Volume 20 Issue 35
Originally issued as J6



Global Journal of Medical Research: J
Dentistry & Otolaryngology
Volume 20 Issue 6 Version 1.0 Year 2020
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-4618 & Print ISSN: 0975-5888

The Importance of Minimal Intervention Dentistry after the COVID-19 Pandemic: A Look to the Future

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Abstract- The new Coronavirus has caused thousands of deaths around the globe, challenged professionals, and collapsed the health systems of many countries, resulting in various measures to contain the spread of COVID-19 and minimize the number of deaths. In the face of this new scenario, researchers and health authorities have been outlining clinical recommendations for dental practice during and after the pandemic. The objective of this paper is to relate the Minimal Intervention Dentistry (MID) with a dental practice of less exposure to aerosols, and, therefore, safer in the current context, after the pandemic of COVID-19. This study also discusses aspects related to bio safety in dentistry, including aerosol control, and lists some of the MID strategies. Bibliographical research was done in the MEDLINE (US National Library of Medicine - NLM) database accessed through Pub Med. The MID advocates the production of selfcare; it aims to control the health disease process, avoids the repetitive restorative cycle, reduces cost, preserves the healthy dental structure, and minimizes pain, all combined with the control of aerosol production.

Keywords: *COVID-19, 2019 new coronavirus, SARS-cov-2, aerosol, dental assistance, preventive dentistry.*

GJMR-J Classification: *NLMC Code: WU 100*



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The Importance of Minimal Intervention Dentistry after the COVID-19 Pandemic: A Look to the Future

Sayene Garcia Batista [α] & Inger Teixeira de Campos Tuñas [σ]

Abstract- The new Coronavirus has caused thousands of deaths around the globe, challenged professionals, and collapsed the health systems of many countries, resulting in various measures to contain the spread of COVID-19 and minimize the number of deaths. In the face of this new scenario, researchers and health authorities have been outlining clinical recommendations for dental practice during and after the pandemic. The objective of this paper is to relate the Minimal Intervention Dentistry (MID) with a dental practice of less exposure to aerosols, and, therefore, safer in the current context, after the pandemic of COVID-19. This study also discusses aspects related to bio safety in dentistry, including aerosol control, and lists some of the MID strategies. Bibliographical research was done in the MEDLINE (US National Library of Medicine - NLM) database accessed through Pub Med. The MID advocates the production of self-care; it aims to control the health disease process, avoids the repetitive restorative cycle, reduces cost, preserves the healthy dental structure, and minimizes pain, all combined with the control of aerosol production. Thus, this model of practice allows dentistry to have a more positive and safer look to the future, after the COVID-19 pandemic.

Keywords: COVID-19, 2019 new coronavirus, SARS-cov-2, aerosol, dental assistance, preventive dentistry.

I. Introduction

An outbreak of pneumonia began in December 2019 in the city of Wuhan, Hubei province - China, and spread rapidly to several countries.[1,2] A new strain of Coronavirus has been identified as the causative agent of the disease, called COVID-19 by the World Health Organization (WHO).[2] COVID-19 is caused by a Betacoronavirus called SARS-CoV-2, which affects the lower respiratory tract and manifests as pneumonia in humans. Despite rigorous global efforts to elaborate preventive measures, the infection caused by COVID-19 continued to increase in many countries around the world.[1-7] Due to the high risk to countries with vulnerable health systems, the WHO considered the outbreak a Public Health Emergency of International Concern (PHEIC) on January 30, 2020. With the progress of the disease, on March 11, 2020, WHO decreed a pandemic of this disease.[1-30]

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Dentistry professionals have a high risk of infection with SARS-CoV-2 due to exposure to saliva, blood, and aerosol/droplets during most dental procedures.[1,2,24,30] The transmission of the virus during dental procedures can occur by inhalation of aerosol/droplets of infected individuals or direct contact with mucous membranes, oral fluids, and contaminated instruments and surfaces.[7,27,31]

The new Coronavirus challenged professionals and collapsed the health systems of many countries, which resulted in various measures to contain the spread of COVID-19 and minimize the number of deaths. In this regard, strict prevention and control measures adopted by governments establish the limitation of people who circulate on the streets, social distancing, the cessation of non-essential commercial activities, new remote work routines, the request to wear masks and the frequent hygiene of the hands.[24-44]

Dental professionals have an essential role in preventing the transmission of COVID-19.[1,7,45] Although many countries suspended routine dental care during the pandemic period, there is a need to handle events related to dental emergencies. Also, in places where the disease is controlled, flexibilization protocols establish the return of activities, including dental services, with the execution of elective procedures as well.

