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Revista de Antropología, Ciencias de la Comunicación y de la Información, Filosofía, Lingüística y Semiótica, Problemas del Desarrollo, la Ciencia y la Tecnología

Año 35, diciembre 2019 Nº 24
Revista de Ciencias Humanas y Sociales
ISSN 1012-1587/ ISSNe: 2477-9385
Depósito Legal pp 198402ZU45

Universidad del Zulia
Facultad Experimental de Ciencias
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Maracaibo - Venezuela

Opción, Año 35, Regular No.24 (2019): 598-611
ISSN 1012-1587/ISSNe: 2477-9385

Study of the Impact of Various Abrasive Factors on the Microrelief of the Surface of Hybrid Ceramic Orthopedic Structures

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Abstract

The aim of the study is to investigate the impact of various abrasive factors on the microrelief of the surface of hybrid ceramic orthopedic structures. A laboratory study was conducted with the optical Profiler S neox (Sensofar, Spain) as a method. As a result, gradual abrasive wear leads to the loss of dry shine of the surface of hybrid ceramic crowns. In conclusion, Processing cleaning powders of various degrees of abrasiveness in the process of conducting professional hygiene of the oral cavity cause abrasive wear of the surface of the hybrid ceramic crowns.

Keywords: Abutments, Crown, Oral, Hygiene, Air-Flow.

El impacto de los factores abrasivos en el micro relieve de las estructuras cerámicas

Resumen

El objetivo del estudio es investigar el impacto de varios factores abrasivos en el microrelieve de la superficie de las estructuras ortopédicas cerámicas híbridas. Se realizó un estudio de laboratorio

Recibido: 10-11-2018 •Aceptado: 10-03-2019

con el Profiler S neox óptico (Sensofar, España) como método. Como resultado, el desgaste abrasivo gradual conduce a la pérdida de brillo seco de la superficie de las coronas de cerámica híbridas. En conclusión, el procesamiento de polvos de limpieza de diversos grados de abrasividad en el proceso de llevar a cabo una higiene profesional de la cavidad bucal causa un desgaste abrasivo de la superficie de las coronas de cerámica híbridas.

Palabras clave: pilares, corona, oral, higiene, flujo de aire.

1. INTRODUCTION

Modern hybrid polished ceramic crowns allow achieving excellent aesthetic results in direct restoration of teeth in the process of orthopedic treatment. Hybrid ceramic crowns correspond to tooth tissues in a number of aesthetically significant characteristics: color, transparency, marginal adaptation, texture and dry Shine of the surface. In compliance with the technology of application of orthopedic crowns and the use of special techniques, it is possible to make the invisible border of the material with the tissues of the tooth (NIKOLAEV, 2012; AHMAD & AHMAD, 2018). However, this result is preserved only in the first months and sometimes weeks of service restoration, because from the moment of its manufacture begins abrasive wear of the surface of the material, which is usually within 6-9 months., leads to the loss of dry Shine, the accumulation of plaque and pigmentation, which spoils the aesthetics of the patient's smile and requires corrective therapeutic and preventive measures.

The process of abrasive wear and aging of the surface of crowns accelerates the increased abrasive load on their surface, the use of whitening toothpaste, the use of strong alcohol, the use of some methods of professional tooth cleaning, for example, air-abrasive method. In connection with the above, it seems relevant to study the characteristics of the impact of various abrasive factors on the microrelief of the surface of hybrid ceramic crowns. The aim of the work was to study in laboratory conditions the influence of the most common powders for professional oral hygiene on the microrelief and dry shine of the surface of hybrid polished ceramic samples.

2. THEORETIC FOUNDATION

The main indication for Air Flow is the presence of a soft pigmented plaque. Ultrasonic dental cleaning is one of the types of professional cleaning that preserves the health of the teeth and the whole body. According to dentists, every adult should undergo an annual procedure to remove tartar from the teeth. As practice shows, Tartar appears in those places where the toothbrush cannot afford to clean the plaque, in this case, ultrasonic cleaning comes to the rescue. Distinctive features of ultrasonic teeth cleaning are that the procedure is painless, does not damage the tooth enamel, because it does not provide for mechanical action and is highly effective (MITRONIN & GRISHIN, 2011). The removal of Tartar occurs quickly and

efficiently. On the basis of clinical observations, it can be concluded that it is often the cause of Tartar caries, and, consequently, many other diseases of the teeth.

