

# Graftless solutions in implant dentistry: Part 2

Authors\_Saj Jivraj, BDS, MSED, and Hooman Zarrinkelk, DDS

## \_c.e. credit part I

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## *Diagnosis, treatment planning and delivery of the immediate load prosthesis*

### \_Treatment protocol

The treatment protocol for graftless solutions involve a;

- 1) Reduced number of implants
  - 2) The protocol has been popularized by the All on 4™ solution (Nobel Biocare). Clinicians should be aware that the graft-less protocols may involve placement of more than four implants.
  - 3) Anterior implants are placed straight
  - 4) Posterior implants are tilted to avoid grafting procedures
  - 5) The patient is provided with fixed rigid acrylic prosthesis which splints all the implants and provides cross arch stabilization
  - 6) The prosthesis is immediately loaded.
- This type of prosthesis is indicated for patients:

- 1) Where good lip support can be provided without a flange.
- 2) Patient does not want to go through grafting procedures.
- 3) Sinus is a limit posteriorly.
- 4) Cost is a factor.

There are certain requirements that must be adhered to ensure clinical success.

### \_Patient requirements

The patient must be in good overall health. The patient must have a good understanding of the prosthesis design. In particular, the patient must be made aware that there will be pink acrylic replacing lost hard and soft tissue. For edentulous patients, this

Fig. 1\_Patient A smile line.

Fig. 2\_ Intra-oral view of patient A.



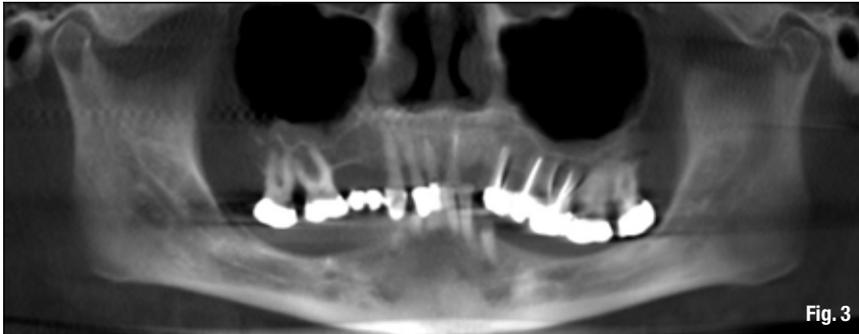


Fig. 3



Fig. 4

may be something they have come accustomed to. For dentate patients, they must be made aware that alveolectomy will be performed and the lost tissue will be replaced by pink acrylic.

### Practitioner requirements

All practitioners involved must have undergone significant hands on training and be comfortable with immediate function procedures. Practitioners must have adequate inventory to ensure clinical success. This includes having additional implants, abutments and temporary cylinders on hand should they be required. Planning for inventory must be carried out way ahead of time.

### Dental laboratory support

From a laboratory perspective, the provisional complete denture must be ready. Denture base resin must be available and adequate instrumentation to finish and polish the prosthesis. The dental technicians responsibility is to complete all the non-clinical phases of treatment after the clinician has indexed the prosthesis intra-orally.

### Case presentation

When a patient presents who is a candidate for graftless solutions, a comprehensive clinical and radiographic examination must be undertaken. This must include CBCT scan, periapical and panoramic radiography. Time must be spent on diagnosis and

treatment planning to ensure a predictable outcome.

Key diagnostic determinants that the clinician must focus on are:

- Hard and soft tissue missing.
- Ridge display during smiling.
- Bone quantity and quality.
- Restorative space required.

Patient A presented for evaluation (Figs. 1, 2). She had not seen a dentist for the last 20 years and, like many patients, her fear was the thought of wearing complete dentures. She presented with a failing dentition and requested implant therapy such as fixed implant-supported restorations. All options were discussed with the patient. The patient's desire was to proceed with implant-supported fixed dentures adopting a graftless approach.

- Treatment planning required:
- Panoramic radiograph
- CBCT
- Clinical evaluation

**Panoramic radiograph:** On evaluation of the panoramic radiograph, the following was found: failing dentition with recurrent caries beneath multiple restorations, low sinus floor, posterior mandibular resorption limiting implant placement in this region and a high mental nerve (Fig. 3). On evaluation of the panoramic radiograph, it was apparent that there was bone availability in zones 1 and 2.

