

the main reason why crown lengthening procedures were not performed was patient dropout. In our study, 48 percent of patients dropped out prior to surgical treatment and continued dropout after the crown lengthening procedure was the main reason for the low case completion rates observed. Although discouraging, a similar dropout rate of 50 percent during presurgical phase periodontal treatment has been reported in another university clinic setting.²⁴ Similar poor compliance with periodontal treatment has been reported in multiple private practice settings prior to and after surgery.²⁵⁻²⁷ We therefore suggest that restorative dentists and periodontists should strive to educate their patients about the value of treatment and motivate them to follow through with treatment.

To our knowledge, this is the first study that characterizes patients and teeth receiving crown lengthening procedures during the course of treatment by general dentists and periodontists. We did not see any significant differences in crown lengthening case characteristics at any point of care. It seems therefore likely that restorative dentist and periodontist case selection criteria do not differ when it comes to demographics, medical history, restorative needs and periodontal status. We noticed, however, that crown lengthening patients form a distinct group among the general clinic patient population. While our general patient population resembles the surrounding community in demographics except for the older age, we observed that patients with crown lengthening needs had a small but significantly higher proportion of females and Hispanic patients. Similarly, while our overall patient population has statistically similar prevalences in medical conditions such as type 2 diabetes mellitus, asthma, obesity, hypertension (8 percent) and tobacco use to surrounding communities,

patients with crown lengthening needs report nearly twice as much hypertension (17 to 18 percent, $p < 0.05$) as part of their medical history. We suspect that antihypertensive medications contribute to xerostomia²⁸ and an increased risk of deep recurrent caries precipitating crown lengthening procedures. While our overall patient population has slightly higher than average levels of periodontal disease (moderate to severe chronic periodontitis: 26 percent) likely due to the older median age compared to the national average,¹⁵ crown lengthening

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patients in this study experienced a significantly lower level of periodontal disease (moderate to severe chronic periodontitis: 6 percent, $p < 0.05$). Most likely, this difference can be explained by the poor crown-to-root ratio observed for teeth with advanced bone loss caused by moderate to severe periodontitis, which then renders these teeth poor candidates for complex restorative procedures including crown lengthening.

Furcation involvement and poor crown-to-root ratio are not absolute contraindications for crown lengthening and restoration and therefore have no maximum predictive values for restoration or extraction. Although furcation involvement is not desired for maintenance of teeth, it is entirely possible to treat furcations exposed during crown

lengthening with a variety of methods, such as tunneling, root amputation or odontoplasty and an appropriately contoured restoration.^{29,30} Similarly, it may be possible in selected cases to add support to teeth with poor crown-to-root ratio by various splinting methods. In addition, relying on radiographic measures alone may be misleading, as projecting a new bone level by 3 mm apical to the final restorative margin may not apply to all patients. Wagenberg et al. suggested that some patients need up to 5 mm of bone removal to avoid long-term biologic width complications,³¹ and restorative needs, such as increased need for occlusal clearance, might dictate an even greater need for crown lengthening.

This study attempted to determine how the periodontists involved decided if crown lengthening should be recommended by reviewing their chart notes. Chart notes revealed little in how periodontists arrived at their diagnosis, and there likely was not a uniform approach to diagnosis because we did not calibrate diagnostic methods prior to this study. Judging from informal case discussions that take place weekly during periodontal faculty meetings, surgical techniques for crown lengthening are the same as described above, but use somewhat different approaches for diagnosing the need and likelihood of success for crown lengthening cases. Because the periodontists involved in this study combine varying amounts of clinical and radiographic evidence for their recommendations on crown lengthening, we were interested in which combination of radiographic criteria most closely predicted the recommendation and eventual treatment outcome. As the periodontists often did not specify in their chart notes what clinical evidence determined their recommended treatment, and radiographs were the