Optimizing the restoration of posterior endodontically treated teeth

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CHAPTER 6

General discussion
Positioned in continuous direct contact with potentially deteriorating factors, having no possibility of regeneration and being the core of key life aspects like nutrition and social interactions, dental tissues must be preserved to the fullest extent. It is not highly efficient to try to manage or maintain a certain asset without accurately quantifying it, and precisely reporting and justifying the expenses. In dentistry, considering teeth as units and reporting cavities by their anatomical location should probably become obsolete at some point. A small MOD cannot be looked at as an extended MOD, and a quantitative documentation method should be elaborated. As soon as teeth fully erupt, an accurate measurement of the volume of healthy dental hard tissues, by the means of intraoral scanners for example, must be undertaken. Determining this limited volume could be a powerful first step to hold accountable and to help counter the detrimental actions of the two main players — patients and dentists — that are responsible for the reduction of the dental capital. When the baseline volume is established, keeping track of tissue loss by pathology or interventions becomes more accurate, incentivizing prevention and minimally invasive treatments. A bit further down the path of healthy teeth, handling remaining dental hard tissues in ETT is crucial. Fragility of ETT resulting from the endodontic procedure should be first addressed by reducing unnecessary removal of dental hard tissues. At the coronal level, concepts of CEC should be adopted but further adjusted to allow a more efficient cleaning of the root canals. Since no sufficient clinical information is available concerning CEC especially in regards to the efficiency of the endodontic treatment through such narrow cavities, TEC seems to be the only applicable option while trying to be as conservative as possible. At the radicular level, non-instrumental or limited instrumentation techniques should probably be the ideal way, and further investigations have to be made in that direction. A similar approach of Wemes et al., using more biocompatible products or techniques, to fixate or remove pulp tissues and bacteria without weakening the roots should be considered. Currently, minimally invasive mechanical preparation of the canals like the combination of SAF with effective irrigation, is the closest
established method to that concept. So far, mechanical cleaning of root canals cannot be avoided since chemical irrigants are not sufficient alone\textsuperscript{1-3}. Since the literature shows that success of both manual and rotary root canal preparations are comparable in terms of residual bacteria and healing\textsuperscript{4}, techniques with lower taper instruments and that do no remove excessive dentin quantities like most rotary systems do\textsuperscript{5,6}, are more probable to provide better mechanical resistance to the tooth.

Despite some studies showing that Sodium Hypochlorite has a degrading effect on dentin, the concentration and time of application play an important role in the rate of that event\textsuperscript{7-10}. Since irrigation time is decreasing with the emergence of single file systems, some attention should be given to the concentration. In endodontic treatments on vital teeth, high concentrations have to be used in order to degrade the pulp tissues, while on teeth exempt of pulp, the minimal concentration with bactericidal effect can be used. Concerning the usage of EDTA, a concentration of 17\% for 1 min or 5\% for 10 min appears to be the best compromise that assures a sufficient removal of smear layer without significantly reducing fracture resistance\textsuperscript{11}.

Concerning post-endodontic treatment restoration of moderately damaged posterior ETT, most MO or MOD cavities can be restored with intracoronal restorations like direct composite, inlays and onlays depending on the defect size and configuration. Despite extensive literature on favorable success rates of such restorations\textsuperscript{12-15}, a large number of dentists still choose to automatically restore ETT with crowns. Crowns on ETT have a good survival rate, but the important factors are the age of the patient at the time of the treatment and the crowns’ mode of fracture that is predominantly catastrophic. The problem would be that conservation time of the “well-engineered” natural tooth tissues is not stretched and optimized to the fullest, and with the increasing life expectancy, patients would often end up being obliged to undergo financially and surgically inconvenient implant procedures at
advanced ages. Chapters 2 and 3 showed that reinforcing such teeth in a non-invasive direct manner rather than opting for a mutilating and often indirect technique could prolong the presence of the dental capital, and could perform well from a biomechanical point of view.

As for severely damaged posterior teeth, it appears that metallic posts should be avoided since the misbelief of reinforcement that they add is outdated and since this restorative phase can worsen the accumulated tooth weakness throughout the preceding procedures. Endocrowns are less invasive alternatives that have shown success rates, that are comparable to conventional crowns. Chapter 4 showed that endocrowns with 2 mm and 4 mm extensions in the pulp chamber of premolars perform as good as crowns in terms of marginal adaptation a resistance to fatigue.

In Chapters 5A and 5B, restorative bulk-fill resin composite was used for the first time in the literature as a luting agent. The idea was to benefit from the increased depth of cure of such materials, by maintaining the already recognized better mechanical properties and convenient viscosity and setting control of normal restorative composites compared to dual-curing resin cements. It was also showed that there is a lack in the literature in regards to light-curing strategies for indirect restorations, and established that 80 s (40 s per buccal and lingual site) can be sufficient to reach adequate polymerization of light-curing resin composite under a thick endocrown. Further investigations have to be made to evaluate different restoration configurations and materials, and propose light-curing strategies accordingly.
References


