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# MICROBIOLOGICAL EVALUATION OF SILICONE FACIAL PROSTHESES

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## *ABSTRACT*

**Purpose:** Microbiological evaluation of the flora under prosthetic rehabilitation of facial defects

**Materials and Methods:** Microbial evaluation of facial prostheses in twelve patients were done by taking eight samples, two samples from the tissue underlying the prostheses and the fitting surface of the prostheses at four observation time allover a year. These samples were cultured and microbial counts were done. The results were compared statistically with that of the samples from the same patient after different observations as well as with other patients receiving other prostheses using T-test.

**Result and conclusion**: Staphylococcus aureus predominated in 90% of the patients. Staphylococcus epidermidis constituted the second most common microorganism 60% of the patients. Yeasts were isolated from 20 % of the patients. Corynebacterium, Escherichia coli, klebsiella were isolated also. The microbial count was greater in tissues underlying prostheses than in the fitting surface of the prostheses in the first three months, and by time the fitting surface of the prostheses increases in microbial count than that in tissues. Esthetically and hygienically, it is recommended to be replaced every year.

**KEYWORDS:** Microbiological evaluation, facial prostheses, flora, microbial counts, cultures, samples.

## INTRODUCTION

Disfigured individuals, lacking eyes, nose, ear, or facial tissues, may not be socially acceptable. Loss of part of the face or having a congenitally missing ear, nose, or eye can have both a social and psychological impact on those affected.[1] Despite recent advances in human facial allotransplantation, appropriate reconstruction is still a challenge as the surgical reconstruction of some aesthetic subunits is nearly impossible or may require multi-step procedures, increasing the burden of care for patients affected by severe facial defects. Rehabilitation of patients with extensive craniomaxill of acial defects by means of anaplastology is still a viable option as

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artificial facial prostheses create excellent cosmetic results by providing good symmetry, color and anatomical details.[2,3]

The demand for maxillofacial prostheses is high, and there is a need to periodically evaluate the services provided. Several investigations about factors related to success and failure of the prostheses must be identified to increase the facial prosthetic longevity and acceptance.

A lack of hygiene maintenance by patients is a risk behavior producing percutaneous inflammation. Multiple microorganisms of the skin may be present with inflammation. coagulase negative staphylococci (CNS), particularly staphylococcus epidermidis, are the most frequently encountered pathogens, followed by Staphylococcus aureus, and the fungus Candida albicans.[4]

The adhesion of microorganisms to a surface is a prerequisite for the colonization of that surface. Differences in surface topography and substratum hydrophobicity and chemistry affect the attachment of microorganisms to a surface, with higher number of cells retained on rougher surfaces. Silicones used in prostheses are processed against dental stone. The resultant silicone surface will reproduce some of the surface topography of the stone where pits were observed caused by the crystalline structure of the surface of stone and therefore, will also not be particularly smooth.[5]

## MATERIAL AND METHOD

Twelve patients with a history of facial defects were selected (seven auricular and five orbital) from the outpatients of the plastic and reconstructive surgery unit of Tanta university constructing facial prostheses using high strength medical grade silicone rubber* *[RTV,(MDX4 –4210)]* [6] giving it a very natural appearance.(Fig 6&7)

### Sample collection:

From all patients of this study, sterile discs 1cm in diameter were used for taking samples for microbiological evaluation at four observation times, these times were at insertion, after three months, after six months, after one year from insertion.

For each case two samples were taken from the tissue underlying the prostheses, and from the fitting surface of the prostheses at different observation times.

These discs were separately immersed in test tubes containing 2 ml. of sterile thioglycolate broth as transport medium. The contents of the tubes were mixed and shacked for 30 seconds.

### Microbial culture

Within 3 hours of taking samples, samples were transported to the microbiology laboratory for microbiological examination. Each sample was cultured both under aerobic and anaerobic conditions for recovery of different bacteria or fungi. Under aseptic technique, microbial cultures were performed as follows:

Aliquots 10$\mu$l of thioglycolate broth suspension of each sample were withdrawn by using automatic pipet with sterile disposable tips and inoculated on four sterile petri dishes containing nutrient agar, tryptic soy agar, MacConkey agar, Sabouraud dextrose agar, blood agar. The sample suspension was spread over the entire surface using sterile glass rod. The nutrient agar and MacConkey agar cultures were aerobically incubated at 37$^{o}$c for 24 hours for detection of aerobic or facultatively anaerobic gram positive and gram-negative bacteria. To detect fungi Sabouraud dextrose agar were incubated at 25$^{o}$c for 48 hours. Blood agar was incubated for 24 hours at 37$^{o}$c in anaerobic jar containing Gas Pack System (oxoid, England) (Fig 2) for recovery of anaerobic bacterial isolates.