During the procedure, a fine mixture of water, air and sodium bicarbonate (baking soda) are applied to the surface of the teeth under high pressure. Solid particles have a spherical shape. Due to this cleaning has no abrasive and polishing effect. Air Flow allows you to clean not only the front surface of the teeth but also hard-to-reach areas, interdental spaces. The presence of veneers, luminaires, crowns in the patient's oral cavity is not an obstacle to the procedure. These designs are also easy to clean with Air Flow.

Before carrying out professional cleaning of teeth, it is necessary to stop all inflammatory processes occurring in the oral cavity. Necessarily cured caries and gum disease. Immediately before the procedure, vaseline is applied to the patient's lips, which will prevent their surface from drying out. A saliva pump is placed in the mouth. The nozzle of the device is placed 3-5 mm from the tooth at an angle of 30-60 degrees. In a circular motion, the dentist cleans the teeth, avoiding exposure to adjacent soft tissues. The waste mixture is collected using a dental vacuum cleaner. The entire Air Flow cleaning procedure takes about 30 minutes. After cleaning, it is necessary to refrain from eating coloring products for several hours. The natural organic film covering the tooth is removed during the procedure, making the teeth more susceptible to the effects of various pigments (KEMOLI & AMERONGEN, 2011).

Cleaning the oral cavity with ultrasound in the clinic includes several stages: treatment of the root canals, removal of plaque and Tartar even in the most inaccessible places, washing the oral cavity and polishing the tooth enamel. Many experts believe that in order to achieve a positive effect from the Commission of any manipulation in the oral cavity, it is advisable to start with ultrasonic cleaning. As practice shows, ultrasonic cleaning of teeth, the cost of which differs from each feature and scope of work, is an effective procedure.

The advantages of the Air Flow method are as follows: easy whitening, safety and painless. The procedure has not only cleansing but also whitening effect. Removal of plaque and pigmentation allows you to return the enamel natural, natural shade. As a rule, after brushing the teeth look lighter by 1-2 tones. Air Flow is a natural whitening that in many cases avoids a more intensive and expensive procedure. The mixture of water, air and cleaning powder does not damage the enamel and surrounding tissues. Interference in the internal structure of the tooth does not occur. Compared to other dental procedures, Air Flow has very few contraindications. Obstacles to its implementation are hyperesthesia of teeth, bronchial asthma, and Allergy to citrus fruits (during the procedure, natural lemon essence is used) (KIRNOSOVA, SEVBITOV & ERGESHEVA, 2017).

During cleaning, the dentist directs the nozzle of the device only to the hard tissues of the tooth that do not have sensitivity. The gum surface is not affected. There is no pain during the Air Flow procedure. PROPHY pearls (Kavo, Germany) powders contain spherical granules

that provide reliable cleaning. This product is offered with the taste of black currant, mint, orange, peach and in a neutral version. Main component: calcium carbonate $CaCO_3$. PROPHY pearls (Kavo, Germany) are spherical granules, which allows obtaining optimal cleaning power: the round shape of the granules provides a greater number of contact points than conventional powder and, accordingly, cleans more efficiently (PETERSEN & OGAWA, 2012). In addition, due to the absence of sharp edges, the powder particles have an extremely gentle effect on the teeth.

PROPHY pearls (Kavo, Germany) powders contain spherical granules, which allow obtaining optimal cleaning power: the round shape of the granules provides a greater number of contact points than the standard powder and, accordingly, cleans more efficiently. In addition, due to the absence of sharp edges, the granules have an extremely gentle effect on the teeth. PROPHY pearls (Kavo, Germany) are available in the following flavors: black currant, mint, orange, peach and with a neutral flavor. Due to a large number of points of contact with the cleaning surface PROPHY pearls (Kavo, Germany) clean the surface of the teeth ultra-efficiently.

Working angle 10°-60°. Due to the sharper angle, the granules process the entire tooth and provide maximum hygiene efficiency. PROPHY pearls (Kavo, Germany) are used for a large number of indications: removal of stains, plaque, and biofilm, cleaning teeth before sealing fissures, cleaning teeth before whitening, when performing orthopedic and orthodontic manipulations.

PROPHY pearls (Kavo, Germany) universal, they are allowed to be used in various situations: removal of discoloration, plaque, and biofilm, hygienic treatment before filling cracks and teeth whitening, use in orthodontics and orthopedics. Advantages: reduces acidity and has a positive effect on the microflora of the oral cavity, gently affects the gums thanks to Microsphere technology, has a pleasant taste and aroma of orange, mint, peach and black currant.