Thus, there is a need to establish service protocols that are safe for both professionals and patients, and convenient in technical and cost terms as well.[33-43] Given the evidence of a high risk of infection of dentists and patients due to the aerosol production caused by most invasive procedures, the adoption of the Philosophy of Minimal Intervention in Dentistry has proved to be even more suitable. In this respect, health promotion conducts can benefit professionals and patients.[7,27] By definition, the Minimum Intervention Dentistry (MID) has the potential to cover all areas of the profession, and it aims to preserve dental tissue as well as to prevent the evolution of the illness.[46-48] Therefore, the principles of the minimal intervention are determined by educational and preventive paradigms to minimize restorative needs and make dental treatments more long-standing.[49,50]

Although there is still a relative resistance and a need for convincing in the implementation of this therapeutic form,[47,48] the MID needs to be incorporated

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by dental specialties to prevent diseases from occurring, and minimize dental strain, hence increasing the longevity of dental elements of individuals who, in the present days, live longer. Furthermore, the MID, in the face of the current health scenario, endorses the decrease in exposure of droplets and aerosols in the dental office, for both the dental team and patients.[36-52] The objective of this paper is to relate the Minimal Intervention Dentistry, a philosophy known for conducts and procedures that preserve the dental structure, with a dental practice of less exposure to aerosols, and, therefore, safer in the current context, post-pandemic of COVID-19. This study also discusses aspects related to bio safety in dentistry, including aerosol control, and lists some of the MID strategies.

II. Materials and Methods

Bibliographical research was done in the MEDLINE (US National Library of Medicine - NLM) database accessed through PubMed, with the keywords "Aerosol," "COVID-19," "Dental Care," "Preventive Dentistry," between the years of 2012 and 2020. Inclusion criteria were articles in English, in their full and free versions.

III. Results and Discussion

a) Understanding the transmission of SARS-CoV-2

In search of new evidence, researchers and health authorities have been outlining clinical recommendations for dental practice during and after the pandemic. Thus, understanding the behavior of the COVID-19 agent, as well as how to prevent its transmission, is extremely necessary.[26] SARS-CoV-2 infections usually spread through respiratory droplets or contact.[24] Therefore, the coughing or sneezing of an infected person can spread SARS-CoV-2 in the air, with the potential to infect individuals in close contact.[7,25,30,35] Such fact determined the recommendation of social distancing, frequent hand washing and use of masks by the population to minimize the spread of the disease by the community.[35-43]

Another significant route is through the droplets of SARS-CoV-2 on inanimate objects located around an infected individual that is subsequently touched by other individuals.[53,54] The virus can survive on surfaces for a few hours; thus, to maintain a safer environment in the dental office, it is necessary to disinfect the surfaces after each dental procedure.[54] The recommended disinfectants are sodium hypochlorite at 0.1%, hydrogen peroxide at 0.5% and alcohol at 70%.[31,34,45,55-64]

Given the direct transmission through contact, the mucosa of the oral cavity is recognized as a potentially high-risk route of SARS-CoV-2 infection[1], in addition to contaminated hands, which could facilitate the transmission of the virus to patients. Undoubtedly, SARS-CoV-2 is present in the saliva of affected patients. This virus binds to receptors of the human angiotensin-converting enzyme 2, which is present in a high concentration in the salivary glands.[1,30,32,61]

The biological risk of transmission of SARS-CoV-2 by inhalation when performing dental procedures is high due to the use of hand pieces under irrigation and ultrasound, which leads to the diffusion of aerosol particles of saliva, blood, and secretions. This aerosol production promotes contamination of the environment, instruments, dental appliances, dental team professionals, patients, and surfaces.[2,7,24,31,53] Although symptomatic patients with COVID-19 have been the major source of transmission; recent observations suggest that asymptomatic patients and patients in incubation are carriers of the SARS-CoV-2.[45,65-67] Such epidemiological factor of COVID-19 made its control challenging since it is difficult to identify these patients and place them in restricted quarantine, which contributes to the dissemination of SARS-CoV-2 in the communities. Thus, adequate protection, disinfection of objects and hand washing are indispensable to prevent the spread of this disease.[2,7,35,45]

