The Influence of Interimplant Distance in Mandibular Overdentures Supported by Two Implants on Patient Satisfaction and Quality of Life

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This study evaluates the influence of interimplant distance (ID) on patient satisfaction and quality of life (QOL) of 55 patients who received mandibular overdentures supported by two implants. IDs were measured over the residual ridge crest and linearly on all of the patients' mandibular casts. The crestal detours of all patients were determined by subtracting these two values from each other. Higher IDs were associated with better QOL scores ($P < .05$), whereas higher crestal detour values were associated with better general comfort, chewing, ease of hygiene maintenance, esthetics, pain, and QOL scores ($P < .05$). *Int J Prosthodont 2015;28:19–21. doi: 10.11607/ijp.3994*

Choosing the optimal location for two implants supporting and retaining a mandibular overdenture (2MOD) is a controversial decision.[1–4] While three possible positions are available—premolar, canine, or lateral incisor areas[1,2]—published reports suggesting improvements in associated patient satisfaction and quality of life (QOL) are inconclusive.[1,3,4] This retrospective study sought to evaluate the influence of different interimplant distances (IDs) on patients' subjective responses. The null hypothesis was that different IDs would affect patients' perceptions regarding satisfaction and QOL considerations.

Materials and Methods

Fifty-five consecutively treated edentulous patients from the Istanbul University Faculty of Dentistry, Department of Prosthodontics' patient pool between 2010 and 2011 were selected for this retrospective report. The sample comprised 31 women and 24 men with an average age of 64.40 years, and the study sample corresponded to a power of 0.80 ($P = .05$). Reported and accepted inclusion and exclusion criteria for mandibular implant surgery were employed in patient selection. Each patient received a complete maxillary denture and two mandibular implants (Astra Tech, Dentsply) in the interforaminal region to support an overdenture (MOD) with single attachments. Standard prosthodontic protocols were employed and included balanced articulation with anatomically shaped artificial teeth, together with maximal extension of the denture base using functional impression methods.[5] The clinical work was carried out by five faculty staff members, and the requirements of the Helsinki Declaration were fulfilled. All patients provided informed consent (reference no. 2597).

Mandibular impressions were made, abutment spaces poured with an autopolymerizing acrylic resin (Palavit G, Heraeus Kulzer), and the rest with dental stone. A wire was adapted to follow the alveolar ridge crest on each cast and between the centers of the abutments to measure the crestal IDs (Fig 1). The spaces between the abutments also were measured directly with a ruler (Fig 1) to determine the linear measurements. The anterior cantilevering value of each 2MOD was then determined for each cast by subtracting the two readings from each other. This provided the required magnitudes of crestal detour (CD).

Patient satisfaction was assessed using a 0 to 100 visual analog scale (VAS) that had already been used successfully.[5] The patients used the scales to record their personal opinions based on the following seven factors: general comfort, retention, chewing, speech, ease of hygiene maintenance, esthetics, and pain.

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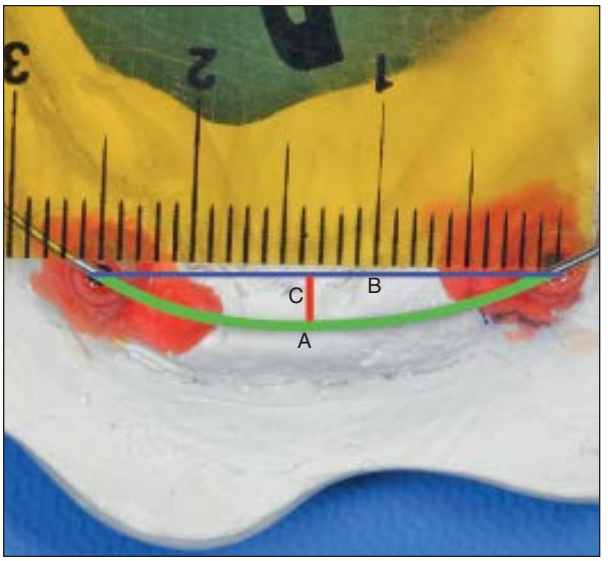

Fig 1 *(A)* Crestal interimplant distances were measured with a wire adapted to the curve of the residual alveolar ridge crest. *(B)* The linear interimplant distances were measured with a ruler. *(C)* Crestal detours were found by subtracting these two values from each other.

Table 1 Crestal and Linear Interimplant Distances and the Crestal Detour Values (mm)

Interimplant	Minimum–maximum (median)	Mean ± SD
Crestal	17–34 (25)	24.98 ± 4.62
Linear	16–33 (23)	23.23 ± 4.16
Crestal detour	0–4 (2)	2.33 ± 1.06

Table 2 Association Between Visual Analog Scale (VAS) Scores and Interimplant Distances

	Interimplant distance ($P < .05$*)		
VAS scores† (mean ± SD)	Crestal	Linear	Crestal detour
Q1: general comfort (86.38 ± 21.73)	.225	.212	.034*
Q2: retention (85.87 ± 22.43)	.344	.520	.789
Q3: chewing (83.33 ± 24.99)	.561	.415	.034*
Q4: speech (87.27 ± 19.31)	.436	.391	.062
Q5: hygiene (80.84 ± 26.28)	.507	.613	.021*
Q6: esthetics (88.65 ± 16.47)	.093	.066	.042*
Q7: pain (83.35 ± 23.75)	.328	.336	.034*

Q = question.
*$P < .05$; positive correlation (Spearman rank correlation).
†Scores based on 0–100 scale.

