). Radiographic

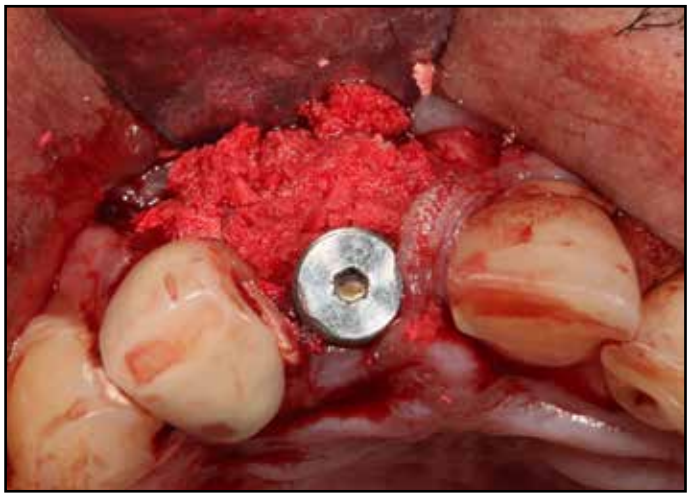

Figure 5: Ossix graft material that had been wetted by sterile saline was placed into the facial void.

examination noted prior endodontic treatment with an inadequate ferrule present to attempt restoration (Fig 2). After evaluation and discussing other treatment options like post and core following osseous crown lengthening, a dental bridge, an immediate implant was planned. Patient was found to be healthy with no underlying medical condition and without any history of smoking or tobacco use. After local anesthesia administration, a full thickness flap was created and elevated, then an uneventful removal of the residual root was performed (Fig 3). Drilling for implant placement was performed under copious cold saline irrigation to minimize heat generation by the implant drill. A Bioner top DM (Bioner, Barcelona) 4mm by 11.5mm dental implant was placed in the osteotomy. After placement a jumping distance of more than 3.5 mm was noted between the implant and facial bone (Fig 4). After wetting the Ossix graft material for 4 minutes with sterile saline, the bone graft was placed into the facial void to fill the jumping distance (Fig 5). A healing abutment of 3 mm height was placed and a radiograph taken (Fig 6). The flap was repositioned to achieve primary closure around the healing abutment and secured with 4-0 nylon sutures with no membrane placed (Fig 7). A temporary bonded bridge was placed on the patient the next day.

Figure 6: Periapical radiograph immediately following implant and graft placement with a healing abutment placed.

After uneventful healing of 4 months, a CBCT was taken that showed good maturation of the bone graft and complete fill of the jumping space filling the void in the extraction socket at implant placement (Fig 8). After removal of the healing abutment, excellent buccal volume of tissue can be appreciated and a lack of inflam-

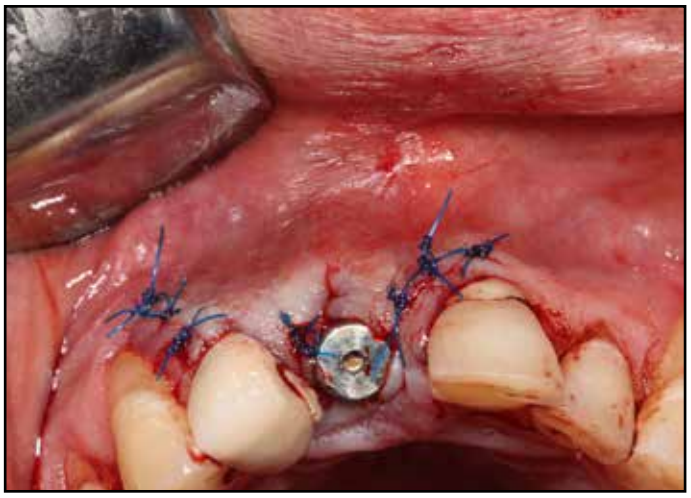

Figure 7: The flap was repositioned to achieve primary closure around the healing abutment and secured with sutures.

mation at the gingival cuff around the implant (Fig 9). A screw retained metal ceramic crown was fabricated and the patient was restored with pleasing esthetics (Fig 10). The final radiograph was taken demonstrating complete seating of the restoration at the implant connector and stable bone around the implant (Fig 11).

DISCUSSION

Innumerous modifications have been proposed to achieve faster, reliable and more esthetic results in dental implants since its introduction, one of the major being placing an immediate implant after extraction, as compared to the standard protocol of waiting for healing of the extraction site. Several classic studies from the 1960's showed the resorption of the alveolar process following tooth extraction, which is significantly more pronounced in the buccal region.[14]

When teeth are present, blood flow is provided through 3 main sources: the periodontal ligament, the periosteum, and the bone tissue.

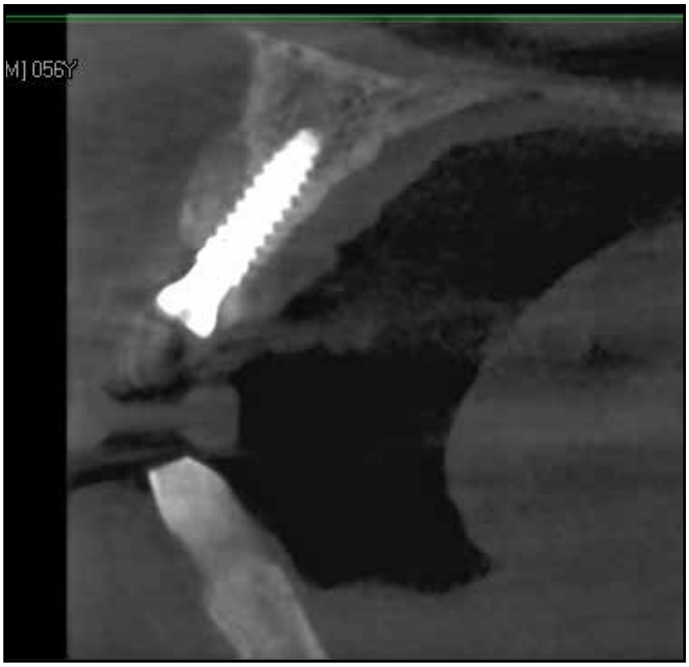

Figure 8: A CBCT as taken at 4 months post graft and implant placement to assess the graft maturation and elimination of the facial socket void.

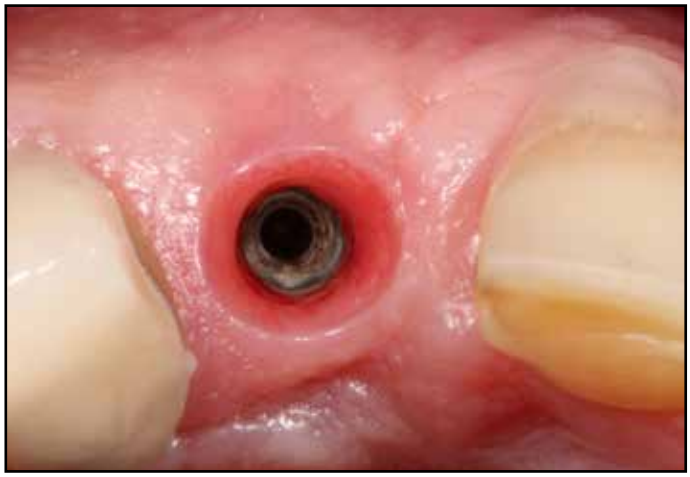

Figure 9: The healing abutment was removed from the implant demonstrating a healthy gingival cuff around the implant.