Therefore, every patient should be considered a potential asymptomatic carrier of COVID-19[7,45,68]. To this date, no effective treatment is available for COVID-19. Moreover, even with a future vaccine, complete eradication of the virus can take time, which reinforces the need for caution in the dental environment.[40,43] COVID-19, just as HIV infection in the 1980s, will lead to a paradigm shift in biosafety care in dentistry. Standard precautionary measures should be reviewed and improved to adapt the clinical routine to the new Coronavirus.[34-44]

b) Current personal protective equipment (PPE) for dental practice

In the dental practice environment, the intense production of aerosols during the procedures exposes workers and patients to the risk of inhaling small particles and droplets, potential carriers of microorganisms such as bacteria and viruses. So, it is crucial to establish a protocol to reduce the risk of contagion, providing a safer environment and protecting patients and oral health professionals.[36-40,68-70]

Aerosols are liquid and solid particles smaller than 50 μm in diameter suspended in the air for long periods. The COVID-19 virus is around 0.12 μm.[69] Hence, for procedures involving the production of aerosol in dental care, it is necessary a more refined filtration as promoted by the masks N95 and PFF2, also called respirators. N95 and PFF2 masks reduce user exposure to particles up to 0.3 μm with a minimum filtration rate of 95%. Surgical masks, regularly used in dentistry, offer filtration of larger particles, spatter, and oral/body fluids when used correctly and are frequently changed.[43,51,52] For the complete and adequate personal protection of the professional and the team, the PPE

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that must be used routinely are disposable apron with the weight between 30 and 50 g/m2, disposable cap, professional mask (N95 and PFF2), safety goggles, face shield and gloves (figure 1).[37-44] The face shields or visors provide an ample protection of the face when associated with the use of the professional mask and the goggles with side seal, even if the professional already wears glasses.[7] The disinfection of the face shields and safety goggles after each attendance is advisable so that there is no contamination. Also, the PPE should be removed carefully. [37-40]