**CBCT:** This provides the clinician with more accurate anatomical measurements and 3-D topography of the osseous architecture. A safe guideline in terms of osseous requirements is that there should be 5 mm of bone width and 10 mm of bone height in the

**Fig. 3\_** Panoramic radiograph of patient A, illustrating high mental nerve, irregular occlusal plane, bone present in zones 1 and 2.

**Fig. 4:** Excessive lip support due to flaring of anterior teeth.

**Fig. 5\_** Excessive tooth display . Patients displays gull wing smile line.

**Fig. 6\_** Overerupted maxillary incisors.



Fig. 5



Fig. 6

**Fig. 7\_** Intra-oral situation.**Fig. 8\_** Problem list includes, over-erupted anterior teeth, posterior mandibular resorption. Irregular occlusal plane. Failing dentition.**Fig. 9\_** Provisional complete dentures.**Fig. 10\_** Flap elevated in preparation for alveolectomy.

maxilla and 5 mm of bone width and 8 mm of bone height in the mandible.

### Clinical evaluation

On clinical evaluation, the following was found:

- **Facial and lip support:** As a result of inadequate posterior support, the anterior teeth had flared and were over-supporting the lip.

- **Smile line and lip length:** Gingiva was visible when the patient produced an exaggerated smile.

- **Incisal edge position:** Conventional prosthodontic guidelines dictate that the incisal edge position should be determined by esthetics and phonetics. The incisal edge should be positioned just palatal to the vermillion border of the lower lip.

Esthetically, there should be 2-3 mm of the incisor visible when the patient is in repose; this display is less for an elderly patient. Other guidelines for incisal edge position include the "S" position and the "F" sound. In this particular patient, it appeared the incisal edge flared forwards and over-erupted. The patient appears to be showing too much incisal edge and this will need to be addressed when deciding its definitive position (Fig. 4).

- **Interarch space:** As a result of missing posterior mandibular teeth and a diagnosis of lack of posterior support, the interarch space had been compromised. Over-eruption of posterior maxillary teeth resulted in inadequate restorative space posteriorly. Over-eruption and flaring of both maxillary and mandibular anterior teeth resulted in a deep vertical overlap of anterior teeth and in adequate restorative space (Fig. 5).

### Gaining restorative space

In patients who require extensive restorative therapy, restorative space constraints frequently arise. The treating clinician must decide how to gain space so restorations with adequate mechanical integrity can be fabricated.

There are a few techniques to gain space for the patient about to undergo full-mouth extractions and implant placement:

- Restoration of the vertical dimension of occlusion
- Alveolectomy
- Combination of the above.

- **Restoration of the vertical dimension of occlusion:** This assumes the patient has lost vertical dimension, when in reality they may not have. Physiological adaptations to alterations in OVD are highly individual. It can be extremely unstable in some patients but very successful in others. We cannot predict in which patient it is likely to be successful; there are no scientific guidelines to do this. There is just clinician experience over time.

Guidelines were established by Di Pietro<sup>1</sup>, who discussed the significance of the Frankfort Mandibular Plane Angle and its relevance to restorative dentistry. He mentioned in his article that patients with a low FMA are predisposed to a decrease in VDO, these patients are more likely to return to their former occlusions if the VDO is opened. Patients with high FMA angles are the opposite and can tolerate an increase in OVD.

So what limits are there to increasing VDO? There are in fact no specific measurements; the increase is dictated by restorative space required, esthetics and phonetics.

