## **Cantilevers in Dentistry**

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A cantilever is a beam supported at only one end. Cantilevers are ubiquitous in engineering and architecture. Think about it. Every time you fly, it is the cantilevered wings that keep you aloft.

All Kennedy Class I and II removable prostheses are dental cantilevers, since oral mucosa is much more viscoelastic than the periodontium. Various clasp, rest, and impression theories are advocated to minimize the fulcrum loads on the distal abutment. Fixed prosthodontic cantilevers are often designed when there is only one small tooth adjacent to a stalwart abutment, eg, replacement of the maxillary lateral incisor or mandibular premolar with 2 or more abutments. With the cements of the past, clinicians were often leery of cantilever designs and the potential for overload.

Osseointegration redefined cantilevers in dentistry. Proper tooth positioning creates implant prostheses designs that are often generously cantilevered anterior, posterior, and lateral to the implants in the resorbed alveolus. Nevertheless, they function well because metal screws and robust implant frames have far more strength than even the best dental cements and toothsized dental castings.

New concepts have extended cantilever applications in 4 other areas: (1) removable prostheses, (2) geriatric dentistry, (3) dental education, and (4) ceramics. The Kennedy Class I cantilever effect was eliminated in a clinical trial by placing an implant at the back of each "free-end saddle" to create a tooth/implant-supported denture base.<sup>1</sup> The use of small posterior cantilevers means that elderly patients can be treated with fixed rather than removable prostheses. Maintenance is easier, there is less decay, and the dentures are impossible to lose.<sup>2,3</sup>

For single tooth replacement, 2-unit cantilevers show success rates similar to conventional 3-unit fixed partial dentures. There is no need for 2 parallel abutment preparations since only 1 tooth is prepared, and they have become the standard for anterior singletooth replacement in some dental schools.<sup>4</sup> Allceramic or metal-free prosthetic designs have been explored in the quest for better esthetics; however, 3-unit ceramic prostheses suffer from crack propagation and fracture compared to metal-ceramic prostheses. Twounit ceramic cantilevers do not seem to have this problem, and show better survival rates compared to 3-unit ceramic designs.<sup>5</sup> My theory is that the natural viscoelasticity of a single-abutment periodontium allows for cantilever micromovement instead of the stress development that occurs within a ceramic 3-unit restoration.

Improvements in enamel and dentin bonding, cements, and ceramics suggest that a conservative approach using cantilever prostheses with fewer abutments will see increased application and popularity in the near future.

## References

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