

Fixed, Immediate-Load, Full-Arch Implant Prostheses; All-on-4 Treatment and Zygoma Implants

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For many years, we believed that dental implants required anywhere from three to six months for osseointegration to occur before restoration and loading. Our main concern was preload and subsequent failure to integrate. This is no longer the case. Today, individual implants are being immediately restored with permanent abutments and provisional crowns. This concept of immediate load is also utilized for fixed full-arch implant prostheses. Patients are now able to have functioning, fixed prostheses the same day as the surgical procedure.

The “All-on- 4” (Nobel Biocare) treatment concept (fig.1) was developed to provide edentulous patients with a functioning restoration using only four dental implants to support an immediately-loaded, full-arch prosthesis.

Figure 1: Maxilla & Mandible



The principle is based on four implants – two straight implants in the anterior and two angled implants in the posterior – supporting a provisional, fixed and immediately-loaded, full-arch prosthesis. This technique was developed by Engineer Bo Rangert P.h.D and Dr. Paulo Malo of Portugal.

This procedure has been performed since 1999 and the cumulative survival rates are between 95% and 98%. Studies have also shown favourable marginal bone

levels (1mm bone loss) and soft tissue parameters for both the tilted and axial implants.

The benefits of this procedure are as follows:

1. Full-arch restoration with only four dental implants
2. Immediate loading the day of surgery
3. Eliminates bone grafting
4. Fixed prosthetic solution is provided

The loss of posterior teeth, particularly at an early age, leads to the loss of alveolar bone. This leads to a relative surfacing of the inferior alveolar nerve in the mandible, and encroachment of the maxillary sinus in the maxilla. In past, bone grafting was attempted to restore the lost bone volume. The need to harvest autogenous iliac (hip) bone or the use of bovine bone deterred patients from accepting treatment. In addition, grafting was unpredictable and required one year for completion of treatment. For those patients that underwent grafting, a new prosthesis was difficult to retain, even with adhesive. Many chose to wear nothing at all for one full year. Patient treatment acceptance is increased by eliminating grafting using tilted implants in combination with immediate function. The edentulous mandible requires only four implants. Restoration of the completely edentulous maxilla with four to six implants (fig.2 and 3) is also a viable treatment option.

Figure 2: All-on-4 with two Zygoma implants

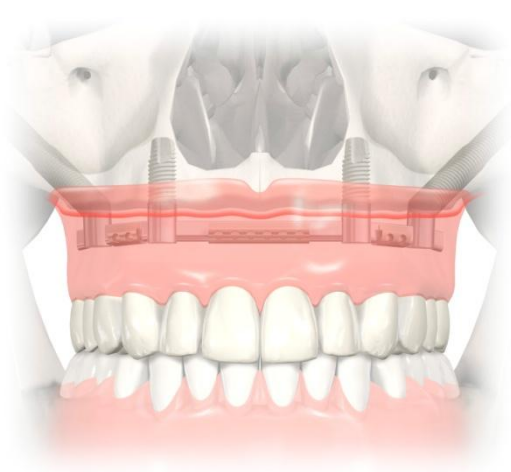
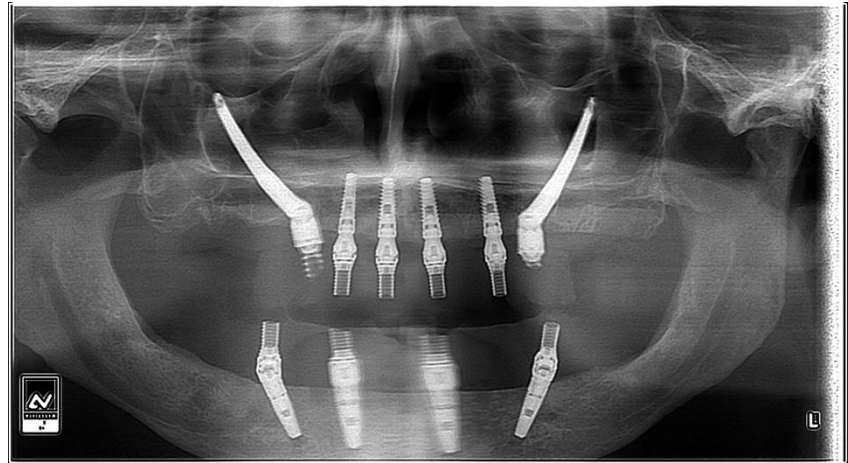


Figure 3: All-on-6 in Maxilla. All-on-4 in Mandible



This technique eliminates the one year waiting period. The prosthesis is fixed and immediately loaded with greater patient comfort. This one day (or same day) procedure is less invasive and has decreased morbidity.

