

## The Use of Dental Radiographs in Evaluation of Prosthetic Margins – Tooth-Supported Fixed Prostheses

Generally speaking, precise marginal fit is preferred for both single and multi-unit tooth-supported fixed dental prostheses (FDPs). Historic and current guidelines suggest that a wide range of marginal misfit (6 to 120  $\mu\text{m}$ ) is considered acceptable. Unfortunately, there is no clinical evidence-based consensus regarding marginal gap size.<sup>1-3</sup> Although an “adequate marginal fit” has never been clearly defined, there is data to suggest that overhanging restorations and readily detectable open margins (clinically and/or radiographically) may increase the risk of secondary dental caries, cause detriment to surrounding periodontal tissues, and perhaps have a negative effect on the esthetic result of anterior restorations.<sup>4-8</sup>

Marginal fit aside, prosthodontic patients are often at high risk for dental caries.<sup>6</sup> Several risk factors have been identified, including existing or recent history of caries,<sup>9</sup> medium or high levels of *Streptococcus mutans* and *Lactobacillus*,<sup>9,10</sup> heavily restored dentition,<sup>11</sup> use of removable dental prostheses,<sup>12</sup> and many others. Marginal gap size between tooth and restoration has been positively correlated with the development of secondary caries.<sup>5,8-16</sup> However, data to support this is limited with a lack of consensus, and has only been closely studied for amalgam, composite, and glass ionomer restorations.<sup>8,17-19</sup>

Overhanging dental restorations can hinder oral hygiene, have associated plaque accumulation, and cause physical irritation, leading to gingival inflammation and potential periodontal destruction. In a cross-over study, overhanging dental restorations were associated with increased gingival inflammation and periodontal probing depths without clinical attachment loss.<sup>4</sup> Furthermore, overhanging dental restorations were microbiologically correlated with increased proportions of Gram-negative anaerobic bacteria and black-pigmented *Bacteroides*.<sup>4</sup> Although undetectable radiographically, roughly only 50% of subgingival crown and FDP margins remain subgingival after 5 years.<sup>20</sup> This suggests that crown margins, especially when overhanging, may have a detrimental effect on periodontal health and/or clinical attachment loss.<sup>4,20,21</sup>

Different detection methods have been proposed for the identification of misfit in dental prostheses and restorations. These procedures include the use of dental explorers, radiographs, and impression materials.<sup>1,2,22,23</sup> However, significant limitations occur, especially when the restoration margin is located interproximally and/or subgingivally.<sup>2</sup> The evidence available to support the use of any certain technique to detect marginal misfit is low- to moderate-quality at best and is very limited.<sup>1,22</sup>

Regardless of the limitations of each respective method, impression making, radiographic evaluation, and exploration all have some capability at measuring marginal defects. Impression making may be more capable of measuring a smaller gap size than using a dental explorer. Radiographic limitations also exist. At greater than 15° of deviation from orthogonal projection of the x-ray tube, a gap size of 0.15 mm is undetectable. Using a combination of techniques is recommended. Most practically, the use of a dental explorer and intraoral imaging are the most commonly used methods at the time of both single- and multi-unit FDP delivery.

It is the position of the American College of Prosthodontists that the following clinical recommendations be considered regarding the use of dental radiographs in the evaluation of prosthetic margins for tooth-supported FDPs:

1. At this time, for both single- and multi-unit FDPs, no conclusive guidelines exist for an acceptable marginal gap size or gap size range; however, minimizing gap size may reduce the risk of secondary caries.
2. Overhanging dental restorations have been correlated with gingival inflammation and negative effects on periodontal health.
3. A combination of both clinical and intraoral radiographic evaluation of restoration margins is recommended.
4. More data is needed to support the use of radiographs after delivery of single- and multi-unit FDPs in relation to prevention of irreversible complications such as extensive caries and tooth loss.

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