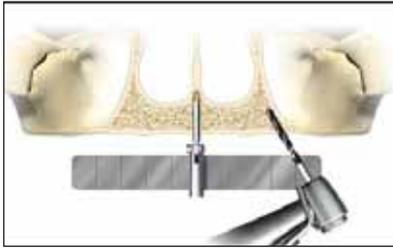


Fig. 11



Fig. 12

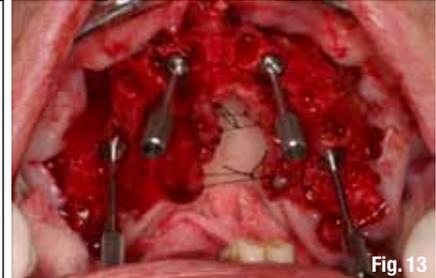


Fig. 13

Clinicians are divided in their theories regarding alteration of OVD. Some believe we cannot alter it, and if we do, it will go back to its pre-treatment position.<sup>2</sup> Others believe we can alter it as much as we need, and it will be stable.<sup>3,4</sup>

There is a consensus that if OVD alteration is required, it is altered as little as possible to achieve the clinician's restorative objectives.

To summarize, it is possible to alter the OVD and from a muscular perspective and not suffer negative sequelae as long as the alteration occurs within the patients physiologically adaptable range.

Alveolectomy is often required when teeth have over-erupted and there is an excess of bone, which compromises the restorative space.

### \_Decision making for Patient A

A majority of the space for Patient A was created by alveolectomy. The rationale for that being;

- Patient A's lip was over-supported due to lack of posterior support and flaring of the maxillary anterior teeth.
- Over-erupted maxillary and mandibular anterior teeth with excess bone.
- Maxillary incisal edge is in incorrect position. Requires repositioning 3 mm apically. This will allow the transition zone to be concealed. This will also require alveolectomy to provide adequate restorative space (Fig. 6).

A duplicate set of mounted diagnostic casts are required. One set of casts is used as a reference; the second set of casts is used for the diagnostic tooth

set up. On this set, model alveolectomy is performed and communicated to the surgeon via a bone reduction guide.

### \_Treatment sequence

• Visit 1 – At the first visit, the following is required:

- a) Pre-operative and extra-oral photos.
- b) Preliminary impressions; these should capture the full depth of the sulcus and all anatomical landmarks.
- c) Smile line evaluation.
- d) Lip support and lip length evaluation.
- e) Vertical dimension evaluation.
- f) Inter-arch relationships.

• Visit 2 – At this visit, jaw relationships are established using conventional prosthodontic guidelines. The following is required:

- a) Smile line, midline and canine lines.
- b) Lip support.
- c) Occlusal plane.
- d) Occlusal vertical dimension.
- e) Centric relations.
- f) Tooth shape, mould and shade.

• Visit 3 – If the patient is fully dentate, a try-in appointment is not feasible. As clinicians, we use anatomical landmarks to position teeth and orientate the occlusal plane. If the patient is edentulous, the following needs to be evaluated at the diagnostic tooth set-up:

**Fig. 11\_ Tilted implant placement.** Posterior implants placed parallel to the anterior wall of the maxillary sinus.

**Fig. 12\_ Multi-unit abutments placed with abutment driver.**

**Fig. 13\_ Severe lack of lip support** requires the patient to wear a prosthesis with a flange.

**Fig. 14\_ Plastic healing caps placed on multi-unit abutments.**

**Fig. 15\_ Goal of implant placement is to have four or more implants placed with multi-unit abutments attached in preparation for immediate loading.**



