Past, Present and Future Trends in Today’s Implantology

by Delia Tuttle, DDS

Abstract

Thanks to so many years of advancements in implant design, restorative choices and digital dentistry, today we can provide patients with a higher level of care. Guided 3D implantology can predict and achieve less-invasive surgeries and fast recoveries for any patient, including the elderly.

Mini implants can be an alternative treatment for severe ridge atrophy by reducing morbidity, and they should be taken into consideration due to their overall successful placement.

Objectives

• Review treatment planning steps in a completely edentulous patient.
• Identify the anatomically challenging structures in implant placement using CBCT and 3D planning.
• Learn a soft-tissue augmentation technique to increase keratinized tissue around implants.
• Establish the appropriate steps for guided surgery before implant placement.
• Discuss positive and negative aspects of guided surgery.
Introduction
Living with dentures from the age of 30 can be challenging. The quality of life can be profoundly affected—especially social life. The patient is wearing old dentures, both maxillary and mandibular, and is completely edentulous. He has neglected dental care due to financial reasons. The following case will demonstrate an effective protocol that I used to address an implant placement in a severe mandibular and maxillary resorption.

Case report
The patient is a 70-year-old man who presented with a chief complaint of soreness during mastication with a lower-worn mandibular denture, which has an old appearance and ill-fitted function. The dentures were fabricated 20 years ago and he has been edentulous from the age of 30.

A review of the patient’s medical history disclosed a case of colon cancer in 2007 that has since been in remission. He presented with hypertension and hypercholesterolemia, which are managed by his physician via daily medications. A dental exam revealed angular cheilitis present bilaterally due to a reduction of vertical dimension of occlusion with his current upper and lower complete removable prostheses.

A normal temporal mandibular function was noted, with no tenderness in the joint or associated muscles. An oral-cancer exam revealed nothing abnormal. The maxillary arch is edentulous and demonstrates significant bone loss due to a long history of denture wear in the arch. Bilateral enlarged maxillary sinuses were present, with very thin bone at the crest. Sufficient ridge and vestibular depth appeared present to achieve support and stability for a full maxillary prosthesis.

The mandibular arch presented with severe atrophy, with loss in the posterior of height and width and resorption, resulting in the mental nerve lying at the superior aspect of the crest bilaterally (Fig. 1). The narrow ridge and inadequate height superior to the inferior alveolar nerve and mental nerve precluded placement of implants distal to the mental foramen bilaterally. Shallow vestibule was noted throughout the mandibular arch with thin keratinization tissue present.

After clinical examination, a CBCT was requested to evaluate the anatomy, and bone quality and quantity. A couple of choices were offered to the patient at this time: a new set of dentures with a minimum of four implants in the maxilla and two implants in the mandibular arch; a new set of dentures with two minimum implants in the mandibular arch; or fix restorations, involving all on #4—the patient was not interested due to high cost.

After reviewing CBCT with the patient, he agreed to three mini implants for the mandibular arch and a new set of dentures.

Treatment-planning challenges
For anatomical structures—mental nerve, inferior alveolar canal nerve, lingual artery and sublingual artery—the decision was made to place two extreme implants in front of the mental nerve and the third implant in the middle of the crest at the level of the mandibular symphysis.

For bone height, width and volume—in a fully edentulous mandibular arch, inadequate buccal lingual width or the presence of undercuts can lead to inadequate implant placement. Ridge splitting can be an alternate treatment.

Because we had a roughly 10mm height, and also 40mm between mental nerve foramen distance, we investigated all the mini-implant companies to find the right length and diameter for the implant placement.

Patient satisfaction was another important consideration. In a multi-country prospective study, patient satisfaction was significantly high with implant-supported overdentures, compared to conventional removable dentures.

Digital technology has provided us with the ability to assess much more information regarding volume, height and width of bone to allow us a flawless implant placement.

