# STRESSES GENERATED FROM ORTHODONTIC OPTIONS USING MICRO-IMPLANT

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## Introduction

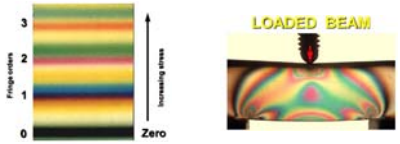
**Introduction:** Fixed and removable orthodontics are commonly used to enhance bony architecture, minimize tooth cutting which is associated with unwanted risks of pulpal exposure and reducing the structural characteristics of teeth to withstand masticatory forces. Additionally, less need for tooth 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.

## Purpose

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

## Materials and methods

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

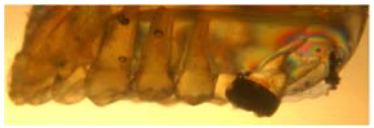



Figures 1 and 2: Schematic representation of stress on a photoelastic model with load. The color layers are referred to as fringes. Notice that there are greater number and greater proximity of fringes decrease as you go further from the load.

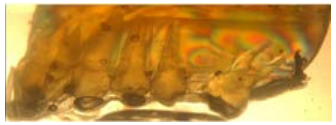
## Results

- The fringes for both appliances demonstrated tensile forces mesial to the tilt of tooth #15 and compressive forces distal to tooth #15.
- For both appliances, stress around the micro-implant, implant threads and bone interface were fairly uniform.
- The amount of stress at the distal portion of tooth #15 was significantly greater with the conventional as compared to the laminated aligner.
- Stress concentration was significantly more localized with the conventional fixed appliance as compared to the NuBrace orthodontic aligner.
- The concentration of stress was more uniform throughout the 2nd molar and the micro-implant as compared to the conventional fixed appliance..
- There was stress distal to the 2nd premolar indicating anchorage of mesial abutment when using the NuBrace aligner not seen with the conventional appliance.

Figure 3: Above is a picture of the photoelastic model without an orthodontic appliance.



Figures 4 and 5: Above are two photoelastic models with fixed orthodontic appliance inserted.



Figures 6 and 7: Above are two photoelastic models with NuBrace orthodontic aligners inserted.

## Discussion

- 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.

## Conclusion

Clinician may benefit from NuBrace over conventional methods due to:

1. Greater control of tooth movement, e
2. Eimination of unwanted stresses,
3. No invasive attachments to minimize tissue irritation and reactive responses, g
4. Greater esthetics and
5. More hygienic toward greater patient compliance and comfort.

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