CASE REPORT

Life-Like Color Characterization and Extrinsic Layering of Silicone Orbital Prosthesis: A Case Report

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Received on: 22 February 2023; *Accepted on:* 20 March 2023; *Published on:* 27 June 2023

Abstract

Orbital mucormycosis was the second most common type of mucormycosis during the COVID-19 wave, which along with the loss of orbital content, lead to a loss of confidence in the patients as well. Prosthodontists play a major role in rehabilitating the lost structure as well as the lost confidence in the patients by providing extra-oral silicone prosthesis. Shade matching of maxillofacial silicone elastomer is one vital step during fabrication of the prostheses. Available literature does not yet describe the procedure of shade matching and extrinsic layering of silicone prosthesis in detail. This article presents a case report of a 45-year-old male patient who presented with a healed surgical site of exenterated orbit due to mucormycosis and complained of disfigurement of the face. A customized silicone orbital prosthesis was fabricated for the patient. The present case report critically focused on color matching during silicone manipulation and extrinsic layering after curing the prosthesis.

Keywords: Extrinsic layering, Maxillofacial prosthesis, Shade matching.

Dental Journal of Advance Studies (2023): 10.5005/djas-11014-0002

Introduction

The wave of COVID-19 has snatched the confidence and belief of many immunocompromised patients by taking away their invaluable organs. Orbits were the second most prevalent site of infection by mucormycosis during COVID.[1] A maxillofacial prosthodontist plays a profound role in reviving the lost confidence in such patients. An indiscernible facial prosthesis marks the success of the prosthesis and boosts the patient's confidence and self-esteem by many folds. Color selection and procedure of shade matching of maxillofacial silicone with adjacent skin without bubble formation is a critical step. Human skin color varies from the darkest brown to the lightest hues which are due to variations in pigmentation. Melanin is one pigment that is majorly responsible for providing the value, hue, and saturation to the skin color. Indian skin complexion ranges from whitish to various shades of brown. Various studies have been conducted to devise the correct color formulas for the maxillofacial a prosthesis.[2–8] Guttal et al. devised a shade guide based on the combination of various colors in definite proportion to achieve the correct base color of prosthesis for various shades of Indian skin tone. Intrinsic pigmentation provides the foundation of color matching, however, the significance of detailed characterization of the prosthesis by extrinsic pigmentation cannot be underestimated. Minimal to significant perceivable change in the shade after complete vulcanization can be corrected by extrinsic staining.[9]

This article presents a case report and lab procedure of fabrication of a Life-Like silicone prosthesis for orbital rehabilitation of a patient who had undergone orbital exenteration because of orbital mucormycosis.

Case Presentation

A 45-year-old male patient came to the Department of Prosthodontics with the chief complaint of disfigurement of a face because of a missing left eye. The patient had medical history of diabetes for 2 years and had been diagnosed with COVID-19 and mucormycosis, 2 years back. The patient presented to the department with healed exenterated site.

A silicone prosthesis was planned to replace the missing orbital structure and boost the patient's confidence. Impression of the defect area was made using irreversible hydrocolloid, an eye shell was selected according to the patient's right eye, and a wax pattern was fabricated and contoured according to the adjacent orbital area. A Wax pattern was tried on a patient for iris location and contour evaluation. The pattern with the cast was flasked, dewaxed, and packed with silicone elastomer using a simple technique described below.

