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# Decision-Making in the Provision of Extra-Coronal Restorations

**Abstract:** Decision-making when choosing an extra-coronal restoration for a molar tooth is often multifactorial, requiring consideration for material properties, the underlying tooth tissue, aesthetics and functional requirements. This article reviews the various factors associated with the decision-making when considering an extra-coronal restoration for a molar tooth. The current literature is disseminated and compared to results obtained from clinicians at the Dental Pan Society meeting in 2007. Dentists were seemingly less likely to consider restorations with greater complications for themselves than they were for their patients. The various implications of the results are discussed.

**Clinical Relevance:** With the plethora of dental materials available, the clinician has a wide choice of restorations. As clinicians become increasingly aware of the relative complications associated with different restorations, they are less likely to choose those that may result in problems, such as loss of vitality. In comparison, patients, if not kept fully informed, are unlikely to be aware of these problems and therefore may be happy to accept a more 'aesthetic' restoration. This decision dynamic is examined in this article.

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The choice as to whether to provide an extra-coronal restoration for a molar tooth is often based upon the need to protect the remaining tooth structure.<sup>1</sup> Once the need for an extra-coronal restoration is identified, the type of crown to be placed should be discussed with the patient, identifying any differences between each in addition to the advantages and disadvantages.<sup>2,3</sup> One factor that may be of high importance to the patient is aesthetics of the final restoration.<sup>4</sup> This can result in some disparity with the reasoning

for crown provision as preparations for more aesthetic restorations often require a greater removal of tooth tissue and so may weaken tooth structure to a greater degree than all-metal restorations.<sup>5</sup> This greater tissue removal is also more likely to result in loss of vitality with consequent morbidity (Figure 1).<sup>6</sup> Indeed, the degree of tissue removal has been correlated to a greater risk of pulpal necrosis.<sup>7</sup>

Where the provision of extra-coronal restorations is elective, and for purely aesthetic or cosmetic reasons, the consequent morbidity may not be fully realized by the patient.<sup>8,9</sup> Moreover, the demand for, and the provision of, wholly aesthetic procedures has been shown to be influenced by the media.<sup>10</sup> Theobald and colleagues illustrated a greater demand by patients attending a cohort of dental practices for aesthetic procedures, such as tooth whitening and veneers, after extreme makeover programmes were aired.<sup>10</sup> A recent survey of members of the American Academy of Esthetic Dentistry (AAED) yielded interesting results. The biggest



**Figure 1.** Long cone periapical radiograph of UL2,3,4. Both the UL3 and UL4 required root canal treatment soon after tooth preparation for all-ceramic crowns. The UL2 exhibited delayed response to sensibility tests.

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threat perceived by members to aesthetic dentistry was overtreatment (33%) in addition to unrealistic expectations influenced by the media.<sup>11</sup> Within their own practising environment, the biggest problem faced by members was unrealistic patient expectations (23%). The results from this study may illustrate an increased awareness of the profession to a decision-making process influenced by the media and patient expectations without due balance for conservation and function.

The popularity of cosmetic dentistry amongst patients is in stark contrast to dentists, who have been shown to favour restorations for their own teeth with proven longevity despite inferior aesthetics.<sup>12,13</sup> This concept has been illustrated further by a survey of members of the American Academy of Esthetic Dentistry.<sup>14</sup> From the survey, Christensen reported that this cohort of dentists favoured metal-ceramic restorations for their patients in comparison to partial or full gold crowns for their own mouths.<sup>14</sup> This view was echoed in a European study where dentists (n=65) were shown to favour restoration longevity in comparison to their patients (n=306), who favoured aesthetics and visibility of the restoration.<sup>15</sup>

