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## Original article

# A double blind randomized clinical trial comparing lingualized and fully bilateral balanced posterior occlusion for conventional complete dentures

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## ABSTRACT

**Purpose:** A lingualized occlusion (LO) for complete dentures reduces lateral interferences and occlusal force contacts and direction; thus, LO is theorized to be more suitable for patients with compromised ridges than fully bilateral balanced articulation (FBBA). However, no studies have yet provided evidence to support LO in edentate patients with compromised alveolar ridges. The purpose of this study was to compare LO and FBBA in edentulous individuals with compromised ridges.

**Methods:** Sixty edentulous individuals were randomly allocated into groups and received dentures with either LO or FBBA. Following delivery, several denture-related satisfaction variables were measured using 100 mm visual analogue scales; oral health-related quality of life (OHRQoL) was also assessed using the Oral Health Impact Profile (OHIP). Sub-group analyses of the effect of moderate and severe mandibular bone loss were also carried out.

**Results:** No significant differences were detected between LO and FBBA with the primary outcome. At 6 months, participants with severely atrophied mandibles and FBBA rated their satisfaction with retention of mandibular dentures significantly lower than those with LO (median LO: 86, FBBA: 58.5,  $p = 0.03$ ). They also had significantly lower OHRQoL for the domain of Pain (median LO: 4, FBBA: 5,  $p = 0.02$ ). General satisfaction and total OHIP scores significantly improved between baseline and 6 months only for the LO subjects with severely atrophied mandibles (satisfaction:  $p = 0.003$ , OHIP total score:  $p = 0.0007$ ).

**Conclusions:** The results indicate that the LO occlusal scheme with hard resin artificial teeth is more efficient for patients with severely resorbed mandibular ridges.

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**Table 1 – Comparison of groups by patient characteristics (all subjects included) at baseline.**

	LO (n = 30)	FBBA (n = 30)	p-Value
Age (S.D.)	72.2 (7.9)	72.9 (8.7)	0.74 <sup>a</sup>
Gender (M/F)	17/13	16/14	0.80 <sup>b</sup>
Edentulous period (years: mean (S.D.))			
Maxillary	13.6 (8.5)	12.6 (10.8)	0.67 <sup>a</sup>
Mandibular	12.9 (8.8)	12.6 (12.7)	0.90 <sup>a</sup>
No. of previous dentures (mean (S.D.))			
Maxillary	2.2 (1.3)	2.6 (2.1)	0.36 <sup>a</sup>
Mandibular	2.1 (1.2)	2.3 (2.2)	0.67 <sup>a</sup>
ACP classification (n [%])			
Class I	4 [13.3%]	5 [16.7%]	
Class II	3 [10.0%]	2 [6.7%]	
Class III	12 [40.0%]	12 [40.0%]	
Class IV	11 [36.7%]	11 [36.7%]	0.95 <sup>b</sup>
Least remaining mandible bone height (mm: mean (S.D.))	20.3 (6.3)	19.8 (6.0)	0.75 <sup>a</sup>
The mandible of the least vertical height (n [%])			
Moderate ( $\geq 20$ mm)	15 [25.0%]	13 [21.7%]	
Severe ( $20$ mm $>$ )	15 [25.0%]	17 [28.3%]	0.61 <sup>b</sup>
The mandible of the least vertical height (mean (S.D.))			
Moderate ( $\geq 20$ mm)	25.6 (3.0)	25.3 (4.0)	0.81 <sup>a</sup>
Severe ( $20$ mm $>$ )	15.1 (3.6)	15.7 (3.1)	0.64 <sup>a</sup>
General satisfaction VAS-mms (mean (S.D.))			
Overall	46.1 (33.6)	55.3 (34.5)	0.30 <sup>a</sup>
Maxillary	62.2 (34.5)	69.6 (33.6)	0.45 <sup>a</sup>
Mandibular	37.7 (34.2)	44.3 (37.4)	0.48 <sup>a</sup>
OHIP-JP16			
Total score	29.0 (13.4)	27.1 (16.3)	0.62 <sup>a</sup>

<sup>a</sup> t-Test.  
<sup>b</sup>  $\chi^2$ -Test.

## 1. Introduction

An optimal occlusal surface design/scheme is essential for successful complete denture retention, stability and support. Unfavorable masticatory forces can induce undesirable denture movements; however, these can be reduced by ensuring contact between the maximal number of teeth on both sides of the arch during centric and all excursive mandibular movements [1]. This occlusal scheme, described as fully bilateral balanced articulation (FBBA), has been considered the ideal occlusal scheme for conventional complete dentures. However, FBBA may be difficult to achieve clinically, as well as time consuming to master [2]. Therefore, a less-complicated occlusal scheme fulfilling clinical requirements became necessary [3]. Lingualized occlusion (LO), advocated in the 1940s as an alternative to FBBA [4], is defined as denture occlusion that articulates only the maxillary lingual cusps with the mandibular occlusal surfaces in centric working and non-working mandibular positions [5]. This means that the buccal cusps of the upper and lower teeth take no part in articulation, which makes tooth arrangement and occlusal correction much simpler and easier to provide than for the FBBA.

Distinct advantages for LO are three-fold; improved denture stability, reduced lateral force and centered vertical force on the mandibular residual ridges [4,6]. These enhance patient comfort and are considered to be particularly successful for patients with compromised ridges. Several randomized controlled trials and a well-conducted pilot study [7] have been reported within the past decade, comparing

several occlusal schemes for complete dentures; anatomic, lingualized, zero-degree posterior form [8–10], canine guidance and balanced occlusion [11] and canine guidance and lingualized occlusion [12]. Bilateral balanced, lingualized and buccalized [13,14] and a systematic review were also published [15–17]. However, none have provided evidence to support LO in dentures for patients with severely compromised alveolar ridge, as has been empirically accepted amongst clinicians. Investigations involving ad hoc analyses of alveolar ridge conditions and various occlusal schemes are still scarce [18].

Therefore, this trial was planned to compare LO and FBBA in edentulous patients with moderate and severe alveolar bone loss. Patient reported outcomes (PROs), general satisfaction and related variables and Oral Health Related Quality of Life (OHRQoL) were used to test the two null hypotheses: (1) there are no differences in patient-based ratings of LO and FBBA occlusal schemes at 3 and 6 months following delivery, and (2) there are no differences in change of patient-based ratings of LO and FBBA occlusal schemes from baseline to 6 months, with mandibular moderate and severe alveolar ridge resorption.

## 2. Materials and methods

### 2.1. The study setting, trial design and participants

The study was conducted at Nihon University Hospital, Anonymous, Japan from December 2007 to August 2009. The prevalence of edentulism in Japan is estimated to be 5.2% in

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