Reductioning surgical morbidity with CBCT-guided implant surgery

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The patient, a 62-year-old woman, was referred by a local periodontist for an implant evaluation. Her record stated that she was a “difficult patient owing to medical complications”. Her stated desire was that she wanted “to be able to chew”.

Medical history

The review of systems was negative. The patient was a non-smoker and drank alcohol socially. She was allergic to iodine and took only hormone replacement medication. She used organic products in her life whenever possible. She stated that she suffered from persistent, recurring yeast infections, which were exacerbated by any antibiotic use. She therefore refused antibiotics for any elective dental treatment.

Diagnostic findings

The patient was healthy, her oral hygiene excellent and there was no evidence of active periodontal disease. Her cancer screening was negative. The temporomandibular joint was quiet with normal range of motion, and she was missing teeth #1 to 4. Her initial radiographic assessment revealed a relatively low maxillary sinus in the area of the prospective implants.

Initial actions: December 2002

The patient was referred to an oral surgeon for an evaluation of her upper right maxilla. With a relatively low sinus, we determined that the patient would need a unilateral maxillary sinus lift and augmentation. This was discussed with the patient, who subsequently refused treatment owing to the need for perioperative antibiotic coverage for these procedures. She would also not accept a removable partial denture. She opted to initiate no further treatment at this time and desired only a regime of routine maintenance.
The patient was re-examined this time with guided implant surgery in mind. She stated that she would accept surgery if it could be done without antibiotics. We conceived a team approach that included me (restorative dentist), Dr. William E. Lippisch (oral surgeon) and dental technician Michael Hennessy.

_Treatment goal_

The patient's treatment goal was to have posterior teeth that would enable her to chew. Furthermore, she wanted treatment performed without the use of systemic antibiotics. Our team's goal included a treatment plan that would result in integrated implants, restored with single, non-splinted crowns, performed with a flapless, minimally invasive guided surgical technique. We planned a one-stage approach without temporisation. The patient agreed to one preoperative antibiotic dose of 2,000 mg amoxicillin and a five-day course of Peridex oral rinse.

_Scan-guide construction_

An appointment was set up and a polyvinyl-siloxane impression of her upper arch, a polyvinyl-siloxane bite registration and an impression of the lower arch were taken. Models were mounted and a wax-up constructed, giving ideal placement of future implants for area #2, 3 and 4. From this wax-up, a scan guide (Fig. 1) was constructed with implants for area #2, 3 and 4, according to the Nobel Biocare design. Gutta-percha markers were placed in the guide for the dual-scan technique. A flange was designed to hold the prospective anchor pin.

Inspection windows were produced in the guide to ensure its proper and complete seating in the mouth. This is paramount for a proper relationship of the radiographic guide to the patient's dentition in the CBCT scan, which helps to verify that the laboratory-fabricated surgical guide was properly seated in the mouth during the surgical phase.

Prior to the CBCT, a polyvinyl-siloxane bite (Fig. 2) was taken with the scan guide in place to be used during the CBCT and for subsequent mounting of the case on a semi-adjustable articulator. This would then replicate the surgical plan.

_Surgical-guide fabrication_

A CBCT scan was taken using Nobel Biocare's 'double scan' technique. This allowed for a combination of the radiographic scan guide to the patient's Dicom CT information in the Nobel Guide Software. A virtual surgery was performed with the Nobel Guide Software (Figs. 3 & 4). We decided that implants could be placed in such a manner as to avoid the sinus lift and augmentation.
As a team, we decided upon the final scenario. Restorative, surgical and laboratory issues were discussed and common conclusions decided. A Nobel Guide surgical guide was ordered through the software and subsequently produced via stereolithographic rapid prototyping. The guide was tooth borne with one surgical pin included to aid stabilisation (Fig. 5). Inspection windows were placed in the guide to ensure full seating during implant surgery.

_Surgery: December 2006_

The patient was anaesthetised using local anaesthesia. The Procera Surgical Guide was placed, ensuring complete seating using the inspection windows. We determined that the patient had maximum attached gingiva. A tissue punch was used through the guide, while it was held in place by finger pressure. The guide and the tissue plugs were removed. Then, the guide was replaced. The Nobel Biocare Guided Surgery protocol (Fig. 6) was followed, including placement of a stabilisation pin and use of a guided template abutment. After all three implants had been placed, the guide and any tissue tags present were removed, and healing caps placed on each implant (Fig. 7). In accordance with the plan, no temporary crowns were placed.

At four months, a standard open-tray impression was taken to produce a mounted master model with a gingival mask. Stock abutments were chosen and modified by me and single-unit porcelain veneer crowns were constructed in the laboratory. At a secondary appointment, the healing caps were removed and the modified abutments placed and torqued (Fig. 8) according to the manufacturer’s specifications. The crowns were tried in, cemented and the occlusion adjusted (Fig. 9).

_Discussion_

This case was not about the design and success of implant placement procedures, but about patient management, using a team approach and a state-of-the-art technique (Nobel Guide) to achieve a patient’s desired request.

At this point in dentistry, it can be agreed that implants are successful. Dentists must not forget that they are treating patients and not teeth or implants. We must listen to our patients and figure out their desires and needs in order to really be successful. In this instance, conventional implant dentistry may have led to an open procedure with grafting of the sinus. By using a guided technique, implants of maximum length were planned and placed, achieving the same goal, but more importantly, respecting the patient’s desires.

_Conclusion_

By adopting a team approach with a restorative dentist, oral surgeon and laboratory technician, we were able to design a biologically sound and supportive prosthesis. Using CBCT technology, we were able to maximise our diagnostic skills in order to idealise the surgical and restorative results. Using minimally invasive techniques, we were able to address the patient’s medical needs and desires by reducing the need for antibiotics and open surgical techniques.

By looking at the placement of the implants in the post-operative CBCT (Fig. 10), the level of accuracy was achieved with guided surgery. A 3.5-year follow-up appointment revealed optimal gingival and osseous health (Figs. 11 & 12).

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