

Assessing The Extent Of Aerosol Spread In Prosthetic Dental Lab

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Abstract:AIM:-The aim of this Number:to estimate the risk of amount of aerosol produced in the dental labs during trimming and shaping of dental prosthesis.

OBJECTIVE:- To create awareness about the risk of lab transfer objects which is handled by technicians who are unaware of the potential harmful contamination present in them.

BACKGROUND:- Aerosol is produced during trimming and shaping procedures done in the dental prosthesis lab. There is a potent risk of transmission of pathogens present in a prosthetic material removed from a Patient mouth and also has the risk of contaminating the other patient's materials in the lab. So this study is aimed at estimating the amount of aerosol produced by taking bacteria as an indicator.

MATERIALS AND METHOD:-Ten dentures were selected from those patients who visit the clinic for adjustment of shaping and trimming. Three blood agar-plates were placed at a distance of 1ft, 2ft & 3ft respectively from the micro motor position. After the trimming procedure was done, the blood agar plates, exposed to the aerosol prosthetic particles were closed and transferred to the microbiology department for incubation at 37°C for 24 hours. The plates were checked for a total colony forming units. The colonies which were formed by bacteria of an oral origin were counted and tabulated.

RESULTS:- The blood agar plates were kept at distance of 1ft, 2ft & 3ft respectively from the micro motor horizontally. There were more colonies found in blood agar plates which was placed at 1ft and 2ft compared to the plate at 3ft distance. The type of bacterial species present were alpha and beta haemolytic streptococci, enterococcus, coagulase negative staphylococcus.

KEY WORDS: dental prosthesis, aerosols contamination, trimming and shaping, blood agar plate, chlorexidine, bacteria.

1. INTRODUCTION

The spread of the infection in the hospital through contamination is the global concern for social and economic reasons. Diseases can be spread by a direct contact or indirect contact [1]. Human-human transmission of diseases can result from a direct contact from an infected person or an indirect contact through an object. Aerosol that travels a short distance from the source to the receptor is also a common form of direct contact transmission [2]. Aerosol transmission has been defined as person-to-person transmission of pathogens through air by means of inhalation of infectious particles. Particles up to 100µm in size are considered inhalable[3].Aerosol transmission is known to be the main route for many diseases such as Tuberculosis, Aspergillosis and many respiratory viruses.

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THE RISK FOR DENTAL TECHNICIANS:

The dental technicians are vulnerable to microbial cross contamination from the impressions and dentures they receives from the dental clinics. Casts prepared from the impression and shaping, smoothing of the dentures may also harbour the infectious microorganisms that can be spread throughout the laboratory when the casts and prosthesis are trimmed [4] In hospitals, infection normally spread through two routes one by direct contact and the next by contaminated instruments [5].Airborne infections are considered as direct contact. Dental clinics and laboratory has high risks of aerosol contamination due to the normal treatment procedures. High speed motors are widely used in dental clinics and laboratories which will generate the aerosols in many dental procedures [5,6,7]. Many authors have already documented the risk of aerosol transmission in the clinical setup. There are not, many studies conducted for demonstrating aerosol in dental prosthetic labs. This study is done to estimate and demonstrate the extent of aerosol production in the prosthetics labs while trimming and shaping the prosthetic materials removed from the patients mouth.

MATERIALS AND METHODS

This study is conducted to estimate the extent of aerosol produced in the dental prosthetic labs. After a week of insertion patient is recalled for a trimming and polishing. The dentures were selected from the patients randomly irrespective of the oral hygiene and the oral prophylaxis. The agar plates were placed in position before the adjustment procedure was started. Three blood agar-plates (Himedia:MP1301) where placed at a distance of 1ft, 2ft & 3ft respectively from the micro motor position. After the trimming procedure was done, the blood agar plates exposed to the aerosol prosthetic particles were closed and transferred to the microbiology department for incubation at 37°C for 24 hours aerobically.

Blood Agar:

Blood agar plates were purchased readymade from Hi media labs to isolate the fastidious organisms.

