Acta Scientific DENTAL SCIENCES (ISSN: 2581-4893)

Volume 4 Issue 9 September 2020

Review Article

Suitable Materials for Indirect Posterior Partial Restorations

Sarra Nasri[1], Yosra Gassara[2], Dalenda Hadyaoui[3]*, Zohra Nouira[3], Belhassan Harzallah[3] and Mounir Cherif[4]

[1]Department of Fixed Prosthodontics, Faculty of Dental Medicine, Monastir, Tunisia

[2]Assistant Professor, Department of Fixed Prosthodontics, Faculty of Dental Medicine of Monastir, Tunisia

[3]Professor, Department of Fixed Prosthodontics, Research Laboratory of Occlusodontics and Ceramic Prosthesis LR16ES15, Faculty of Dental Medicine, University of Monastir, Monastir, Tunisia

[4]Professor, Head of Department of Fixed Prosthodontics, Faculty of Dental Medicine, Monastir, Tunisia

***Corresponding Author:** Dalenda Hadyaoui, Department of Fixed Prosthodontics, Research Laboratory of Occlusodontics and Ceramic Prosthesis LR16ES15, Faculty of Dental Medicine, University of Monastir, Monastir, Tunisia.

Received: August 05, 2020

Published: August 27, 2020

Abstract

Indirect posterior partial restorations may offer a viable and cost-effective treatment option for the restoration of extensively decayed teeth. An increasing variety of restoration materials are available on the market nowadays, which makes the material choice a difficult decision. In this article, the most important criteria of selection are presented to guide the dentist in the selection of the restoration material.

Keywords: Dental Materials; Partial Restorations; Dental Ceramic; Inlay; Onlay

The indirect partial restorations (IPR) have become a therapy of choice when it comes to restore a decayed tooth [1]. This is explained by the prioritization of dental conservative attitude and the augmentation of esthetic demand of our patients even when it concerns posterior teeth [2].

Dietchi., *et al*. [3] had elaborated a list of specifications for materials dedicated to indirect partial restorations as for example, they must:

- Allow a conservative preparation,
- Restore the natural morphology, aesthetic and mechanical strength of the dental structure,
- Ensure an optimal adaptation of the interfaces
- Be biocompatible
- Radio-opaque
- Ensure a good longevity.

There exists three major classes of materials that respond to this list : metal alloys, composite materials and ceramics [4].

Even presenting good mechanical properties like high ductility, perfect adaptation to the limits and stability of that adaptation, metallic materials such as cast gold are no more indicated because of their unesthetic aspect, high cost and problems due to ploymetallism.

Composite resin blocks manufactured by CAD/CAM procedures, provide good color match, are easy to finish and allow intra oral repair. However, there are chances of poor marginal fit, in addition to their poor wear resistance and difficulty to obtain good polish which put them in a disadvantage compared to ceramics [5,6].

All ceramic materials with high strength are becoming popular as esthetic restorations. They represent a better alternative to composite, amalgam and gold.

Ceramic restorations maintain a better anatomic form, exhibit a better marginal integrity and colour stability in oral cavity than their composite counterpart. They also reinforce the remaining dental hard tissue as they bond to the tooth with adhesive cement. But, its abrasiveness to natural tooth structure which may accelerate the wear of natural enamel is an important disadvantage [7,8].

Polycristallin ceramics with no vitreous phase like zirconia are not favorable to be bonded. New long-term studies proposed that a procedure of airborn particles abrasion associated with retentive features helps to strengthen the bond between zirconia and tooth structure. However, this is not applicable to partial restorations with no-retentive preparation [9]. Consequently, they are contra-indicated for indirect posterior partial restorations.

Currently, hybrid materials form a new class of CAD/CAM materials. They are new ceramic/polymer materials, or ceramic polymer infiltrating network materials (PICN), that associate the positive aspects of both ceramics and composites with a lower cost than ceramics, and has similar properties to natural tooth structure. They possess low hardness levels, high levels of flexural strength, and high flexural resistance, apart from presenting acceptable marginal integrity of the restoration and acceptable optical properties for the posterior sector. They can be used as a restoration material for single full coverage restorations, even in patients with parafunctional activity [10-12].

