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CURRENT CONCEPT OF MORPHOFUNCTIONAL CHANGES OF DENTAL TISSUE INDUCED BY ODONTOPREPARATION FOR METAL-CERAMIC CONSTRUCTIONS

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Progressive development of modern stomatological science involves the continuous improvement of the known methods of diagnosis and treatment of dental diseases. In the field of prosthodontics example of this trend is the availability of metal-free crowns in the market, which have appeared as an alternative to metal-ceramic. However, taking into account the number of factors metal constructions are still relevant. Basing on the analysis of the literature to optimize approach in odontopreparation for metal-ceramic crowns, identify morphological changes of dental tissues at different types of orthodontic preparation, and give clinic-morphological study of the proposed method of preparing teeth for metal-ceramic construction. Analytical method based on analysis of histochemical, histological features of identifying structural components of hard tissue in intact teeth and teeth with different types of odontopreparation and volumetric digital scanning to determine the working preparation thickness of hard tooth tissue in different experimental groups. Analyzing the literature, the results of own research it should be affirmed the development of some kind of vibration disease in the tissues of the tooth that causes destructive changes of hard tissue and pulp, expressed in varying degrees in experimental groups. On the basis of the determined morphological changes in the tissue of teeth during odontopreparation for metal-ceramic construction, it is justified the maximum preservation of hard tissue of neck area, forming a ledge symbol, to maximize the functional capacity of the pulp, which is confirmed by a number of own laboratory research.

Key words: orthodontic preparation; metal-ceramic crowns; morphofunctional changes in dental tissues; CAD / CAM.

Taking into account the progression of lesions in hard tissue of teeth, the question of prosthesis of patients with coronal tooth defects is currently important. Considering the trend of rapid development of metal-free aesthetic orthopedic constructions metal-ceramic constructions remain relevant, because of the relative availability in terms of price compared with metal-free [3].

Analyzing the long-term results of prosthesis with solid orthopedic constructions with ceramic lining basing on data processing of scientific literature, it was concluded that cases of immediate and long-term complications related to the occurrence of inflammatory reactions of the pulp are fairly frequent [1, 11].

Research work about the prevalence of dental defects that require restoration of coronal part by artificial crowns do not cover sufficiently the issue of development of morphological changes of hard tissue of the tooth and its pulp caused by odontopreparation for metal-ceramic construction. As a result, the study of disorders of the pulp operation, changes of dental hard tissues and ways to prevent these processes is still important [2, 5, 7].

Structural changes of enamel and dentine of coronal part of premolars, which occur during odontopreparation can have a decisive influence on the pulp of the tooth. Through the nature of morphological adaptation processes occurring in the tissues of the teeth under conditions of odontopreparation for full metal-ceramic crowns clinical prognosis for orthopedic treatment can be determined.

Deepen understanding the intricacies of odontopreparation for full metal-ceramic crowns, features of the morphological changes of dental hard tissues in different types of odontopreparation and provide a morphological study of the proposed method of preparing teeth for metal-ceramic construction.

The purpose of this study was deepen the idea of the fineness of odontopreparation under full metal ceramic crowns, the peculiarities of morphological changes of solid teeth tissues in different types of odontoparametration, as well as to give clinical and morphological substantiation of the proposed method for teeth preparation for metal-ceramic structures.

Materials and methods. The study was conducted in two research groups using two methods of preparation of vital teeth for full metal-ceramic construction. The first research group included teeth that were prepared with classic beveled rounded ledge in the cervical region, the second one had maximum preservation of hard tissue in the same area. The study was conducted on premolars, which were subjected to the planned removal for orthodontic impressions. To control the depth of preparation by the chosen methods, for the reliability of data and its systematization, the method of volumetric digital

scanning plaster models of the jaws with prepared teeth was applied using a volumetric digital scanner of CAD system «Arcad Premium» of «CAD / CAM ARCADIA» apparatus [4, 8, 9, 12].

Results and discussion. During the study, basing on selected methods, it was determined a causal relationship between the way of odontopreparation and morphological changes of hard dental tissue and pulp, the essence of which directly depends on changes of tissues caused by the depth of odontopreparation if clear compliance of procedures algorithms is provided.

Sections of premolars with sawcut in vestibular-oral direction after histochemical processing acquired specific color. Dentin was dyed with solution Periodic Acid-Schiff in dark red color; enamel with solution of alcian blue in blue. Preserved after cutting tooth pulp was dyed with hematoxylin-eosin solution, which made basophilic structures dark blue and oxyphilic structures became pink. The study of dental tissues micropreparations was carried out by light microscope in the 200- and 400-fold magnification.

