# Short Communication

# Changes in Occlusal Force at Denture Dislodgement After Refabrication or Optimization of Complete Dentures

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The aim of this study was to evaluate the change in occlusal force at denture dislodgement (OFD) in patients with poorly fitting complete dentures after improvement. In 91 patients, OFD was recorded before treatment, immediately after fitting the renewed denture (direct effect), and 1 week, 1 month, and 6 months later (adaptation). OFD increased significantly (P < .01) after optimizing the dentures and was dependent on patients' gender and age. The greatest changes occurred within the first week. It can be concluded that the increase in OFD is not only induced by the optimized denture, but also—and to an even greater extent—by adaptation. *Int J Prosthodont 2008;21:305–306.* 

**T**he occlusal forces at denture dislodgement (OFD) in complete denture (CD) wearers reach only 11% to 33% of the occlusal forces recorded in dentate subjects.<sup>1,2</sup> Improvements in chewing comfort, chewing ability, eating enjoyment, security, and speech perceived by the patient after optimizing poorly fitting dentures are well documented<sup>3</sup>; however, scarce information is available on the changes in OFD.<sup>4</sup> Furthermore, it is unclear whether an increase in OFD after optimizing CDs is solely related to a better fit of the denture or also a result of adaptation. This study aimed to answer this question. The 2-part null hypothesis tested was as follows: (1) Refabrication or optimization of a CD does not directly affect the OFD, and (2) OFD does not increase within the adaptation period after improving the dentures.

## **Materials and Methods**

Ninety-one edentulous patients previously provided with CDs in both arches were randomly chosen to participate in this study (mean age: 63.7 years; 46 men, 50 women). All patients needed either relining or refabrication of their CDs (Table 1). New dentures were fabricated using acrylic resin denture teeth (SR Antaris and SR Orthotyp, Ivoclar Vivadent) and a methacrylate-copolymer resin base material (PalaXpress, Heraeus Kulzer). Denture optimization included relining and adjustment of the occlusion (same materials as used for refabrication). In each patient, functional impressions were made with a closed-mouth impression technique using Xantopren function for border molding and Xantopren comfort light (Heraeus Kulzer) for the seal impression. For maxillary impressions, a post dam was applied.

After fitting, all dentures were subjected to a Gothic arch registration to record the sagittal jaw relation and then remounted in a semiadjustable articulator (Condylator Vario) to establish bilateral balanced occlusion. All patients were treated in undergraduate courses under strict supervision of calibrated clinical instructors.

The occlusal force required to dislodge the denture (ie, OFD) was assessed with a disposable gnathometer (Procter & Gamble) before treatment,<sup>5</sup> immediately after fitting (direct influence) of the new or optimized dentures, and 1 week, 1 month, and 6 months later (adaptation period). The OFD was gauged in the anterior and molar (left/right) regions with a 30-second time-out period between each measurement following a standardized protocol.<sup>5</sup> Mean values were calculated. All measurements were carried out by the same investigator.

Prior to use, the gnathometer was calibrated (n = 10) using a universal testing device (Zwick 1454) at a crosshead speed of 10 mm/min. For all gnathometers, a linear relationship between the load applied and the gnathometer scale value was obtained (1 scale value equals a load of 11.3  $\pm$  0.2 N).

The data were subjected to analysis of variance (ANOVA) followed by the Tukey test and the *t* test for pairwise comparisons (P=.05 for all tests).

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 Table 1
 Age of the Dentures Prior to Optimization and Refabrication

|               | Denture age |       |        |       |       |
|---------------|-------------|-------|--------|-------|-------|
| Intervention  | < 1 y       | 1–4 y | 5–10 y | >10 y | Total |
| Optimization  | 9           | 38    | 10     | 0     | 57    |
| Refabrication | 0           | 0     | 19     | 15    | 34    |
| Total         | 9           | 38    | 29     | 15    | 91    |

**Fig 1** Results of the OFD measurements (gnathometer values). One scale value equals 11.3 ( $\pm$  0.2) N. Vertical bars represent the 95% confidence interval. Mean values were calculated for the measurements in the molar right and left region (OFD molar) and in the anterior region (OFD anterior). Same lowercase letters denote groups that were not significantly different (Tukey test; P > .05). Horizontal bars denote the results of the pairwise comparison between OFD molar and OFD anterior (*t* test).

**Table 2**Analysis of Variance with Mean OFD as theDependent Variable

| Independent variables   |        | Р    |
|---|--------|------|
| Time*   | 9.505  | .000 |
| Gender  | 4.154  | .042 |
| Patient age   | 4.859  | .008 |
| Intervention <sup>†</sup>                                     | 5.415  | .021 |
| Time $	imes$ gender   | 0.230  | .922 |
| Time $\times$ patient age                                     | 0.107  | .999 |
| Gender $	imes$ patient age                                    | 8.028  | .000 |
| Time $	imes$ gender / patient age                             | 0.216  | .988 |
| Time $\times$ intervention                                    | 0.170  | .954 |
| Gender $	imes$ intervention                                   | 1.954  | .163 |
| Time $\times$ gender $\times$ intervention                    | 0.106  | .980 |
| Patient age $\times$ intervention                             | 13.496 | .000 |
| Time $\times$ patient age $\times$ intervention               | 0.108  | .999 |
| Gender $\times$ patient age $\times$ intervention             |        | .492 |
| $Time \times gender \times patient \ age \times intervention$ | 0.393  | .814 |

\*Time of the evaluation: baseline, 1 week, 1 month, and 6 months. <sup>†</sup>Optimization vs refabrication.

#### Results

The OFD values are shown in Fig 1. The Tukey test revealed a significant increase in OFD directly after fitting (P < .05) as well as for the entire adaptation period (6 months after insertion; P < .01). OFD was higher in the posterior region than in the anterior region (t test: P < .001). The ANOVA revealed a significant influence of gender (P < .05), patient age (P < .01), and type of intervention (refabrication versus optimization; P < .05) on the OFD (Table 2).

#### Discussion

The greatest increase in OFD was observed within the first week after insertion, which is in clear contradiction to the results of Müller et al,<sup>4</sup> who reported a preliminary decrease in occlusal force in the first few days after fitting. This difference may be the result of the different measurement methods applied (gnathometer versus



central bearing point). The gnathometer focuses more on denture adhesion, while the central bearing point may be limited because of initial pressure spots.

Overall, the data indicate the strong influence of the initial denture improvement and adaptation on the OFD of CD patients, which is clearly different from dentate and partially dentate subjects.<sup>1</sup> Regarding the influence of age and gender, these results are in agreement with those already reported.<sup>4</sup> Both parts of the null hypothesis were rejected.

#### Conclusion

Within the limitations of this study, it can be concluded that the increase in occlusal force at denture dislodgement is not only induced by the optimized denture itself, but also-and to an even greater extent-by adaptation.

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