MICROBIOLOGIC STUDY REGARDING THE RISK OF CROSS INFECTION IN THE TECHNICAL LABORATORY

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Abstract: The risk of cross infection in the technical laboratory has drawn the practitioner's attention particularly in the recent years. The present research show that the microorganism transition is conducted throughout the impressions received from the dentist, but also after processing the denture and intermediate prosthetic parts, that were checked in the oral cavity and then brought back to the laboratory. Because of these premises, the introduction of a good practice code for the activity conducted in the technical laboratory is absolutely necessary. Considering these facts the current study wishes to show the contamination degree of the denture after it is processed in the technical laboratory, in order to establish the most efficient measures to prevent cross infections.

The contamination assessment was carried out using the quantitative cultivation method. The samples were cultivated on nutritive agar, and then incubated at 37° C, for 24-48 hours.

The results show the necessity of strict legislation regarding the impression and prosthesis circuit, in order to reduce the contamination risk of patients and medical personnel throughout the ongoing clinical-technological algorithm.

INTRODUCTION

The contamination risk throughout the activities conducted in the dental laboratories raised specialist's interest, especially in the last years, because in this segment of the dental algorithm the cross-infection risk is still high Wakefield (1990). If in the dental praxis the asepsis and antisepsis rules are very strict, an dthe instrument circuit is well documented (The Ministry of Health Order no.349 from 11 April 2005.), for the dental laboratories strict regulations are still absent.

Although there are implemented standards for the dental praxis, Neville Debattista, Zarb M.(2007), showed that over 60 % of the impressions arrived from dental offices in the dental laboratories are contaminated with *Enterobacter cloacae*, *Escherichia coli*, *Klebsiela oxytoca*.

Although microorganisms transition can be carried out by the impressions received from the dentist, there are a few studies that also incriminate the processing of the denture or the intermediate prosthetic parts that were verified or adapted in the oral cavity of the patient, Verran J, Kossar S, and McCord JF. (1996).

The tools and the polishing paste used to polish the prosthesis are important contamination sources, according to the studies of Witt S, Hart P. (1990)

Wakefield's studies (1990) showes that 9 out of 10 prosthesis sent from the dental praxis completely sterile had been contaminated with Gram negative bacilli as *Pseudomonas*, *Acinetobacter*, *Escherichia coli* or *Moraxella* after they were processed in the dental laboratory.

All these studies confirm the necessity of strict regulations regarding the circuit of impressions and intermediate prosthetic parts, in order to reduce the contamination risk for both patients and medical personnel along the clinical-technologic algorithm.

Because of this, in the present study we set to highlight the contamination degree of dentures after processing them in the technical laboratory, in order to establish the most efficient measures to prevent cross infection.

This study wishes to support the existing research and was born from the desire to improve dental and technical activity, after discovering that the existing results are yet not centralized as a practical application direction. This is why the elaboration of a good practice guide that is to be established in all dental and technical work places is an extremely necessary measure.

MATERIAL AND METHODS

To trace the contamination sources from the technical laboratory, we assessed the microbial load of intermediate prosthetic parts prior to checking and adapting them in the oral cavity. We used non-sterile prosthetic parts, and sterilized ones using current disinfectants.

The prosthetic parts used in this study were especially made for this study according to the classic production algorithm, Donciu V. David D. Patrascu I Serb H. (1994), using thermo-polymerized acryl Prothyl Hot (Zhermack SpA). The processing procedure was carried out using classic acryl burs mounted on a 30.000 rpm Marathon N3 hand grinder and brushes, pumices and slurries used for polising, mounted on a horizontal motor (40.000 rpm). We used Abraso-Starglanz (Bredent) polishing paste.

We analyzed four maxillary complete dentures and a polishing brush in order to asses the microbiologic contamination degree.

The samples were coded and analyzed as follows:

- P1 – non-sterile dentures polished using brushes and polishing paste that had been used in prior processing
- P2 – non-sterile dentures polished using brushes and polishing paste that had not been in prior processing
- P3 – sterile dentures (sterilized using a Pursept 0.15 g/l solution) polished using brushes and polishing paste that had been in prior processing
- P4 – sterile dentures (sterilized using a Pursept 0.15 g/l solution) polished using brushes and polishing paste that had not been used in prior processing
- P5 – polishing brush that had been used for prior processing
- The control was represented by sterile and non-sterile dentures analyzed before they were processed in the dental laboratory.

