Stemmed Implant (Dr. MP Lococo)

Comparative Engineering Analysis

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By

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Introduction:

The intent of this study is to review the newly developed dual root Stemmed Implant and compare it to that of an existing single root design.

Areas of interest include:

- Resistance to torque.
- Resistance to shear at the bone – implant interface.
    - Identified by load induced gaps.
- Body to Root Ratio.
- Total required bone volume removal for insertion.
- Total surface area requiring osseo-integration.

The stress plot images (figures 1. & 2.) show torque induced stress levels at the implant/gum-bone surface interface. Higher stress (red = higher) indicate a greater resistance to torque. A 12 in-lb torque was applied in a counter clockwise direction when looking from the top.

The lower dual roots are seen to have a higher resistance to torque as indicated by the higher stress levels in the dual root surface

The single root design shows relatively little resistance to torque applied loads

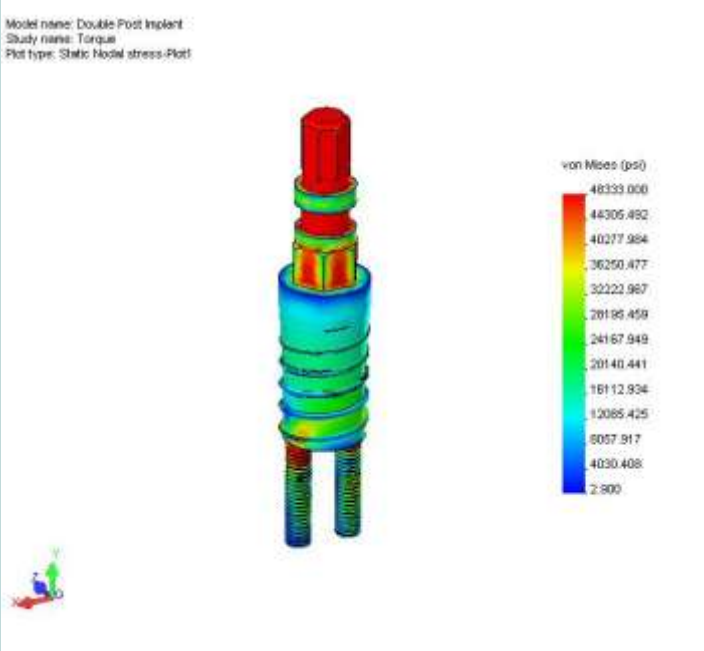


Figure 1 dual root design

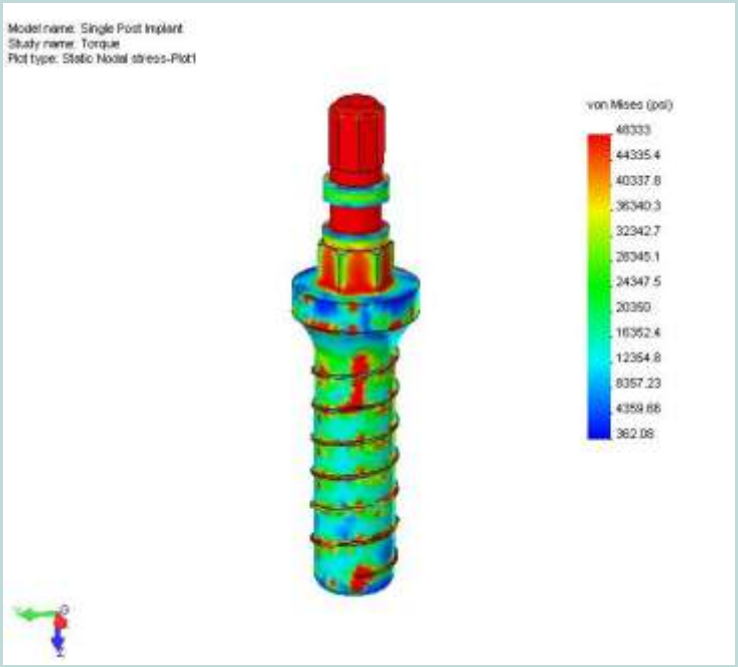


Figure 2 single root design

Figures 3 & 4 show comparative gaps created by the applied 12 in-lb ccw torque.

The single root maximum displacement at the gum/bone interface with the implant body = 0.011 inch. The dual root maximum displacement at the gum/bone line to implant body = 0.008 inch

The difference 0.011/0.008 = 38% greater displacement of the single root as compared to the dual root *under the same load*. We feel there may be a greater tendency for the single root design to experience separation from the gum/bone.