After a tooth is extracted, the periodontal ligament disappears, and only 2 nourishment sources remain. In addition, the cortical bone is poorly vas-

Figure 10: Final screw retained porcelain to metal crown was placed and screw access was sealed with composite.

cularized when compared to the medullary bone; therefore, when a flap is raised for implant placement, supraperiosteal blood supply ceases, leaving only the poorly vascularized bone without its medullary component, leading to bone resorption in the initial stages.[15] Such bone remodeling in response to inadequate blood supply becomes more critical in the buccal region due to characteristics naturally inherent to this region's nature and anatomy, which may lead to serious compromises both for osseointegration and esthetics.[16]

Deficiency of facial bone anatomy has a negative impact on esthetics and is a critical causative factor for esthetic implant complications and failures.[17] Experimental studies on canine mandibular premolar sites revealed substantial structural and dimensional alterations to the facial bone wall of the extraction socket.[18,19] These catabolic changes are initiated by resorption of the bundle bone that lines the extraction socket. They are correlated with the disruption of blood supply from the periodontal ligament and significant osteoclastic activity.[18,19]

Figure 11: A radiograph as taken of the final screw retained restoration to verify complete seating of the restoration at the implant connector.

CONCLUSION

Ossix bone seems to be an ideal choice in cases such as mentioned in this report.

The handling properties, less spillage compared to particulate grafts, ease of packing in defects and good bone turnover are some of the factors, which in the authors opinion makes Ossix bone a good material.

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Disclosure
The authors report no conflicts of interest with anything in this article.

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The One Functional Position, Implant Level, Indirect, Impression Technique: Description of the Technique and a Case Report

Ioannis Vergoullis, DDS, MS[1] • Konstantinos Valavanis, DDS[2]
Catherine Badell, DDS[1] • George Papadopoulos, CDT[3]

Abstract

Introduction: Several implant impression techniques have been proposed and evaluated involving conventional and digital protocols. The conventional protocols involve two main methods, the direct and the indirect technique, where the latter is widely used for clinical cases involving less than three implants. One of the most significant problems of the implant level, indirect technique relate to the accuracy of three dimensional impression post installation into the impression along with the stability of the impression post into the latter upon pouring of the stone model. In order to overcome these limitations a new approach of the implant level, indirect technique, which we call, One functional position technique, is presented along with a case report.

Case Report: A 67 year old healthy male, presented in our clinic for prosthetic rehabilitation of a successfully osseointegrated dental implant in the upper right canine area. The one functional position impression technique was utilized and the implant was restored with a screw retained, monolithic ceramic restoration.

Results: The proposed impression technique appeared to accurately record the three dimensional position of the implant and the topography of the cervical and emergence profile present around the latter, as developed by a custom healing abutment.

Conclusions: The one functional position, implant level, indirect impression technique appears to be effective in improving the efficacy of the conventional implant level, indirect impression technique, overcoming some of the problems related to the design of stock impression posts and current protocols of use.

KEY WORDS: Dental implant, impression, prosthetics

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INTRODUCTION

Dental implants have been established as a successful treatment option for replacement of missing teeth.[1] Among several factors involved with the success of implant treatment are an accurate impression technique that will reproduce an accurate working cast.[2] Several impression techniques have been proposed and evaluated involving conventional and digital protocols.[3] The conventional protocols involve two main methods, the direct (open tray) and the indirect (closed tray) technique, where the comparison regarding the accuracy of results between the two techniques for impressions involving a small number of implants has been controversial.[4,5] However, the indirect technique serves as a more simple approach due to the fact that resembles the impression technique of natural teeth and requires more simple steps of application and manipulation of the impression inside the mouth.[6] Some of the most significant problems of the implant level, indirect technique relate to the accuracy of three dimensional impression post installation into the impression along with the stability of the impression post into the latter upon pouring of the stone model.[7,8] In order to overcome these limitations a new approach of the implant level, indirect technique, which we call, One functional position technique (1FPT), is presented along with a clinical case.

DESCRIPTION OF THE TECHNIQUE AND CASE REPORT

A 67 year old male with an implant in the upper right canine area (MIS, Tel Aviv, Israel), previously placed in our clinic and being successfully osseointegrated, presented in our clinic for restorative rehabilitation with a single implant supported restoration. A custom healing abutment was already installed to the implant in order to form a custom shaped gingival emergence and cervical profile following a specific protocol of treatment, with the use of the Cervico system (VP Innovato Holdings, Cyprus), previously described[9] (Figure 1a). The requirements of the Helsinki Declaration were observed, and the patient gave informed consent for all restorative procedures.

Custom Impression Post Fabrication Process

A stock, implant level, closed tray impression post (VP Innovato Holdings, Cyprus) was customized in order for its sub-gingival portion to become the exact duplicate of the sub-gingival portion of the utilized custom healing abutment[10] (Figures 1b, 1c, 1d). The customization process was done, utilizing the tools and following the methodology of the Cervico System, being previously described.[9] This system provides the tools (custom emergence and cervical profile guide and mold), that among other things, allow the customization of the impression post in an easy and accurate way in order for the latter to acquire a sub-gingival portion that is the exact replica of the sub-gingival portion of the custom healing abutment produced by the system.

At the day of implant impression, the custom healing abutment was removed and the site was evaluated. The clinical evaluation revealed a successfully osseointegrated implant, surrounded by healthy and stable soft tissue (Figure 2a).

Following, the custom impression post was installed into the implant and a radiograph was taken in order to confirm proper installation and accurate fit of the two elements (Figure 2b). Upon proper fit confirmation, bonding agent and composite material (DMP, Greece) was added

Figure 1a: Custom healing abutment in place.

Figure 1b: Stock impression post installed into the Cervico mold.

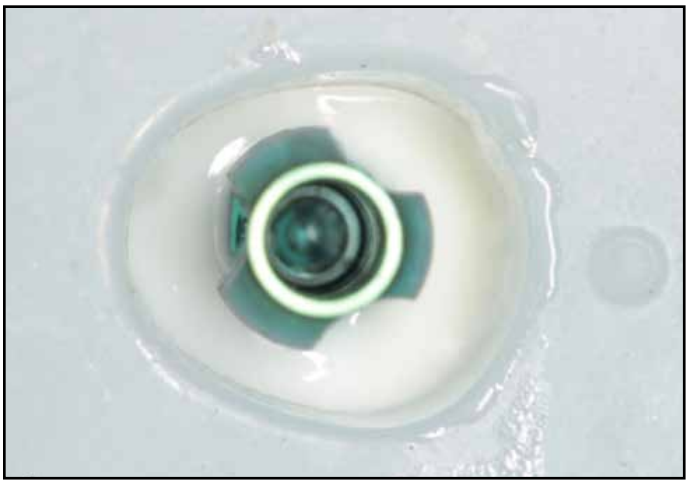

Figure 1c: Customization process of stock impression post by addition of flowable composite material into the well of the Cervico mold.