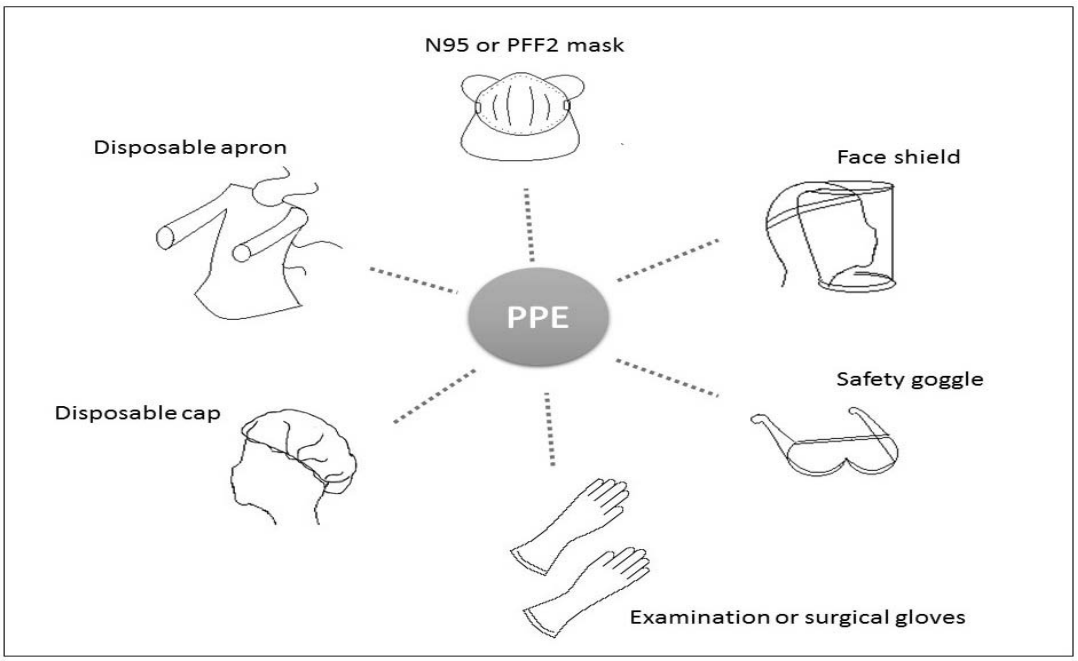


Figure 1: Personal protective equipment (PPE) required for dental care

c) Protocol for dental care

Dental professionals should implement strict infection prevention and control measures to avoid the transmission of microorganisms during attendance.[36-44] After the COVID-19 pandemic, for the assistance of asymptomatic patients and suspected or confirmed cases of infection by SARS-CoV-2, dentists should follow new guidelines regarding prevention and control measures, according to the available evidence. Thus, it is recommended a protocol with guidelines to be followed for dental care, determining more rigorous prevention and control actions for patients and dental staff (Table 1). [7,30,32-44]

d) Health Promotion and Minimal Invasion Dentistry

For the management of dental procedures, it is necessary, in addition to being aware of the transmission routes of SARS-CoV-2, to acknowledge and implement the Minimal Intervention Dentistry. Dentists should adopt strict measures of personal protection and avoid/minimize operations that may produce droplets or aerosols.[27,35] The risk of direct inhalation of the virus is mainly related to the use of handpieces and ultrasonic cleaners, which generate aerosol and droplets, often mixed with saliva and blood.[45] Thus, it is advisable to avoid and lessen the use of handpieces to reduce the production of aerosols/droplets and use manual instruments, use rubber dams to significantly reduce the spreading of aerosols/droplets and use surgical aspirators to control the diffusion of particles in the air.[30,32,36,40]

In this context, the MID, which endorses preservation of the dental structure, extended longevity of teeth, avoids the restorative surgical cycle and reduces treatment costs, should be pointed out as the principal philosophy of dental practice after the COVID-19 pandemic, since it allows performing procedures that, for the most part, minimize or prevent the production of aerosols (figure 2).[27,40] Among the actions related to MID, they go from adequate diagnosis to inclusion of educational measures related to the production of self-care, chemical-mechanical removal of decayed tissue, ART, sealants and esthetic procedures of minimal intervention (table 2).[47,48]

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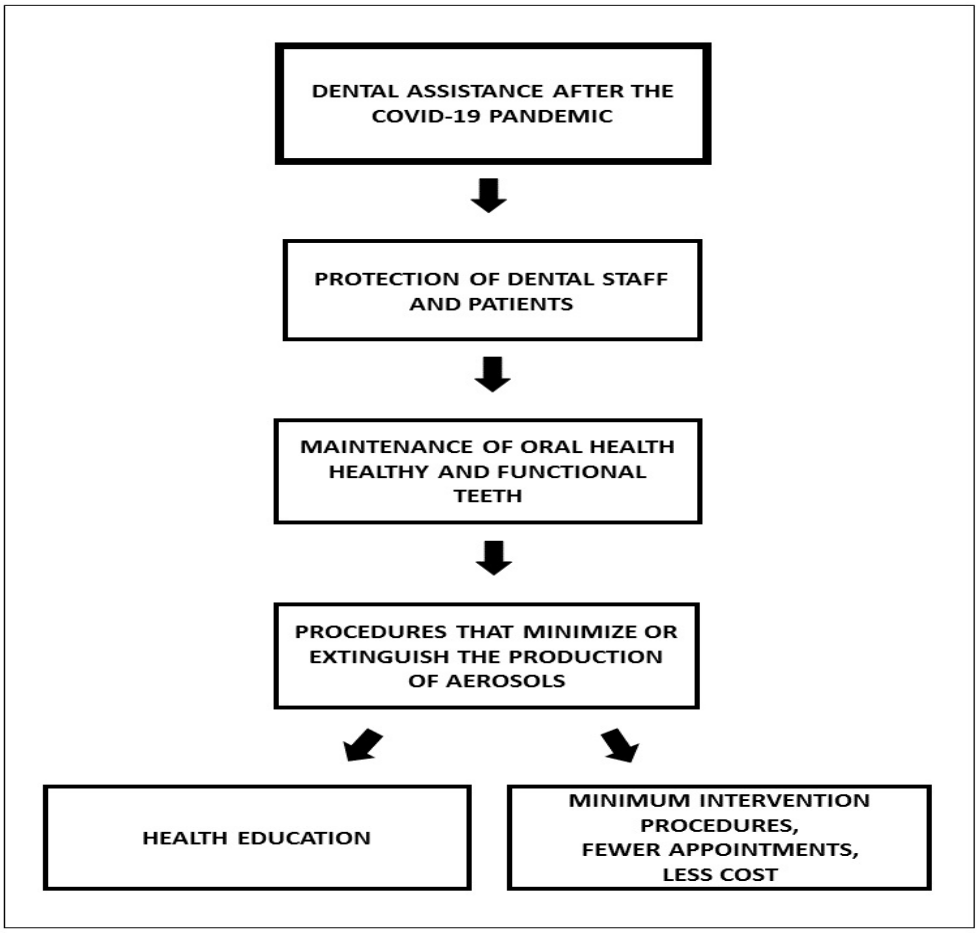