In the first experimental group of teeth it was revealed that creation of the classic ledge causes areas with disorder of mineralization in dentin. Hyperemia with swelling, bleeding and erythrocytes smoothing was observed in the pulp that potentially leads to inflammation after prosthetics. The second research group is characterized by irregular intussusception of odontoblasts into predentin, mainly in the neck area and small hyperemia [6]. Regarding the apex of coronal pulp, it should be noted that the violations similar to changes in the first group. This is due to the necessity of preparing the chewing surface of the tooth at the same depth in both experimental groups in order to prevent an increase in occlusal vertical dimension and premature occlusal contacts between the studied teeth and their antagonists. Edema of pulp in neck area of the second group is characterized by less visualized changes compared to the first, and has the opposite nature of the process. Also in both groups it is observed the focal disorder of dentin mineralization due to degenerative changes in odontoblasts, invaginated into predentin because of swelling of the pulp connective tissue [10].

Analyzing the results of histological changes in the pulp of the teeth from first and second research groups it was concluded that there is peculiar kind of vibration disease in the tissues of the tooth, based on the vibration angiotrophoneurosis.

Due to the above it should be noted that the morphological changes of hard tissues and pulp are caused by "vibroparodontal syndrome" during odontopreparation. Its manifestation in the pulp are circulatory disorders of the blood vessels of different caliber, accompanied by sludge syndrome in venules, stasis in the capillaries, swelling the intercellular substance and pinpoint hemorrhages that lead to degenerative changes in bodies and processes of odontoblasts, which affects the biomineralization of dentin.

The abrasion tool impacts directly on the pulp and dentin during odontopreparation. In this case Ca²⁺ ions, which are released during the demolition of hydroxyapatite crystals and liquid of dentinal tubules trigger vibration angiotrophoneurosis in the pulp and degenerative changes in odontoblasts.

Considering the analysis of the literature, the results of own research and impact of abrasive tools which odontopreparation was conducted with, the development of some kind of vibration disease in the tissues of the tooth that causes destructive changes in dentin and pulp should be affirmed, which is expressed in varying degrees in all experimental groups.

Summarizing the results of this study it should be noted that the issue of presence of fragmented disorder of premolar's root intertubular dentin mineralization as a result of vibration, which appears before or after odontopreparation is still open. This issue will be considered in further research conducted in different chronological framework.

Conclusion

Due to the above, on the basis of the determined morphological changes in the tissue of teeth during odontopreparation for metal-ceramic construction, it is justified the maximum preservation of hard tissue of neck area, forming a ledge symbol, to maximize the functional capacity of the pulp, which is confirmed by a number of own laboratory research.

Prospects of further studies. Further research is planned to determine the peculiarities of rearrangement of the gum cellular condition, provided different types of odontopreparation are used.

References

1. Ayad M. F. Influence of tooth preparation taper and cement type on recementation strength of complete metal crowns / M. F. Ayad, W. M. Johnston, S. F. Rosenstiel // J Prosthet Dent. – 2009. – Vol. 102(6). – P. 354–361.
2. Begliuk D. A. Functional characterization of the dental pulp and periodontal tissues in patients with partial edentulous / D. A. Begliuk // Res and Educ J. «Health and education in the XXI century». – 2010. – Vol. 12(8). – P. 377–379.

3. Conrad H. J. Current ceramic materials and systems with clinical recommendations: a systematic review / H. J. Conrad, W. J. Seong, I. J. Pesun // J Prosthet Dent. – 2007. – Vol. 98(5). – P. 389–404.
4. Davidovich G. The use of CAD/CAM in dentistry / G. Davidovich, P. G. Kotick. // Dent Clin North Am. – 2011. – Vol. 55(3). – P. 559–570.
5. Etman M. K. Quantitative measurement of tooth and ceramic wear: in vivo study / M. K. Etman, M. Woolford, S. Dunne // Int J Prosthodont. – 2008. – Vol. 21(3). – P. 245–52.
6. Gasiuk P. A. The influence of orthodontics preparation for the unfixed orthodontic constructions on the tooth pulp from the point of view of morphology / P. A. Gasiuk, V. B. Radchuk, P. P. Brekhlichuk [et al.] // Intermedical J. – 2015. – Vol. 3(5). – P. 39–43.
7. Hazhva S. I. Analysis of errors and complications of prosthetics using unremovable prosthetic constructions / S. I. Hazhva, G. A. Pashinian, A. A. Alyoshin // J Dent. – 2010. – Vol. 2. – P. 7–8.
8. Li R. W. Ceramic dental biomaterials and CAD/CAM technology: State of the art / R. W. Li, T. W. Chow, J. P. Matinlinna // J Prosthodont Res. – 2014. – Vol. 58(4). – P. 208–216.
9. Mously H. A. Marginal and internal adaptation of ceramic crown restorations fabricated with CAD/CAM technology and the heat-press technique / H. A. Mously, M. Finkelman, R. Zandparsa [et al.] // J Prosthet Dent. – 2014. – Vol. 112(2). – P. 249–256.
10. Radchuk V. B. Influence of odontopreparation under the metal-ceramic construction on the tooth tissue / V. B. Radchuk, P. A. Hasiuk, S. O. Rosolovska // Clin Dent. – 2015. – Vol. 3-4(12-13). – P. 129–130.
11. Reitemeier B. A prospective 10-year study of metal ceramic single crowns and fixed dental prosthesis retainers in private practice set tings / B. Reitemeier, K. Hänsel, C. Kastner [et al.] // J Prosthet Dent. – 2013. – Vol. 109(3). – P. 149–155.
12. Ivanitsky I. O. Comparative characteristics of morphometric parameters and histostructure dental hard tissues under conditions of ultrasonic and classical odontopreparations / I. O. Ivanitsky, N. V. Gasyuk, I. Yu. Popovich // Bulletin of the Ukrainian Academy of Medical Dental: Actual problems of modern medicine. – 2013. – Vol. 13(2). – P. 202–205.