Fig. 14

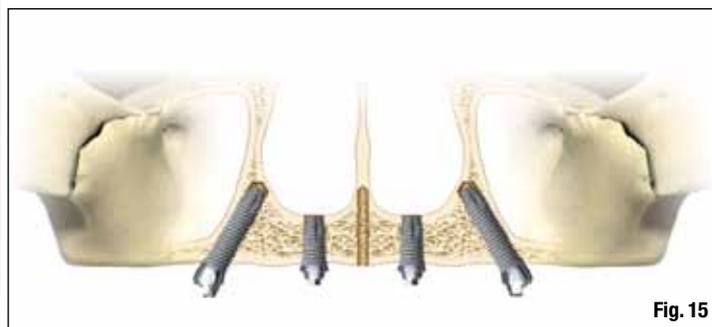


Fig. 15



Fig. 17

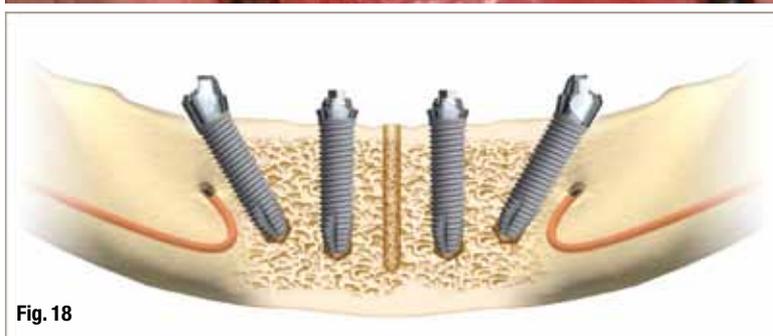


Fig. 18

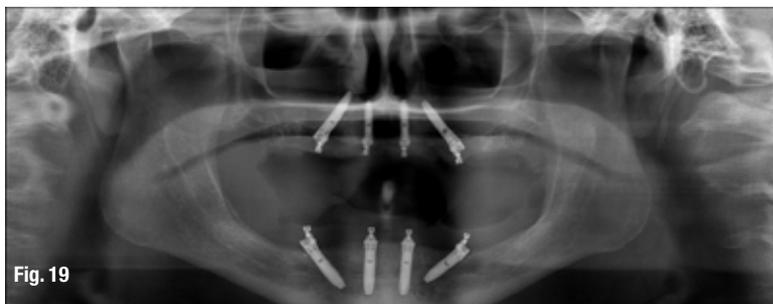


Fig. 19



Fig. 20

Fig. 17\_Multi-unit abutments placed.

Fig. 18\_Goal of implant placement is to maximize the AP spread.

Fig. 19\_Panoramic radiograph illustrating implant placement.

Fig. 20\_Clinical situation with all implants and multi-unit abutments placed and healing caps attached.

- a) Smile line, mid-line and canine lines.
- b) Lip support.
- c) Occlusal plane.
- d) Occlusal vertical dimension.
- e) Centric relations.
- f) Tooth shade and shape selection.

• Visit 4 – At this visit, the provisional complete dentures for the immediate load should be ready. It is critical that the restorative dentist meets with the surgeon to communicate bone reduction for restorative space, anteroposterior spread of implants and multi-unit abutment angulations required. It is recommended that the restorative dentist provide the surgeon with a duplicate denture of clear acrylic resin with the palate removed. This will allow the surgeon to visualize the abutment angulations in relation to the immediate load prosthesis.

### Implant surgery

The goal of implant surgery includes:

- 1) Extraction of all of the remaining teeth (Fig. 7).
- 2) Alveolectomy.
- 3) Immediate implant placement to achieve a primary stability of 35 Ncm. This is achieved by under-preparation of the osteotomy site; use of longer implants to achieve greater bone to implant contact; and use of an implant design and surface that is conducive to increased biological stability
- 4) Implants are all placed at the same level. The posterior implants are placed so that they tilted and parallel to the anterior wall of the maxillary sinus. The anterior implants are placed so that the transition line will not be visible (Fig. 8).
- 5) Multi-unit abutments are placed to correct the angulations of the tilted implants. The selection of the healing abutments is such that after suturing, the crestal incision 1 mm of abutment is above the soft-tissue line (Figs. 9,10).
- 6) If alveolectomy has been performed, tissue is trimmed. Plastic caps are placed on the multi-unit abutments. The surgeon then approximates the tissue around the caps so the restorative dentist can operate at a supragingival position (Figs. 11, 12).
- 7) In the mandible, the surgical goals are the same. Teeth are extracted, alveolectomy performed and the implants are placed. The posterior implants are tilted and the anterior implants are straight. The surgeon's goal is to achieve as much of an antero-posterior spread as possible within the limitations imposed by the loop of the inferior alveolar nerve exiting the mental foramen (Figs. 13-16).

### Prosthetic considerations for immediate loading

There is an abundance of literature that supports immediate loading of the edentulous patient.<sup>5</sup> Immediate loading is defined as a protocol whereby the implants are placed and put into immediate function



Fig. 21



Fig. 22



Fig. 23



Fig. 24



Fig. 25



Fig. 26

the day of surgery.

There are a number of prosthetic considerations that must be understood prior to embarking upon the immediate load process. Meticulous attention to detail is required for the process to be successful.

