Research Paper Dental Science

Photodynamic method of denture disinfection

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ABSTRACT

Disinfection of dentures is important for prevention of cross-contamination between dental practitioners, dental technicians and patients. It is also a basic part of the therapy of denture stomatitis. Photodynamic disinfection is a promising alternative of the classical disinfection methods.

KEYWORDS photodynamic disinfection, dentures, prevention

Introduction

Mechanical brushing, chemical disinfectants, microwave, ultraviolet and γ-irradiation, ethylene oxide and photodynamic disinfection can be used as denture cleansing methods.

American Dental Association (ADA) [1] states that every patient should be treated as a potential source of infection. Chemical disinfectants as diluted chlorine, glutaraldehyde and iodophor solutions are recommended. Chau et al, 1995 [2] concluded that soaking in sodium hypochlorite 0,525 % for 10 min. is the only one effective method for disinfection of the surface and up to 3 mm in depth of the denture. According to Dikbas et al, 2006 [3] the most used by the patients cleaning methods are: brushing only (with water only, with soap or with toothpaste); soaking only (in hypochlorite or in diluted cleansing tablets) and combination (brushing and soaking in hypochlorite, in vinegar, in mouthwash or in cleansing tablets). Brushing only is the most popular and easy method, but it may cause damage of the acrylic resin. The long term immersion in hypochlorite and other chemical disinfectants (for example alkaline peroxides) may cause deterioration of the denture base material by changing the mechanical properties in the form of discoloration (bleaching) of acrylic resin or corrosion of metal alloys [4,5]. Some ingredients of the chemicals penetrate into the denture and remain in it and after that fail into the oral cavity and may cause allergic and toxic tissue reactions.

Microwave irradiation is a promising method for denture disinfection, but with changes in hardness of some of the materials [6].

The aim of this short communication is to present the method of photodynamic disinfection of dentures as prevention of cross-contamination in the dental office.

Materials and methods

Photodynamic disinfection [7,8] involves the use of photoactive dye - photosensitizer (PS), which is activated by 1ight with a specific wavelength in the presence of oxygen. The transfer of energy or electron/proton from the PS to atmospheric oxygen results in highly toxic oxygen formations as free radicals, superoxide ions and singlet oxygen $^1O_2$. Reactive oxygen forms participate in redox processes of cell structures, leading to destruction of the pathogens.

The new method we offer consists in the following: immersion in a solution of photosensitizer for 10 minutes; removal from the solution and irradiation with red light, 635 nm for 10 minutes[9].

For our experiments we had used specially constructed by our scientific group apparatus for photodynamic disinfection of dental impressions and prosthetic constructions (BG patent Utility model 2428/29.05.2013).

The design of the apparatus is in the form of a box with an internal chamber and equipped with LED lamps and a cooling fan during operation. We carried out measurements of dentures (for upper and lower jaw) and found that the dimensions of the chamber of the apparatus (length 15 cm and width 12 cm) are sufficient to allow it to put together a set of dentures (upper and lower). The height of the chamber is 10 cm in order to achieve the desired output radiation.

Results and discussion

Photodynamic disinfection is easy, safe and strictly selective method for inactivation of pathogenic cells and is a good alternative in the fight against orally transmitted diseases. The main problem with this method is the biofilm formed in vivo on the dentures, so we can offer combination between mechanical cleaning (brushing) and photodynamic disinfection for better results.

Conclusion

In conclusion, the use of effective denture cleansing methods is very important for prevention of cross-contamination in dental office.

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