Table 3 Association Between Oral Health Impact Profile (OHIP-14) Scores and Interimplant Distances

	Interimplant distance ($P < .05$*)		
OHIP-14 (mean ± SD)	Crestal	Linear	Crestal detour
Functional limitation (0.18 ± 0.43)	.603	.563	.690
Physical pain (1.24 ± 1.54)	.517	.444	.012*
Psychologic discomfort (1.18 ± 1.79)	.503	.297	.267
Physical disability (1.0 ± 1.9)	.469	.819	.863
Psychologic disability (0.24 ± 0.92)	.089	.119	.741
Social disability (0.09 ± 0.4)	.022*	.011*	.184
Handicap (0.07 ± 0.33)	.021*	.011*	.168
OHIP-14 total (4.0 ± 5.76)	.338	.578	.318

*$P < .05$; negative correlation (Spearman rank correlation).

The Turkish version of the Oral Health Impact Profile (OHIP-14), covering seven domains (functional limitation, physical pain, psychologic discomfort, physical disability, psychologic disability, social disability, and handicap), was used for the QOL assessment.[5]

Relationships between the evaluated parameters were evaluated by using Spearman rank correlation analyses. The results were assessed at a significance level of .05.

Results

The mean IDs are presented in Table 1. No statistically significant association was detected between the IDs and VAS scores ($P > .05$; Table 2). Higher CDs were associated with higher scores for all VAS questions except for the second (retention) and fourth (speech) questions (Table 2).

Higher IDs were associated with significantly lower social disability and handicap domain OHIP-14 scores ($P < .05$; Table 3). Higher CDs were associated with significantly lower physical pain domain OHIP-14 scores ($P = .012$). No significant association was detected between the OHIP-14 total and the other domain scores and the IDs and CDs ($P > .05$; Table 3).

Discussion

The study's results suggest acceptance of the proposed null hypothesis. The use of single attachments in 2MODs is associated with more complications, especially deactivation of matrices in higher IDs

(possibly because of greater tipping of the overdentures)[2,4]; while more anterior implant placement is reported to result in less peri-implant stress.[1] However, the authors' clinical observations did not reflect the reported ones, at least not over the limited time frame of this study's observation period.[1,4] Anterior cantilevering of 2MODs (CD) appeared to affect patient satisfaction and the OHIP-14's physical pain domain positively, whereas the increase of CDs may have improved the resistance to rotational movements and denture stability. Consequently, the design of 2MODs may have impinged the soft tissues less and led to a reduced perception of pain or discomfort. The observed results showed that higher IDs improved the social disability and handicap scores noted in the OHIP-14. The posteriorly placed implants may have improved the retention of the 2MODs—especially during chewing of sticky food—leading to enhanced perceptions of self-confidence that affected QOL.

It is acknowledged that potential factors such as fit of the dentures and wear of the attachments may have affected results. Moreover, this study's observations should be interpreted with caution because it is retrospective and lacks a control group. The evaluation also was carried out in a post hoc manner and may, therefore, not accurately describe actual improvement in the assessments. Nonetheless, it is the first clinical report to suggest the possible significance of a correlation between implant location and resultant patient-mediated perceptions of improved outcomes.

Conclusions

Clinical studies with larger patient groups and a more robust research design clearly need to be reconciled with diverse outcome success criteria to determine optimal implant location when prescribing MODs. Nonetheless, this preliminary study suggested that increased IDs might improve edentulous patients' satisfaction and QOL.

Acknowledgments

The authors reported no conflicts of interest related to this study.

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Literature Abstract

A systematic review of implant-supported overdentures in the edentulous maxilla, compared to the mandible: How many implants?

There is much evidence for adopting two implant-supported overdentures as the treatment of choice for the edentulous mandible. However, evidence for a similar treatment modality for the maxilla is lacking. This systematic review focused on survival of the implants, maxillary overdenture, and peri-implant tissue condition over the course of a year. Twenty-four papers were included for meta-analysis. The results indicated that for 6 or more splinted implants, implant survival was 98.1% and overdenture survival was 99.5%. For 4 or fewer splinted implants, implant survival was 97.0% and overdenture survival was 96.9%. For 4 or fewer nonsplinted implants, implant survival was 88.9% and overdenture survival was 98.9%. The condition of peri-implant tissues was seldom reported. The authors concluded that fewer than 4 nonsplinted implants had an increased risk of implant loss. They highlighted the lack of reliable long-term data and poor radiographic assessment of bone loss—a predictor of future implant loss—as well as lack of studies determining restoration of function and quality of life as areas to be addressed to enable meaningful recommendations regarding this treatment modality.

Raghoebar GM, Meijer HJA, Slot W, Huddleston Slater JJR, Vissink A. *Eur J Oral Implantol* 2014; 7(suppl 2):S191–S201. **References:** 47. **Reprints:** GM Raghoebar, Department of Oral and Maxillofacial Surgery, University Medical Center, Groningen, PO Box 30.001, 9700 RB Groningen, The Netherlands. Email: g.m.raghoebar@umcg.ni—*Steven Soo, Singapore*