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Considerations Regarding Resin Composite Handling during Restorative Procedures

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Restorative Procedures in the COVID-19 Era

At the end of 2019 a novel disease (COVID-19) resulting from a new β-virus (SARS-CoV-2) of the Coronavirus family was identified. It originated in Wuhan City, Hubei (China), but rapidly spread over several countries in Europe first, until affecting the rest of the world within few weeks, alerting the World Health Organization (WHO) to declare the global pandemic breakdown at the beginning of March 2020 [1]. COVID-19 immediately aroused concerns due to its high contagiousness, and to the predilection for the lower respiratory tract that manifested as bilateral pneumonia in humans. The mode of transmission of this highly virulent disease occurs through saliva and aerosol formation [1,2]. Dental treatments have been intrinsically associated with the risk of cross-infection, due to the working setting proximal to the mouth of the patient and generation of aerosol during most of the procedures [2]. Consequently, major concerns have been raised among dentists on how to prevent COVID-19 transmission in dental studios while continuing to treat patients safely [3]. Much has been said about proper sterilization and disinfection protocols for dental instruments which, if used properly, can eliminate the risk of cross-infection in dental offices [4]. The use of rubber dam is mandatory for quality conservative restorations inserted in a context of safeguarding the health of dental professionals and the patient [5]. However, despite the undisputed usefulness of the rubber dam for effective dental treatments, even today, a large number of clinicians attempt to perform dental care without its use [6,7]. As a result, an increased risk of cross-infection could occur with contact with saliva or bacteria in the patient's oral cavity and tools or materials that can be used with other patients. Caries treatment is an inevitable intervention in every day practice. Once the caries-affected tissue is removed, cavity obturation is then performed with sequential layering of Resin Composite Materials (RCM) [8] that is usually preferred to other restorative materials due to their mechanical characteristics, good esthetics, and long survival rates [9]. RCMs come in screw-type tube form that is opaque so that the material is not affected by light and heat. In clinical settings, there are two most widely used methods to extract the RCM from its tube. In the first, RCM are inserted in cavities in thickness up to 2 mm with a spatula, and the same spatula is then used repeatedly between the tube and the dental cavity, until restoration has been completed (Figure 1). During the second method, a certain amount of composite material is put in a pad until its use (Figure 2). In this case, covering the material from the ambient light is mandatory to prevent undesirable premature polymerization reaction of the RCM, as this can affect the intrinsic characteristics of the material and make it prone to fracture or secondary caries [9].

Current Status of Resin Composite Handling

No official protocol on safe handling of resin composite or disinfection of disposal tube exists in the current literature. An underestimated problem during restorative procedures remains contamination of RCM tubes which is a direct consequence of using the same spatula for collecting RCM from the tube and placing it in patient's mouth.

According to a survey, only 68% of undergraduate students admitted that they use separate spatulas when placing composite material in the prepared cavity [10]. Ferraz et al. [11] reported the presence of microorganisms both on composite material itself and on the outside of composite tubes collected from three dental practices. The presence of contaminated RCM tubes becomes even more concerning and detectable in dental schools [12]. Werle et al. [13] found that 51% of the analyzed material collected from composite tubes was contaminated. Only one study aimed to investigate the efficacy of different solutions for spatula disinfection in simulated clinical conditions [14]. Rubbing the spatula for 4 to 5 times in 70% ethanol embedded gaze was demonstrated to be an effective way of decontamination, with accepting time and relatively low cost. However, this strategy was reliable

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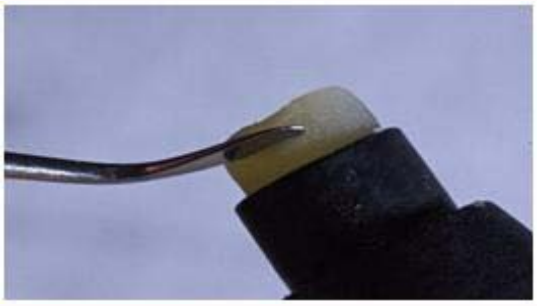

Figure 1: A spatula is repeatedly used between the disposal tube and the tooth cavity.

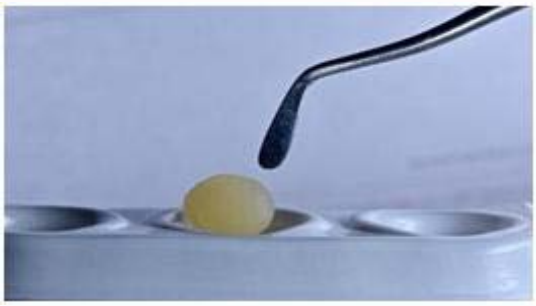

Figure 2: A certain amount of resin composite is previously positioned on a pad. Not always these pads are furnished with a cover that does not allow light to reach the material and thus may trigger a series of unwanted physical processes.

with *C. albicans* and *L. brevis*.

Pauletti et al. [15], tested weather photo activation of RCM can reduce the number of microorganisms in the contaminated samples. Complete absence of microorganisms in the analyzed samples was shown after RCM had previously been photo activated by LED light for 20s (with wavelength range of 470 nm and power output of 1,250 mW cm^{-2}). Lastly, properties of RCM in a manner which is used frequently for handling composite during clinical lessons in restorative dentistry (RCM obtained directly from the tubes, fractionated RCM and RCM stored in dappen dish) were compared to composite obtained from an individual biosafety device (RESTAURASAFE). According to the results, RCM obtained from RESTAURASAFE device demonstrated higher hardness and degree of conversion when compared to other storage methods [16].

At the moment, there are no indications in the literature on what the best method for using RCMs during restorative procedures is, and the choice of how to handle the material is left to the clinician. The continuous use of the same spatula between patient's mouth and tube, within which the composite is supplied, can raise doubts about a possible risk of cross infection. On the other hand, preliminary preparation of the supposed amount of material gives rise to many doubts, such as: What is the right amount needed to fill the cavity that I am treating? During cavity filling procedures, what is the best place to safely store the composite, as not to affect its mechanical and physical characteristics? And how long before cavity sealing can I prepare the supposed amount of material I would need, without causing the structural changes of the material itself it? In the light of all these unanswered questions, it is necessary to simulate research in this direction to add a detail of strength to our restorative procedures and guarantee higher biosafety standards.

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