Method:

Ten dentures were selected from those patients who visited the clinic for adjustment of shaping and trimming of the denture. Shaping and trimming was done with a micro motor with the speed of 35,000Rpm. Three blood agar were placed at a distance of 1ft, 2ft, 3ft respectively from the micro motor horizontally. After that trimming procedure was done, the aerosol prosthetic particles were collected in the plates, which was closed and transferred to the microbiology department for incubation at 37°C for 24 hours. The plates were checked for a total colony forming units, the bacterial colonies which are non oral origin were excluded, and the colonies which are formed by bacteria of an oral origin were counted and tabulated.

TABULATION:

| Sl.No | Plate at 1 ft & No of colonies | Plate at 2 ft & No of colonies | Plate at 3ft & No of colonies |
|-----------|--------------------------------|--------------------------------|-------------------------------|
| Sample 1 | 68 | 160 | 48 |
| Sample 2 | 91 | 155 | 70 |
| Sample 3 | 112 | 155 | 70 |
| Sample 4 | 49 | 52 | 36 |
| Sample 5 | 55 | 62 | 50 |
| Sample 6 | 51 | 67 | 34 |
| Sample 7 | 56 | 65 | 47 |
| Sample 8 | 60 | 56 | 62 |
| Sample 9 | 162 | 164 | 155 |
| Sample 10 | 162 | 169 | 148 |
| Mean | 86.6 | 110.5 | 72.0 |

TYPES OF BACTERIAL COLONIES ISOLATED

1. α -haemolytic Streptococci
2. β -haemolytic Streptococci
3. Enterococcus species
4. Coagulase Negative staphylococcus

RESULT:

While trimming the dental prosthesis the amount of aerosol particles produced was more in blood agar placed at 2ft compared to blood agar place at 1ft and 3 ft It indicates that there is a high risk of transmission of infection to the dentist and the lab technicians. The extent of aerosol spread is indicated by transfer of bacteria from the prosthesis material to the adjoining areas.

DISCUSSION:

The exposed blood agar plates were incubated at 37°C for 24 hours. The colonies were counted and tabulated. The 30 exposed blood agar plates contain a colony of Enterococcus, alpha and beta haemolytic streptococci and coagulase negative staphylococcus. The risk of aerosol transmission of pathogenic agents during dental treatment is unknown. Dentists use high energy equipment; such as scalars, micrometers, and hand piece in the presence of body fluid such as blood, saliva, and dental plaque [11,12]. This combination has been shown to generate aerosols with micro-organisms of oral origin. In patients who harbour bacteria and virus of blood born or respiratory origin, aerosol generation may prove a significant health hazard to

dentists and their assistants. In the early 1940s, Jannison et al, took serial photo images of a sneeze of an adult male, due to a technical limitation of that time, they were only able to show the movement of the particles with a diameter large enough to fall to the ground at speeds of milliseconds [8,20]. Nonetheless, they were able to estimate that the maximum distance spanned by the droplets was 2-3 feet at most, and their initial speed was at least 152ft/s . Hence most of the droplets and aerosol particles will reach at the distance of 2-3ft (30cm-84cm) [8]. Kahn et al, reported cross-contamination during polishing in an experiment which simulated routine polishing of the complete denture without using any disinfection measures before the procedures or with the addition of disinfectant to the pumice.[3,19] In the previous studies they used a many types of medium such as sterile Petri plates, brain-heart infusion medium and blood agar to isolate the bacterial species present in the aerosol infection [9,13]. In this study Blood agar plates were selected for specific colony counting and also used to isolate the fastidious bacteria. It also accelerates the growth of medically important fastidious bacteria. Demonstration of viruses were not included in this study but in other studies conducted by previous authors demonstrated viruses were also present in the aerosols.

CONCLUSION

While trimming the dental prosthesis the amount of aerosol particle was produced more in 2ft blood agar compare to 1ft and 3 ft blood agar. It indicates there is a high risk of transmission of infection to the dentist and the lab technicians. The extent of aerosol spread is indicated by transfer of bacteria from the prosthesis material to the adjoining area.[14,15] However it should be borne in mind that there is a possibility of even viruses carried through them. Hence before trimming the dental prosthesis, the prosthetic material should be immersed in a chlorexidine or any other broad-spectrum disinfectant to prevent the aerosol contamination [10,16]. More Dentists and assistants are prone to the microbial infection in their working area due to aerosol contamination.[17,18] In many studies it has proved that normal skin flora of the dentists were altered due to this aerosol contamination. Hence using a personal protective barriers & disinfectants only can reduce the risk of infections transmitted from patient to a dentist

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