Double flow (PetroDent, Russia) powder-non-abrasive, fine, based on sodium bicarbonate-for polishing and removing plaque with a light whitening effect. The powder is poured into a spherical cavity located on the tip body, or, in the case of Air-Flow devices, into a special recess built into the body. Since inside the Air-Flow tip, there are two channels - external - for water supply, - and internal-for the mixture of air and powder particles, Air-Flow powder is connected to the water jet only at the outlet of the tip, i.e. directly at its tip. Accordingly, the risk of water entering the powder channel is excluded.

Flow-Klinz PROFI (TekhnoDent, Russia) contains calcium carbonate (50-70 microns) and sodium bicarbonate (50-60 microns). Effectively removes plaque, soft plaque, removes pigmentation and whitens teeth efficiently cleanses fissures before sealing, not leading to hyperesthesia, does not clog the tip in all machines for sand-blast type.

3. METHODOLOGY

This work was done at Sechenov University with supported by the Russian Academic Excellence Project 5-100. A laboratory study was conducted with the optical Profiler S neox (Sensofar, Spain) to hybrid polished ceramic samples of a square shape of 5 mm to 10 mm and a thickness of 2 mm. blocks were cut on the same samples. The samples are treated with a coating liquid; the final polishing is done to a mirror Shine using a polishing set designed for hybrid ceramics. 5 samples were used for each type of treatment.

The surface quality of the samples (average size of micro-roughness) was assessed using the optical Profiler S neox (Sensofar, Spain). These profilometers have been developed to measure the roughness of both smooth and very rough surfaces. Confocal profiling provides the highest plane resolution that can be achieved using an optical profiler. The spatial sampling can be reduced to 0.10 μm, which is ideal for measuring small objects. Lenses with high numerical aperture (0.95) and magnification (150X) are used to measure smooth surfaces with slopes greater than 70° (slope of rough surfaces up to 86°). Proprietary confocal measurement algorithms provide vertical repeatability in the nanometer range. The degree of polishing of the samples was considered sufficient with an average size of surface micro-roughness not exceeding 58 nm±0.10 nm (Fig.1).

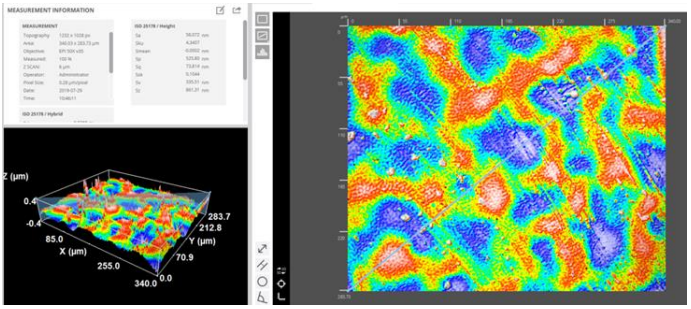


Figure 1: The result of the study of hybrid polished ceramic samples after glazing.

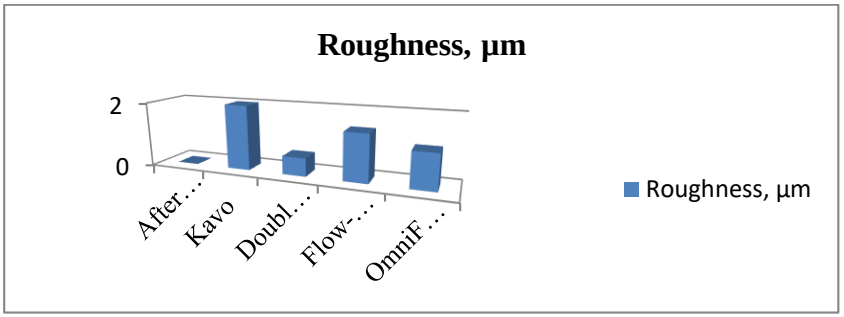
Hybrid polished ceramic samples were divided into 4 groups (5 samples per group) and subjected to abrasive effects associated with professional oral hygiene. Then the samples were thoroughly washed with water, dried and the degree of micro-roughness of their surface was assessed by scanning profilometry.

4. RESULTS

The dynamics of changes in the micro-roughness of the surface of samples of hybrid polished ceramic crowns under the abrasive effects of various powders are shown in graph 1. Initially, as noted above, the average size of the micro-roughness of the surface of all samples was not more than 58 nm±0.10 nm, which corresponds to the concept of dry surface gloss. After various influences the change of

characteristics of a surface of samples depending on type of the applied abrasive factor was recorded.