### Morbidity in crown provision

When considering restorations for teeth that have suffered significant tissue loss, the decision faced by the dentist may be either to place a large direct restoration or consider an indirect extra-coronal restoration. Indeed, the placement of a crown has been shown to result in fewer subsequent treatment visits or the need for remedial treatment for catastrophic failure than large amalgam restorations (four or more surfaces) over a 10-year period.<sup>16</sup> In contrast, a systematic review revealed that amalgams have superior survival and cost effectiveness in comparison to other modes of direct and indirect cast restorations.<sup>17</sup> Prior to restoration, the clinician needs to appraise the remaining coronal tooth tissue objectively, judging the amount of tissue removal required to provide

a retentive restoration whilst gauging the likelihood of significant pulpal insult.<sup>18,19,20</sup> Indeed, the tooth may have already undergone procedures that have compromised the pulp and hence may be inherently more vulnerable.<sup>21</sup> The prospective advantages of crown provision must be balanced against risks such as the development of endodontic pathology requiring root canal treatment.<sup>6,22</sup>

Once the decision to provide a crown is made, the type has implications for both patient and dentist. In a retrospective study of 400 restorations provided over an 8-year period in a teaching hospital, most complications were encountered with both porcelain jacket crowns and metal-ceramic crowns in comparison to partial or full veneer (gold) crowns.<sup>23</sup> Complications encountered included endodontic problems and aesthetic concerns, with the single most frequent complaint being fracturing of porcelain from the underlying metal (Figure 2).<sup>23</sup> Despite these results, this cross-sectional study was considered preliminary by the authors as the recall rate of patients was poor. These problems of compromised aesthetics and associated fracture of porcelain were echoed by Walton and colleagues in a retrospective study.<sup>24</sup> In terms of biological complications, the mean incidence of loss of vitality subsequent to crown provision (metal/metal-ceramic) has been shown as 3% in a narrative review.<sup>25</sup> In a study of 1084 teeth over 30 years, greater tooth tissue removal resulted in a statistically significant chance of pulpal necrosis (13.3%).<sup>7</sup> In this investigation, full coverage restorations had the highest incidence of pulpal necrosis in comparison to partial veneer restorations and unrestored controls (Figure 3).<sup>7</sup> Further differences in restoration morbidity were illustrated in a randomized controlled trial comparing full gold crowns and highly sintered ceramic crowns.<sup>26</sup> The incidence-free (such as loss of vitality and fracture) Kaplan-Meier survival probability for gold crowns and highly sintered ceramic crowns was shown to be 92.7% and 89.8%, respectively at 24 months.<sup>26</sup> Optimal marginal fit was detected in



**Figure 2.** Fractured porcelain from this bridge resulted in the need for replacement despite sound marginal integrity and otherwise healthy abutment teeth.



**Figure 3.** Endodontically treated LR6 restored with a partial veneer gold crown.



**Figure 4.** Partial veneer ceramic restoration on the UL6. The restoration exhibited marginal breakdown most notably on the mesial aspect.



**Figure 5.** Full mouth rehabilitation illustrating differential use of materials depending on visibility, occlusal clearance and aesthetics. Case courtesy of Francis Nohl.

74% of gold crowns in comparison to 51% of ceramic crowns at 24 months (Figure 4).<sup>26</sup> In the same study, full gold crown surfaces were smoother (93.2%) in comparison to ceramic crowns (72%) at 24 months.<sup>26</sup>

### Patient input

When the type of crown is decided, the patient may not be fully aware of the increased likelihood of both biological and mechanical complications of the more invasive restoration.<sup>8,9</sup> Indeed, patients have been shown to favour aesthetic restorations with a lesser emphasis on the risk of post-operative complications and longevity. This was in contrast to the opinions of the dentist who placed greater emphasis on longevity for their own treatment.<sup>13</sup> Differences in the opinions of dentists and their patients have been illustrated when considering aesthetics.<sup>15</sup> Jørnung and Fardal illustrated that patients' opinions of the aesthetics of their own smiles were significantly greater than the dentists' perceptions.<sup>15</sup> Where aesthetic treatment is being considered, patients' greatest anxiety is that they may not be happy with the final restoration.<sup>27</sup> Patients have been shown to be less dissatisfied with compromised aesthetics in molar teeth in comparison to those in the aesthetic zone (Figure 5).<sup>28,29</sup>

A study has compared dentists' and patients' attitudes towards the placement of crown margins.<sup>30</sup> Of the 370 patients surveyed, the majority preferred optimum health potential (64%) in comparison to optimal aesthetics (36%) when considering placement of anterior crown margins either supra- or subgingivally. Of the dentists surveyed, 89% placed margins subgingivally for wholly aesthetic reasons, despite patients in the study putting a greater emphasis on health. Unfortunately, only 64% of dentists in the study felt it appropriate to discuss the position of the crown margin prior to commencement of treatment.

