

# General principles for complete crown preparations

## Introduction

Dental preparations must be carried out according to previously established scientific principles, which are: mechanical, biological and aesthetic.<sup>1-4</sup> This constitutes one of the most important stages in the construction of a dental prosthesis, either as an individual crown or a fixed dental prosthesis retainer.

The metal-ceramic crown has always been the full-coverage restoration most used in dentistry, and is still considered the “gold standard” because it derives its aesthetics from natural appearance due to the translucence of the ceramic and the strength of the metallic substructure.<sup>5,6</sup> At the present time the development of reinforced vitreous ceramics such as lithium disilicate allow the construction of metal free crowns with satisfactory esthetics and mechanical properties to make single crowns and short extension fixed dental prostheses in the anterior area with similar clinical survival to the metal-ceramic crown.<sup>7,8</sup> Failures in the dental preparation lead to the failure of the restoration either by insufficient reduction of the dental structure that could cause over-contour, having a high aesthetic compromise and gingival inflammation affecting the periodontal health of the patient,<sup>9</sup> color alteration (opacity or translucent), and insufficient thickness of the restorative material. If excessive tooth wear occurs, irreversible pulp damage, weakening of tooth structure and decreased retention and resistance affecting biomechanical behavior can occur.<sup>3</sup> If the preparation of the cervical termination is located deep, invading the periodontal biological space, one of the following four pathological alterations would occur: infra-osseous pocket formation, gingival recession, localized bone loss, localized gingival hyperplasia or a combination of the alterations described above.<sup>10</sup>

To correctly perform dental preparation, three fundamental aspects must be taken into account:

1. knowledge of the dental morphology and the dentogingival unit (biological space).
2. the amount of dental structure removal required by the restorative materials.
3. the shape and diameter of the dental bur used for dental preparation.<sup>3</sup>

In dental preparations for full crowns or fixed prosthesis abutments, there are some variations that depend on the restorative material chosen according to the specific case by the clinician. The purpose of this review article is to provide clarity regarding the general basic concepts that should be taken into account when making dental preparations for complete crowns and crowns that will be fixed prosthesis abutments regardless of the restorative material selected.

The analysis of several factors of the preparation will help to determine the acceptable ranges in which an adequate dental preparation is found.<sup>1-4</sup> To receive a crown restoration either alone or as part of a retainer for a fixed prosthesis, those factors are: the height of the preparation, the convergence of the axial walls, the configuration of the finishing line and the amount of space needed for prosthetic material. Next we will examine each of them individually.

## Preparation height

Several authors have made recommendations on the minimum

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height necessary for a dental preparation to have an adequate retentive effect of the crowns that will be placed, this of course, taking into account that the angulation of the axial walls of the preparation is adequate. The height of the preparation is important since it allows a greater contact area between the substrate and the restoration, which increases the friction effect and therefore the retention of the crown; said recommended height is greater than or equal to 5 mm from the marginal finish line.

## Convergence of the axial walls

A very important aspect to consider in the design of preparations for dental crowns is the degree of convergence of the axial walls. This is related to two fundamental concepts that are: give a slightly expulsive angle towards occlusal or incisal according to the case, together with the correction of undercuts that could prevent the removal of the provisional crowns, as well as of the definitive crowns, and generate an adequate frictional effect in conjunction with the height of the preparation. The convergence of said walls must be between 6° to 15°. According to some authors,<sup>1-3</sup> these angulations are controlled by the selection of the bur with suitable angulations as well as the proper handling of the inclination of the same while they are in contact with the dental tissue. In the case of preparations for fixed prostheses, it must be taken into account that said angulations must maintain a relationship of parallelism between all the pillars of the same prosthesis, giving it a correct insertion path.

