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Approximating Surface Matrix Band for Dentist to Use for Patients

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Problem Statement

- Matrix bands provide a tooth contour for dentists to follow when performing restorative procedures (i.e cavity fillings)
- **Problem(s)**
 - Matrix bands are only capable of surrounding one tooth at a time
 - The thickness of two bands adjacent to one another exceeds the natural tooth contact gap
 - When restoring interproximal cavities, traditional matrix bands unnecessarily increase procedure time
- **Goal: Create a *dual* matrix band system which is ...**
 - Thin enough to fit in between the affected teeth and maintain the appropriate contact gap
 - Rigid enough to securely adapt to the shape of the tooth walls.



Client Requirements

- Device must be able to securely fit to the convex/concave contour of 2 adjacent teeth undergoing restoration
- Device material must be non-toxic
- Device should be equivalent or less costly to manufacture as compared to existing matrix bands
- Device must remain inert in the presence of filling materials (amalgam, ceramic, composite etc.)
- Device should not be obstructive or clash with other tools to be used (rotary instruments, mirrors, forceps, suction etc.)
- Device should be thin and have high tensile strength



Summary of Last Semester

- Finalized Prototype Design
- Finalized Testing Plans
- SolidWorks Simulation of Prototype Mechanical Strength



Final Prototype Goals

- Test .002 in. band width to ensure mechanical integrity
- Reverse engineer and 3D model retainer parts to allow for reconstruction of two-way retainer
- Obtain bands to physically test in MTS machine vs. simulations
- Explore outsourcing methods to ensure good value deal



Fabrication Methods

- Initial plan is to outsource the fabrication of the retainer, but modify bands ourselves
- Band can be adjusted in size via metal rollers and trimming to correct dimensions, other methods are feared to be too imprecise on such small scales



Testing Methods

There are two levels that are necessary in testing our prototype in order to insure ability to reach the client requirements.

1. Functionality Testing - Qualitative ability
2. Mechanical Testing - Quantitative ability to resist failure



Functionality Testing

➤ Functionality Testing

- Premise:
 - These tests will be used as an assessment to qualitatively determine the overall functionality, structural integrity, and ease of use of the “doublehug” matrix band.
- Testing targets:
 - Ease of bending the device
 - Ease of securing the device between the teeth
 - Ease of removal
 - Subjective structural integrity of the band (particularly the interproximal part)
- Method of Measurement :
 - Questionnaire asking the client to assess the various physical characteristics on a scale of 1-5.



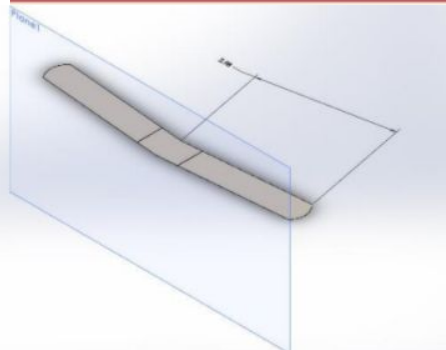
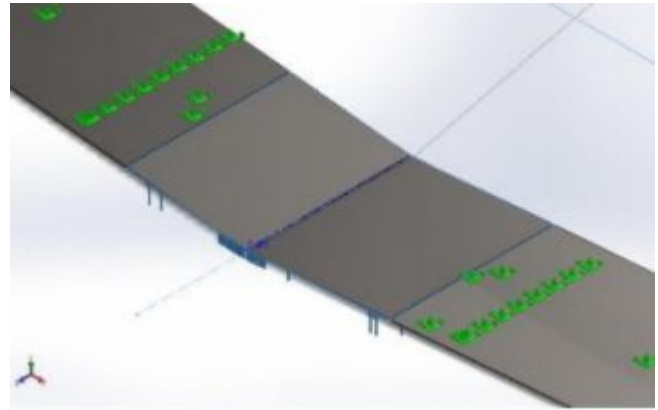
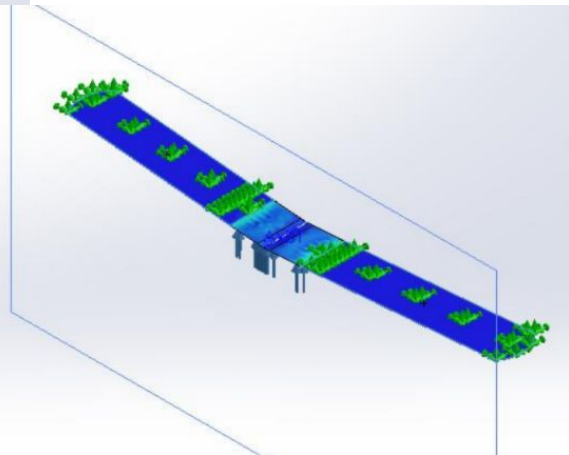
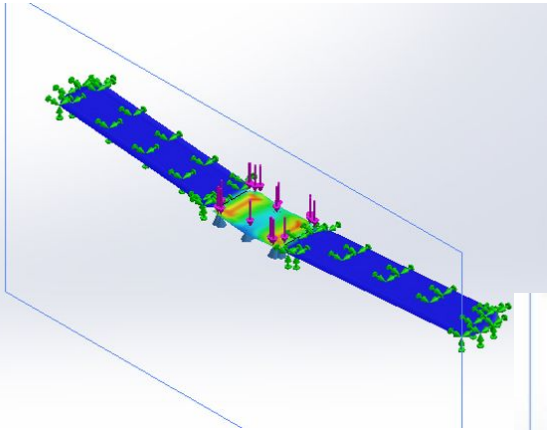
Mechanical Testing