When treatment (Air–Flow) with the use of cleaning powder PROPHY pearls (Kavo, Germany) (Fig.1), in which calcium carbonate, with an average particle size of 65 microns-the average size of the micro-roughness on the surface of the samples was 1.9994 ±0.14 µm; when using Double flow (PetroDent, Russia) powder (Fig.3), which is based on sodium bicarbonate, with an average particle size of 65 microns-0,5609±0,12 µm; using powder Flow-Klins-Profi (Fig.4) based on calcium oxide (contains calcium carbonate and sodium bicarbonate) with an average particle size of 60 µm-1.4520±1.09 µm; when applying Omniflow (OMNIDENT, Germany) powder (Fig.5) (contains a mixture of calcium carbonate and phosphate with sodium bicarbonate) with an average particle size of 65 µm – 1.0792±0.09 µm.



Graph 1: Dynamics of changes in micro-roughness of the surface of samples of hybrid polished ceramic crowns under abrasive effects of various powders.

As is known, gradual abrasive wear leads to the loss of dry shine of the surface of hybrid ceramic crowns (ISHIKIRIAMA, ORDOÑÉZ-AGUILERA & MAENOSONO, 2015). As a result, their aesthetic characteristics deteriorate, there is an increased accumulation of plaque and pigmentation of their surface, corrective medical and preventive measures are required.

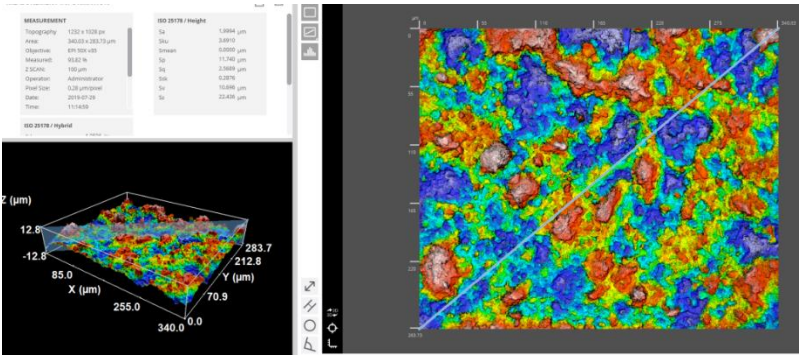


Figure 2: Result of investigation of hybrid polished ceramic samples after application of PROPHY pearls (Kavo, Germany) powder.

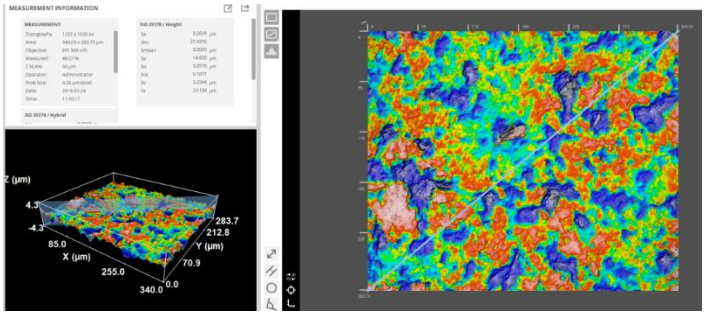


Figure 3: Result of investigation of hybrid polished ceramic samples after application of Double flow (PetroDent, Russia) powder.

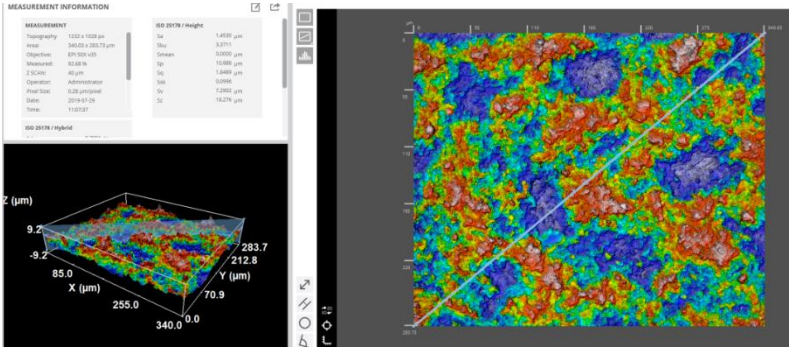


Figure 4: The result of the study of hybrid polished ceramic samples after the application of Flow-Clinz-Pro powder.