Figure 2: Essential guidelines for dental care after the COVID-19 pandemic

It is noteworthy that in many countries, efforts to contain COVID-19 have resulted in an economic recession. The sudden decline in demand for goods and services and unprecedented unemployment have exacerbated the complexity of the current situation. Hence, inevitably, the new reality will imply changes for restructuring and recovery of the economy.[6] The reflections of COVID-19 on the world economy will represent an impoverishment of populations, justifying the need to adopt MID procedures, since they have lower costs. That will represent more democratic access to dentistry, which is essential especially in underdeveloped and developing countries.[6,24,27,69,70]

IV. Conclusion

The risk of SARS-CoV-2 infection is high to dentistry professionals and their patients. Therefore, it is necessary to adopt rigorous and functional biosafety protocols, along with the strategies of Minimal Intervention Dentistry. The MID advocates the production of self-care, aims to control the health disease process, avoids the repetitive restorative cycle, decreases cost, preserves the healthy dental structure, minimizes pain, and aerosol production. Such a model of practice allows dentistry to have a more positive and safer look to the future after the COVID-19 pandemic.

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Table 1: Protocol with guidelines for dental care after the COVID-19 pandemic

Patient-related consideratios	PPE for the dental team	Administration of the dental environment	Recommendations for dental procedures	Postoperative cleaning and disinfection
• Perform patient triage - Guide patients mainly by telephone before the appointment, make a pre-anamnesis with an evaluation of COVID-19 potential risk. Have you had a fever, cough or shortness of breath? Have you had contact with someone contaminated by COVID-19? • On the day of the appointment repeat the anamnesis oriented for COVID-19 • Advise patients on social distancing, mask use and frequent hand hygiene • Advise the avoidance of a companion whenever possible, except in cases of need for assistance • PPE for patients during care: safety goggles, disposable apron, disposable shoe covers	• Disposable cap 30G/m^2 • Safety goggles with side protection • Face shield • N95 or PFF2 mask • Long-sleeved, waterproof hood or apron with a minimum weight of 30G/m2 • Examination or sterile gloves Recommended Sequence For Ppe Placement: 1. Sanitize hands 2. Put on the disposable apron 3. Put on the surgical mask; N95 respirator or similar 4. Put on the disposable cap 5. Sanitize hands 6. Put on the safety goggles 7. Put on the face shield 8. Sanitize hands 9. Put on the gloves Recommended Sequence For Ppe Removal: 1. Remove the gloves 2. Sanitize hands 3. Remove the disposable apron 4. Sanitize hands 5. Remove the face shield 6. Sanitize hands 7. Remove the safety goggles 8. Sanitize hands 9. Remove the disposable cap 10. Remove the mask 11. Sanitize hands	• Make appointments at longer time intervals in order to avoid crowding in the waiting room and perform the necessary cleaning and disinfection procedures for each service • Use disposable shoe covers (patients and professionals) in order to keep the environment cleaner • Perform cleaning and subsequent disinfection of reception counters, toilets, door handles, taps, etc., with soap and water and disinfectants such as 70% Ethyl Alcohol or 0.5% Hypochlorite after each service • Use covering barriers in equipment such as prosthesis motors and photopolymerization devices in order to prevent cross-contamination • The triple syringe should be subjected to cleaning and disinfection to each patient and the exchange of barriers should be performed • During circulation in adjacent areas after the attendance, the professional and the team should wear surgical masks and maintain distancing. Patients should reattach their masks after the attendance • Ensure air quality and renewal to establish safer environments. It is recommended to use air conditioning with an exhaust that ensures directing of air vents and appropriate air exchanges (minimum of 6 air changes per hour). Another option is to use a portable air filtration unit HEPA (High Efficiency Particulate Arrestance)	• Performpreoperative mouthwash with 1% to 1.5% Hydrogen Peroxide (9 ml for 30 seconds) or with substances based on 0.05% ethylpyridin chloride or 0.2% povidone-iodine for patients who are not allergic to iodine, or chlorhexidine at 0.12% • Always perform four-hand service • Avoid aerosol-generating procedures whenever possible. Avoid the use of handpieces, ultrasound and triple syringe. It is recommended that high-rotation handpieces have an anti-reflux system • In case of necessary aerosol-generating procedures, it is indispensable to carry it out with four hands, using powerful suckers (suction pumps) and rubber dams to minimize droplets and aerosols • Prioritize minimally invasive or atraumatic restorative techniques - manual instruments only • Give preference to extraoral techniques of imaging examinations, panoramic radiography and computed tomography	• Properly dispose barriers used in infectious waste • It is necessary to wait at least 15 minutes for the droplets to decay from the air after the end of a dental procedure and the patient's exit to start cleaning and disinfecting the dental office • Perform concurrent cleaning and disinfection between the attendances and at the end of the day, perform the final cleaning • 70% ethyl alcohol and sodium hypochlorite should be used after surface cleaning with neutral or alkaline detergents. The recommended exposure for disinfection with 70% ethyl alcohol is three applications with vigorous friction, followed by natural drying between applications