Lab Technique for Fabrication of Silicone Prosthesis

- Oil colors (Faber-Castle) were dispensed in predetermined proportions according to the shade guide chart based on the study by Guttal et al. on a white tile using the spoon end of a Lecron carver where one full flat scoop of color would determine one portion of the color (Fig. 1A).[7]

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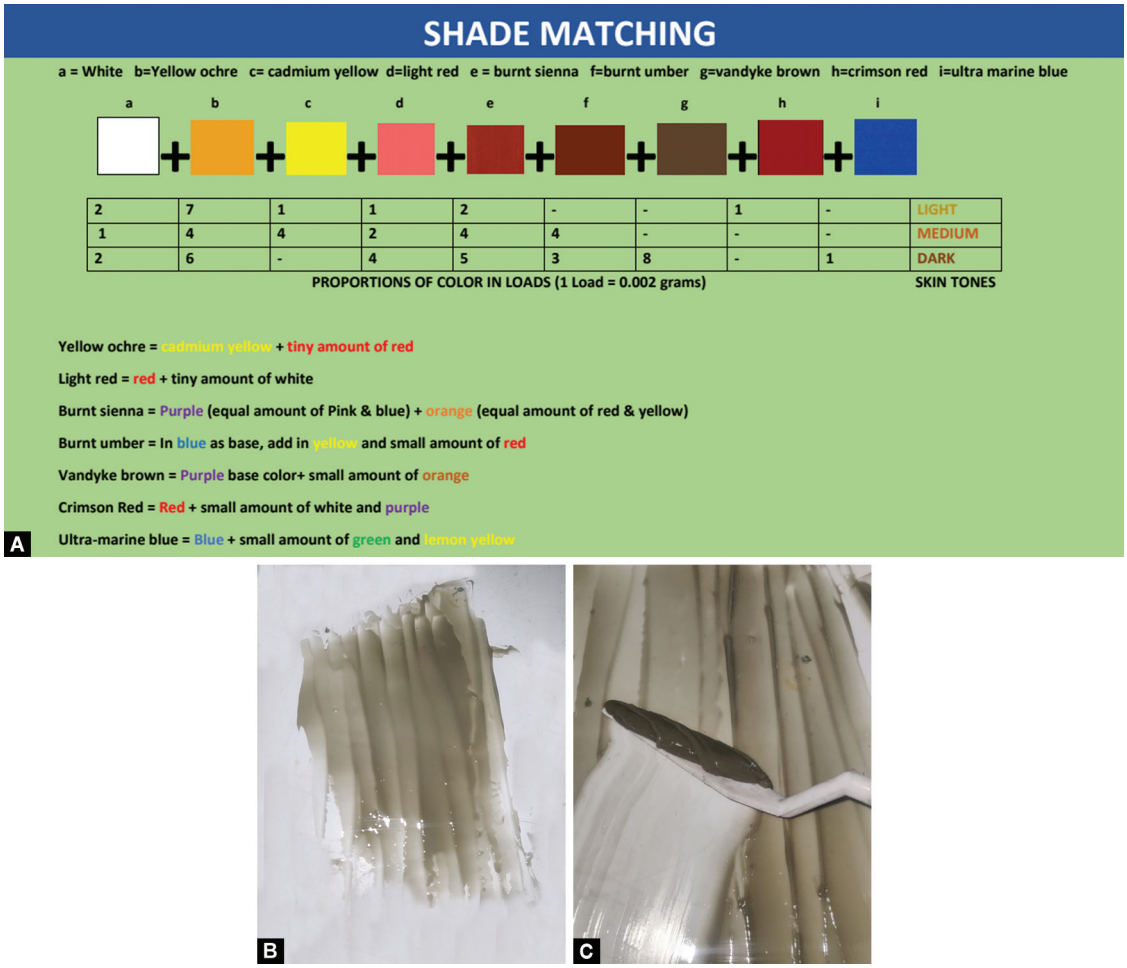
How to cite this article: Singla S, Sehgal K, Khanna M, *et al*. Life-Like Color Characterization and Extrinsic Layering of Silicone Orbital Prosthesis: A Case Report. Dent J Adv Stud 2023;11(1):39–42.