Clinical protocol
Maxillary and mandibular dentures were fabricated after assessing the correct vertical dimension of occlusion, making sure that the implant attachments will be incorporated in the ideal space for the mandibular overdenture. The dentures were fabricated with
Hiossen mini implant placement at surgery.

Patient presented with a very narrow ridge buccal lingual with 3mm-3.2mm present. CBCT helped determine implant size, mapping the ridge area while the patient was under local anesthetic. Patient presented a large lingual mid-symphysis exostosis, which actually helped with the implant placement.

We used Hiossen implants due to the versatile sizes of implants, 1.8mm diameter by 8mm length. A mid-ridge incision was made with a No. 15 scalpel premolar to premolar area, and a full buccal and lingual periosteal flap was deflected to visualize the ridge. With a round 6mm surgical bur, the knife ridge was smoothed off at the surface. Three implants were placed in front of the mental nerve and one was placed in the middle of the ridge, achieving bicortication stabilization (Fig. 2).

The anesthesia was done using two carpules of Septocaine. Monofilament 4.0 black sutures were placed around the necks of the implants. The denture was released around the head of the balls and a reline with Visco-gel was applied four days after surgery. Sutures were removed after eight days and no infection or other complications were present. Postsurgical instructions were given to the patient, which included chlorhexidine mouth rinse two times a day, and light brushing during first two weeks.

Pain was addressed with Motrin, 800mg every six hours. Five hundred milligrams of amoxicillin was used three times a day for 10 days. The patient recovered very well after surgery. The denture was relined periodically with Visco-gel.

After four months the lower denture was attached chairside with cold pink acrylic. (Fig. 3)

Patient satisfaction was beyond expectations. He was able to bite into a sandwich without having movement on the lower denture.

Soft-tissue augmentation

A systematic review demonstrated that implants with an adequate band of peri-implant keratinized mucosa had less mucosal inflammation and recession. Autogenous, allogenic or xenogeneic grafts can be used for soft-tissue augmentation. An autogenous soft-tissue graft is considered the gold standard of the treatment outcome.

After one year, the patient returned for the soft-tissue augmentation procedure (Fig. 4). At this time we performed an epithelial tissue graft to increase the keratinized tissue around the implants and also to increase the vestibule depth, which has limitations. The procedure was done in collaboration with Dr. Roberto Rossi, a periodontist.

The epithelial tissue graft was prelevated from the upper-left ridge, using a No. 15 scalpel (Fig. 5). Procedures were done using three carpules of Septocaine for donor and recipient area. The donor measurements were able to cover only two implants on the lower left and central. Shrinkage was considered at this point and the graft was prelevated in a larger size and maintained with saline solution. The hemostasis for the donor site was achieved using resorbable sutures, 4.0 chromic gut, and also a hemostasis cellulose gauze.

The maxillary denture was inserted for hemostasis purposes due to great pressure contacts. The recipient site was prepared with a pear-shaped, fine diamond bur, more facial mid-implant line and distal of the implants. The ridge was at the same level with the lip mucosa, with no vestibule present. The graft was well adapted around implants using 6.0 proline sutures (Figs. 6 & 7).

Sutures were removed after two weeks and patient did not wear his lower partial for one month. Soft food was recommended, as well as 600mg Motrin for pain as needed. Healing was uneventful and the patient could wear his partial after a couple of adjustments. Tissue looks better with more volume on
The patient was extremely satisfied with the mandibular mini implants and he decided to have some implants on the maxillary arch as well. A five-implant overdenture was the patient’s treatment choice. In the meantime, I had training on 3D guided implantology with Implant Direct using Anatomage. The experience was amazing and I started to plan all my dental implant cases using surgical guides from CBCT.

The patient denture was duplicated in my office using Biocryl X material. A CBCT was done with the duplicate denture in place. A polyvinyl siloxane impression was used to fabricate study models in order to have an accurate scanning for the surgical guides.

Take a look at the CBCT images (Fig. 9).

the surgery site (Fig. 8). Patient wanted to wait for the other site to be functional.