Реферати

СУЧАСНІ УЯВЛЕННЯ ПРО МОРФОФУНКЦІОНАЛЬНІ ЗМІНИ ТКАНИН ЗУБА ІНІЦІЙОВАНІ ОДОНТОПРЕПАРУВАННЯМ ПІД МЕТАЛОКЕРАМІЧНІ КОНСТРУКЦІЇ Гасюк Н. В., Гасюк П. А., Радчук В. Б.

Прогресуючий розвиток сучасної стоматологічної науки передбачає постійне вдосконалення відомих методів діагностики та лікування стоматологічних захворювань. В галузі ортопедичної стоматології прикладом даної тенденції є наявність на ринку безметалевих коронок, що з'явилися як альтернатива металокераміці. Проте зважаючи на ряд чинників, металокерамічні конструкції і досі є актуальними. Однак, протезування даним типом конструкції вимагає подальшого вдосконалення в плані модифікації способу одонтопрепарування. Метою даного дослідження була оптимізація підходів до одонтопрепарування під металокерамічні коронки. В результаті власних досліджень слід стверджувати про розвиток у тканинах зуба своєрідної вібраційної хвороби, що призводить до деструктивних змін твердих тканин та пульпи зуба, виражених різною мірою. На основі встановлених морфологічних змін тканин зубів при одонтопрепаруванні під металокерамічні конструкції, обґрунтованим є максимальне збереження твердих тканин пришийкової ділянки, формуючи символ уступу, з метою максимального забезпечення функціональної здатності пульпи, що підтверджено рядом наукових робіт сучасників і власними лабораторними дослідженнями.

Ключові слова: одонтопрепарування; металокерамічні коронки; морфофункціональні зміни тканин зуба; CAD/CAM.

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СОВРЕМЕННЫЕ ПРЕДСТАВЛЕНИЯ О МОРФОФУНКЦИОНАЛЬНЫХ ИЗМЕНЕНИЯХ ТКАНЕЙ ЗУБА ИНИЦИИРОВАННЫХ ОДОНТОПРЕПАРИРОВАНИЕМ ПОД МЕТАЛОКЕРАМИЧЕСКИХ КОНСТРУКЦИИ Гасюк Н. В., Гасюк П. А., Радчук В. Б.

Прогрессирующее развитие современной стоматологической науки предполагает постоянное усовершенствование известных методов диагностики и лечения стоматологических заболеваний. В области ортопедической стоматологии примером данной тенденции является наличие на рынке безметаллических коронок, появившиеся как альтернатива металлокерамике. Однако, ввиду ряда факторов, металлокерамические конструкции до сих пор актуальны. При этом, протезирование данным типом конструкций требует дальнейшего усовершенствования в плане модификации способов одонтопрепарирования. Целью данного исследования была оптимизация подходов к одонтопрепарированию под металлокерамические коронки. В результате собственных исследований, следует утверждать о развитии в тканях зуба своеобразной вибрационной болезни, что приводит к деструктивным изменениям твердых тканей и пульпы зуба, выраженных в разной степени. На основании установленных морфологических изменений тканей зубов при одонтопрепарировании под металлокерамические конструкции, обоснованным является максимальное сохранение твердых тканей пришеечного участка с формированием символа уступа, с целью максимального сохранения функциональных возможностей пульпы, что подтверждено рядом научных работ современников и собственными лабораторными исследованиями.

Ключевые слова: одонтопрепарирование; металлокерамические коронки; морфофункціональні зміни тканин зуба; CAD / CAM.

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