These differences in preferences between patient and dentist may be due to first hand knowledge and experience of problems that are encountered with more aesthetic

restorations, in addition to a perception of aesthetic issues which may not be of concern to patients.

### The UK perspective

During the Dental Pan Society meeting of 2007, 390 delegates were asked two focused questions with specific reference to extra-coronal restoration provision via closed circuit recording devices. The first question related to the choice of restoration for a patient's lower first molar, whereas the second question focused on restoration placement for the dentist's own tooth (Figures 6 and 7). The results showed that the majority of delegates favoured the placement of full gold crowns (FGC) as opposed to alternative treatments. These observations are in contrast to an extensive US web-based study of 757 dentists who seem to have progressively become more in favour of aesthetic restorations for their own molar teeth.<sup>12</sup> Information on over 6,000 was obtained, 75% of which were restored. Of the teeth that were restored, 10% were complete veneer crowns (full gold crown) and 8% were metal ceramic crowns. Of those restorations that were placed in the year immediately preceding the survey, 29% were crowns incorporating metal and 38% were aesthetic restorations, such as highly sintered all-ceramic restorations. The majority of crowns (62%) were metal-ceramic in comparison to full gold crowns (38%).<sup>12</sup> These results were in contrast to restorations that were placed 6–30 years previously, the vast majority of which were either full gold crowns or amalgam restorations.<sup>12</sup>

Although dentists surveyed at the UK Dental Pan Society meeting generally favoured FGC, there were some interesting variations within the categories and their sub-groups. A marginal difference in preference of restoration provision between the dentist's own mouth and that for a patient's, when restoring a mandibular molar tooth, was apparent. A greater number of delegates favoured FGC for their own mouths (70%) in comparison to that of their patients (65%) (Figures 6 and 7). This difference may be a manifestation of delegates' experiences, with patients demanding a more aesthetic restoration regardless of

information that may have been provided in terms of longevity, morbidity and function. In this respect, for a practitioner to communicate the relative advantages and disadvantages of different types of restoration can be difficult, whilst still respecting patient values and autonomy. Indeed, the patient decision-making process in relation to extensive restorative treatment has been investigated.<sup>29</sup> The most important factor for the 250 patients surveyed when deciding to progress with complex restorative treatment was the dentist/patient relationship. This was more significant if the dentist made the patient feel involved and able to share in the decision when given enough practical information.<sup>29</sup> Patient education at the treatment planning stage may allow patients to reflect on their initial desire for a more aesthetic restoration when weighing up the risk/benefit of the less aesthetic restoration.<sup>28</sup> In light of results obtained from the Dental Pan Society meeting, delegates may have underestimated the patient's ability to grasp the relative advantages and disadvantages when deciding on an extra-coronal restoration.

### Conclusions

The influence of patients expecting more aesthetic restorations, in combination with increased media coverage of cosmetic procedures, may result in the increased provision of restorations that carry a greater risk of morbidity, such as loss of pulp vitality. Dentists seem to favour restorations with proven longevity and decreased invasiveness, as opposed to patients for whom the converse is true. These differences may be due to assumptions on patient preference with regards to aesthetics of restorations without due consideration for the patient's perception of health benefit. Patient education on the advantages and disadvantages of the restorations available should be conducted to ensure informed decision-making at the treatment planning stage for definitive restorations.