The contamination degree assessment was achieved by the method of growing microorganisms on Petri dishes, Simona Dunca, Octavita Ailiesei, Erica Nimitan, Stefan Marius, (2004), using nutritive agar (Merck, Germany). The inoculum was obtained by repeatedly washing the prosthesis with 5 ml of sterile distilled water. For the samples processed with brushes and polishing paste used prior in other processing activities we made decimal dilutions (10^{-1} - 10^{-3}), that were later used for insemination. For inoculum we used a volume of 100 µl inoculum / Petri dish, and in the brushes case we conducted the insemination both by washing it and by imprinting it in the agar. The incubation (24 hours at 37° C) was followed by a quantities assessment of the microbial load.

All determinations were carried out in triplicate.

RESULTS AND DISCUSSIONS

The existing studies results, along the current dentist activity show the necessity to introduce of a more efficient control for the medical act. In the dental praxis the rules are clear but sadly in the dental laboratory this methodology is still not enough documented. This is why the introduction of a good practical guide is vital.

The experimental model that was used clearly demonstrates these premises. We underwent microbiological investigations both non-sterile and sterilized (using current disinfectants) dentures.

In order to asses the microbiological contamination degree inside the dental laboratory, the dentures were processed using both new and used brushes and polishing paste.

The microbiological analysis of the non-sterile prosthesis (Photo 1) showed that the processing conducted with instruments and paste that were used before in other dentures induces a considerable increase of the microbiological load (Photo 2). A lower contamination level was established for the non-sterile dentures (Photo 3) that were processed with brushes and polishing paste that were not used prior for other dentures (Photo 4). In this case the high number of contaminant microorganisms cannot be attributed to the used brushes and paste (Photo 5, Photo 6), but more likely to the manipulation of the prosthetic parts inside the dental laboratory.

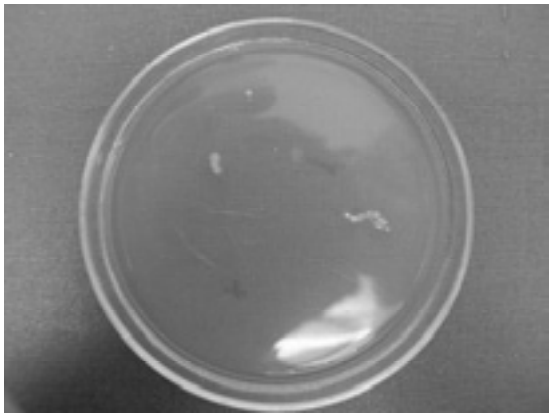

Photo 1 – Microbial load of sample P1 before processing with brushes and polishing paste that had been used before (dilution 10^{-3})

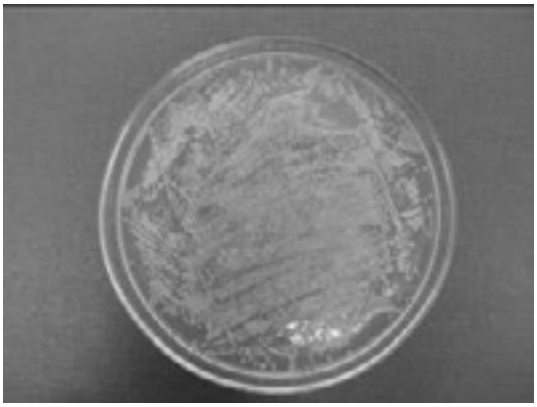

Photo 2 - Microbial load of sample P1 after processing with brushes and polishing paste that had been used before (dilution 10^{-3})

