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

Generally speaking, precise marginal fit of tooth-supported fixed restorations (crowns and multi-unit fixed dental prostheses) is preferred. Historic guidelines suggest that a marginal misfit of 6 to 30 micrometers is considered acceptable.\(^1,2\) Although an “adequate marginal fit” has never been clearly defined, data suggest that overhanging restorations and readily detectable (clinically and/or radiographically) open margins may increase the risk of dental caries, cause detriment to surrounding periodontal tissues, and perhaps have a negative effect on the esthetic result of anterior restorations.\(^3-6\)

Marginal fit aside, prosthodontic patients are often at high risk for dental caries.\(^5\) Several risk factors have been identified, including existing or recent history of caries,\(^7\) medium or high levels of Streptococcus mutans and Lactobacillus counts,\(^7,8\) heavily restored dentition,\(^9\) use of removable dental prostheses,\(^10\) and many others. Marginal gap size between tooth and restoration has been positively correlated with the development of secondary caries.\(^4,11-14\) However, this data is not unanimously supported and has only been closely studied for amalgam, composite, and glass ionomer restorations.\(^15-17\)

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.\(^3\) Furthermore, overhanging dental restorations were microbiologically correlated with increased proportions of Gram-negative anaerobic bacteria and black-pigmented Bacteroides.\(^3\) Although indetectable radiographically, roughly only 50% of subgingival crown and fixed dental prosthesis margins remain subgingival after 5 years.\(^18\) This data suggests that crown margins, especially when overhanging, may have a detrimental effect on periodontal health and/or clinical attachment loss.\(^3,18,19\)

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.\(^1,2,20,21\) However, significant limitations occur, especially when the restoration margin is located interproximally and/or subgingivally.\(^2\) 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.\(^1,20\)

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, but what does this mean clinically? Radiographically, at > 15 degrees of deviation from orthogonal projection of the x-ray tube, a 0.15 mm gap size is undetectable. Are these findings biologically relevant?

At this time, for fixed dental prostheses and/or single crowns, no conclusive evidence relates marginal gap size and/or marginal placement (supra/subgingival) to secondary caries.

Overhanging dental restorations have been correlated with gingival inflammation and negative effects on periodontal health.

Current Clinical Recommendations

After a crown or fixed dental prosthesis is seated with clinical confirmation (visual and use of explorer) of “adequate” marginal fit, a radiograph taken with orthogonal projection is recommended after cementation. Ideally, conventional or digital radiographic imaging with a charge-coupled device should be used. At this time, regular use of cone beam computed tomography (CBCT) and/or panoramic radiographic imaging after delivery of crowns or fixed dental prostheses lacks adequate scientific support. Any future radiographic imaging during routine professional oral hygiene maintenance should ideally be taken with the same settings and geometric orientation (or as close a feasibly possible) for each patient. If there are concerns of marginal fit during clinical examination, a radiograph may be taken to evaluate marginal fit prior to cementation; however, another radiograph after cementation is still recommended to provide a final baseline radiographic image. This enables a baseline assessment to be used for comparison with future radiographic imaging. This may enhance the clinician’s ability to detect early radiographic changes over time. These changes could be correlated with secondary caries, crestal bone loss, and/or other dentoalveolar pathology. More data are needed to support the use of radiographs after delivery of crowns and fixed dental prostheses in relation to prevention of irreversible complications such as extensive caries and tooth loss.

References


References cont.


References cont.


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