

Bone Reduction Surgical Guide for the Novum Implant Procedure: Technical Note

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The Novum System offers a unique opportunity to create a definitive, immediately loaded fixed prosthesis on the edentulous mandible for patients who meet specific presurgical criteria. Since this system is based on precisely placed implants and prefabricated bar structures, the surgical techniques are critical in obtaining a satisfactory result. It is especially important that the bone reduction required to create space for the implants and bar assembly be in the proper plane and deep enough to leave room for eventually setting and processing teeth. The surgical guide described here can be an important adjunct during bone reduction to assure proper spatial positioning of the preformed titanium bars. Mounted casts of the correct or corrected maxillary dentition and mandibular arch are required at the appropriate vertical dimension of occlusion. The mandibular cast is reduced in prescribed dimensions to allow the subsequent creation of a processed resin surgical guide for use during the initial stages of surgery. This guide, when used for bone reduction during surgery, eliminates the arbitrary removal of osseous structure and helps assure the plane of implant placement is appropriate for each patient. When used routinely, a significant complication of the Novum procedure can be minimized or eliminated completely. Setting of teeth and processing are subsequently simplified, especially in the posterior dimensions, with this guide technique. (INT J ORAL MAXILLOFAC IMPLANTS 2002;17:715-719)

Key words: dental implants, fixed prosthesis, immediate loading, preprosthetic oral surgery, surgical techniques

The Novum implant system (Nobel Biocare, Göteborg, Sweden) was introduced in 1999 as an immediate loading alternative to the conventional mandibular hybrid restoration for the edentulous patient.¹ It consists of 3 implants placed pre-

cisely between the mental foraminae that immediately support a definitive fixed prosthesis fabricated on premachined components.² This technology has been used in Sweden at the Brånemark Osseointegration Center for over 5 years with prosthesis and implant success rates of 98% reported over a 3-year period.^{1,3,4} More importantly, the rates of crestal bone loss around the supportive implants are shown by the same investigators to be essentially the same as those for the conventional delayed approach, which endorses both the efficacy and safety of this biologic response to immediate loading.¹

The most challenging aspect of the Novum concept is the surgical technique once the patient selection process has been successfully completed. Each patient must have enough bone volume to allow a superior table of at least 6 mm in width to be created while leaving enough osseous depth for implant placement. In preparing the mandibular superior alveolar and basal bone, it is critical to parallel the maxillary plane of occlusion and reduce enough bone to leave vertical space for denture teeth and

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Fig 1 Loss of orientation during bone reduction and implant placement can result in significant posterior space restrictions for arranging and processing teeth. As illustrated, the lack of interarch posterior space left no room for the upper bar and required the teeth to be processed to the lower bar with minimal cantilever extension.



Fig 3 The mandibular cast is reduced to allow approximately 15 to 16 mm of space, which will be necessary to accommodate the bar structure, denture teeth, and vertical space taken up by the implant extension through bone. An additional several millimeters of mandibular cast reduction is necessary here.

prosthesis componentry at the patient's predetermined vertical dimension of occlusion. If the planar reduction is misdirected, the resultant tilt of the bar structures may create reduced or insufficient room for arranging teeth and processing. This most commonly occurs as a result of the loss of orientation to the occlusal plane as bone reduction proceeds with the mouth open. The resultant interarch discrepancy is usually most critical distally, and can severely compromise the prosthetic result (Fig 1).

The following technique for creating and using a bone reduction guide has significantly minimized this complication in clinical practice.



Fig 2 An appropriate maxillary plane of occlusion is essential for positioning the Novum structures correctly for each patient. The maxillary plane is established in this situation by mounting the processed maxillary complete denture at the predetermined vertical dimension of occlusion. If the patient's existing denture is satisfactory or the remaining dentition is in the desired plane, then no further modifications are necessary.

METHOD

It is critically important that the maxillary occlusal alignment be appropriate for each patient before any surgical procedures are initiated, since this is the reference plane for lower bar placement. Thus, all restorative procedures or denture corrections need to be completed in the maxilla prior to implant intervention in the mandible.

Casts of the corrected maxillary dentition (or denture) and mandibular arch are mounted in centric relation at the patient's determined vertical dimension of occlusion (VDO) (Fig 2). The mandibular cast is reduced anteriorly to accommodate the bar structures and implants while leaving room for arranging denture teeth. This requires 15 to 16 mm of space from the cast platform to the opposing dentition (Figs 3 and 4a). Vertical stops are left on the cast distally, either in the form of remaining molars or with contact against the retro-molar pads and distal ridge tissue (Fig 4b).