However, there are no studies that describe their behavior as plural fixed prosthesis [13].

With a conservative, nonretentive cavity design, partial-coverage ceramic, composite and hybrid restorations provide a number of distinct advantages over traditional cast-metal options. However, unique challenges are associated with precise delivery of the restoration and the clean up of excess luting resin. Restorative success and long-term gingival health are dependent on interproximal integrity at the restoration-tooth interface [14].

Although they seem to possess all of the characteristics of the ideal material for single restorations and to be used in the presence of severe wear associated with bruxomania, hybrid ceramics have their limits and drawbacks.

A dilemma is imposed because of the lack of clinical studies, even if the short and medium term studies show satisfactory results.

The aesthetic properties of restorations made of these materials are sufficient and equal to monolithic glass-ceramic restorations machined by CAD /CAM which allows their indication both in posterior and anterior areas. Nevertheless, the aesthetic finish remains lower than that obtained with laminated all-ceramic crown which allows customization and remains, hence, the « gold standard » in the restoration of the anterior sector.

Criteria of selection

- **Biologic considerations**: Ceramic materials remain the most biocompatible materials used in dentistry. While, Composite materials machined with CAD/CAM techniques or by high temperature treatment have a low conversion rate so low toxicity.
- **Esthetic considerations:** Ceramics have better optic properties than composite materials. Besides, nowadays there have been developed degraded blocks which are not available for composite materials [15,16].
- **Mechanical considerations:** Depending on the volume of the cavity and the nature of residual tissue : when the elasticity modulus of both dental tissue and material of restoration are close, there is lower risk of fracture [17].

So, when the adhesion concerns enamel, we should choose glass-ceramic restorations (elastic modulus of 69-95 GPa close to enamel) [17].

When the substance loss is localized in dentin, composite and hybrid restorations are priviliged because the rigidity of ceramics exposes the tooth to the fracture.

When it comes to overlays, ceramics are the best option because it helps transmit the compressive forces to enamel.

According to Magne, composite restorations for vital teeth should be reserved to inlays and onlays of reduced volume; and whenever we need cusp coverage we should choose ceramic materials [18].

When it comes to endodontically treated teeth, two *in vitro* studies of Magne and Knezevic [19] indicated that the fatigue resistance of composite and hybrid material overlays realized on molars are more important than ceramic restorations [18].

Functional considerations

Occlusal function is an important factor to be evaluated before restorative material choice. For a heavy bruxer, hybrid materials are the material of choice due to their stress absorbing nature.

In the cases of extensive tooth wear and regardless of its type, both direct and indirect minimally invasive restoration types could be considered depending on the amount of worn dental tissues, the loss of vertical dimension, esthetic and phonetic compromise and cost–benefit analysis.

When there is a necessity of increase of occlusal vertical dimension, frequent modifications and repair all along the treatment procedure could be needed; So, indirect composite restorations are preferred to ceramic restorations [20].

Opposing teeth are an important factor to consider before choosing restorative material. It is preferable to choose the same material so that the tooth wear would be similar. Otherwise, the material with lower abrasiveness will wear rapidly and the restored tooth will undergo a compensatory extrusion [21-23].

Conclusion

The choice of the adequate material for posterior restorations depends on multiple criteria including esthetic, biologic and mechanical factors.

In recent years, dentistry has benefited from a marked increase in the development of esthetic materials, including ceramic and hybrid materials. Their indications depend on the extent of the restoration, the nature of the antagonists, fabrication procedure and the parafunctional context.

Bibliography

1. Morimoto S., *et al*. "Survival Rate of Resin and Ceramic Inlays, Onlays, and Overlays: A Systematic Review and Meta-analysis". *Journal of Dental Research* 95.9 (2016): 985-994.

2. Opdam N., *et al*. "From 'Direct Versus Indirect' Toward an Integrated Restorative Concept in the Posterior Dentition". *Operative Dentistry* 41 (2016): S27-S34.