Increasing the keratinized tissue around the implant area increases the survival rate of the implants because the inflammation is less around implants. Personal hygiene can be better since the tissue is no longer thin. Also, the multiple denture insertions can affect the quality of tissue over time because of the pressure.
Patient had a separate appointment in the office to try-in the surgical guide and verify the fit (Fig. 10).

Implant placement was done flapless using the surgical guide, stabilized by three mini screws (Fig. 11). The quality and quantity of bone was deficient but we were able to place five 3.2 Implant Direct implants in position #5 (10mm), #6 (8mm), #8 (8mm), #9 (8mm), and #11 (8mm) (Fig. 12). Primary stability was obtained for four implants out of five.

Due to bilateral maxillary sinus pneumatization, we avoided placing implants on the posterior of the maxilla. Patient did very well during the surgery and his vitals were monitored with a pulse oximeter and blood-pressure cuff. The healing was uneventful under an Amoxicillin antibiotic therapy of 500mg three times a day for 10 days. The patient didn’t wear his denture for three weeks (Fig. 13).

Tokuyama denture material soft reline was used for his denture to be functional for the next six months. The overdenture will be prepared in six months. The final design will have a metal reinforcement and the palate coverage will be reduced (Fig. 14).

**Conclusion**

Mini implants are great for treating edentulous patients with minimal ridge width. The limitations are:

1. The interarch space requirement, due to the height of the supra-gingival attachment.
2. Implants require having great parallelism at placement to avoid problems with insertion of the denture, and also to prevent additional lateral load forces during function.

Overall, mini implants are a highly successful implant option and should be taken into consideration for the resorbed edentulous mandible. Guided implantology is the present and the future for dental implants.

Positive aspects of guided implant surgery include the following:

- Safe, predictable surgery
- Surgery time is reduced
- Fast healing, reduced morbidity
- Can be done flapless when grafting or bone reduction is not required
- Immediate load can be taken into consideration
- Implant placement is accurate

The negative aspects include these factors:

- CBCT equipment needed
- Training needed to accurately read the scans and software planning
- Surgery planning takes longer
- It’s difficult to deal with unexpected complications without previous experience with dental implants
- Guide cannot be used with a limited mouth opening
- Necessity of investment in a surgical kit and software
- Patient pays for the guide and CBCT.

*See references on p. 85.*

**Author Bio**

Dr. Delia Tuttle graduated from UCLA’s School of Dentistry in 2009 and graduated from medical school in Romania in 2000, where she practiced as a physician before she became a dentist. She has enjoyed practicing all aspects of general dentistry, including but not limited to: wisdom-teeth extractions, bone grafting, implants, gum surgery, root canals, dentures, partials and cosmetic dentistry. Tuttle owns a private practice in Lake Elsinore, California. She can be reached at tuttledelia@yahoo.com.
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1) Patient satisfaction factor(s) following implant treatment is (are):
   A. Denture stability
   B. Chewing stability
   C. Speech
   D. Comfort and improved function
   E. Improved taste and quality of life
   F. All the above

2) True or false: A systematic review demonstrated that implants with an adequate implant of keratinized tissue are more successful due to less mucosal inflammation and recession.
   A) True
   B) False

3) After a soft-tissue grafting procedure around implants, wearing the denture is recommended after:
   A. 1 week
   B. 2 weeks
   C. 3 weeks
   D. 4 weeks

4) CBCT planning for guided surgery is recommended to be done with a:
   A. Denture outside of the mouth
   B. Denture inside the mouth
   C. Duplicate barium denture inside the mouth

5) Guided surgery involves:
   A. Faster surgery and faster healing
   B. No limitations
   C. High financial cost
   D. Ease in resolving unexpected complications
   E. A and C

References:
4. Improving denture stabilization with the ERA Mini implant – Clinical CE article Drs. Gregori M. Kurtzman and Douglas Dompkowski use mini implants to provide improvement in denture and mastication. Volume 3 Number 6

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