Positioning Implants for Overdentures: A Prototype Implant-Paralleling Device. Technical Note

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As implant-assisted dentistry continues to grow, increasing emphasis is being placed on the surgical positioning of implants so that they can be optimally restored. While this is essential for esthetics with fixed implant restorations, it is equally important with implant overdentures, where the type of retentive mechanism, artificial tooth position, and denture flange contour may be affected by implant position. Unfortunately, surgical guides or templates may be used less often with overdenture cases because of the associated time, costs, and difficulty in positioning during surgery, leading to compromised implant location or orientation. This paper describes a prototype paralleling device that can aid in the surgical positioning of implants for overdentures.
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Key words: implant overdenture, implant position, paralleling device, surgical guide

The use of a surgical guide to position implants for optimal restoration has been widely advocated when a fixed prosthesis is planned, so as to avoid angulation or alignment problems that could compromise the esthetics of the final restoration.[1–4] While implant position is likely less critical when a removable prosthesis will be utilized, a surgical guide can nevertheless help to avoid interference of the implant abutments with artificial tooth placement, retentive mechanisms, or the denture flange.[5,6] The placement of implants as close to perpendicular to the occlusal plane as possible has also been cited as important in reducing stress intensity and concentration around the implants.[7] Since without a surgical template, the surgeon has only the anatomy of the patient to use as a reference for implant placement, a guide may also serve as a communication device between members of the implant team. Ultimately, implants are of limited use if they cannot be restored in a manner that meets the functional, esthetic, comfort, and maintenance requirements of the patient.

It appears that despite the foregoing advantages of implant surgical guides, they may be used less often with overdenture cases. From the restoring dentist's standpoint, the time and costs involved in fabricating a template may be difficult to justify when removable prosthesis design is flexible enough to cover some variations in implant position. Even when a surgical guide is provided for an implant overdenture situation, the surgeon may be tempted to set it aside because of difficulty positioning it accurately on a severely resorbed edentulous ridge.

While attempts have been made to obviate the need for a custom-made template by developing manufactured fixture positioning guides (Nobel Biocare Canada, North York, Ontario, Canada) to align implants with remaining teeth, the longest possible distance between implants using these guides is 12 mm, which is often insufficient if bar/clip retention for an implant overdenture is planned.[8]

The main problems with implant position relative to overdenture rehabilitation appear to be either lack of parallelism (Fig 1) or placement either too far facially or lingually. In the former

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Fig 1 Nonparallel implants would be difficult to restore with individual abutment attachments.

Fig 2 Implant paralleling device (IPD) with knurled adjustment knob and adjustable length. The IPD is positioned over the exposed alveolar ridge to determine optimal location and separation of implants for an implant-supported overdenture.

situation, bar/clip retention is generally more tolerant of convergent or divergent implants, while in the latter, individual attachments will generally allow better flange adaptation than will a bar. Nevertheless, it is preferable if implant positions allow a wide range of choices for prosthetic reconstruction, rather than dictating a particular design. This article describes a prototype of an implant-paralleling device (IPD) that has been used successfully in placing implants for both individual ball-attachment and splinted bar/clip attachment overdentures.

Implant Paralleling Device Prototype

Based on a design by the author, Nobel Biocare developed a device to determine inter-implant distance, allow correct faciolingual implant orientation, and develop parallelism between implants. The IPD was designed with an adjusting knob to establish implant positions between 20 and 25 mm apart (Fig 2), noting that in many patients, distances greater than 25 mm between implants led to transgression of the vestibule by a bar-retention mechanism. This range was based on both clinical experience and recommendations that, with respect to peri-implant bone health around 2-implant bars, the optimum distance between implant centers ranges between 22 and 27 mm.[9] By positioning the IPD over the ridge after the full-thickness mucoperiosteal flap has been raised, the future relationship of a bar to the ridge crest can be visualized and the implants placed such that the bar will not encroach on the vestibules and interfere with denture flanges (Fig 2). The openings on either end of the IPD (Fig 3) will accommodate guide or twist drills used for implant site preparation through the narrower opening, and a modified direction indicator, which stabilizes and orients the device while the second site is being prepared, through the wider end.

