

Disposable Fox Ruler: a proposal to avoid cross-contamination

Régua de Fox descartável: uma proposta para evitar a contaminação cruzada

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ABSTRACT

Numerous pathogens, including SARS-CoV-2, can remain viable on surfaces over days, which favors cross-contamination. Preventive measures are essential to prevent infections and control the spread of COVID-19. Fox ruler is an essential device in the clinical planning of complete dentures and the contact with the patient's oral fluids during handling is unavoidable. Despite its importance, the conventional polycarbonate Fox ruler is easily damaged in the sterilization process. Therefore, the purpose of this article is to propose the use of a disposable Fox ruler. The confection is carried out in a simple way with wooden toothpicks joined by cyanoacrylate glue, following the same shape as the conventional one, but with the additional advantage of being made in an individual size according to the upper edge. The proposed disposable Fox ruler makes it possible to obtain the parallelism of the upper wax roller with the bipupillary line and with the Camper plane. Therefore, the disposable device described in this article was able to perform the same functions as the conventional one, in a practical way, without risks of cross contamination and with low cost.

Indexing terms: Containment of biohazards. Dental occlusion. Denture, complete. Disposable equipment. SARS CoV 2.

RESUMO

Vários patógenos, incluindo SARS-CoV-2, são capazes de permanecer viáveis em superfícies durante dias, o que favorece a contaminação cruzada. Medidas preventivas são essenciais para prevenir infecções e controlar a propagação da COVID-19. A régua de Fox é um dispositivo essencial no planejamento clínico de próteses totais e é inevitável o contato com os fluidos orais do paciente, durante seu manejo. Apesar de sua importância, a régua de Fox convencional de policarbonato é facilmente danificada com o processo de esterilização. Portanto, o objetivo deste artigo é propor a utilização de uma régua Fox descartável. A confecção é feita de forma simples com palitos de madeira unidos por cola de cianoacrilato, seguindo o mesmo formato do convencional, mas com a vantagem adicional de ser produzida em tamanho individualizado de acordo com o rebordo superior. A régua Fox descartável proposta permite obter o paralelismo do rolete de cera superior com a linha bipupilar e com o plano de Camper. Portanto, o dispositivo descartável descrito

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neste artigo foi capaz de desempenhar as mesmas funções do convencional, de forma prática, sem riscos de contaminação cruzada e com baixo custo.

Termos de indexação: *Contenção de riscos biológicos. Equipamentos descartáveis. Oclusão dentária. Prótese total. SARS-CoV-2.*

INTRODUCTION

Dental equipment and instruments represent a great risk of cross-infection among patients, if they are not properly prepared for use [1], since several procedures are generators of aerosol in the environment. This condition combined with the presence of body fluids such as the patient's blood and saliva, known as bioaerosol, culminates in the spread of bacteria, fungi, and viruses. It makes the professional and everyone involved in care vulnerable to various infections, including COVID-19 [2-5]. The virus responsible for COVID -19 is SARS-CoV-2, which first appeared in China in December 2019 and, within a few months, resulted in a worldwide pandemic [2-6].

Studies have shown that SARS-CoV-2 can remain viable on metal, glass and plastic surfaces for a few days, a condition that makes cross-contamination feasible [6]. Therefore, preventive measures are essential to prevent infections and control the spread of COVID-19, especially in relation to the transmission via aerosol produced during the dental visit [3]. In addition to the routine biosafety protocols for dental care, new guidelines have been established.

Fox ruler is a device used during the manufacture of complete dentures in order to obtain parallelism between the upper wax roller, the bipupillary line and the Camper plane for the adjustment of the anterior and posterior region of the orientation plane [7]. This is a stage in the clinical planning of complete dentures, where the adjusted base will guide the ideal disposition of the teeth to reestablish aesthetics, phonation and chewing [8]. Despite coming into contact with the patient's oral fluids, Fox ruler is not often sterilized for reuse, due to strict sterilization recommendations and the high chances of product damage in this process. Therefore, the objective of the present study is to propose the use of a disposable Fox Ruler made with wooden spatulas to reduce the risks of cross-contamination, without jeopardizing the individualized registration of the occlusal plane. For this, the internal wooden spatulas must be affixed to the front spatula following the width of the upper wax plane. The disposable Fox Ruler was used to determine the occlusal plane during the manufacture of a complete denture.