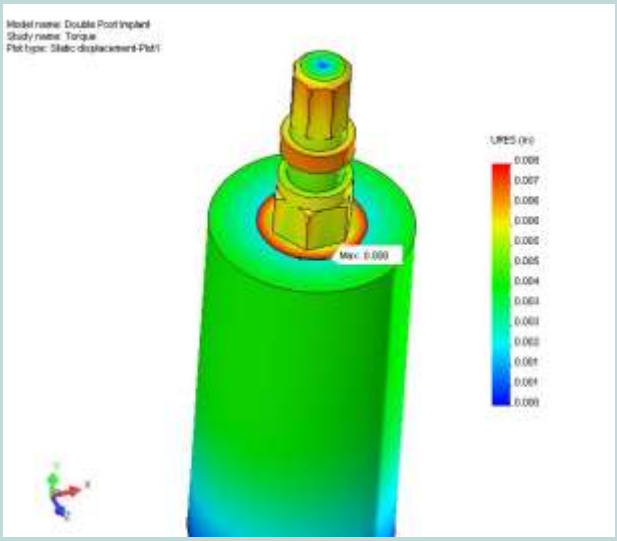


figure 3 dual root max displacement 0.008 in

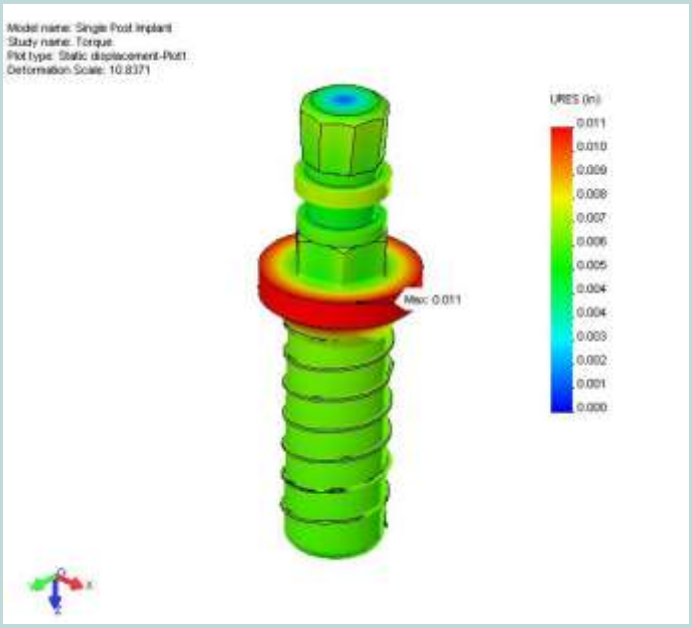
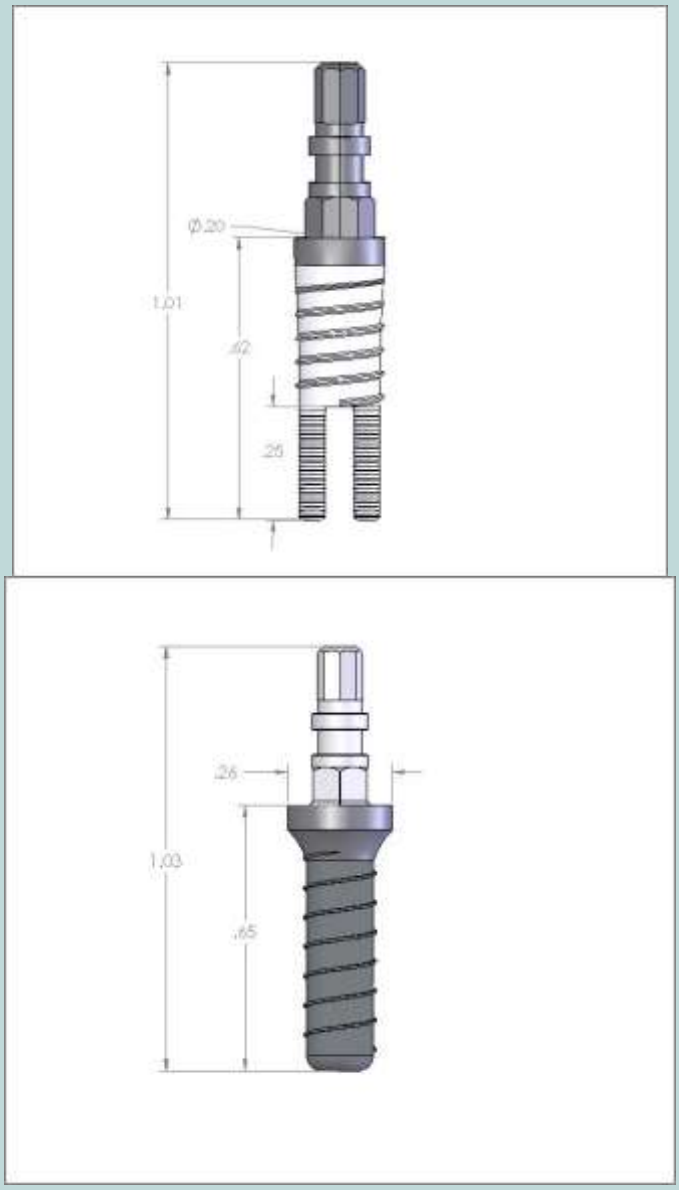


figure 4 single root max displacement 0.011 in

The Body to root ratio of the dual root implant in this analysis is 0.62/0.25 = 2.48:1. Changes to this ratio will reduce stress in the root as well as change the bone removal volumes.



The total required bone volume removal for insertion. Dual Root Implant = 0.012 in^3, Single Root Implant = 0.016 in^3. The Dual Root design removes 1/3 less tissue.

Total surface area available for osseo-integration. Dual Root Implant = 0.376 in^2, Single Root Implant = 0.428 in^2. The Single Root design has 14% more surface area below the gum line.