An important prerequisite for predictable healing is absence of micromotion. Brunski<sup>6</sup>, reported that micromotion of 100 microns may constitute a threshold value for machined implant surfaces to osseointegrate adequately. Favorable loading conditions can be achieved by splinting the implants together immediately after placement. Micromotion at the bone implant interface is limited, thus facilitating the healing process.

The prosthesis should satisfy the following requirements:

- 1) Provide cross-arch stabilization with a screw-

retained rigid prosthesis with no cantilevers.

- 2) No premature occlusal contacts.
- 3) No interferences in lateral excursion.
- 4) Minimal vertical and horizontal overlap.
- 5) Provide adequate esthetics.

### Prosthetic technique for fabrication of the immediate load prosthesis

The patient arrives at the restorative dentists office with implants placed and healing caps placed on the multi-unit abutments (Fig. 17).

There are several techniques for fabrication of the immediate load prosthesis including the direct and indirect techniques. In this article, the direct technique will be described.

- Step 1: The position of the implants must be

**Fig. 21** Position of implants is indexed by placing occlusal registration material in the intaglio of the denture.

**Fig. 22** Large holes are made in the denture.

**Fig. 23** Temporary cylinders are connected to the multi-unit abutments and hand tightened.

**Fig. 24** Denture is placed over the temporary cylinders. Occlusal plane and tooth display is verified.

**Fig. 25** Temporary cylinders are connected to the denture using cold cured acrylic resin.

**Fig. 26** The intaglio of the denture is filled with cold cured acrylic resin, finished and polished.



Fig. 27

Fig. 28

**Fig. 27**\_Prosthesis is finished and polished.

**Fig. 28**\_Undersurface of prosthesis is convex, highly polished and no debris on the fitting surface of the temporary cylinders.

indexed within the intaglio of the maxillary denture. A variety of materials can be used to do this ranging from wax to occlusal registration material. The purpose of this step is to locate the implant positions as they relate to the prosthesis (Fig. 18).

Step 2: With the use of a large acrylic bur, make holes in the positions of the markings. The holes should be big enough so as not to interfere with the circumference of the temporary cylinders (Fig. 19).

Step 3: Place the temporary cylinders on the multi-unit abutments (Fig. 20).

Step 4: Place the denture over the temporary cylinders and ensure it goes into place. The denture should seat passively around the temporary cylinders.

Step 5: Observe the patient from the front. Ensure the occlusal plane is level and the tooth display is what was planned (Fig. 21).

Step 6: Connect one of the anterior temporary cylinders with cold curing acrylic resin, hold into place until it has set. Observe the patient from the front to ensure the occlusal plane is still level.

Step 7: Connect the remainder of the cylinders with cold curing acrylic resin. Ensure the resin circumferentially is bonded to the temporary cylinder and engage the first two to three grooves of the temporary cylinders. The cylinders should be stable within the denture (Fig. 22).

Step 8: Unscrew the prosthesis and re-inforce the temporary cylinders within the intaglio with cold curing acrylic resin. Follow appropriate disinfection protocols.

Step 9: Use cold cured acrylic resin to fill in the intaglio of the denture (Figs. 23,24). Use appropriate lab protocols to finish and polish.

Step 10: Evaluate the undersurface of the prosthesis. There should be no acrylic over the fit surface or the internal of the temporary cylinders. The undersurface of the prosthesis should be convex and well polished. There should be a space of 1.5-2 mm between the undersurface of the prosthesis and

the soft tissue to allow for inflammation of the tissue (Fig. 25).

Step 11: Deliver the maxillary prosthesis and hand tighten the screws.

Step 12: The mandibular prosthesis is delivered in exactly the same way. The only reference for stability of the mandibular denture is the buccal shelf. Index the position of the implants with bite registration material.

Step 13: With an acrylic bur, make holes in the intaglio of the denture.

Step 14: Place the temporary cylinders on the multi-unit abutments.

Step 15: Place the denture over the temporary cylinders and ensure there is a passive fit. The occlusal aspect of the temporary cylinders should not be higher than the occlusal level of the teeth. If they are, section the temporary cylinder with a disc.