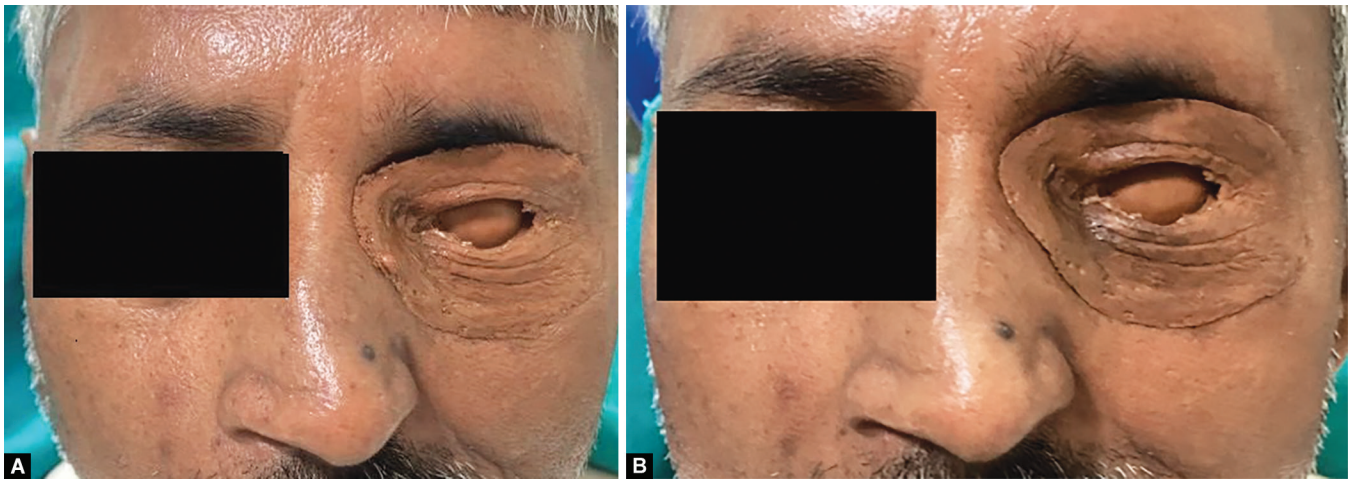
Source of support: Nil

Conflict of interest: None



Figs 1A to C: (A) Shade matching chart; (B) Mixing of base and catalyst in horizontal strokes; (C) Silicone pressed against white tile till transparent layer is obtained followed by picking of material by dragging silicone mixing spatula

- Dispensed colors were mixed on the tile and a catalyst (Part B of the Technovent M511 maxillofacial silicone elastomer, MaxFacIndia, Pune, Maharashtra, India) was added over it.
- Color-modified catalyst was added to the base (Part A of Part B of the Technovent M511 maxillofacial silicone elastomer, MaxFacIndia, Pune, Maharashtra, India) according to the manufacturer's instructions in the ratio of 1:10.
- To avoid air entrapment while mixing, the base and catalyst were mixed in horizontal strokes against the white tile using a silicone mixing spatula until a homogenous mix was obtained (Fig. 1B).
- The small amount of this mixture was transferred on a transparent sheet which was folded and took near to the skin adjacent to the defect area or to the contralateral side to assess the shade matching.
- To darken the shade of silicone prosthesis, marine blue or Vandyke brown was added and to lighten the shade white or untinted silicone was added wherever necessary.
- After satisfactory color matching, silicone mix was transferred to the mold made of dental stone since it avoids a color change of the prosthesis after polymerization.[9]
- Before transferring the silicone to the mold, petroleum jelly was applied to mold cavity walls as a separating medium.
- To ensure bubble-free prosthesis, a small amount of silicone mix was taken on silicone mixing spatula and pressed against the white tile in horizontal strokes so that a very thin, almost transparent layer of a silicone was obtained (Fig. 1C).
- The mixture was picked on a silicone mixing spatula by dragging the spatula on the tile (Fig. 1C).
- This mixture was wiped in the mold cavity. The next portion of silicone was added overlapping the previous portion to avoid air entrapment at this stage. The whole mold cavity was filled in a similar manner.
- Mold was packed and compressed under a hydraulic machine followed by curing at 100°C in a hot air oven for 1 hour.
- The prosthesis was retrieved after bench cooling to room temperature (Fig. 2A).
- Chloroform was used to remove any surface contamination and improve the adhesion of the succeeding silicone layer during extrinsic staining.
- For extrinsic staining, the catalyst of silicone was modified by adding different shades according to the shade of patient's skin. For areas with greater shade difference than the base color of the prosthesis, a minimum amount of catalyst was added to the color, just sufficient enough to wet the color, and in areas requiring less modification of base shade, the



