THE EFFECT OF EQUILIBRATING MASTER CASTS ON THE OCCLUSAL HARMONY OF CAST RESTORATIONS

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Introduction

Fabrication of indirect full coverage restorations that are in occlusal harmony upon delivery still remains a problem in restorative dentistry today. The materials and techniques that are used to facilitate fabrication of these restorations undoubtedly contain inherent inaccuracies that still manifest in the final product. Even upon perfect execution of all required techniques, inevitable errors are present in final impressions, master casts and mountings, as well as the investment and casting processes. If problems are not intercepted in the laboratory phases, the loss of valuable chair time is the result.

The gypsum products used for fabricating most master casts have long been suspected for inaccuracies relating to their expansion. Currently the American Dental Association, specification No. 25 indicates that final setting expansion measurements are made 2 hours after mixing. Heshmati and colleagues, however, found that type IV and V dental stones show delayed linear expansion or early contraction continuing up to 72 -120 hours. It is also known that different brands of die stones with equivalent ADA classifications may be dramatically different with respect to expansion properties.

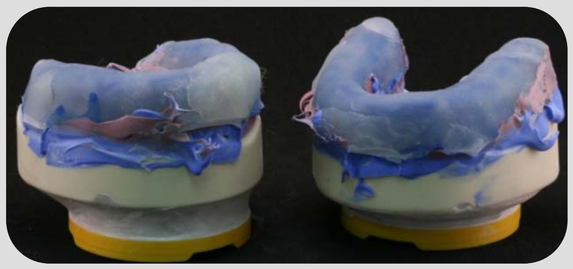
Our recent in vitro research has found that low expansion die stone casts made from a simulated equilibrated patient (CR=MI), when mounted with a facebow and wax interocclusal record, will regain a CR-MI slide with an average pin opening of 0.17mm. Further, if this inaccuracy was uncontrolled when a single mandibular first molar crown was fabricated, the resulting crown would inherently be in hyperocclusion on insertion into the simulated patient. Anecdotal evidence by many a clinician has given a similar report of this phenomenon.

Purpose

This study was undertaken to determine the possibility of accurately replicating an equilibrated patient's occlusion with gypsum casts on an articulator. The viability of a cast adjustment procedure to improve the occlusal fit of an indirectly fabricated restoration was assessed.

Cast Equilibration

Standardized Patient



PVS Impressions of Patient

Reinforced Aluwax
Centric Relation Record

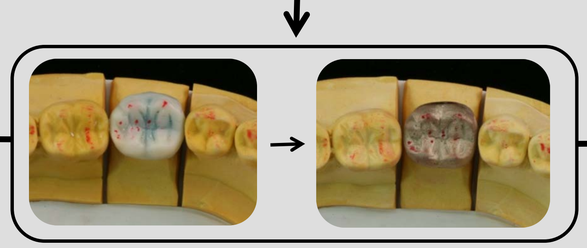
Mounted Patient Casts in
Centric Relation
(low expansion stone)

20 Total Sets of Mounted Patient Casts

10 Unadjusted Casts

10 Adjusted Casts

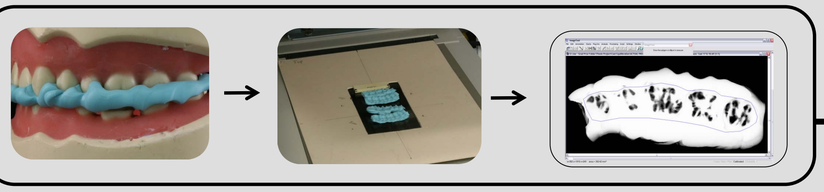
All mounted casts developed an "Artifact" CR-MI slide when mounted. The resulting pin opening (0.17mm) was eliminated in the adjusted cast sets



20 Gold Castings (lost
wax technique)

Crowns from
unadjusted casts
delivered to patient

Crowns from adjusted
casts delivered to
patient



Occlusal PVS registrations of inserted restorations were digitally scanned and analyzed for areas of actual (AC) and near contact (NC)

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Patient with no inserted
Crown

