STRESSES GENERATED FROM ORTHODONTIC OPTIONS USING MICRO-IMPLANT

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INTRODUCTION

Fixed and removable orthodontics are commonly used to enhance bony architecture, minimize tooth cutting which is associated with unwanted risks of pulpal exposure and reducing the structural characteristics of teeth to withstand masticatory forces. Additionally, less need for tooth reduction may optimize resistance and retention form prior to prosthetics. Therefore, clear aligners may be viable alternative due to greater esthetics and patient comfort. Prior studies have demonstrated that clear aligners with a soft internal lining may cause generation of less stress to teeth and bone, thereby minimizing potential damage to those areas. An additional question is raised with respect to utilization of microsurgical implants for added anchorage using clear laminated aligners.

OBJECTIVE

To compare effectiveness of conventional molar uprighting appliances referred to as Molar Distalizer and NuBrace aligner using microsurgical implants as anchors.

MATERIALS AND METHODS

Three-dimensional photoelastic model.

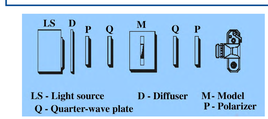
MODEL DESCRIPTION

- Photoelastic model of a dentulous adult maxilla was fabricated using different teeth and bone simulants with tooth #15 mesially tilted by 4 mm.
- Conventional molar uprighting appliance designed to use a micro-implant as an anchorage for uprighting tooth #15.
- Impression was sent to NuBrace for CT scan to fabricate laminated aligner using CAD/CAM technology.
- The laminated aligner incorporated digital tooth movement and Bracketless Anti Resorption (BAR)technique for optimum results.
- Each system was inserted on the photoelastic model and the resulting stresses were observed and photographed in a circular polariscope.

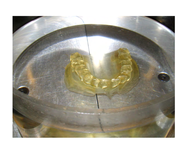
RESULTS

No load | **Laminated Aligner** | **Conventional Molar Upright Appliance**

- The fringes for both appliances demonstrated tensile forces mesial to the tilt of tooth #15 and compressive forces distal to tooth #15.
- Stress around the implant was fairly uniform around the implant threads and bone interface.
- The amount of stress at the distal portion of tooth #15 was significantly greater with the conventional as compared to the laminated aligner.
- There was no evidence of active engagement mesial to the tilted molar.



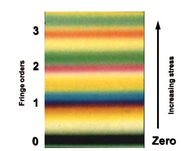
Circular polariscope arrangement.



Model in tank of mineral oil ready for aligner installation and stress observation.

TEST PROCEDURE

- The laminated and conventional molar upright applieance were inserted on the model and resulting stresses observed in the field of the polariscope and digitally photographed.
- Stress data for the two systems were analyzed using a computer graphics program to quantify stress intensity by fringe number counting.



Photoelastic interpretation

Above is a schematic representation of load exerted on a photoelastic model. Notice that increased stress in the proximity of the load - model interface. However, as the number of fringes and proximity of fringes decrease as you move away from the direct load. Above photo scale demonstrates intesity of stress as seen by colors.

DISCUSSION

- However, the conventional appliance had no active engagement at the mesial of the tilted molar to facilitate uprighting.
- Therefore, in order for to achieve analogous forces, the stress would have to be more concentrated as evidenced in this study.

CONCLUSIONS

Clinician may benefit from NuBrace over conventional methods due to: Greater control of tooth movement, elimination of unwanted stresses, no invasive attachments to minimize tissue irritation and reactive responses, greater esthetics and more hygienic toward greater patient compliance and comfort. We would like to thank Space Maintainers and NuBrace for appliance fabrication. and bone outside of the region, +/or greater patient comfort are mandated.

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