Figure 1d: Customized impression post, comprising a custom body that is the replica of the custom body of the healing abutment produced in the same well of the Cervico mold.

on the facial aspect of the supra-gingival portion of the custom body of the impression post and light-cured. The added material extended from the custom body to and over the free gingival area adjacent to the latter, creating a lateral extension of the custom body with a convex shape (Figures 2c, 2d). An impression was taken utilizing the one-step, implant level, indirect technique and polyvisiloxane impression material (Image PVS, Dental Line, Athens, Greece).[11] Upon curing and setting of the impression material, the impression and subsequently the custom impression post were removed from the mouth and the custom healing abutment was replaced to the implant. Following, an impression of the opposing arch along with bite registration were taken.

Figure 2a: Developed, custom, emergence and cervical gingival profile.

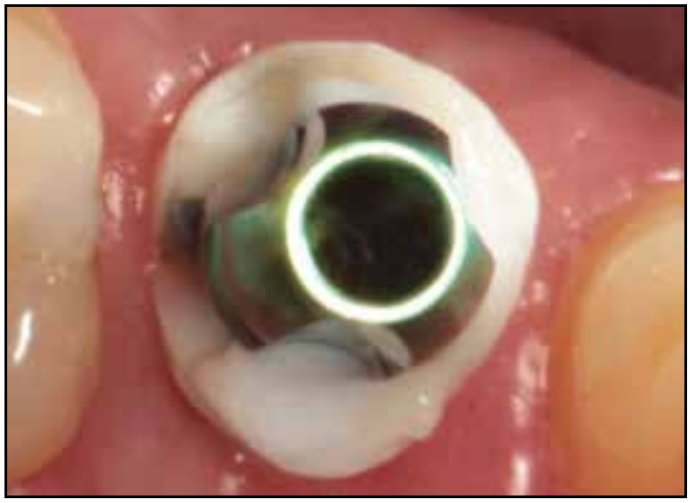

Figure 2b: Custom impression post installed onto the implant.

Figure 2c: Addition of composite material on the custom body of the impression post.

Figure 2d: Light curing of the added composite material that extends over the free gingival margin, generating a supra-gingivally located convex surface.

The generated impression comprised on its superficial surface a concavity that represented the exact negative replication of the convexity present on the custom body of the impression post as the latter was created by the intra-oral addition of composite material (Figure 3). Thus, the generated impression comprised a reference point/area that is very easy to optically track in order to align and install the custom impression post into the impression, in only one functional position, irrespectively of the design of the stock impression post and the number of functional positions the latter may offer (Figures 3a, 3c). Moreover, the matching of the convex surface of the custom impression post with the concave surface of the impression, that represents

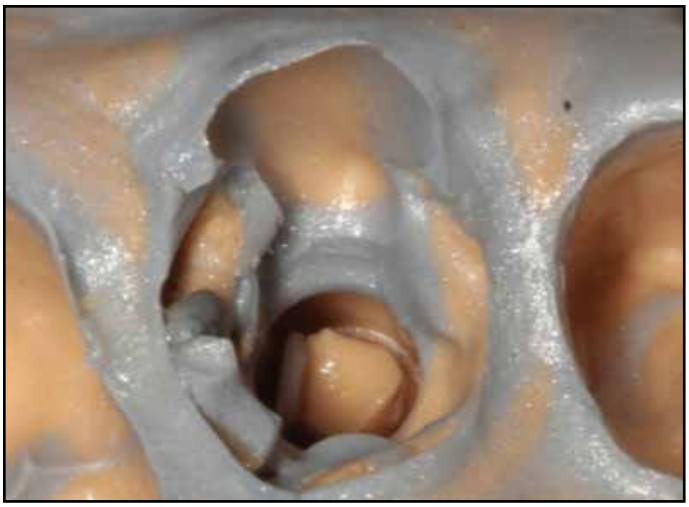

Figure 3a: Close view of the impression, revealing the generated concavity which is the negative replication of the convexity created onto the impression post by the addition of the composite material intra-orally.

Figure 3b: Impression post installed into the impression.

Figure 3c: Close view of final position of impression post into the impression. The interaction of the convex surface of the impression post with the corresponding concave surface of the impression provides the one functional position installation of the impression post into the impression.

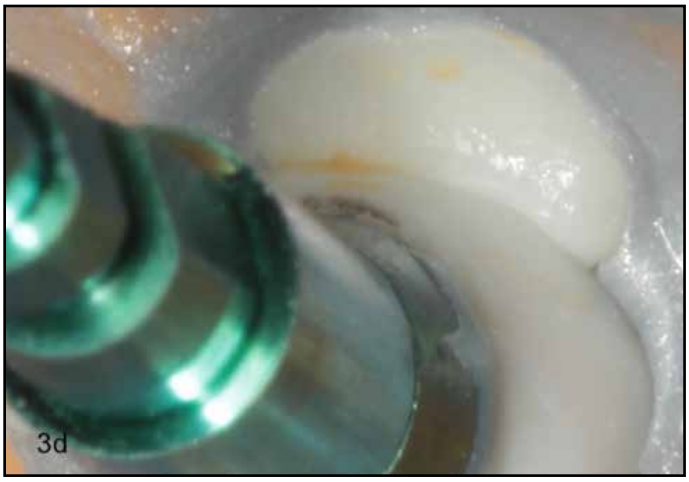

Figure 3d: Close view of final position of impression post into the impression. The perfect match of the two surfaces of interest allows the easy verification of proper vertical positioning of the impression post into the impression.

its negative replication, acts as an objective and optically accessible area in order to determine accurately the proper vertical fit of the impression post into the impression (Figure 3d). Finally, the volume and shape of the custom body of the impression post allows a stable, movement free, installation of the impression post into the impression in both vertical and lateral directions.[12]

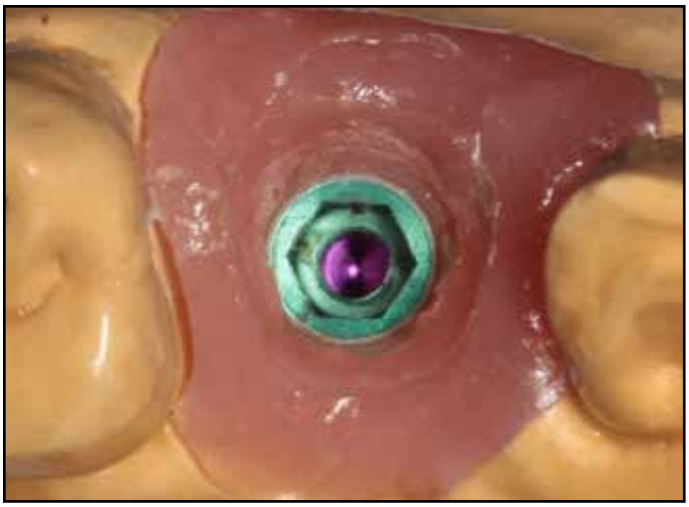

Figure 4a: Generated working model. The custom emergence and cervical profile is accurately replicated and transferred to the lab.

