Theoretical axial wall angulation for rotational resistance form in an experimental-fixed partial denture

John Francis Bowley[1,2,3]*, Elizabeth Krall Kaye[1,4], Raul Isidro Garcia[1,4]

[1]Department of Veterans Affairs, Boston Healthcare System, Jamaica Plain, MA, USA
[2]Restorative Sciences & Biomaterials, Boston University Henry M. Goldman School of Dental Medicine, Boston, MA, USA
[3]Restorative Dentistry and Biomaterials Sciences, Harvard School of Dental Medicine, Boston, MA, USA
[4]Department of Health Policy & Health Services Research, Boston University Henry M. Golman School of Dental Medicine, Boston, MA, USA

PURPOSE. The aim of this study was to determine the influence of long base lengths of a fixed partial denture (FPD) to rotational resistance with variation of vertical wall angulation. **MATERIALS AND METHODS.** Trigonometric calculations were done to determine the maximum wall angle needed to resist rotational displacement of an experimental-FPD model in 2-dimensional plane. The maximum wall angle calculation determines the greatest taper that resists rotation. Two different axes of rotation were used to test this model with five vertical abutment heights of 3-, 3.5-, 4-, 4.5-, and 5-mm. The two rotational axes were located on the mesial-side of the anterior abutment and the distal-side of the posterior abutment. Rotation of the FPD around the anterior axis was counter-clockwise, Posterior-Anterior (P-A) and clockwise, Anterior-Posterior (A-P) around the distal axis in the sagittal plane. **RESULTS.** Low levels of vertical wall taper, ≤ 10-degrees, were needed to resist rotational displacement in all wall height categories; 2-to-6-degrees is generally considered ideal, with 7-to-10-degrees as favorable to the long axis of the abutment. Rotation around both axes demonstrated that two axial walls of the FPD resisted rotational displacement in each direction. In addition, uneven abutment height combinations required the lowest wall angulations to achieve resistance in this study. **CONCLUSION.** The vertical height and angulation of FPD abutments, two rotational axes, and the long base lengths all play a role in FPD resistance form. ***[J Adv Prosthodont 2017;9:278-86]***

KEYWORDS: Fixed partial denture; Resistance form

INTRODUCTION

The resistance form of a fixed prosthodontic restoration has been defined in the *Glossary of Prosthodontic Terms* as "*the features of a tooth preparation that enhance the stability of a restoration and resist dislodgement along an axis other than the path of placement*."[1] The word "*features*" in the definition above relates two opposing walls and other adjuncts that contribute to the restoration's ability to resist rotational forces of dislodgement. A luting agent has been incorporated to assist these preparation attributes and oppose these forces that would act to dislodge the restoration from its position of physiological function during mastication.

The literature has demonstrated many factors that are related to resistance form: vertical wall angulation to the prepared tooth's long axis, wall height, finish line locations, total surface area, adjunct features, and surface texture. Much of the historical literature[2-36] has proposed vertical wall angulation levels of the two opposing walls as *convergence angles* in the range of 6-to-12° total taper or 3-to-6° per

Corresponding author:
John Francis Bowley
VA Boston Healthcare System, Dental Service (523/160)
150 South Huntington Street, Jamaica Plain, MA 0230-4893, USA
Tel. +18573645125: e-mail, john.bowley@va.gov
Received October 7, 2016 / Last Revision May 21, 2017 / Accepted June 19, 2017

© 2017 The Korean Academy of Prosthodontics
This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (http://creativecommons.org/licenses/by-nc/3.0) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.