implant dentistry has become a well proven accepted standard of care for the single tooth, multiple missing teeth, as well as the fully edentulous arch of teeth. Constant changes are rapidly improving our ability to clinically treat patients in a more expeditious, efficient and less invasive manner. Technologies using CBCT (cone beam computerized technology) 3-D imaging, computer generated planning software, guided surgery and immediate function have benefited our patients with reduced treatment times, minimally invasive and simplified surgical techniques, reduction of postsurgical discomfort and the immediate placement of a fixed restoration.

The guided implant surgical and prosthetic technique for the All on 4 restoration of an edentulous arch has gained greater acceptance and success. Its benefits are many:

- The ability to rehabilitate the completely edentulous jaw with a minimum of bone volume and avoiding in most situations bone grafting procedures.
- Flapless surgery which allows for the patient to experience less surgical trauma, pain or swelling.
- Strategically placed implants, 2 posteriorly and 2 anteriorly, with good anchorage have shown very successful outcomes.
- Angulations of the implants allows for longer implants to be placed with cortical bone anchorage. Greater anterior-posterior spread of implants creates an ability to restore teeth back to the first molar region with the reduction of cantilever effects.
- The prosthetic tooth movement relative to the underlying bone.
- The prosthetic position allows for the re-establishment of vertical dimension most patients have lost to either bone loss due to periodontal disease or existing old dentures.
- Primary immediate implant stabilization reducing the mechanical load by implant splinting.
- An immediate function fixed restoration at the time of surgery due to implant stability.
- The immediately loaded restoration allows for easier transition for patients from a removable to a fixed restorative state.
- Simplifies the procedure for the clinician.

Clinical report

Planning

A 70 year old woman presented with a maxillary denture. The patient has been edentulous in the upper jaw for over 10 years (Fig. 1). She has worn several different sets of dentures during that period of time. A preliminary evaluation of her dental and medical history was obtained. Her medical history presents with no significant contraindications for implant surgery. A treatment plan was devised utilizing guided implant surgery and the All on 4 (Nobel Biocare) protocols.

The upper denture was relined in order to fit intimately with the tissue, at a corrected occlusal vertical dimension and with a pleasing, acceptable, esthetic alignment. This will duplicate as a radiographic template.

Multiple 2-mm holes were placed into the dentures at different levels and in areas both buccally and palatally. These holes were filled with gutta percha as radio-opaque markers.

A double scan technique was used. Initially appropriate pre-surgical medications were given which included antibiotics, analgesics and an antimicrobial rinse.

A new silicone centric occlusal record was created with the surgical guide and opposing arch. This allows proper seating of the guide at the time of surgery.

Surgery

After all pre-surgical diagnostics and planning were completed guided implant surgery was performed. Initially appropriate pre-surgical medications were given which included antibiotics, analgesics and an antimicrobial rinse.

Local anesthetics were given ie. lidocaine and bupivacaine and the surgical guide inserted. Biting on the interocclusal record for 1 – 2 minutes allowed for tissue displacement insuring a more positive position of the guide to the planning data. Positioning and seating of the guide was confirmed. While the patient remained closed on the interocclusal record our initial step was to place the 3 pre-planned horizontal stabilization pins. This secured the guide. The interocclusal record was removed, exposing the surgical sites of the guide.

The first osteotomy was prepared, choosing one of the anterior positions. Appropriate sequencing of the tissues punch, drilling guides and twist drills were used according to the manufacturer’s directions (NobelGuide; Nobel Biocare). Once the osteotomy was completed, the pre-planned implant type, length and size were placed and a template abutment inserted.

This now provided the guide with additional stability from a vertical direction as well. The
remaining three implant osteotomy sites were then prepared using the same sequential drilling protocols and the appropriate implants were placed. (Fig. 8)

After implant placement the surgical guide was removed and the 2 anterior straight multiunit abutments (Multiunit abutment; Nobel Biocare) were placed first, followed by the posterior 30 degree angled abutments (30 degree Multiunit abutment; Nobel Biocare) using a laboratory fabricated custom jig. (Fig. 8) The all acrylic hybrid prosthesis was tried in for fit and confirmed by radiographic evaluation. Occlusion and vertical dimension were evaluated and minor adjustments made as needed. The prosthesis was screwed in, access holes covered and immediate function obtained. (Fig 10)

Post-operative instructions regarding hygiene maintenance, soft diet and continued antibiotics (daily for 1 week), anti-inflammatory (ibuprofen 600mg 3 times a day for 3 days) and antimicrobial (chlorhexidine rinse, daily for 1 week) were prescribed. Any other medications thought to be necessary, such as a narcotic for pain, would be considered at this time as well.

**Restorative**

After 3 months of osseointegration the restoration of a titanium reinforced fixed hybrid prosthesis (Procera Implant Bridge; Nobel Biocare) was created. The interim prosthesis was removed, tissue and implant site inspection for osseointegration were evaluated, and the following sequence of appointments were necessary for the completion of the final restoration.

1. Custom tray impression using impression transfers for the positional relationship of the implants to the ridge and each other. (Fig 11)
2. Verification jig to identify that the implants on the master cast are in the identical position as they are in the mouth. (Fig 12)
3. Bite block records to measure the vertical and centric relation positions.
4. Wax try-in to ensure the esthetics, tooth position, phonetics and occlusion. Also this identified the spatial relationship between the correct tooth position, the ridge and the implant abutments to create a custom milled
titanium bar that was milled and fit within the parameters of the prosthesis.

5. Try-in of the custom milled titanium retention bar along with the transfer of the tooth setup for final evaluation of fit, esthetics and function (phonetics and occlusion). (Fig 12)

6. Delivery of the final prosthesis, minor occlusal adjustments, torquing the retention screws to 15 Ncm, and restoring the screw access holes. (Fig 14)

7. Radiographic confirmation of the fit of the prosthesis to the implant abutments, implant placement and integration. (Fig 15)

**Summary**

Technological advancements continue to revolutionize our abilities to treat our patients in a more efficient and less invasive manner. Through CBCT dual scan data visualization of available bone, anatomical issues that may be encountered during surgery, soft tissue thickness and prosthetic tooth position may be revealed. 3-D virtual planning allows us to diagnosis plan implant sites, develop surgical guides to transfer that information intraorally and create a prefabricated, immediate function prosthesis before the patient is even in our dental chair. By using surgical guides for implant placement the implants may be placed through a minimally invasive flapless procedure, quickly, predictably and with a low level of complications. This minimizes the patient’s pain, time and stress. Restoratively, we are able to bring our patients from a removable denture to a functioning fixed prosthesis immediately. Considering the advantages and benefits of implant placement and restoration through guided techniques, we can recommend this as a viable alternative to treatment for rehabilitation of the edentulous jaws.

**REFERENCES**