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Original Research Paper

Dental Science

DISINFECTION OF ALGINATE IMPRESSION MATERIALS USING U-V LIGHTS COATED WITH CANDIDA ALBICANS

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KEYWORDS :

INTRODUCTION

AIM

Each dental discipline may be challenged by somewhat different organisms. Infectious agents in the blood and saliva of patients may include a diverse range of organisms. Dental impressions serve as a source of infectious microorganisms to dental personnel who handle the impressions or casts made from them. Many pathogenic microorganisms as well as opportunistic pathogens can be transmitted by impressions. The latter pathogens may cause opportunistic infections especially in immune compromised individuals. Immersion disinfection, sonication with disinfectants, microwave irradiation, ultra-violet light exposure,have all been suggested as methods to disinfect impressions.

Dental impression materials vary in dimensional stability with time and humidity. Hence, many are unsuitable for immersion in disinfectant solutions. The potential for distortion is of major concern when procedures for disinfection of dental impressions are considered.The standard procedure of rinsing impressions under tap water immediately after removal from the mouth, eliminates gross contamination along with most saliva and blood. However, not all microorganisms are removed and they can be a source of infection. Contact with contaminated impression material is a possible avenue in the spread of disease. Since sterilization of impressions is expensive, time consuming, and may be potentially damaging to the material, surface disinfection with various chemicals has become an alternative. The prevalence of candidal stomatitis among patients has been reported as varying between 9% and 97%

Candida albicans plays an important role as the major cause of microbial origin in denture related stomatitis. Candida albicans is an ovoid or spherical budding cell, which produces pseudomycelia both in culture and in tissues. Candida species are normal inhabitants of the skin and mucosa. Candidiasis is an opportunistic endogenous infection, the commonest predisposing factor being diabetes.

OBJECTIVES OF THIS STUDY

1 .To find out the efficacy of ultra-violet light in causing decrease in colony count of Candida albicans.
2. To find out the relative efficacy of ultra-violet light exposure on Candida albicans at varying times of exposure.
3. To find out the appropriate time of exposure at which ultra-violet light is efficient to kill Candida albicans maximally.

REVIEW OF LITERATURE

Robert J. Boylan et al, (1987)[36], evaluated the disinfectant properties of the BDU (Buffalo ultra violet disinfection unit), an instrument that emits u-v light radiation in an enclosed area, on some dental materials that might be adversely affected by exposure to chemical disinfectants. Their results showed both advantages and disadvantages of the use of u-v light as a disinfectant. They concluded that u-v light kills microorganisms that are not shadowed from its emissions within seconds. Thus, microbes on the surfaces of items or even, if located below the surface, are positioned in such a way that they are killed by u-v light. Their tests for u-v light exposure were more stringent than the procedure recommended by the manufacturer for optimal killing. They routinely used 120 seconds exposure whereas the manufacturer of the BDU recommends exposure for 30 minutes' with reorientations between exposures.

Hiroshi Ishida et al (1991)[18], tested the effects of u-v light on fungi and impression materials. They studied the effect of u-v light on dimensional change and surface roughness of impression materials, namely irreversible hydrocolloid, agar and silicone. Their results indicated that u-v light (250 μW/cm2) killed most Candida organisms (103 cells per ml) within 5 minutes.

Cannor C et al (1991)[6], discussed cross-contamination in prosthodontic practice. They were of the opinion that more number of debilitated and immuno compromised patients are being treated in dentistry particularly in prosthodontics. Some sources of transmission are through contaminated aerosols, splatter particles from hand pieces, polishing lathe, pumice, rag wheels, acrylic trimming burs, prosthodontic instruments, prosthesis and the materials used. For adequate protection, they suggested to use safety glasses**,** high velocity evacuation, eye shields, face masks, rubber gloves and vaccination.

They concluded that control measures for cross-contamination should be considered within the following categories – patient evaluation, personal protection, instruments and equipment decontamination, clinical techniques, impression handling and laboratory asepsis to break the chain of infection.

MATERIALS AND METHOD :

I. MATERIALS USED

1. Alginate impression materials samples
2. Master Die for preparing samples
3. Candida albicans culture
4. Nutrient broth (pH 5.6)
5. Sabouurauds dextrose agar
6. Sterile disposable petriplates
7. Calibrated wire loop 4mm in diameter
8. Test tubes
9. Test tube stand
10. Stainless steel spatula