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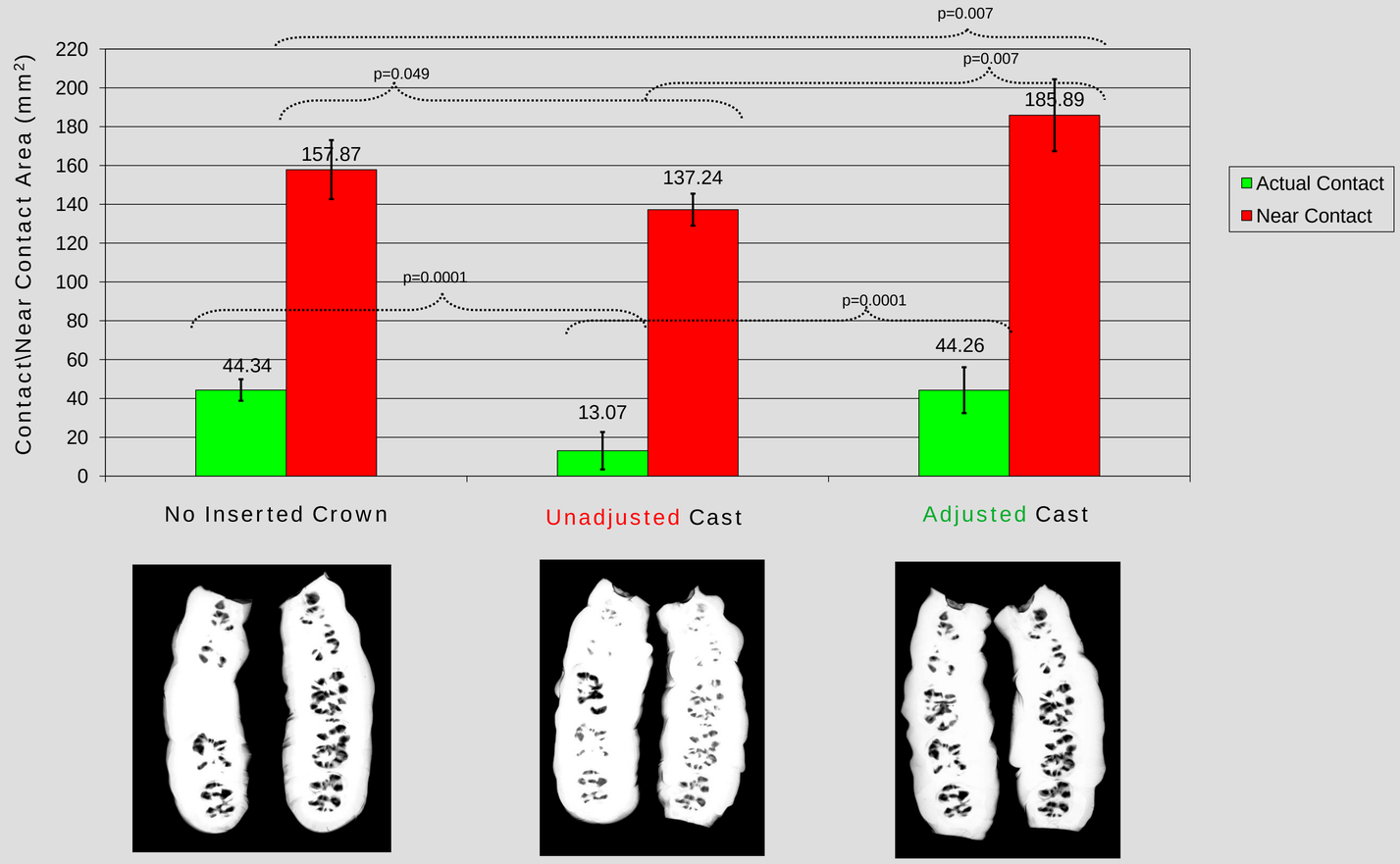
* = Position of crown preparation with/without crown

Non Parametric Statistical Comparison of Occlusal Harmony



Conclusions and Clinical Significance

1. Casts from a simulated patient cannot be accurately mounted to replicate the patient's occlusal contact areas.
2. Mounted casts of an equilibrated simulated patient will contain an artifact CR-MI discrepancy.
3. A single posterior casting fabricated on mounted unadjusted master casts will be in significant hyperocclusion upon insertion into simulated patient.
4. The occlusal surfaces of mounted master casts can be predictably "adjusted" to allow fabrication of occlusally accurate crowns intraorally

Related Literature

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