3. Dietschi D and Spreafico R. "Evidence-based concepts and procedures for bonded inlays and onlays. Part I. Historical perspectives and clinical rationale for a biosubstitutive approach". *International Journal of Esthetic Dentistry* 10.2 (2015): 210-27.

4. Magne P., *et al*. "Esthetic Restorations for Posterior Teeth: Practical and Clinical Considerations". *International Journal of Periodontics and Restorative Dentistry* 16.2 (1996).

5. Dietschi D., *et al*. "In vitro performance of class I and II composite restorations: a literature review on nondestructive laboratory trials—part I". *Operative Dentistry* 38.5 (2013): E166-E81.

6. Köken S., *et al*. "Influence of cervical margin relocation and adhesive system on microleakage of indirect composite restorations". *Journal of Osseointegration* 1.1 (2019): 21-28.

7. Belli R., *et al*. "Fracture rates and lifetime estimations of CAD/CAM all-ceramic restorations". *Journal of Dental Research* 95.1 (2016): 67-73.

8. Rocca GT., *et al*. "Evidence-based concepts and procedures for bonded inlays and onlays. Part II. Guidelines for cavity preparation and restoration fabrication". *International Journal of Esthetic Dentistry* 10.3 (2015): 392-413.

9. Quigley NP., *et al*. "Clinical efficacy of methods for bonding to zirconia: A systematic review". *Journal of Prosthetic Dentistry* (2020).

10. Jorquera G., *et al*. "Hybrid Ceramics in Dentistry: A Literature Review" (2018).

11. Yadav R and Kumar M. "Dental restorative composite materials: A review". *Journal of Oral Biosciences* 61 (2019).

12. Zhang K., *et al*. "Bioactive Dental Composites and Bonding Agents Having Remineralizing and Antibacterial Characteristics". *Dental Clinics of North America* 61.4 (2017): 669-687.

13. Della Bona A., *et al*. "Characterization of a polymer-infiltrated ceramic-network material". *Dental Materials: Official Publication of the Academy of Dental Materials* 30.5 (2014): 564-569.

14. Veneziani M. "Posterior indirect adhesive restorations: updated indications and the Morphology Driven Preparation Technique". *International Journal of Esthetic Dentistry* 12 (2017).

15. Aboushelib MN., *et al*. "Microtensile bond strength of different components of core veneered all-ceramic restorations. Part 3: double veneer technique". *Journal of Prosthodontics: Official Journal of the American College of Prosthodontists* 17 (2008): 9-13.

16. Rekow E., *et al*. "Performance of Dental Ceramics: Challenges for Improvements". *Journal of dental Research* 90 (2011): 937-952.

17. Ferraris F. "Posterior indirect adhesive restorations (PIAR): preparation designs and adhesthetics clinical protocol". *International Journal of Esthetic Dentistry* 12.4 (2017): 482-502.

18. Kois DE., *et al*. "Evaluation of Fracture Resistance and Failure Risks of Posterior Partial Coverage Restorations". *Journal of Esthetic and Restorative Dentistry* 25.2 (2013): 110-122.

19. Magne P and Knezevic A. "Simulated fatigue resistance of composite resin versus porcelain CAD/CAM overlay restorations on endodontically treated molars". *Quintessence International* 40.2 (2009).

20. Dahl BL., *et al*. "Occlusal wear of teeth and restorative materials: a review of classification, etiology, mechanisms of wear, and some aspects of restorative procedures". *Acta Odontologica Scandinavica* 51.5 (1993): 299-311.

21. Chou H-Y and Lopez E. "Wear of Dental Restorative Materials. Mechanics of Contact and Lubrication, MTM G230 Department of Mechanical and Industrial Engineering Northeastern University Spring (2006).

22. Ahmed N and Zafar M. "Effects of wear on hardness and stiffness of restorative dental materials". *Life Science Journal* 11 (2014): 11-18.

23. Peña A., *et al*. "Micro-abrasion study of some dental restorative materials and enamel". *Proceedings of the Institution of Mechanical Engineers Part J Journal of Engineering Tribology* 227.5 (2013): 486-495.