METHODS

Using wooden spatulas joined with cyanoacrylate glue, a disposable Fox Ruler was made, following the same inclination and shape as the conventional one. To individualize the size of the portion of the ruler positioned inside the patient's mouth, the operator must affix the device's internal spatulas to the front spatula, according to the width of the wax plane (figure 1).



Figure 1. Disposable Fox Ruler.

RESULTS

The disposable Fox Ruler allowed the same applicability as the conventional Fox Ruler (figure 2), with the advantage of being of single use, excluding the need for sterilization and the possibility of cross-infection by contact with the instruments. Moreover, it was possible to individualize the width of the disposable ruler according to the size of the patient's edge.



Figure 2. Determination of the occlusal plane.

DISCUSSION

To avoid cross-contamination between patients, this study proposed the use of a disposable Fox Ruler, since the transmission of pathogens through blood and saliva exposes dentists and patients to a high risk of infection [9].

Numerous pathogens, including SARS-CoV-2, may be transmitted with direct contact. The transmission can occur by body fluids, salivary droplets, respiratory secretions, and aerosol [9]. Droplets and aerosols are the most important routes of transmission of the virus in dental procedures, as they are unavoidable conditions in care. The use of a high-speed handpiece in the oral cavity creates significant amounts of droplets and aerosols that remain suspended in the air for up to 30 minutes before being deposited on surfaces or sucked into the air conditioning system, due to their small size [10].

Patients infected with SARS-CoV-2 have a viral load abundantly present in the saliva. Therefore, instruments after contact with the oral cavity must be sterilized or discarded. In the manufacture of complete dentures, one of the most used methods for determining the occlusal plane is the parallelism with the Camper Plane, which is an imaginary line drawn from the tragus to the wing of the nose [1]. For such purposes, the conventional Fox Ruler sold in aluminum or polycarbonate is the most used instrument. Inevitably, the device is often in contact with the patient's oral fluids during clinical use. Although some manufacturers ensure that either aluminum rulers or those injected in polycarbonate can be sterilized in an autoclave, the recommendations of position, temperatures and times are strictly precise. The rulers must be positioned inside the autoclave with one side fully supported on a flat surface, never in a vertical position and separated from other utensils. Otherwise, the flatness of the rulers may be compromised with possible feathering, especially those of polycarbonate. Regarding temperature and time, polycarbonate rulers can be sterilized if it does not exceed 121°C with time not exceeding 20 minutes. Aluminum rulers can be sterilized in an autoclave with temperatures up to 134°C

during 10 minutes. Due to these strict recommendations and high chances of damaging the device, most professionals only disinfect the Fox Ruler with chemical agents for its reuse, allowing for cross-contamination. The Fox Ruler made with wooden spatulas proposed in this report performs the same functions as the conventional one in a practical and low-cost way. The device can be discarded after use, avoiding pathogen transmission.

In addition, it is important to take into account that the conventional Fox Ruler has a standard width of the portion that is positioned inside the patient's mouth, making it difficult to determine the occlusal plane orientation in narrow and small maxillary ridges. The disposable ruler proposed in this article also allows an individualization of the device's width, being easily adaptable to any size of upper edge.

CONCLUSION

The disposable Fox Ruler made with wooden spatula is easily made, has a low-cost, performs the same functions as the conventional one, in a practical way, reducing the risks of cross-contamination, with the additional advantage of being made in an individual size according to the maxillary edge each patient.

Collaborators

All authors conceptualized and designed the technique presented. The graduate students MG Bueno, CYC Sugio, and AAMN Garcia took the photographs under the supervision of the professors S Soares and KH Neppelenbroek. The professors defined the intellectual content of the manuscript. MG Bueno, CYC Sugio and AAMN Garcia made the literature search and prepared the manuscript. All authors contributed with the manuscript editing. CYC Sugio, S Soares, and KH Neppelenbroek also revised the paper critically before submission.

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