Remaining Coronal Structure and Trends for Cusp Coverage - Descriptive Review

Cascão M.[1], Gavinha S.[1] ,Carrilho M.[1], Martins F.[1], Manarte-Monteiro P.[1]
mfcascaoufp.edu.pt

[1] **Faculty of Health Sciences, University Fernando Pessoa, Porto, Portugal**

Introduction

Weakened coronal structures can compromise tooth resistance to fracture, by occlusal loads, and may require reinforcement with restorative cusp coverage (CC).

Objectives

To conduct a descriptive review of CC clinical options and to identify dental structural conditions that may guide the requirement of CC intervention for structure functional reinforcement.

Methods

A search in Pubmed was done with the keywords: Resin-based composite, Composite, Ceramic, Tooth fracture, Cusp coverage, Bicuspid, Weakened teeth, Cavity preparation design. Thirty articles were identified. Methodology included review, clinical and in vitro studies, published between 2005 and 2015 years.

Results

Seven publications were selected. The CC can be executed through direct (composites) and indirect (ceramic materials and/or composites) restorative techniques. Several clinical conditions guide to CCs, such as endodontically treated teeth and, in this group, premolars teeth are more susceptible to fracture, by anatomic factors as shape and location (Table 1; Figure 1); and still, variations in cavity dimensions and cavity preparation designs (Figure 1). However, some authors suggested that less aggressive preparations (Figure 2) are adequate rather than extended preparations over the cusps to prevent fracture, when using adhesive indirect restorations with resin-based composites.

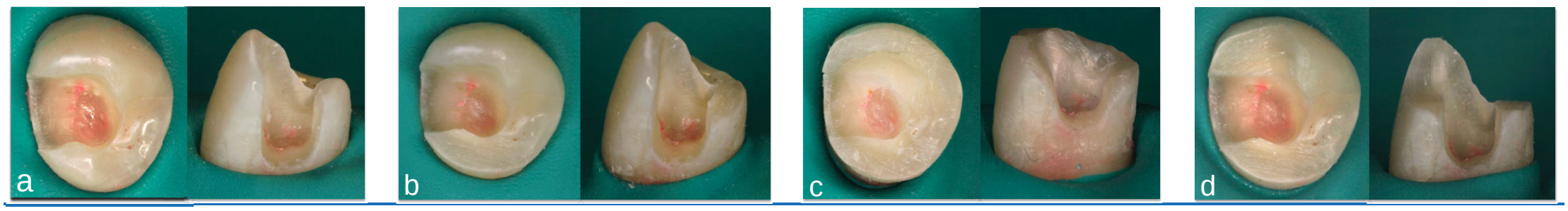

Figure 1- Endodontic treated premolars with cavity preparation occlusal – mesial (occlusal and mesial views), have an increased (%) fracture resistance; **(a)** Conventional coronal restoration - 80 %; **(b)** Coronal restoration with partial cusp coverage - 82%; **(c)** - Coronal restoration with conventional full coverage of cusps - 97% ; **(d)** Coronal restoration modified with full coverage of cusps – 96% (Xie *et al.*, 2012).

(A) Endodontically Treated Teeth	(B) Anatomic Location	(C) Cavity Preparation Design
• Faria *et al.* (2011)- Review Article - endodontically treated teeth are more fragile due to the loss of structural integrity;	• Lia Mondelli (2009)– *in vitro* study - premolars with CC have greater resistance to fracture; • Faria *et al.* (2011) – review article - the anatomical location determines the load at which a tooth is subjected, thereby being a significant factor in the restoring moment ; • Xie (2012) – *in vitro* study - the total CC gives the tooth increased strength when compared with partial CC, or restorations without CC; this fact becomes more relevant in teeth subject to higher occlusal loads, as are the premolars;	• Morimoto (2009) – *in vitro* study - there are no significant differences in fracture resistance between inlays and overlays ; • Faria *et al.* (2011) – review article - the remaining structure is the determining factor for the choice of restorative option; • Kantardzic (2012) – *in vitro* study - the wall thickness is not proportional to the tension exerted; • Guess (2013) – *in vitro* study - the preparation form does not alter the resistance, but in full CC cases there is less incidence of fractures;

Table 1 - Clinical trends: (A)- Endodontically treated teeth, (B)- Anatomical location (C)- Cavity preparation design, that drives for a restorative reinforcement with cusp coverage .

Figure 2 – Average dimensions of a cavity preparation for an onlay placement, in a bicuspid tooth:
A=2.5mm/5.0mm; B=2.5mm; C=2.5 mm; D=1.5 mm; E=1.5 mm; F=1.5 mm
Fonseca *et al.* (2007)

Conclusions

Cavity preparation design influence cusp stiffness: more deep and wide cavity designs promote cusp deflection greater loads. The remaining coronal structure, occlusal loads and the selected materials/techniques are important factors in cups coverage restorative decisions.

Clinical Implications

Cusp coverage is a safe option to functionally restore posterior teeth with weakened remaining coronal structure.

References

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Keywords
Resin-based composite
Ceramic
Tooth fracture
Cusp coverage
Bicuspid
Weakened teeth
Cavity preparation design