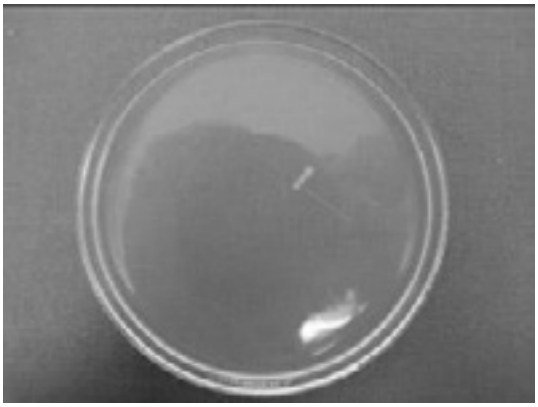

Photo 3 - Microbial load of sample P2 before processing with brushes and polishing paste that had not been used before (dilution 10^{-3})

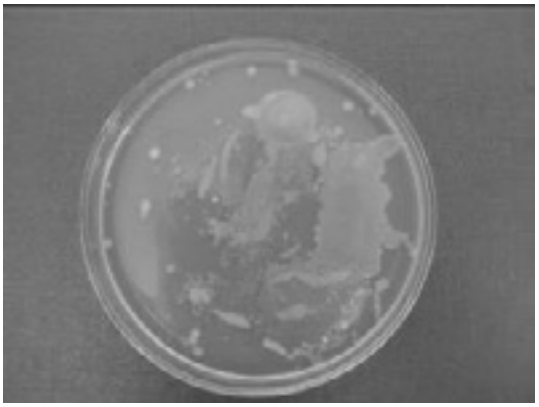

Photo 4 - Microbial load of sample P2 after processing with brushes and polishing paste that had not been used before (dilution 10^{-3})

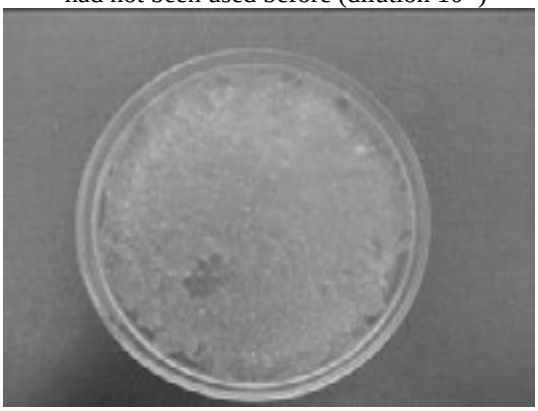

Photo 5 - Microbial load of sample P5 (dilution 10^{-3})

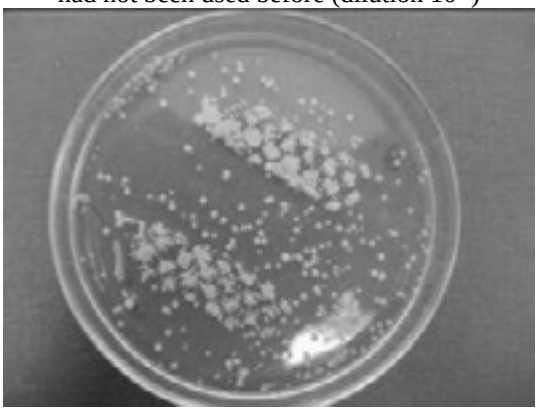

Photo 6 - Microbial load of sample P5 (imprint)

The existence of two contamination sources for the dentures through the processing algorithm is also supported by the result of the analyses made on dentures sterilized with Pursept 0.15 g/l.

The sterilization was carried out to remove the initial microbial load of the dentures in order to better highlight the potential contamination sources from the dental laboratory

Our results confirm initial observations according to witch processing dentures with wised brushes and paste (Photo 7), induce a massive contamination (Photo 8).

Also the test carried out in the Microbiologic Laboratory confirmed the fact that sterile dentures (Photo 9) can be contaminated not only by processing them but also by simply handling them during processing (Photo 10).

