Influence of Ferrule, Post System, and Length on Stress Distribution of Weakened Root-filled Teeth

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**Aim**
- To investigate the effect of ferrule, post type, and post length on stress distribution in weakened root-filled teeth using 3D computer model.

**Materials & Methods**
- Extracted sound MAX central incisor was scanned and the external anatomy of the enamel, dentin and pulp in the crown & root portions were recorded.
- Data were imported to computer-aided design (CAD) software and a sound tooth and 8 3D models of a weakened root-filled central incisor were generated.
- The weekend teeth were constructed to be prepared and restored as follows:
  - **Model 1:** Cast post & core (CPC) at 7mm length with 2mm ferrule
  - **Model 2:** Cast post & core (CPC) at 7mm length without ferrule
  - **Model 3:** Cast post & core (CPC) at 12mm length with 2mm ferrule
  - **Model 4:** Cast post & core (CPC) at 12mm length without ferrule
  - **Model 5:** Glass fiber post (GFP) at 7mm length with 2mm ferrule
  - **Model 6:** Glass fiber post (GFP) at 7mm length without ferrule
  - **Model 7:** Glass fiber post (GFP) at 12mm length with 2mm ferrule
  - **Model 8:** Glass fiber post (GFP) at 12mm length without ferrule
- Models were subjected to 100-N oblique loading at the palatal surface, and the results were evaluated by von Mises criterion and maximum principal stress assessment and distribution.

**Results**
- GFP models showed homogeneous stress distribution similar to that of the sound tooth.
- The post length did not influence stress distribution of GFP models.
- High levels of tensile stress inside the root canal were observed for cast post models.
- In CPC models, there were high levels of tensile stress within the root canal with shorter posts.
- Ferrule presence was important for both post systems.
- The use of CPC without ferrule created a high stress conc. regardless of the post length.

**Conclusion**
- Ferrule presence promoted more satisfactory stress distribution to the roots.
- Post length influenced the stress distribution only for the models restored with a CPC.
- CPC should be avoided to rehabilitate weakened roots in the absence of a ferrule.

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