Step 16: Place the denture over the temporary cylinders and guide the patient into centric relation. Practice this movement a few times to ensure the patient goes to a repeatable position. Index one of the anterior temporary cylinders with a cold cured acrylic resin. Guide the patient into centric relation and hold the patient there for two to three minutes until the acrylic resin has set. The denture should be stable; verify the patient can open and close in a repeatable fashion

Step 17: Index the remaining temporary cylinders.

Step 18: Unscrew the prosthesis and re-inforce the temporary cylinders within the intaglio with cold curing acrylic resin. Follow appropriate disinfection protocols.

Step 19: Use cold cured acrylic resin to fill in the intaglio of the denture. Use appropriate lab protocols to finish and polish. Evaluate the undersurface of the prosthesis. There should be no acrylic over the fit surface or the internal of the temporary cylinders. The undersurface of the prosthesis should be convex and well polished. There should be a space of 1.5-2 mm

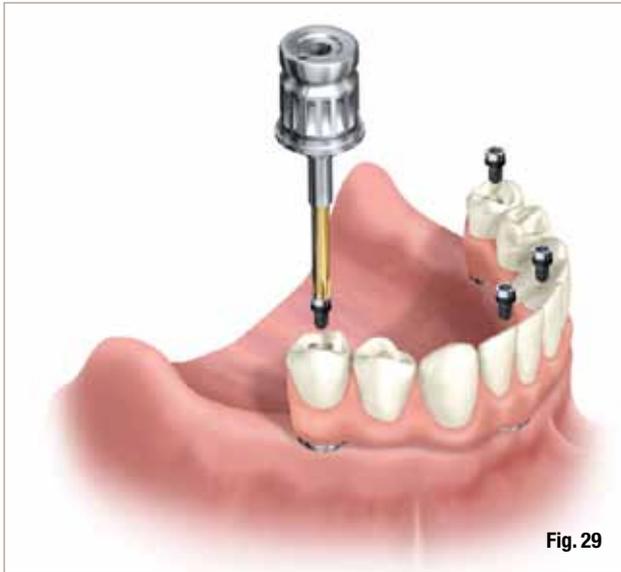


Fig. 29



Fig. 30



Fig. 31

between the undersurface of the prosthesis and the soft tissue to allow for inflammation of the tissue.

Step 20: Deliver the mandibular prosthesis and hand tighten the screws. Adjust occlusion and provide postoperative instructions for the patient.

### Occlusal adjustment

There is no scientific evidence to show that one type of tooth form or one type of occlusal scheme is preferred by patients or is more efficient.

The occlusion in the provisional immediate load prosthesis is designed to protect the implants in the weakest quality bone.

In static occlusion, there should be:

- 1) No premature contacts.
- 2) Minimal vertical and horizontal overlap.
- 3) Silver mylar should hold from canine to canine.
- 4) Silver mylar should drag through the posterior teeth.

The rationale for the above is that the further posterior we go, the higher the occlusal forces. As clinicians, our goal is to minimize occlusal load on the implants that are more posteriorly positioned and in

the poorest quality bone.

In dynamic occlusion:

- 1) No interferences in lateral excursion.
- 2) No interferences in protrusive excursion.

### Postoperative protocol

Postoperative protocol includes:

- 1) Soft diet is recommended for the first eight to 10 weeks. Biologically, this is when the osseointegration phase is at most risk.
- 2) Appropriate pain medication and antibiotics are prescribed.
- 3) Patient is asked to rinse with 0.12 percent Chlorhexidine gluconate mouthwash and clean with a soft brush.
- 4) Occlusion is evaluated at 24 hours and minor adjustment may need to be made to satisfy the protocol above. The occlusion is checked at one week, one month and three months postoperative appointments.
- 5) Patient is asked to report any complications immediately.
- 6) Once the initial healing has occurred and the surgical site has healed, the oral hygiene regimen should include the use of an oral water jet appliance twice daily.