II. EQUIPMENTS USED

1. Incubator
2. Ultra violet light unit

III. METHODS

1. DIMENSIONS FOR FABRICATION OF MASTER DIE

Diameter : 30 mm
Thickness : 3mm

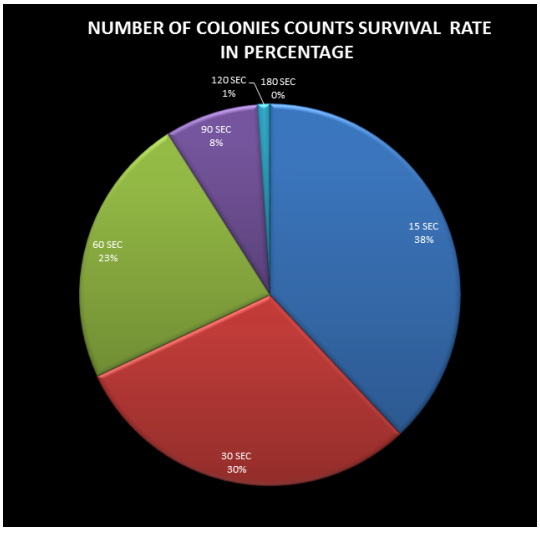
IV. PROCEDURE FOR PREPARING THE SAMPLES

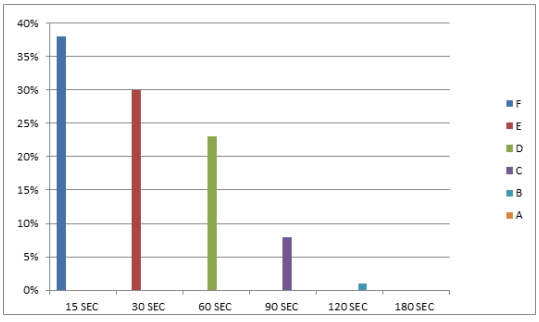
Mixing of alginate impression materials was done according to the manufacturer's instructions and the mixed material was smeared over the die avoiding air bubbles entrapment. Then using clean glass slab, the materials was pressed against the die to ensure a planar surface.

After setting the impression was checked for defects. The impressions with visible defects were rejected. The samples of alginate materials were thus prepared. Samples were divided into six groups namely A,B,C, D, E and F with each group follows exposure time of 15,30,60,90,120 and 180 seconds respectively.

COLONY COUNTS AFTER EXPOSURE TO VARYING WATTAGE OF UV LIGHT (8 watts)

SAMPLE	15 sec	30 sec	60 sec	90 SEC	120 SEC	180 SEC
1	55	38	20	10	0	0
2	62	29	18	8	0	0
3	59	36	22	14	0	0
4	58	35	26	13	0	0
5	48	30	24	12	0	0
6	53	46	18	4	0	0





COLONY COUNTS AFTER EXPOSURE TO VARYING WATTAGE OF UV LIGHT (16 watts)

SAMPLE	15 sec	30 sec	60 sec	90 SEC	120 SEC	180
1	20	12	8	8	0	0
2	18	10	5	5	0	0
3	17	11	4	4	0	0
4	16	13	7	7	0	0
5	15	12	5	6	0	0
6	19	10	6	8	0	0

COLONY COUNTS AFTER EXPOSURE TO VARYING WATTAGE OF UV LIGHTS (24 WATTS)

SAMPLE	15 sec	30 sec	60 sec	90 SEC	120 SEC	180
1	7	5	0	0	0	0
2	8	6	0	0	0	0
3	6	4	0	0	0	0
4	8	6	0	0	0	0
5	7	6	0	0	0	0
6	9	8	0	0	0	0

SUMMARY

This study was done to evaluate the efficacy of ultra-violet light in decreasing the colony counts of Candida albicans after coating the irreversible hydrocolloid impression material with Candida albicans colonies. A circular master die (dimensions: diameter-30mm, thickness-3mm) was fabricated. Samples were prepared with alginate impression materials . They were coated with Candida albicans colonies with standardization. Three different tubes were used in ultra-violet light unit corresponding to 8watts, 16watts, and 24watts.The times of exposure were 15, 30, 60, 90, 120 and 180 seconds.

The results were tabulated and statistically analysed. It was found that ultra-violet light exposure more efficiently decreases the colony counts of Candida albicans on samples.

CONCLUSION

Exposure to ultra-violet light more effectively decreased the count of Candida albicans colonies. The greater the wattage used, the lesser was the time required to decrease the colony count of Candida albicans to zero.

DISCUSSION

The ultimate purpose of dentistry is to heal. Obviously therefore, dentists must avoid causing disease. The potential hazard of dentists acquiring or transmitting infectious diseases during the delivery of dental care has been identified in recent times.

Analysis of prosthodontic set-ups shows that many of the instruments and support equipment have the potential to transmit disease but are not amenable to adequate sterilization or disinfection.

The patient's history often contains insufficient information to make a complete evaluation of the status of that patient, and a person who is unknowingly incubating a disease is often, more of a threat, than one with a recognized clinical disease. Therefore, there is a valid need for an effective system for prevention of cross infection.

Prosthodontic patients are high risk patients relative to their potential to transmit infectious disease as well as to acquire it.

Among the predisposing factors most widely associated with fungal infections are immunocompromised conditions, current infections, debilitating illness, steroid therapy and prolonged antibiotic therapy. The patients are identified by advanced age, existing disease, chemotherapeutic regimens or transplant surgery. Many of these patients are recipients of prosthodontic treatment, often in conjunction with surgical procedures. Therefore, prosthodontic treatment must not be a potential source of infection, no matter how infrequently this may occur.

Fungi are ubiquitous in the environment and some cause infection in humans. The risk of infection may be increased where fungi are recovered in high numbers. Their increase in high numbers in prosthodontic clinic and laboratory increases the risk of infection.

Ultraviolet light can kill or inactivate microorganisms by damaging deoxyribonucleic acid (DNA). Wavelength range between 200 and 300 nm, corresponding to the peak absorption of DNA is effective and the absorption of u-v light by the DNA molecule causes microorganism death; u-v radiation has been used to disinfect water supplies, lab equipment, rooms and halls in hospitals. The ultra-

violet light causes the formation of thymine containing photo products in the DNA of affected cells. If the photo products are not repaired or excised from the DNA, the cells will die Effectiveness of Ultra-violet rays in disinfection depends on a number of factors. Among these are time, intensity, humidity and direct access to the organism. Since dental prostheses provide a number of sites for shielding microorganisms from direct exposure to u-v light from only one direction, it is imperative that, u-v light must be reflected so that items within the disinfection unit will be exposed to u-v radiation from many directions. Frequent orientation of an item between exposures in the unit also increases the chances of killing microorganisms that may be "shadowed"