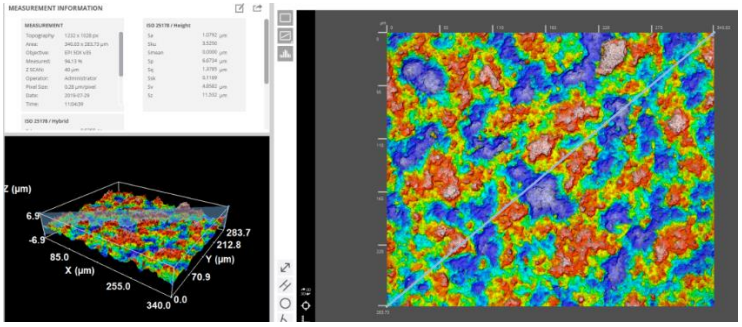


Figure 5: Result of investigation of hybrid polished ceramic samples after application of Omniflow (OMNIDENT, Germany) powder.

5. CONCLUSION

Processing cleaning powders of various degrees of abrasiveness in the process of conducting professional hygiene of the oral cavity cause abrasive wear of the surface of the hybrid ceramic crowns, the

loss of a dry light, and the deterioration of the aesthetic characteristics of crowns (1,9994 ±0,14 μm, 0,5609±0.12 μm, 1,4520±1,09 μm and of 1.0792±0,09).

REFERENCE

AHMAD, I., & AHMAD, S. (2018). Multiple Skills and Medium Enterprises' Performance in Punjab Pakistan: A Pilot Study. **Journal of Social Sciences Research**, 7(2010), 44-49. USA

ERMETICI, M., SEGÙ, M., BUTERA, A. (2014). "Comparison to the scanning electron microscope of professional dental hygiene methods on metal-free layered structures and metal-free monolithic structures processed by different polymerization cycles". **Minerva Stomatol**. Vol. 63, Nº 6: 189-202. Italy.

ISHIKIRIAMA, S., ORDOÑÉZ-AGUILERA, J., & MAENOSONO, R. (2015). "Surface roughness and wear of resin cement after toothbrush abrasion". **Brazilian Oral Research**. Nº 29. pp. 1-5. Brazil.

KEMOLI, A., & AMERONGEN, W. (2011). "Effects of oral hygiene, residual caries and cervical Marginal-gaps on the survival of proximal atraumatic restorative treatment approach restorations". **Contemporary Clinical Dentistry**. Vol. 4, Nº 2: 318-323. India.

KIRNOSOVA, A., SEVBITOV, A., & ERGESHEVA, E. (2017). "Changes in the state of the marginal gum after professional oral hygiene by various methods". **Dentistry**. Vol. 96, Nº 6-2: 10-11. UK.

MITRONIN, A., & GRISHIN, S. (2011). "Criteria for assessing the quality of aesthetic tooth restoration". **Cathedra. Department-dental education**. Nº 37. pp. 52-54. USA.

NIKOLAEV, D. (2012). "Selection criteria adhesive systems and technological rules of work with them". **STIonline**. Nº 10. pp. 24-27. USA.

PETERSEN, P., & OGAWA, H. (2012). "The global burden of periodontal disease: towards integration with chronic disease prevention and control". **Periodontology**. Vol.60, Nº 1: 15-39. USA.

SEVBITOV, A., KIRNOSOVA, A., & BRAGO, A. (2015). "Comparative evaluation of the effectiveness of various methods of professional oral hygiene". **Proceedings of the international Symposium Reliability and quality**. Nº 2. pp. 365-367. USA.

SHARMA, N., QAQISH, J., KLUKOWSKA, M. (2011). "The plaque removal from a power brush with a novel brush head". **The Journal of clinical dentistry**. Vol. 22. Nº 1: 19-22. USA.

WEENING-VERBREE, L., HUISMAN-DE, G., VAN DUSSELDORP, L. (2013). "Oral health care in older people in long term care facilities: a systematic review of implementation strategies". **International Journal of Nursing Studies**. Vol. 50, Nº 4: 569-582. Netherlands.

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Revista de Ciencias Humanas y Sociales
Año 35, N° 24, (2019)

Esta revista fue editada en formato digital por el personal de la Oficina de Publicaciones Científicas de la Facultad Experimental de Ciencias, Universidad del Zulia.
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