Figs 2A and B: (A) Cured orbital prosthesis before extrinsic staining; (B) Cured orbital prosthesis after extrinsic staining

portion of the catalyst was increased to the color as per the shade required.

- Prosthesis was placed on the defect area. A gloved finger or cotton swab was dipped in the modified catalyst and dabbed on the surface that needs modification.
- After a satisfactory application of colors on the prosthesis, a thin coat of base of silicone elastomer was sprayed onto the prosthesis. As the base of M511 maxillofacial silicone elastomer (Technovent M511 maxillofacial silicone elastomer, MaxFacIndia, Pune, Maharashtra, India) is highly viscous, it was modified by adding ethanol.[3,10]
- In the end, the untinted clear silicone elastomer base was sprayed on the prosthesis and it was cured at 100°C for 1 hour in a hot air oven.
- The prosthesis was tried on the patient for evaluation of shade and appearance (Fig. 2B).
- Spectacles were used to retain the prosthesis.

Discussion

Silicone elastomer is the most commonly used material for fabrication of maxillofacial prosthesis and its color matching is a vital step. The present case report described the procedure of fabrication of silicone orbital prosthesis with a detailed sequence of color matching and involved simple steps to ensure the accuracy of matched color. Dispensing the colors on the white tiles made the visualization of shade easy. Adding these mixed colors in the catalyst part instead of the base of the M511 maxillofacial silicone elastomer ensured homogenous color dispersion in silicone because of the less viscosity of the catalyst part. After mixing the base and catalyst, matched color was evaluated against the skin adjacent to the defect area using a cellophane sheet. The shade was lightened or darkened by adding untinted silicone or marine blue/vandyke brown respectively as per requirement. Untinted silicone was preferred over white color to lighten the shade to avoid the chalkiness of the prosthesis.[7] After final shade matching and curing of the prosthesis, extrinsic staining was done to impart a Life-Like appearance to the prosthesis. For extrinsic staining, a gloved finger or cotton swab was used to impart a skin like texture to the prosthesis.[3,10] Thin layer of untinted silicone was sprayed after extrinsic staining to avoid a shiny surface and add depth to the prosthesis. The application of a thin layer of base ensured more efficient penetration of base in silicone and a more complete cure.

This procedure of color matching has been described with respect to Technovent M511, high-temperature vulcanized maxillofacial silicone elastomer (Technovent M511 maxillofacial silicone elastomer, MaxFacIndia, Pune, Maharashtra, India) and needs to be evaluated with another commercially available maxillofacial silicone elastomer for accuracy. Also, commercially available oil paints were used rather than specific intrinsic and extrinsic stains provided by Technovent MaxFac India (Technovent, MaxFacIndia, Pune, Maharashtra, India) which does not ensure the longevity of color stability of maxillofacial silicone elastomer similar to the manufacturer specific stains. Also, it needs to be kept in mind that the shade formula used in this case report may vary among subjects of different ethnic backgrounds.

Conclusion

The present case report describes the procedure of orbital prosthesis fabrication with a critical focus on color matching and silicone manipulation to avoid bubble formation in the prosthesis at various stages, i.e., from the start of mixing of the base and catalyst till the packing of the mold cavity. The easy and detailed formula for intrinsic staining using commercially available oil paints has been described. The easy and detailed formula for the method of extrinsic staining has also been described that gives the ultimate Life-Like appearance to the prosthesis.

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