### Microbial count

The microbial count of each sample was determined using the surface viable counting method that was performed under a laminar flow

TABLE (1) Comparing Staphylococcus aureus count (CFU/ml) affecting tissue underlying prostheses and the fitting surface of the prostheses in different recall visits:

| Comparing 2 readings | Mean difference | Standard error of mean | T-test |
|---|---|---|---|
| Prostheses after3 and 6 months | 486.8 | 207.61 | 2.345* |
| Prostheses after 6 and 12 months | 83.2 | 33.0672 | 2.516* |
| Prostheses and tissue after 3 months | 334 | 124.77 | 2.677* |
| Prostheses and tissue after 6 months | 48.8 | 45.9332 | 1.062 |
| Prostheses and tissue after 12 months | 144 | 39.0783 | 3.685* |

**** represent significant change at level of 5 %***

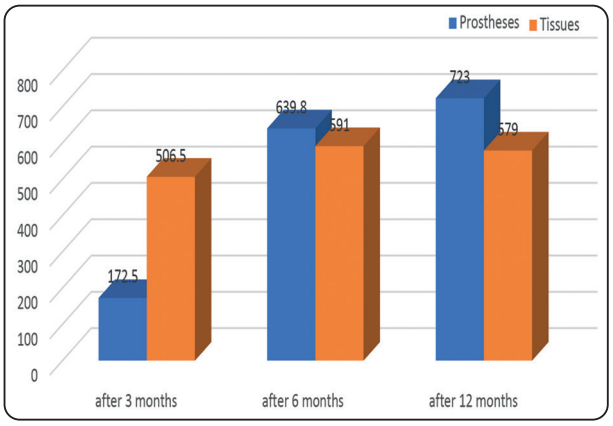


Fig. (1) Comparing Staphylococcus aureus count (CFU ml) affecting tissue underlying prostheses and the fitting surface of the prostheses in different recall visit.

Fig. (2) Colony counter device, Anaerobic jar containing gas pack system.

cabinet. An aliquot of 100$\mu$l of the prepared sample solution was diluted ten-fold diluted using a suitable micropipette (Sovorex, Switzerland) and three eppendorf tubes each containing 900$\mu$l of sterile saline to prepare 10, 100, and 1000 folds dilutions. An aliquot of 50$\mu$l of the undiluted suspension and of each of the prepared dilutions was evenly spread on the surface of blood agar and tryptic soy agar plates each divided to 4 sections. (Fig 3)

After the suitable incubation period, the colony count of each type of the detected bacteria was determined in each sample with the help of a colony counter device (Technical and Scientific Sup., Germany) (Fig. 2)

Fig. (3) A representative example of the distribution of different concentration of sample suspension in surface viable counting test

The colony count per ml of original sample was calculated and expressed as colony forming units per milliliter (CFU/ml). The results were compared statistically with that of the samples from the same patient after different observations as well as with other patients receiving other prostheses.[4]

**Identification of the recovered bacterial isolates**

Preliminary identification of microorganisms was performed on the basis of cultural growth characteristics and by microscopical identification. To confirm the identification, further studies of the biochemical activities were done according to standard methods.[7,8,9,10]

## RESULTS

The pooled microbiological results from the discs taken at the four different recall visits, at insertion, after three months, after six months, and after one year, showed variable frequencies of isolation of each type of microorganism. Coagulase-positive staphylococci (Staphylococcus aureus) predominated in 90% of the patients. Coagulase-negative staphylococci (Staphylococcus epidermidis) constituted the second most common microorganism 60% of the patients. Yeasts were isolated from 20 % of the patients. Corynebacterium, Escherichia coli, klebsiella were isolated also in a percentage of the sample 10%,10%, and 20% respectively.

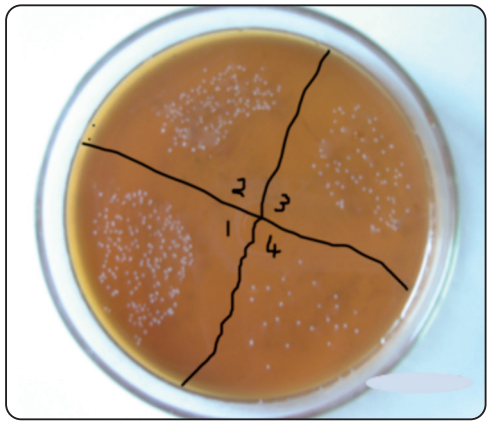


Fig. (4) Staphylococcus aureus.