The splint is fabricated from an initial waxup, which indexes into the occlusal surfaces of the maxillary dentition and contacts the reduced mandibular cast on both the anterior platform and the distal stops (Fig 5a). Retention for the splint is a convenience during surgery and can be accomplished with ball clasping or other wire retainers (Fig 5b). The final splint is processed in clear resin and subjected to heatless sterilization prior to surgery (Fig 6).

The patient's VDO is recorded extraorally with facial markers before surgery is initiated. These marks must be preserved during surgery and can be protected with clear adhesive tape (Fig 7). During the surgical procedures, the bone reduction is

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Fig 4a The space for processing denture teeth is visualized with the assembled bars on the reduced mandibular cast. The base plate spacer below the bar compensates for the approximate extension of the implants through bone.



Fig 4b Lateral visualization will verify that the posterior spaces are adequate. The retromolar pads and distal ridge are left intact for use as vertical stops.



Fig 5a A wax pattern is developed between the maxillary occlusal/incisal surface and the modified mandibular cast. Ball clasps can be incorporated into the pattern prior to processing. Distal stops are incorporated as base rests on the distal ridge and retromolar pads.



Fig 5b In some dentate patients, existing mandibular dentition can also provide an excellent vertical stop at the correct point of closure. The remaining tooth or teeth can be extracted when they are no longer needed.



Fig 6 When attached to the maxillary denture on the articulator, the surgical guide should serve as a valuable visual aid in planning for bone reduction.



Fig 7 Prior to the surgical procedure, it is necessary to record the predetermined vertical dimension of occlusion for the patient. This will be a future reference for complete closure during bone reduction under local anesthesia and sedation.



Fig 8a The guide should seat on the reduced bone surface with minimal gap spacing visible on inspection.



Fig 8b The distal stops, in this case base extensions, should be visualized to be sure splint-tissue contact is maximized.



Fig 9 The final guide position is verified by having the patient close together with facial structures at rest to determine if the prerecorded vertical dimension has been repeated.



Fig 10 Jaw relation records are taken immediately after surgical closure and bar tensioning using either a pre-made record base and rim or a silicone putty technique. The mounted casts demonstrate the space available for setting and processing teeth against the opposing dentition. Minimal, if any, upper bar reduction is necessary since the controlled bone reduction created a favorable plane for lower bar placement.

periodically monitored with the guide until the posterior vertical stops appear completely engaged and the anterior platform contact is acceptable (Figs 8a and 8b). This final seated position is verified by confirming the patient is at the prerecorded VDO as determined by the facial reference points (Fig 9). A secondary benefit of the surgical guide is the ability to monitor and influence the anterior-posterior plane of the platform around the arch curvature during the osteotomy.

When bone reduction is complete, the various sizing and placement steps are completed using the templates conventionally. The value of the surgical splint can be visualized when the casts are initially

articulated, and the interarch space for arranging and processing teeth becomes evident (Fig 10). The bar structures should be roughly parallel to the plane of the maxilla and uniformly spaced relative to the opposing arch. The completed fixed restoration should have adequate titanium support under the distal cantilever extensions for first molar occlusion (Figs 11a and 11b).

CONCLUSION

The technique presented for construction and use of a surgical bone reduction guide helps assure that the



Fig 11a Lateral view following placement of maxillary immediate denture and mandibular definitive Novum fixed prosthesis.

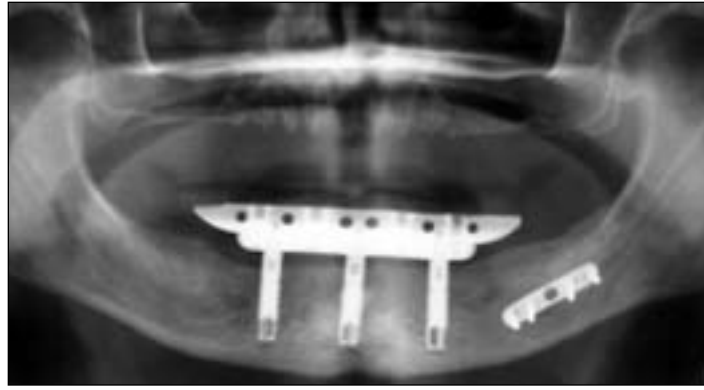


Fig 11b The final panoramic radiograph shows the spatial relationship of the bar structures in the delivered Novum mandibular prosthesis. The very slight reduction of the distal bar on the right side is evident as the only area that required relief. The left side bone fixation plate was from a previously repaired fracture.

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Novum procedure can be effectively completed with minimal laboratory and prosthetic complications. These splints have proven valuable as a visual and surgical aid during bone reduction by eliminating the need to estimate or arbitrarily determine the critical spatial relationship between the prefabricated bar assembly and the opposing dentition.

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