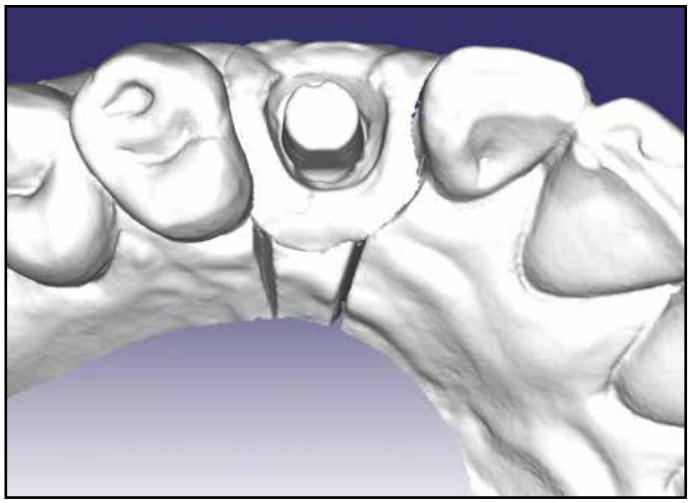

Figure 4b: Digital file (STL) of the scanned working cast with the abutment core in place.

Figure 4c: Screw-cemented prosthesis, fabricated by the lab.

Figure 4d: Clinical evaluation, one moth post prosthesis installation.

The lab technician coupled an appropriate implant analog with the custom impression post and after identifying the two areas of reference, concave on impression and convex on the custom body of the impression post, he installed the impression post into the impression making sure that the convexity present on the custom body of the impression post

fully seats three dimensionally to the concavity present on the impression (Figure 3a).

Silicone material (gingival mask) was introduced around the exposed surface of the custom body of the impression post and the inner surface of the composite extension of the custom body. This inner surface acts as an extension of the impression material allowing the accurate print of the external surface of the gingival that it was overlapping in the mouth. The gingival mask after curing and setting represents the exact shape of the peri-implant gingival tissue. Following, the gypsum was poured to fabricate the working cast. The two casts were articulated using a semi-adjustable articulator. The implant position and the generated custom emergence and cervical profile appeared to be accurately recorded and provided the lab technician the foundation for the fabrication of a natural in shape and size implant prosthesis with proper contour and contact surfaces[13] (Figure 4a). The working casts were scanned with a digital Scanner (Roland DG Corporation of Hamamatsu, Japan) and a monolithic zirconium prosthesis (Doceram GmbH, Dordmunt, Germany) permanently cemented extra-orally on a titanium base abutment (MIS, Israel) was fabricated, utilizing CAD CAM protocols[14,15] (Figure 4b). The screw access bore was maintained in order for the prosthesis on its final format to be screw retained [16] (Figure 4c). A screw retained prosthesis is advantageous as it establishes easy retrievability and eliminates the chances of cement escape and subsequent development of cement sepsis around the implant during intra-oral cementation process.[17]

At the day of final prosthesis delivery, the custom healing abutment was replaced by the final prosthesis. The proper fit of the prosthesis was evaluated clinically and radiographically and any necessary occlusal adjustments were made. The contact surfaces were evaluated with the use of dental floss and the screw-retained prosthesis was torqued at 30Ncm as per the implant manufacturer recommandations. The screw access bore was blocked with a layer of sterile Teflon tape and a second layer of micro-hybrid composite material. Oral hygiene instructions were given to the patient.[18]

The patient was re-evaluated one month post prosthesis installation. The clinical examination showed successful prosthesis and soft tissue adaptation (Figure 4d).

DISCUSSION

The accurate impression of an implant and of the custom emergence and cervical gingival profile present around the latter is one of the fundamental elements for the esthetically and functionally successfull implant therapy.[19] There are two main techniques used in conventional implant impression protocols, the direct (open tray) and the Indirect (closed tray) techniques, where the results of many studies with regards to accuracy of one over the other, especially for small number of implants, has been controversial.[20,21] One main factor on choosing the most appropriate impression technique relates not only to the accuracy of the results but also to the easiness of the procedure. The implant level, indirect technique, especially for single or two implants, is widely adopted as a more easy procedure to follow as it requires less manipulation during the process of impression, it can work with shorter in length impression posts that require less available intra-oral working space and resembles the process of impression of natural teeth. However, some of the problems

that have been identified with this technique relate to the design of the one-piece, stock impression posts used with this technique.[22] These impression posts usually comprise more than one orientation surfaces on their body and thus more than one functional position of installation into the impression. These surfaces are printed into the inner layers of the impression, making sometimes difficult their identification by the Dentist or Lab technician. If the impression post is wrongly installed into the impression, then it needs to be removed and replaced, a process that can traumatize the inner surface of the impression and subsequently lead to inaccurate vertical installation of the impression post into the later. The proposed in this article, one functional position technique, allows for only one functional position of installation of the one-piece closed tray impression post into the impression, where the reference surface for installation is printed on the superior aspect of the impression and not into the deeper layers of the latter. This makes the process of identification and utilization of the desired position of installation, much easier.

Another problem related to the implant level indirect technique, that also presents one of its main disadvantages over the direct technique, is the fact that in many clinical cases it is very difficult to identify and confirm the proper final vertical position of the impression post into the impression. Again, this problem relates to the design of the stock impression posts, where a vertical stop in proximity to the posts' prosthetic platform is not commonly available and even when there is such a surface available, the later does not have adequate dimensions. The proposed technique offers the advantage of providing such a stop surface with the customization of the impression post and the generated convex surface on the supra-gingival portion of its custom body. Most importantly it allows an easy confirmation of proper vertical fit of the impression post into the impression, by easily evaluating/inspecting the proper coupling between the convexity present on the impression post and the concavity printed on the superior aspect of the impression at a superficial level.

Finally, another problem related to the design of stock impression posts and their use with the implant level, indirect technique, is the fact that a lot of times the impression post does not present adequate lateral stability while being installed into the impression and, or during the cast molding process. This is due to the fact that the stock impression posts for implant level, indirect technique have a tapered design and lack volume. Thus in cases where inadequate length of the impression post is supragingivally exposed in the mouth, the length and volume of the impression post installed into the impression is inadequate in order to offer the desired lateral stability. Although the impression material does not seem to be detrimental in the impression process, since Polyvinyl siloxane and polyether being the most commonly used implant impression materials have been found by many researchers equally effective with no statistically significant difference in terms of implant impression accuracy, it is advantageous to use a polyether material in these clinical scenarios.[23,24,25] The polyether provides a more rigid engagement of the impression post, due to its higher shore value. However, mostly cost related factors drive the majority of the clinicians to use polyvinylsiloxane impression material in most of their clinical cases. The proposed technique involves

customization process of the impression post, as this has been proven a necessary process in order to accurately and predictably record the developed custom emergence and cervical profile.[26,27,28,29] After this customization process, the custom body increases the volume of the impression post and this volume in return increases the lateral stability of the custom impression post into the impression, regardless of the impression material utilized.