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Table 2: MID procedures, indications and advantages

Minimum Intervention Procedures	Indications	Advantages
Health education	Educational and preventive actions aiming at the instruction of habits that maintain health and prevent diseases, such as motivation and conscious cooperation of patients in health promotion, educational lectures, supervised toothbrushes, evaluation of change in habits and adoption of appropriate eating habits	Appropriation of knowledge about the health-disease process, including risk factors and protection of oral health so that the conscious patient can gain the autonomy of care to promote health
Preventive approach to early carious injuries	Monitoring of non-cavitated lesions, stoppage of mineral losses and disease control at predetermined intervals	Maximum preservation of healthy dental structure; cost reduction to the patient; increased longevity of the functional teeth; repetitive restorative cycle deceleration
Sealants	Deep and retentive fissures in molar and premolar occlusal surfaces, obstructing areas of biofilm retention when the patient cannot adequately sanitize them; in cavitated carious in enamel, where hygiene is compromised	Simplified technique; reduction of operative time; reducing the risk of developing posterior carious lesions
Chemical-mechanical removal of decayed tissue	Aid to atraumatic restorative techniques in dentin lesions with cavitation and without pulp involvement	Preservation of healthy dental tissue, enabling ultraconservative and painless removal of infected tissue; easy application and effectiveness
Atraumatic restorative treatment - ART	Treatment of carious lesions in early lesions, used in places without dental structure or equipment and also in offices or clinics with complete structure	Low cost, simple technique; easy execution; preservation of healthy dental tissue; does not require rotating instruments; does not require anesthesia
Maintenance and repair of adhesive restorations and non-replacement	No intervention in case of minor defects that do not generate negative consequences if untreated and repairs when there are defects that can be corrected by smoothing and polishing	Preservation of dental tissue; reducing the risk of damaging the pulp; no need for anesthesia; reduction of the risk of iatrogenic damage to adjacent teeth; reducing costs to the patient; increased longevity of restoration; repetitive restorative cycle deceleration
Esthetic procedures of minimal intervention	Execution of dental bleaching; ultraconservative preparations for facets (absence of preparations for the direct ones); esthetic transformations without preparation; enamel microabrasion	Maximum preservation of healthy dental structure; reducing costs to the patient; increased longevity of functional teeth; repetitive restorative cycle deceleration

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