➤ Mechanical Testing

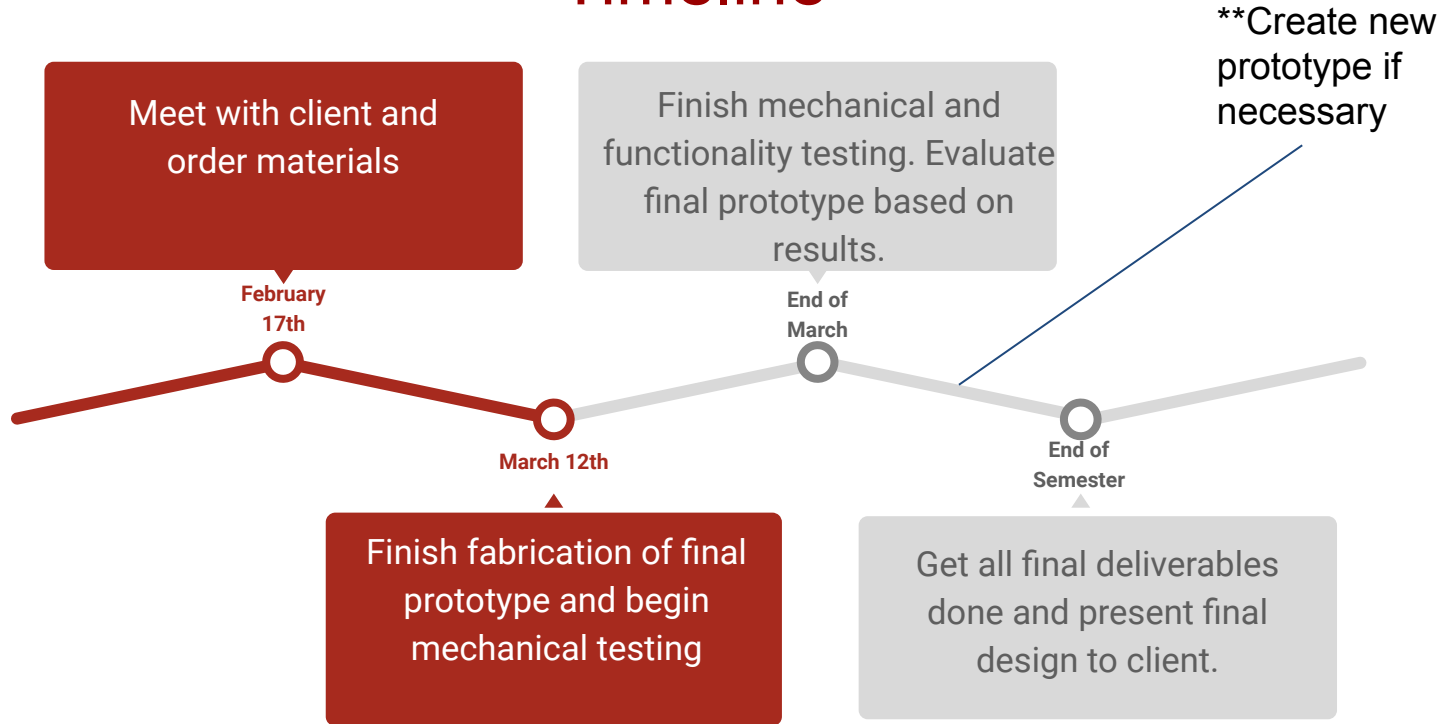
- Premise:
 - These tests will be used as an assessment to quantitatively determine if the bands are physically able to undergo the stresses necessary in the procedure.
- Testing targets:
 - Test so that the modified matrix band matches up to the matrix band traditionally used.
 - Test to see what various thicknesses of bands are able to undergo stress wise, which may help inform how thin the bands can be in the final prototype.
- Method of Measurement :
 - Placing the various band thicknesses and prototypes into the grips of an MTS machine and compare how the strength of the updated band compares to the commonly used band.



Final Prototype



Timeline



Materials and Costs

- Matrix bands - \$6.19/36pk
- Outsourcing - cost unknown at this time
- Potential costs with trimming (renting)



Acknowledgements

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