CONCLUSIONS

This is the first report of a modification of the implant level, indirect impression technique, involving the customization of the impression post and subsequent intra-oral modification of its supra-gingival portion by means of an intra-orally generated convex surface, made out of composite, extending from the custom body to and over an area of the free gingival margin. This modification appears to be effective in improving the efficacy of the implant level, indirect impression technique, overcoming some of the problems related to the design of stock impression posts and current protocols of use of the aforementioned technique. In vitro and, or in vivo evaluation of the proposed technique and comparison with regards to its accuracy to widely used indirect and direct impression techniques for single and multiple implants is necessary in order to validate the assumptions of this report.

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Disclosure
The authors report no conflicts of interest with anything in this article.

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From Single Discolored Tooth to a Full-mouth Reconstruction

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Abstract

A full mouth reconstruction and rehabilitation is a reality. Predictability and success can be achieved if the golden rules of healthy, functional, dynamic occlusion are tested and implemented in a structured, orderly manner to secure the multiple intricate phases of treatment.

How do you address healthy, functional occlusion to a person who doesn't have any pain, discomfort, or concern? This is one of the greatest challenge that facing dentists who try to achieve and provide optimum dental care for all their patients. The following Case Report presents the treatment progression of one such patient.

KEY WORDS: Occlusion, treatment planning

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INTRODUCTION

A majority of dentists cannot articulate and present the benefits and value of optimal care to their patients, especially if the patient doesn't have any symptom like pain or discomfort. Accordingly, these dentists provide patch-up dentistry, which doesn't last and leaves the patient unhappy with the outcome and the dentist professionally dissatisfied with his/her performance due to failing to transfer the benefits of achieving their end goals of proper treatment: health, aesthetic, beauty, function, longevity and stability.

CASE REPORT

A 62-year-old male presented to our office with the chief complaint of a discolored tooth #8: "I don't like the color of my front tooth" (Figure 1). What transpired was a journey from a single discolored tooth to a full mouth reconstruction. As the first step, a full comprehensive oral-muscular examination was performed with photos, full mouth x-rays and full upper and lower diagnostic models were taken (Figures 2a-c, 3). Additionally, face bow record to mount the upper cast and CR records were taken by the bimanual manipulation technique with the first point of contact to record any deviation, deflection or fremitus in occlusion.

Before starting any prosthetic work, as a diagnostic methodology it is of a great importance to make sure the condyles are completely seated in CR position without any pain or tenderness and to remain stable for a few months. In order to achieve this, an orthopedic physiological occlusal splint (deprogrammer) was constructed on the lower jaw on CR records mounted on the articulator, establishing four points of even contact on the left and right side simultaneously. The splint was then utilized to relax the mastication muscles as the first step of occlusal therapy and to differentiate between occlusal muscular disorder or true internal derangement of the joint.

Figure 1: Pre-operative situation.

In 1983, it was determined by Williamson and Lundquist,[2] via electromyographic activity, that the muscles of mastication were shown to be at rest during canine guidance more than during group function, suggesting that canine protected occlusion reduces muscle strain.

The goal is to find and locate the centric relationships ("CR"), regardless of the teeth's position–CR is the relationship between the upper and lower jaws which is the condyles to be seated in the glenoid fossa without strain or force. The CR is considered a great reference point on how to start and end up with a healthy and stable bite. A complete charting, periodontal examination revealed moderate horizontal bone loss. However, occlusal exam revealed attrition, abrasion, clenching, grinding. Additionally, the teeth were flattened and signifi-

Figure 2a: Pre-operative situation.

Figure 2b: Pre-operative situation.

Figure 2c: Pre-operative situation.

cantly worn down, with further occlusal analysis we found the following occlusal scheme:

A. No cuspid protected occlusion was found.
B. Slight bilateral group function and considerable deflection from the third molar in protrusive movement which predicts the lack of anterior guidance. As it shows in figure one, it's edge to edge in class III malocclusion.

Wiens, et al.[1] provides a discussion on occlusal equilibration. The definition of occlusal equilibration is, "the elimination of prematurities or deflective occlusal contacts or [creating] harmonious gliding tooth contacts, which reduces off-axis loading or atypical wear patterns."[3] Specifically, on those patients who are symptomatic or those who will be undergoing. They also argue for a mutually protected occlusion and that the goal of occlusal therapy is to create stability and harmony by which ever means is appropriate for the patient in each specific case. There should not be any balancing interfering contacts during any movement in all cases in a natural and prosthetic dentition. Wines, et al.[1] also including support for a canine protected occlusion because of its effectiveness in eliminating occlusal interferences during laterotrusive, mediotrusive, and protrusive excursions .

Figure 3: Pre-operative radiographs.

The master treatment plan and the blueprint was constructed as follows:

1. Redo RCT on tooth # 8, cast post, and all porcelain crowns on teeth #'s 4→13 and cast gold on all upper molars
2. The proposed and approved treatment plan by the patient is to lengthen the clinical crowns of teeth #'s 4→13 and teeth #'s 20→29
3. Removal of lower teeth #s 17 and 32
4. Complete perio-osseous surgery for four quadrants to remove all diseased bone and reducing pocket depth and establishing a better, healthier perio environment for the more definitive prosthetic work
5. Construction of lower porcelain veneers on teeth #'s 22→27, PFM on premolars #'s 20, 21, 28, 29, and complete cast gold crowns on tooth #'s 18, 19, 30, 31.

Figure 4: Occlusal splint deprogrammer.

Figure 5: Diagnostic waxup.

Figure 6: Provisional restorations.

Due to severe grinding and attrition, the patient lost all his posterior holding contacts. Therefore, the mandible slide forward and gave a pseudo class III impression.

A diagnostic wax-up was made and presented to the patient (Figure 5). Then this was transferred to a set of acrylic provisionals (Figure 6). By utilizing the models, copying the diagnostic wax up, and having a plastic tray made on the models, they served us as a guide during the surgical crown lengthening procedure to determine how much we needed to remove from the soft and hard tissues to achieve appropriate length of the upper and lower anterior teeth:

- Lower anterior teeth #'s 22→27 was prepared for veneers. Luxatemp was used as a temporary restoration (Figures 7, 8)
- Upper anterior and bicuspid teeth #'s 4→13 were prepared for full porcelain crowns, acrylic crowns were used as a temporary restoration.
- All bicuspids were prepared for PFMs
- All molars were prepared for full casted crowns
- It's noteworthy that temporary restorations will chip and wreck for 2-3 times during 2-3 months of being temporized by acrylic which is considered normal for adjusting to a new normal bite. From deprogramming to reprogramming, the muscles will accept and adopt to the new muscular position

CONCLUSION

The patient was very cooperative and receptive to a full mouth rehabilitation treatment although