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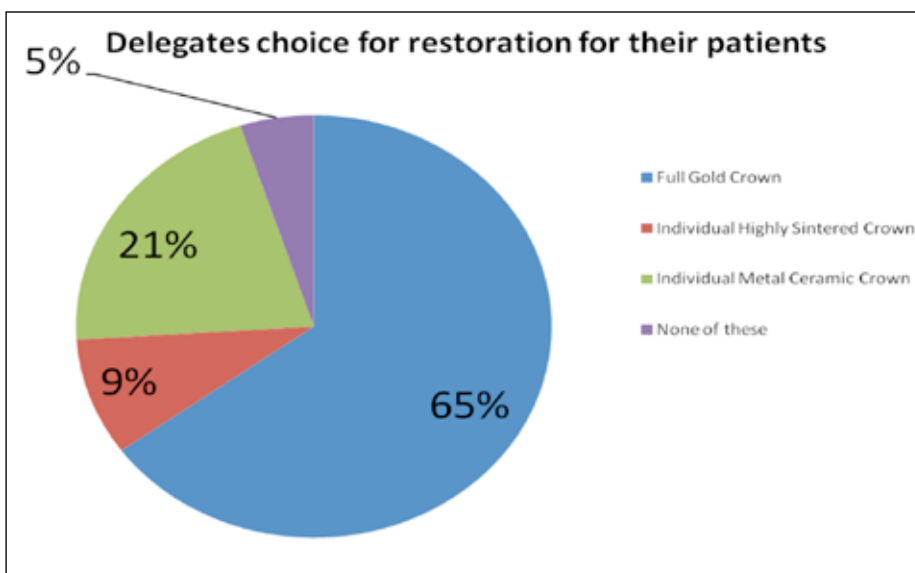


Figure 6. Pie chart illustrating delegates’ choice of restoration of their patients’ lower first molar tooth.

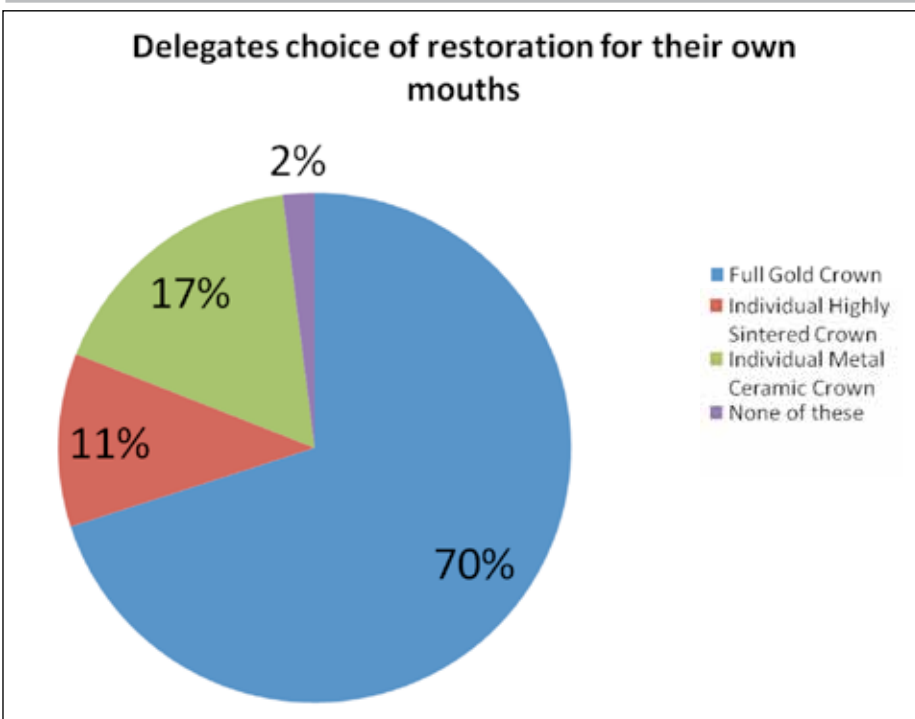


Figure 7. Pie chart illustrating delegates’ choice of restoration for their own lower first molar tooth.



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