The immediate load technique depends on two crucial factors for success:

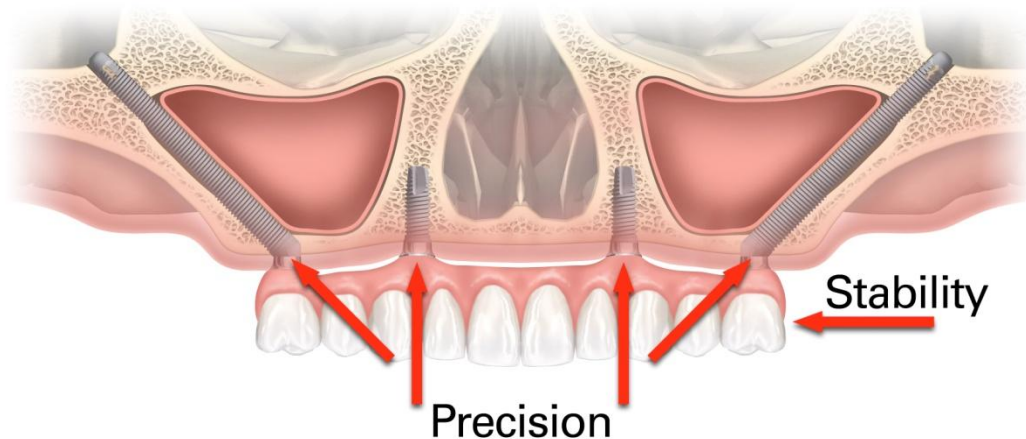
1. Cross Arch stabilization of the dental implants into a rigid acrylic provisional prosthesis.
2. Adequate torque level insertion of the dental implants.

Care is taken to increase the anterior to posterior spread of the implants. Posterior cantilevers are also eliminated during the provisional phase. In the "All-on-4" approach, the posterior implants are distally tilted to 45 degrees to increase the anterior to posterior spread. This allows the final prosthesis to have 12 teeth. A small cantilever is tolerable in the final prosthesis only.

Zygoma implants are long titanium implants used for anchorage into the zygoma bone for a graftless maxillary implant solution (see x-ray above). They are made by Nobel Biocare and range in length from 32 to 52 mm. They have a 45 degree offset near the implant platform. They are used in the maxilla when bony atrophy is severe. It is used in an All-on-4 or All-on-6 approach, with either 2 or 4 anterior

axial implants respectively. The All-on-6 approach is particularly useful for patients with parafunction.

Figure 4: Zygoma Implants



These zygoma implants (fig.4) are inserted palatal to the alveolar crest in the second premolar or first molar region. They penetrate the palatal bone, pass through the maxillary sinus and insert into the zygoma bone. Osseointegration into the zygoma bone requires six months' time. Immediate load of the zygoma implant is only possible with Cross Arch Stabilization, as described. Zygoma implants cannot be used as individual locator attachments. Forces that cause bending moments (lateral loads) are most unfavorable on this implant and as such, the implant needs to be rigidly supported by the entire prosthesis. In cases where the maxillary bone atrophy is severe and generalized, four zygoma implants may be used. This is called the "Quad Zygoma". The "Quad Zygoma" technique is the last available option for severely resorbed maxillae. Axial anterior implants are not possible in these patients. The lack of axial implants mandates a permanent soft diet with this restoration. A recent patient I treated with these various techniques will be presented.

The pre-surgical prosthetic examination and evaluation is critical to the final outcome. To determine the final prosthesis, three specific clinical assessments must be made at the initial consultation:

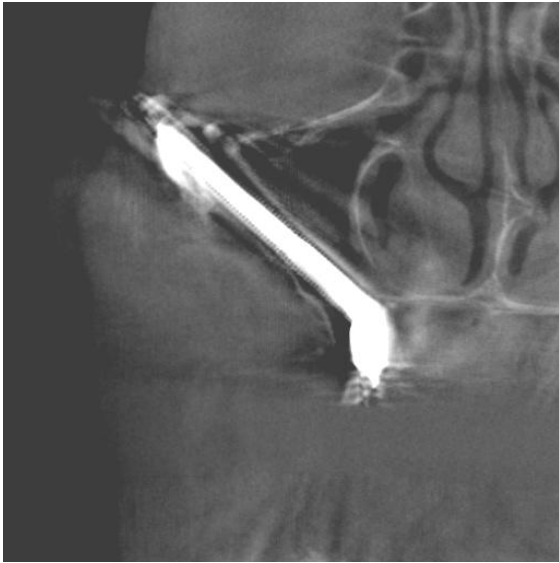
1. **Determine the presence or lack of a composite defect.** Is it a tooth-only defect or a composite defect with missing teeth, bone and soft tissue.
2. **Determine the transition line.** This is based on the smile line. The smile line needs to be coronal to the transition line of the prosthesis.
3. **Determine the final prosthesis.** Tooth only defects receive bridges. The majority of cases have mild to severe composite defects and will receive hybrid prosthesis when completed. This involves a titanium bar with acrylic teeth.