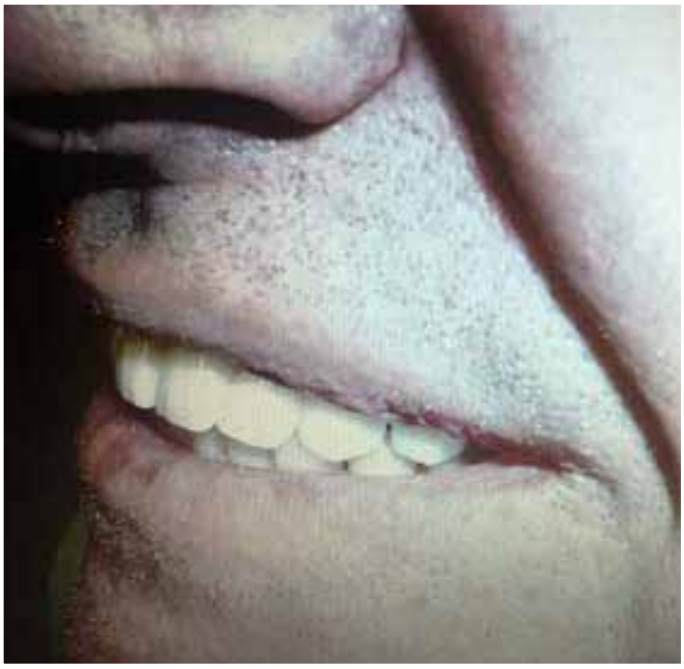

Figure 7: Provisional restorations.

Figure 8: Provisional restorations.

Figure 9: Final restorations.

it took 12 months to finish the entire treatment (Figure 9). Additionally, the patient continues to wear the occlusal splint to protect the restorations from possible damage and to provide reasonable guidance during the night in case of any non-conscious excursive movement.

The patient reported no muscle pain or discomfort and appreciated the outcome by elevating the dental IQ of the patient. Moreover, by creating a form of simple steps to a complete occlusal rehabilitation and breaking it into small procedures, we can test drive the outcome of every phase of the treatment before getting to the next phase and making more definitive changes if needed for long-term success.

Very often manipulation of occlusion can be tough and acceptance is never guaranteed; however, predictability was achieved and accomplished by providing education to the patient and creating the proper form and function to assure the cardinal goals of successful treatment which are:

1. Function
2. Health
3. Beauty
4. Longevity
5. (and most importantly) Stability

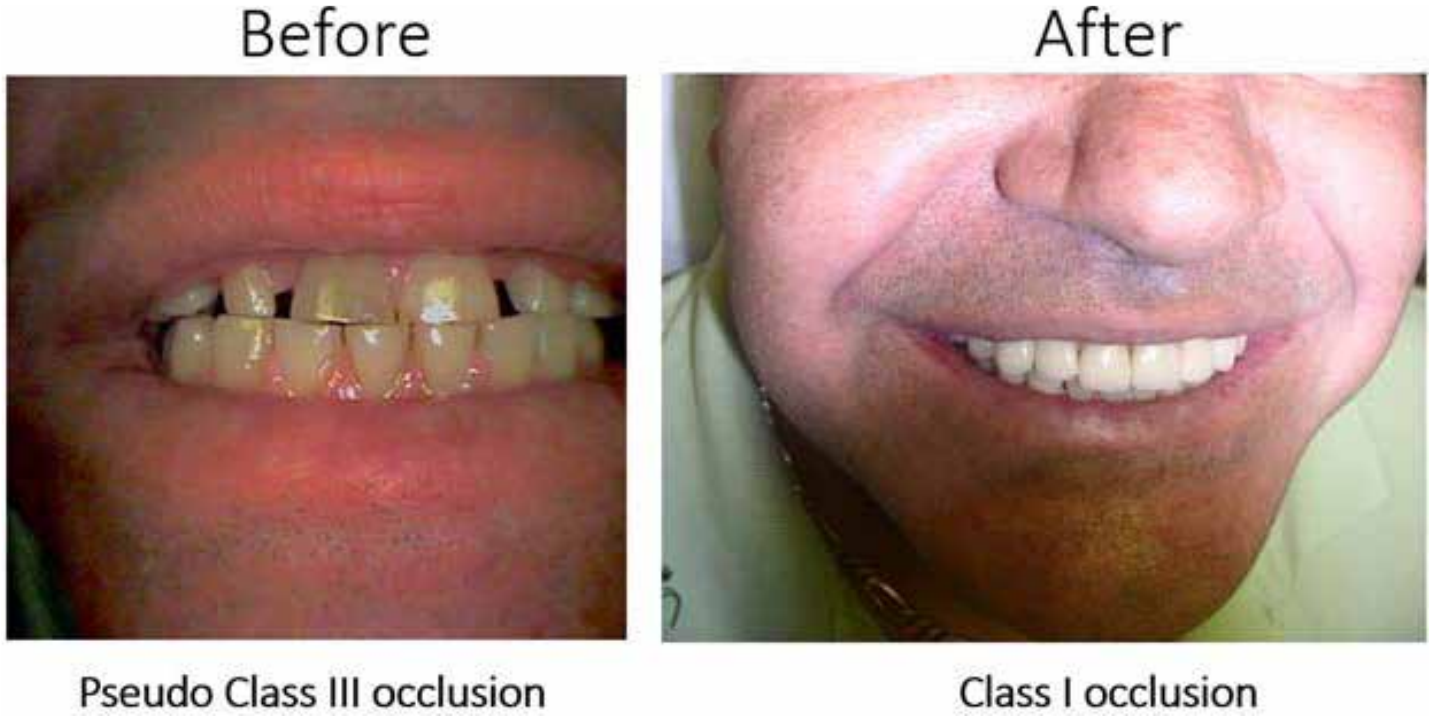

Figure 10: Before and after photographs.

A significant amount of time was spent educating and demonstrating the benefits of the therapy to the patient; both risks and rewards were addressed as well as.

Canine protected occlusion was the occlusal scheme of choice for restoring the patient's dentition due to:

1. The canine has a good crown and root ratio capable of tolerating high occlusal stress and it is the patient's strongest tooth to bare the lateral excursion forces
2. The upper canine root has a greater palatal surface area which is suitable for guiding lateral movement
3. The canine is the best tooth to play a pivotal role in crossover movement (extreme lateral – protrusive to protect the four incisors)
4. The canine provides the best proprioception in the anterior region

The before and after pictures of this patient's full-mouth rehabilitation treatment show the transformation from pseudo-Class III occlusion to Class I occlusion (Figure 10).

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Disclosure
The author reports no conflicts of interest with anything in this article.