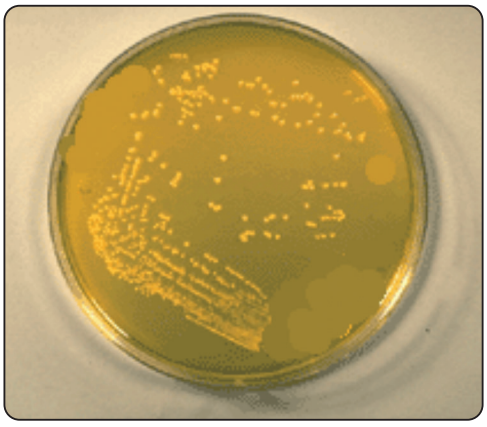

Fig. (6) Auricular prostheses after one year.

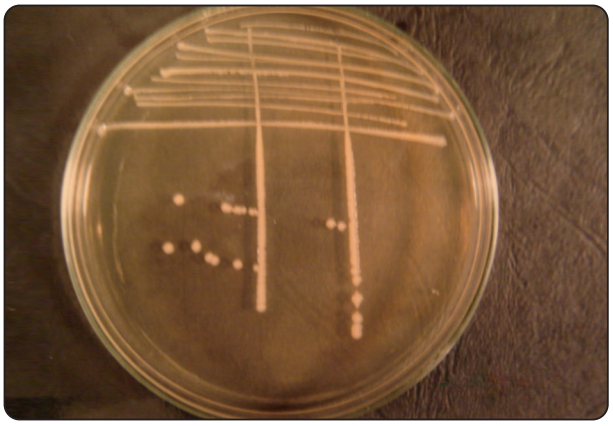

Fig. (5) Staphylococcus epidermidis (CNS).

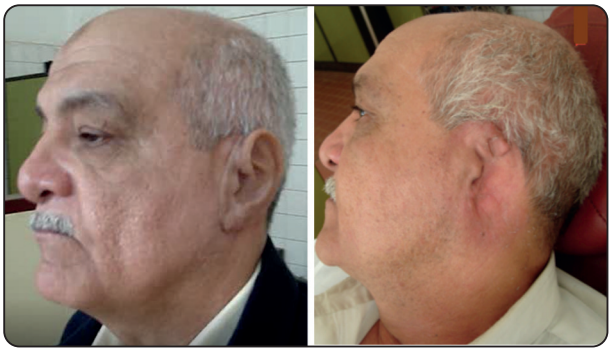

Fig. (6) Auricular prostheses after one year.

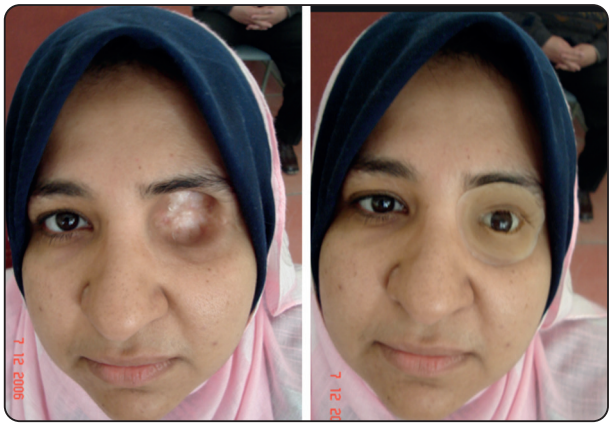

Fig. (7) Orbital Prostheses after one year.

## DISCUSSION

Microbiological study was performed by taking samples using sterile discs 1 cm in diameter to standardize the surface area examined instead of using cotton swabs or paper points. Microbial count of each sample was done from both fitting surface of the prosthesis and the underlying tissues. These tests aimed to reveal the hygiene condition for prosthesis and its positioning field.

Clinical experience indicates that most skin irritation in patients will decrease upon local treatment with water and soap combined with antibiotics. However, the skin will soon become irritated again once the antibiotic treatment has been stopped.[11] The observed rapid recurrence of irritation could be related to reinfection with microorganisms derived from the prosthesis, especially because mechanical cleaning does not remove all microorganisms. When the surfaces of the prostheses were cleaned, as the patients were instructed, the biofilm covering the prosthesis was removed, but microorganisms could still be observed buried in the material. The presence of microbial biofilms has several implications, importantly, their occurrence could be related to material degradation and skin irritation, ultimately leading to dysfunction of the facial prostheses.

The choice of cleaning method is an important consideration for lengthening the serviceable time of facial prostheses as microbial organisms and biofilms could degrade facial prostheses and cause skin irritation. Whether microwave disinfection is a suitable cleaning method without degradation of the properties of a prosthesis is unclear.[12]

## CONCLUSION

Color of the prostheses changed gradually by time till became darkened after nine months. Insertion or removal the prostheses became easier by time.

The microbial count was greater in tissues underlying prostheses than in the fitting surface of the prostheses in the first three months, and by time the fitting surface of the prostheses increases in microbial count than that in tissues. Esthetically and hygienically, it is recommended to be replaced every year.

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