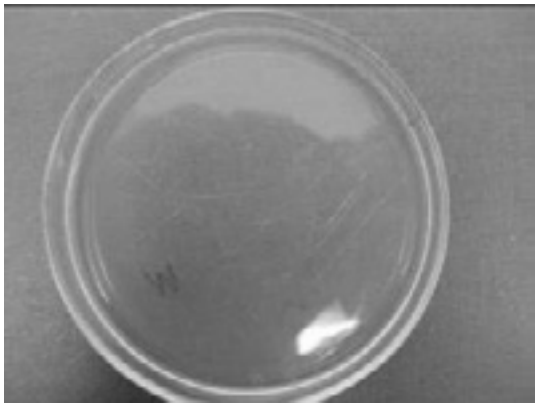

Photo 7 - Microbial load of sample P3 before processing with brushes and polishing paste that had been used before (dilution 10^{-3})

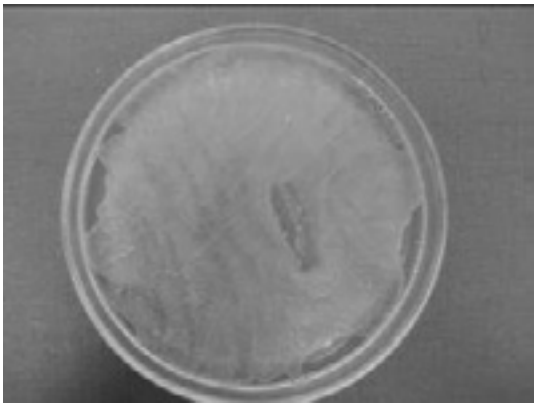

Photo 8 - Microbial load of sample P3 after processing with brushes and polishing paste that had been used before (dilution 10^{-3})

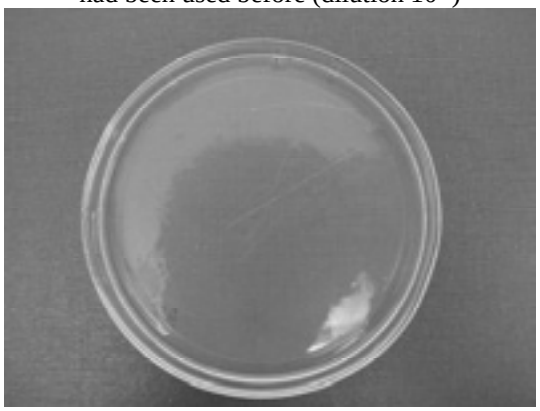

Photo 9 - Microbial load of sample P4 before processing with brushes and polishing paste that had not been used before (dilution 10^{-3})

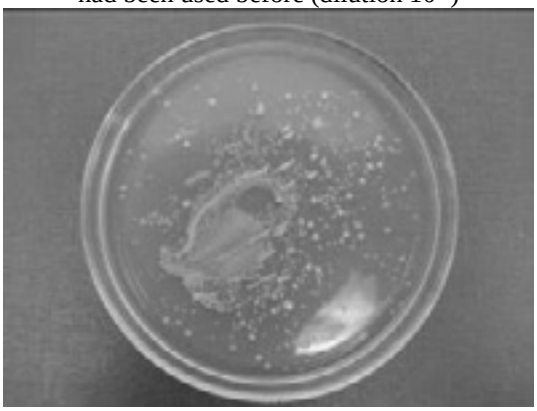

Photo 10 - Microbial load of sample P4 after processing with brushes and polishing paste that had not been used before (dilution 10^{-3})

The results obtained in the present study come to complete existing studied which have shown that in dental laboratories the transition of contaminant microorganisms is carried out by the prosthetic parts received from dental offices, but more importantly by processing these dentures that were checked and adapted in the oral cavities of patients, Verran J, Kossar S, McCord JF.(1997).

Alike Witt and Hart (1990) we sown the instruments and pastes used for polishing dentures are the most important source of contamination toward the dental office but also toward the dental laboratory.

Our stud’s results along all the others confirm the necessity of a set of strict regulations regarding the impressions and prosthetic part circuit, in order to reduce the contamination risk of both medical personnel and patients, throughout the clinical-technologic algorithm.

CONCLUSIONS

Dentures processing using instruments and polishing paste that were used before in other operations, as well as handling them, accounts as the main microbiological contamination sources along the work algorithm conducted in the dental laboratory. Also the old polishing paste can be considered an important vector in the contamination of the denture.

The future elaboration of a good practical guide, which will be obeyed in all dental work units, is well supported by the conducted microbiological analysis, being a necessary and welcomed measure.

These conclusions will contribute in the future in development of a practical guide of prophylactic measures and to establish strict rules of asepsis and antisepsis along the clinical algorithm and also in the direction of centralizing results.

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