Other factors to assess are:

1. Vertical dimension of occlusion
2. Anterior – Posterior tooth position
3. Parafunctional habits
4. Occlusal plane orientation
5. Jaw relationships
6. Status of opposing dentition
7. Status of present dentition or the existing complete upper denture

Pre-operative radiographic assessment requires both a panoramic radiograph and a Cone Beam CT scan. The CBCT allows proper determination of bone volume for sizing of the anterior axial and posterior tilted implants. The Zygoma implant requires a pre-operative CBCT for assessment of the Zygoma bone and for pre-operative assessment of the maxillary sinus. The length of zygoma implant to be used is determined intra-operatively. A healthy maxillary sinus is required for the placement of zygoma implants. Postoperative CBCT is taken to confirm placement of the Zygoma implants (fig.5). Avoidance of the orbit and the eye is obviously critical.

Figure 5: Post-operative CBCT of Zygoma implant



A study by Bjorn Petruson (2004); Scand. J. Plastic Reconstruction Surgery; found that titanium fixtures in either the maxillary sinus or nasal floor showed no signs of inflammation. This procedure would not be feasible otherwise.

Case Report Patient G.L

Figure 6: Mrs.G.L



Figure 7: Pre-operative Maxilla



Figure 8: Pre-operative Mandible



Mrs. G.L. (fig.6,7,8) is a 67 year old female who has worn a complete upper denture for 35 years. Her maxillary denture became so mobile; she could not eat, laugh or even swim properly. Her CUD often fell out. She presented with severe and generalized maxillary alveolar bone atrophy. She was told by all clinicians that evaluated her that “She did not have enough bone for maxillary dental implants”. G.L. works with the elderly and was disturbed with what she saw. She did not

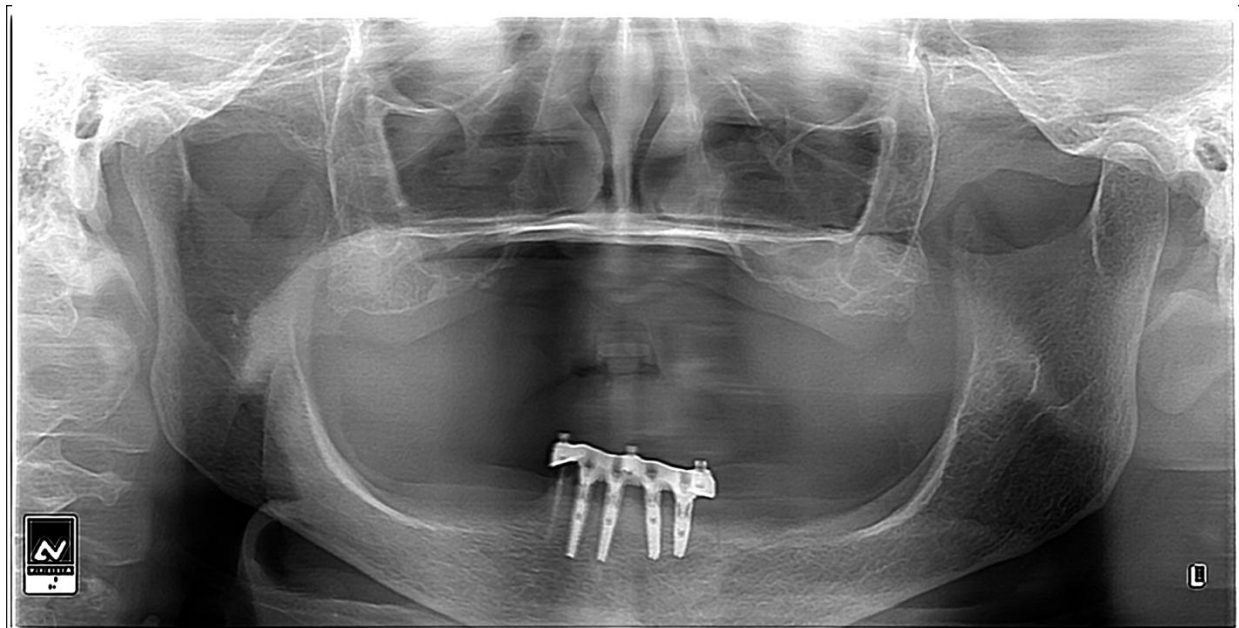
wish to face a future without a stable prostheses. Her request was fixed maxillary and mandibular prosthesis that provided both function and esthetics. Five years ago, she had four implants placed tightly in her anterior mandible and restored with a bar. I believe this mandibular removable prosthesis may have further contributed to her anterior maxillary bone loss, similar to a dentate combination syndrome.