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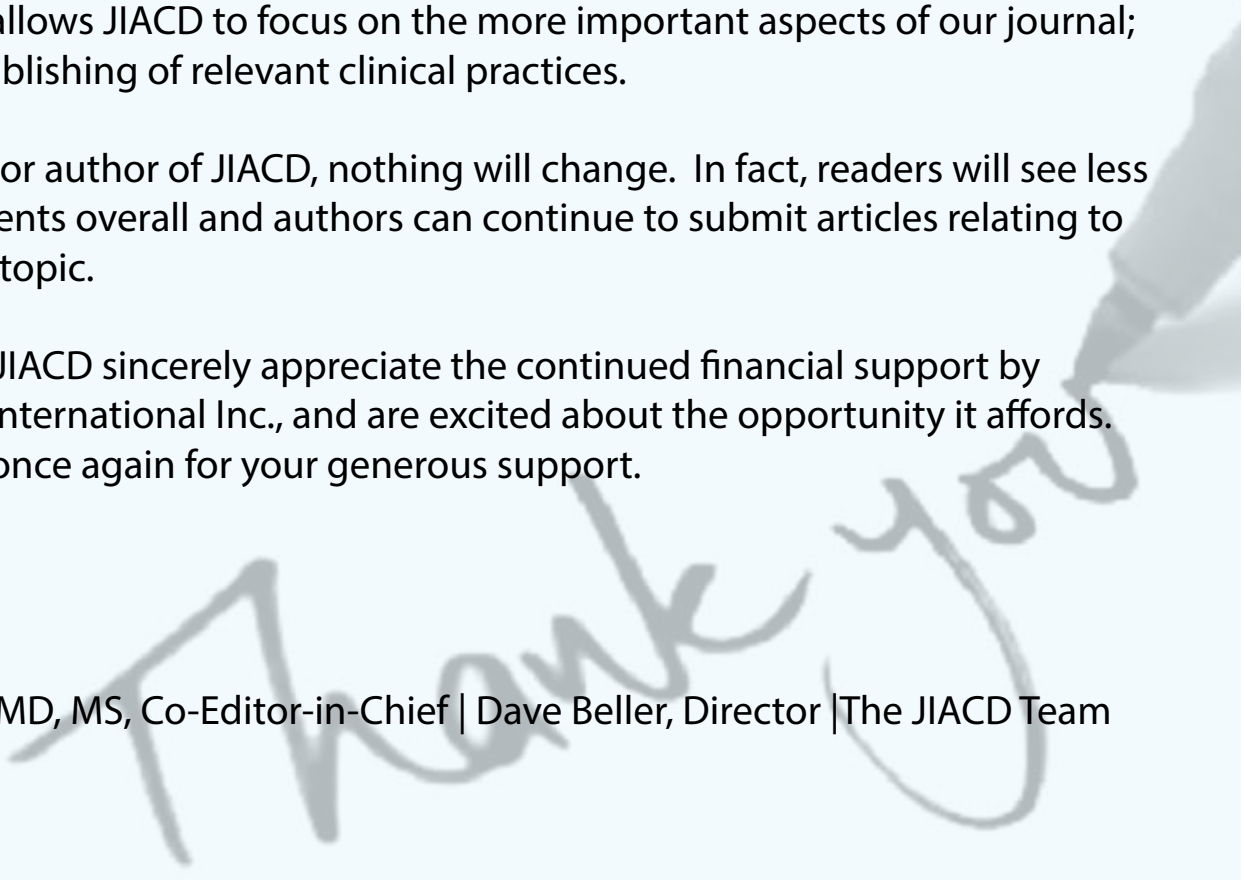
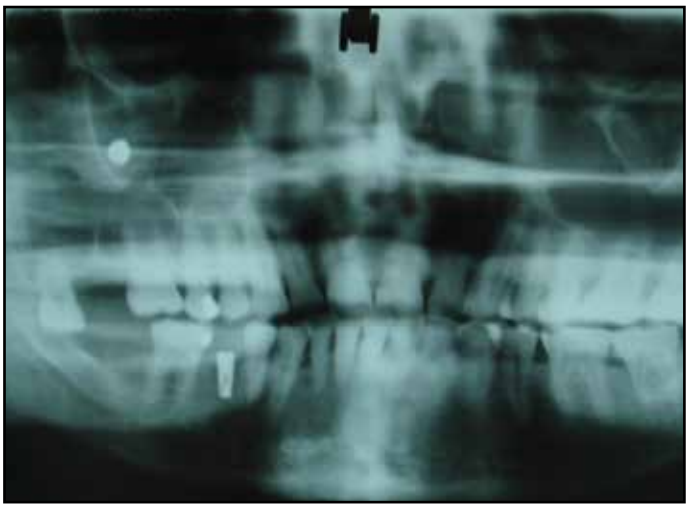


Complications of the Sinus Lift Procedure

Lanka Mahesh, BDS, MBA[1] • Gregori M. Kurtzman, DDS[2]
Praful Bali, MDS[1] • Varun Raj Kumar, MDS[1]

Abstract



The sinus lift is one of the most common procedures performed to increase the height of posterior maxilla for placement of dental implants. It is a sensitive area which is prone to complications, the most common being sinus membrane tear and bleeding. This article discusses some of the complications associated with sinus lift procedure

KEY WORDS: Sinus lift, complications, sinus membrane

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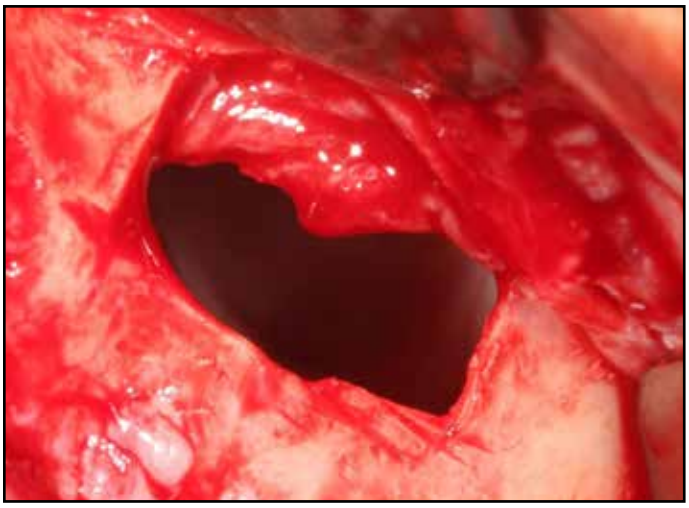

Figure 1: Sinus membrane perforation.

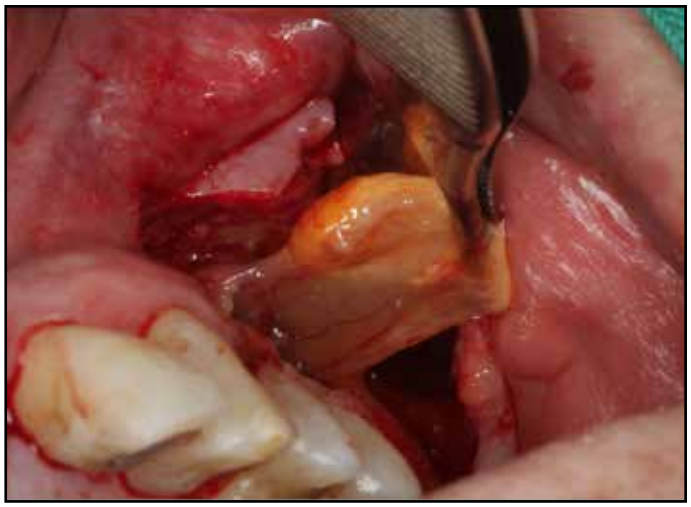

Figure 2: Mucocele.