## Configuration of the termination margin

To perform the proper preparation of a tooth that will receive a crown should take into account the principle of avoiding the right angles and prepare rounded angles according to the recommendations of some manufacturers of restorative materials. Some authors recommended using the shoulder or chanfer, which is obtained using a diamond bur of equal configuration that provides a space in the reduction of the cervical area compatible with the requirements of the restorative material.<sup>5,6,11,12</sup> It is very important to maintain the finish line without invading the periodontal biological space and thus maintain soft tissue health throughout the treatment's useful life.<sup>9</sup>

## Space for prosthetic material

Adequate wear of the dental tissue is of the utmost importance<sup>1-4</sup> for two fundamental reasons, the first being that an excess of preparation weakens the dental structure, as well as that it may compromise

the integrity of the pulpal tissues and their vitality. One of the main biological failures reported in the literature regarding crowns and fixed prostheses on teeth is the loss of pulpal vitality.<sup>13</sup> On the other hand, a limited space of preparation will limit the space available for the placement of prosthetic material, in addition to taking into account that depending on the anatomical area of the crown this thickness varies, this is a very important point at the time of making the preparations. This wear can be controlled with several techniques one of the easiest to implement according to our consideration is the use of matrices<sup>14</sup> taken from the waxed model with the predetermination of the case, This will help us to maintain control of the spaces during the preparation as well as the subsequent calibration of the provisional ones of which we will obtain more specific measures in each area of interest of the restoration.

## Conclusion

The realization of preparations for dental crowns are through procedures that are carried out with certain frequency and in indicated cases, in relation to the previously revised concepts that are the height of the preparation. The convergence of the axial walls, design of the termination of the margin, and the available prosthetic space are crucial to obtain adequate preparations and ensure a better final result. Although there are several trends in the design of the preparations, many of these techniques coincide in the search for the same factors discussed above.

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## Conflict of interest

The author declares that there is no conflict of interest.

## References

1. Goodacre J. Designing tooth preparations for optimal success. *Dent Clin N Am.* 2004;48(2):359–385.
2. Goodacre J, Campagni WV, Aquilino SA. Tooth preparations for complete crowns: An art form based on scientific principles. *J Prosthet Dent.* 2001;85(4):363–376.
3. Shilllingburg. *Fundamentals of fixed prosthodontics.* 3<sup>rd</sup> edn. Quintessence publishing, 1997.
4. Stern N, Grajower R. Tooth preparation for full coverage-basic Principles and rationalized clinical procedures. *J Oral Rehab.* 1975;2(4):325–340.
5. Gardner FM, Tillman KW, Combs MC, et al. *In vitro* failure load of metal-collar margins compared with porcelain facial margins of metal-ceramic crowns. *Journal of Prosthetic Dentistry.* 1997;78(1):1–3.
6. Ulusoy M, Toksavul S. Fracture resistance of five different metal framework designs for metal-ceramic restoration. *International Journal of Prosthodontics.* 2002;15(6):571–574.
7. Pjetursson BE. A Systematic review of the survival and complications rates of all-ceramic and metl-ceramic reconstrucitios after an observation period of at least 3 years. Part I: Single crowns. *Clin Oral Impl Res.* 2000;7;18 Suppl 3: 73–85.
8. Pjetursson BE, Sailer I, Makarov NA. All-ceramic or metal-ceramic tooth-supported fixed dental prostheses (FDPs)? A systematic review of the survival and complication rates. Part II: Multiple-unit FDPs. *Dental Materials.* 2015;31(6):624–639.
9. Batista G, Santos pantaleon D, Bonfante G. Factores estéticos en la preparación del diente para coronas metal-cerámicas. *Rev Odontol Dominic.* 1998;4(3):141–148.
10. Tal H. Responses to periodontal injuryin the dog: removal of gingival attachment and supracrestal placement of amalgam restorations. *Int J Periodont Rest Dent.* 1989;3:45–55.
11. Sikka Swati. Marginal Strength of Collarless Metal Ceramic Crown. *International Journal of Dentistry.* 2010;521470.
12. Noor A Nawafleh, Hatamleh MM, Öchsner A. Fracture load and survival of anatomically representative monolithic lithium disilicate crows with reduce tooth preparation and ceramic thickness. *J Adv Prosthodont.* 2017;9(6):416–422.
13. Ken Tan A. Systematic review on survival and complications rates of fixed partial dentures (FPD's) after an observation of at least 5 years. *Clin Oral Implants Res.* 2004;15(6):625–642.
14. Magne PD. *Optimización del diseño y evolución de la cerámica para la dentición anterior.* Quint Int Edición Española. 2000;10:615–625.