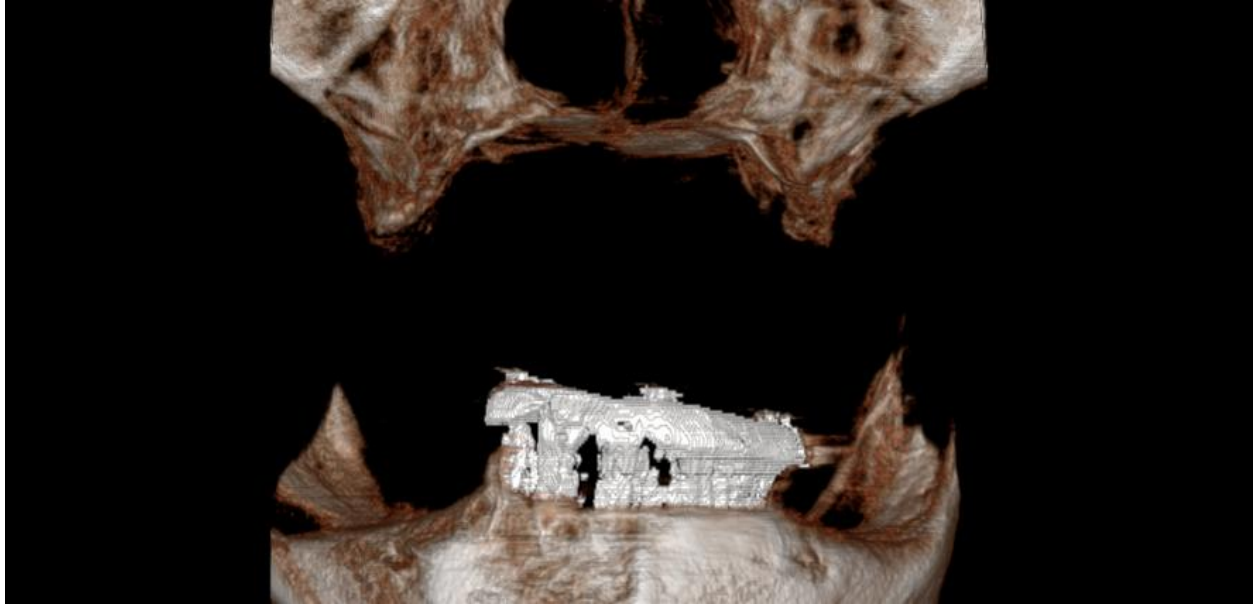
Medical history revealed her to be in good health. She is a non-smoker. Her dental history revealed no parafunctional habits. She presented with a high dental I.Q and was highly motivated.

Preprosthetic evaluation revealed:

1. A severe maxillary composite defect and a moderate mandibular composite defect
2. The transition lines were beyond the smile lines and, thus, not an issue
3. The final prosthesis is to be a hybrid – titanium bar with acrylic teeth for both maxilla and mandible.

Pre-operative panorex and Cone Beam CT for patient G.L:

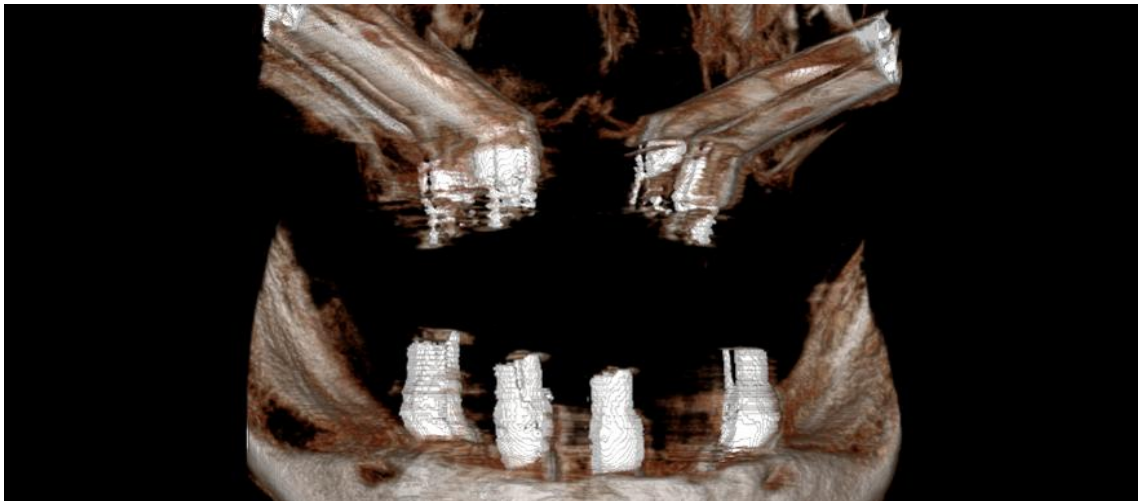
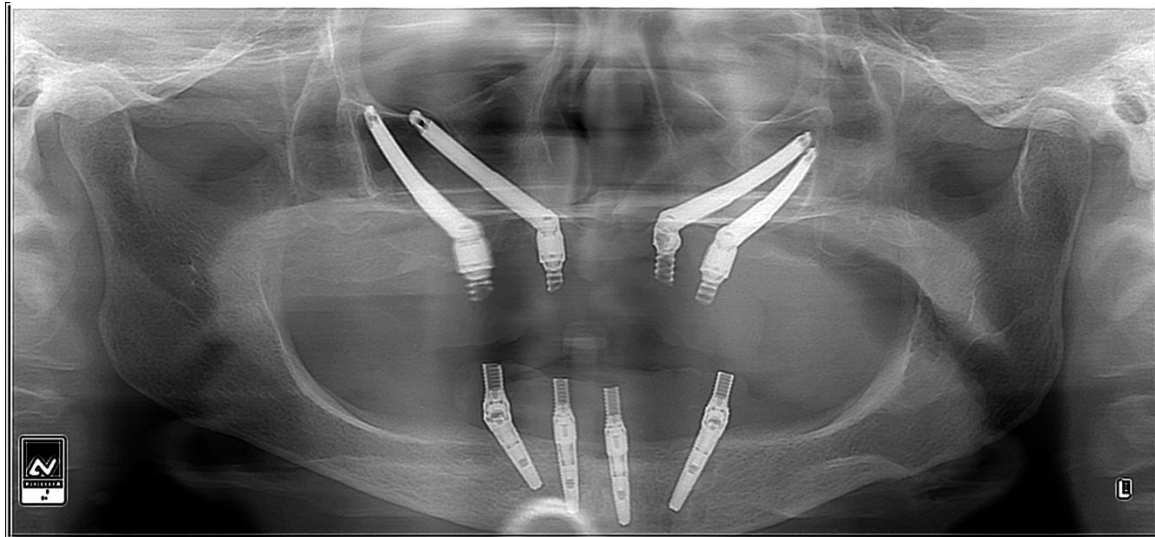




Radiographically, she displayed very little bone remaining with her maxillary alveolus. She displayed a complete absence of bone in the anterior maxilla. There was no bone where the nasal floor met the anterior maxilla. Panorex revealed a residual 43 root tip along with 4 anterior mandibular implants. Her only treatment option for the maxilla was the Quad Zygoma. In the mandible, she had adequate bone volume for an All on 4 treatment.

Surgery was performed in our office under general anesthesia with a medical anesthetist. Surgery was 4.5 hours in length.

Post-operative Panorex and Cone Beam CT for patient G.L :



Zygoma implants were placed in positions 15, 12, 23 and 25. In mandible, the 43 root tip was removed and the four dental implants were removed with a trephine. Vertical reduction alveoplasty was performed in the anterior mandible to create prosthetic space for the future hybrid prosthesis. Four dental implants were placed in mandible in an All-on-4 approach. The two distal implants are angulated for increased anterior-posterior spread. No grafting was performed. All implants were rigid.

G.L. had her fixed maxillary and mandibular prosthesis inserted the same day. In total, the entire procedure took 12 hours, including the recovery time after the general anesthesia. G.L. was instructed to eat a soft diet only. All other maxillary

treatments require a soft diet for the first six months only. An isolated All on 4 treatment in mandible requires a soft diet for only three months. Once integration is confirmed, the final hybrid prosthesis is fabricated. The patient does not go without fixed teeth at any time.

Patient G.L Day of surgery. Maxilla & Mandible



Patient G.L post-operative day of surgery



2 weeks after surgery



4 weeks after surgery