INTRODUCTION

Placement of dental implants has become an indispensible treatment modality when treatment of missing teeth is considered. The prime requisite for dental implants is the presence of good bone, thus bone grafting is carried out wherever bone is deficient. There is vast literature which states that sinus expands in the absence of teeth resulting[1] in thin bone incapable of placement of implant placement, in such cases bone grafting is done via direct or indirect sinus lift, increasing the height of bone in posterior maxilla. This procedure was first described by Dr. Hilt Tatum at an Alabama implant conference in 1976 which opened doors to new techniques and opportunities for replacement of missing teeth.

However, maxillary sinus is a delicate area and there are many vital structures which should be considered, also proper treatment planning is involved, which if not considered can result in catastrophic results. The most common being sinus membrane tear, placement of implant in deficient bone height and dislodgement of implant in the sinus cavity. This article discusses some of the most common sinus lift complication which can be encountered during the surgery, which are summarized in as follows:[3] 1) Intraoperative: Bleeding, buccal flap tear, infraorbital nerve injury, membrane perforation; 2) Early postoperative: incision line opening, bleeding, barrier membrane exposure, infraorbital nerve paresthesia; 3) Late postoperative: graft loss/failure, implant failure, oroantral fistula, implant migration, inadequate graft fill.

Intraoperative complications can arise during any surgical procedure, the most common of which is membrane perforation (Figure 1) occurring in about 7-44% of procedures.[4-6] This can further lead to acute or chronic sinus infections, loss of grafting material and the disruption of normal sinus physiology.[3,6] In such cases no grafting procedure should be carried out and the site can be re-opened after 2-3 weeks when the membrane has repaired itself. However, few authors advocate grafting even in cases of membrane tear as no association between the membrane perforation and the implant survival has been found.[3,6] Certain anatomical factors such as sinus septa, mucosal swelling, mucoceles

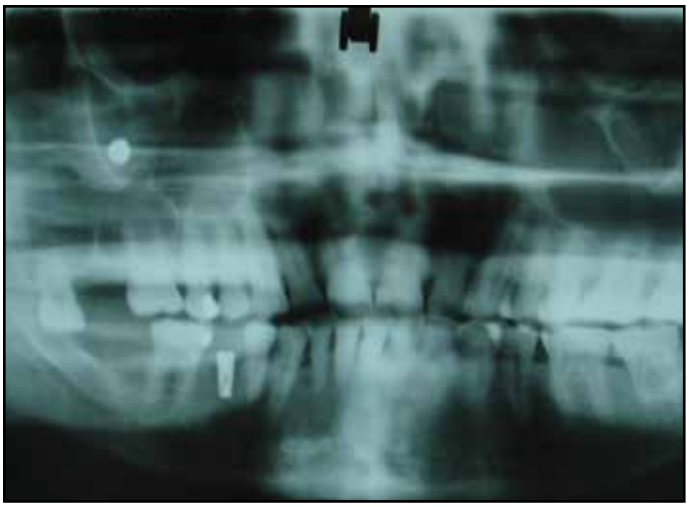

Figure 3: Dislodged implant in the maxillary sinus.

Figure 4: Post-operative opening of suture line.

(Figure 2), narrow sinus or osteotomy design or an increased lateral wall can increase the risk of membrane perforation. Thus such the site should be free of pathologies before sinus lift.

Bleeding is another common complication, slight bleeding from the surgical site is a normal phenomenon of any surgery, and bleeding from soft tissues is of short duration however, if profuse bleeding occurs one should consider the possibility of damage or severing of the artery or branches of the vascular supply of the lateral wall of the sinus and the surrounding soft tissue or damage to the posterior lateral nasal artery. All efforts should be done towards control of the bleeding, only when clinician is sure of no hemorrhages, bone grafting procedure can be commenced.

Displacement of dental implants to adjacent anatomic structures (Figure 3) is another reported complication. This occurs when proper treatment planning is not done and there is no initial stability of the dental implant placed which occurs in cases of insufficient bone height and quality. Displacement of an implant may further cause serious consequences such as sensory disturbance, maxillary sinusitis, oroantral fistula. The migration of such implants in the ethmoid, sphenoid sinuses, orbit, nose and anterior cranial fossa is much more sporadic[7-9] other reasons for such displacement are poor surgical skills of the operator, the presence of an uncured perforation, too much implant tapping or the application of an excessive force.[10] Another reason could be autoimmune reaction to the periimplant bone destruction caused by the implant, which leads to the loss of integration[11] Caldwell-Luc technique has been proposed to retrieve dental implant or any foreign body material from the sinus, however sometimes implant may be embedded further up towards the orbit, causing retrieval difficult. This results in extra surgeries and expenditure for the patient.

Early post-operative complications such swelling or slight bleeding from the surgical site are common and transient. Complications such as exposure of the underlying membrane due to opening of suture line (Figure 4) mainly occur due to excessive swelling. Thus post operative instructions should be clearly given and should be reinforced on the patient. Late complications

of the surgery include loss of the graft causing implant failure. This may also lead to implant migration in other anatomical structures as aforementioned and oroantral fistula. According to the literature, acute postoperative sinusitis occurs as a complication in up to 4.7% of sinus graft procedures.[12] Rhino sinusitis is a well-known complication associated with the sinus lift procedures where surgical treatment is required to further stop the spread of infection.[13-14] Most often the infection appears after more than one week of the surgery. According to the literature it has been shown that 3-20% of patients who have predisposing factor for sinusitis are at risk of developing postoperative transient sinusitis.

CONCLUSION

The sinus lift is a common procedure yet it is prone to complications, some of which may become life threatening especially when a dental implant gets dislodged in the sinus cavity.

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Disclosure
The authors report no complications with anything mentioned in this article.

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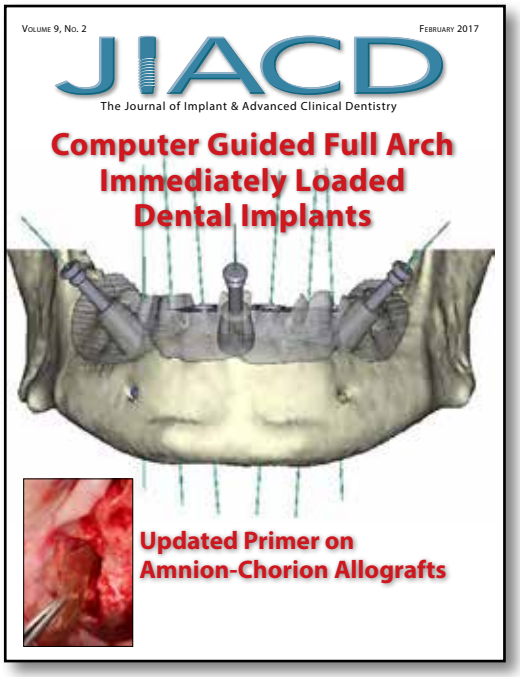

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