Graftless solutions protocols are designed to provide immediate rehabilitation of completely edentulous patients using dental implants. The scientific literature shows that this procedure has an excellent prognosis.<sup>7,8</sup>

Several factors are involved in the success of these procedures. From the surgical perspective, the most notable are careful implant site preparation, establishing optimum implant sites, providing

**Fig. 29** Prosthesis is screwed into placed and hand tightened.

**Fig. 30** Intra-oral of upper and lower immediate load prosthesis placed.

**Fig. 31** One day post op of patient with immediate load provisionals placed.

maximal anteroposterior spread of the implants and the provision of adequate interocclusal space. From a prosthetic perspective, cross-arch stabilization by splinting all of the implants immediately after surgery, careful occlusal adjustment and eliminating distal cantilevers on the provisional prosthesis.

The immediate function protocol described minimizes surgical morbidity as a result of the reduced number of procedures and implants placed reducing overall treatment time and cost to the patient. This ultimately results in increased patient acceptance and an increase in the number of patients treated.

### \_References

- 1) Di Pietro GJ, Moergeli JR Significance of Frankfort mandibular plane angle to prosthodontics. *JPD* 1976 Dec;36(6):624-635
- 2) Niswonger ME, The rest position of the mandible and the centric relation. *J Am Dent Assoc* 21:1572-82, 1934.
- 3) Hellsing G. Functional adaptation to changes in vertical dimension. *J Prosthet Dent*. 1984; 52:867-870.
- 4) Dahl BC, Krogstad O. Long-term observations of an increased occlusal face height obtained by a combined orthodontic/prosthetic approach. *J Oral Rehabil*. 1985; 12:173-176.
- 5) Schnitman PA, Wohrle PS, Rubenstein JE, DaSilvaJD, WangNH. Ten-year results for Branemark implants immediately loaded with fixed prostheses at implant placement. *Int J Oral Maxillofac Implants*. 1997;12:495-503.
- 6) Brunski JB *Int J Oral Implantol*. 1988;5(1):31-4
- 7) Malo P, Rangert B, Nobre M "All on 4", immediate function concept with Branemark implants for completely edentulous mandible. A retrospective clinical study. *Clin Impl Dent Relat Res* 2003;5(suppl 1):2-9
- 8) Capelli M, Zuffeti F, Testori T, Del Fabbro M. Immediate rehabilitation of completely edentulous jaws with fixed prosthesis supported by upright and tilted implants. A multicenter clinical study. *Int J Oral Maxillofac Implants* 2007;22:639-644\_

### \_contact

### implants

You may contact Saj Jivraj at:

Saj Jivraj, BDS, MS.Ed  
300 E Esplanade Drive, No. 1600  
Oxnard, Calif. 93036  
[saj.jivraj@gmail.com](mailto:saj.jivraj@gmail.com)

Jivraj offers one-on-one dental implant training. To sign up, call Dr. Jivraj's office to schedule your training: (805) 988-8985. CEUs will be provided. Tuition is free.

### \_about the authors



**Saj Jivraj, BDS**, completed his dental degree at the University of Manchester in England and his advanced prosthodontic training at the University of Southern California. He is the former chairman section of fixed prosthodontics and operative dentistry at University of Southern California, School of Dentistry. Jivraj has published numerous articles on esthetic and implant dentistry in peer-reviewed journals and has presented on aspects of implant dentistry and advanced prosthodontic procedures both nationally and internationally. He maintains a private practice limited to prosthodontics and implant dentistry in Oxnard, Calif.



**Hooman Zarrinkelk, DDS**, completed his dental degree at Loma Linda University. Following dental school, he was selected as research fellow in oral and maxillofacial surgery at the University of Texas Southwestern Medical Center, Parkland Hospital. Upon completion of his research projects, Zarrinkelk returned to California to complete his surgical residency training at Loma Linda University Medical with special emphasis on reconstructive jaw surgery. Zarrinkelk has been granted diplomate status by the American Board of Oral and Maxillofacial Surgery. He is a fellow of the American Association of Oral and Maxillofacial Surgeons and American College of Oral & Maxillofacial Surgeons. He is also a diplomate of the American Dental Board of Anesthesiology. Zarrinkelk is an associate professor of oral and maxillofacial surgery at Loma Linda University. He maintains a private practice with special interests in reconstructive jaw surgery and CT-guided dental implant surgery.