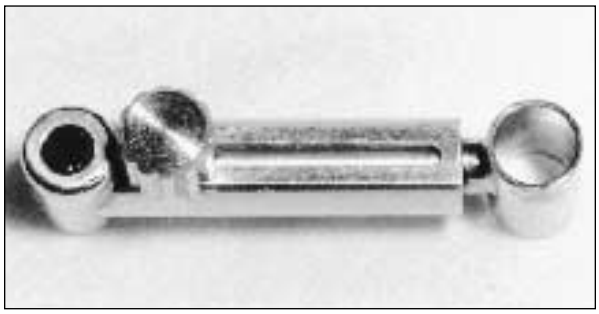

Fig 3 The IPD is designed such that guide and twist drills will fit through the narrower end *(left)* for implant site preparation, and a modified direction indicator will fit through the wider end *(right)* for stabilization and orientation in the first site while the second site is being prepared.

After the inter-implant distance is set on the IPD, it is used with guide and twist drills to mark and prepare the site for the first implant. Once the first implant site is completed, the IPD is turned around to allow a direction indicator to be placed through the wider opening for orientation while the second site is being prepared (Fig 4). A standard direction indicator was modified by removing the shoulder to allow full seating through the IPD and into the site prepared for the first implant (Fig

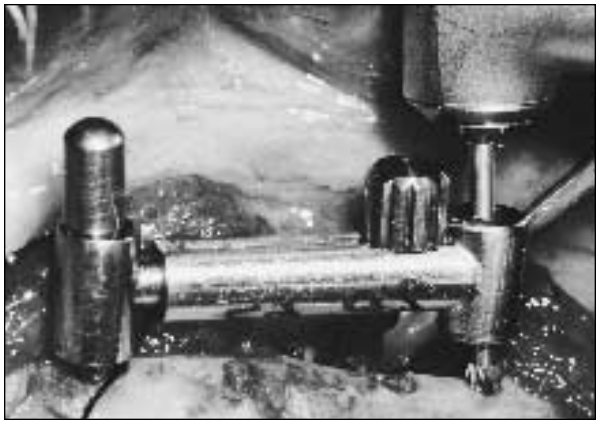

Fig 4 The IPD is reversed for preparation of the second implant site *(right)* and oriented by placing a modified direction indicator in the first site *(left)*.

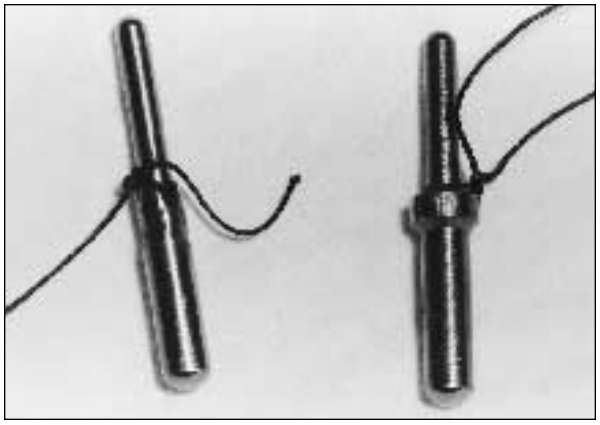

Fig 5 A standard direction indicator *(right)* may be modified by removing the shoulder *(left)* to allow full seating through the IPD into the first implant site to orient and stabilize the paralleling device while the second site is being prepared.

5). Once the second site is completed, the IPD may be set aside and sterilized for future use. The IPD may also be of assistance in locating the implants at second-stage surgery if the interimplant measurement has been recorded.

Summary

A prototype of an implant-paralleling device, which eliminates the need for a custom surgical template when an implant overdenture is planned, has been described. The IPD allows predetermination of inter-implant distance and controls both faciolingual orientation and parallelism of the implants. By ensuring both that the implants are parallel to each other and that they are placed such that a straight line between them does not transgress either the facial or lingual vestibules, the IPD allows the restoring dentist to choose either a bar/clip or an individual attachment retentive mechanism based on the patient's requirements and not on the dictates of implant position.

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