

A CROSS SECTIONAL QUESTIONNAIRE BASED STUDY TO DETERMINE THE CORELATION BETWEEN KNOWLEDGE AND FABRICATION PROSPECTS OF MAXILLOFACIAL PROSTHESIS IN POST COVID MUCORMYCOSIS PATIENTS

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ABSTRACT

Purpose - The aim of the study is to assess the knowledge among prosthodontists related to the course of fabrication of maxillofacial prosthesis in PostCovid mucormycosis patients.

Method – It is a cross sectional, questionnaire study which was performed among the prosthodontists and the postgraduate students all over India. The questionnaire was based on the clinician’s preference in terms of impression materials, prosthetic materials and methods of shade matching. Initially, the questionnaire was tested for validation among 20 sample size and was judged by an expert and lay panel. The Content Validity Ratio was 0.7 which elicited that the questions were acceptable and agreeable. It was further tested on a sample of 200 respondents for proper analysis and desired level of accuracy. The CHI-square test was performed using 20 variables between three groups based on the years of experience – Group A (<5 years), Group B (5-10 years) & Group C (>10 years).

Result – The result showed that Group B exhibited the highest value in terms of the number of cases treated by the clinicians, method of fabrication and shade selection. A significant difference of $p = 0.02$ was observed when comparing the three groups.

Conclusion – Within the limitations of this cross sectional study, it was concluded that in the rehabilitation of PostCovid mucormycosis patients, a combined effort of theoretical knowledge of maxillofacial prosthesis along with clinical experience, communication and awareness about the recent advances and technologies is required.

Keywords: Maxillofacial prosthesis, PostCovid Rhino-orbitalmucormycosis, Orofacial Rehabilitation, Silicone.

INTRODUCTION

One of the most common superinfection that affected the COVID patients was Mucormycosis. India reported around 40,000 cases of this infection. It is a rare, rapidly progressive, life-threatening opportunistic infection. The most common variety is rhino-orbital-cerebral mucormycosis (ROCM) with morbidity reaching 85% even with quickly implemented treatment.¹ It spreads through nasal cavity affecting pterygopalatine fossa and orbital region leaving behind a large midfacial defect.

Fukuda et al did a questionnaire study on the assessment of the surgical treatment of patients with nasal or paranasal malignant tumours. He concluded that all patients complained of unaesthetic appearance, and 63% of them were dissatisfied. He concluded that the surgical treatment is restricted to specific patients only in terms of patient's psychology, functional efficiency and survival outcome.²

The extensive resection of the necrosed tissue lead to scarring and affects the diseased person aesthetically, physically, functionally and psychologically. The defects can be minor intraoral, major midfacial defects or a combination of both. Therefore, the success of management of such patient lies in systematic planning and precise designing of the prosthesis. The knowledge of prosthetic rehabilitation plays a major role in establishing functional efficiency ,structural balance and esthetic harmony. Unlike other disease, the choice of surgical planning for prosthesis is limited in mucormycosis. The choice of prosthesis varies with simple removable prosthesis to advance implant prosthetic options.³

The rehabilitation treatment is done after analyzing the complete recovery from infection. The tensile strength of the tissues is assessed, and based on stability of the healed tissue, the prosthesis is designed. In most of the cases, the healed wound is of nonkeratinized type which can further affect the retention of prosthesis. Therefore, skin grafts are used as a source of keratinized mucosa to enhance the stability of the prosthesis and decrease any further postoperative complications.⁴ The essence of the prosthetic design lies in its simplicity and radical approach. It may vary with the type and extension of the defect. The conventional obturator designs and fabrication procedures seems to be a great success.⁵ The use of immediate surgical obturator improved the patient quality of life, especially in phonetics, deglutition, and safeguarding the tissue for complete healing. The facial defects are rehabilitated with suitable prosthesis. The implant supported prosthesis are not critically reviewed in post-covid mucormycosis cases due lack of documentation.⁶ It can be due to the lesser prevalence of the disease and the chances of reoccurrence in the past few years.

Though the conventional technique in the fabrication of maxillofacial prosthesis has been in practice for a very long time, it has a lot of limitations. The technique requires high technical expertise, it is time-consuming, labor-intensive, and uncomfortable for the patients. With the introduction of CAD/CAM in dentistry, many of the dereliction of the Conventional technique has been compensated. ⁷ The prosthesis made from digital workflow helps in patient education. It is more acceptable by the patient as it can be shown to them prior to the final prosthesis for approval or further modification.⁸

The most common method for shade matching is the "trial and error" method. It is a chairside procedure which involves the gradual introduction of color pigments to the silicone. The final color is visually analysed against the patient's skin and is modified until an acceptable color match is achieved.

This procedure is time consuming and require fine skills. The verity of the resultant color depends on a lot of aspect, one of which is the subjective nature of human color perception. This factor varies from person to person. Mobile phone colorimeter is an app that helps you to select the patients skin color in the numerical

value of HUE, CHROMA and VALUE. Nowadays, a variety of mobile phone colorimeter applications are available in the market which provide simple, cheap and readily available color measurements. This technique improves the trueness and efficiency of color matching procedure.⁹

Rehabilitation of maxillofacial defects can be quite tricky. The level of difficulty will depend on patient's defect and the clinician's comprehension and their fine skills. Therefore, the present is performed to determine the correlation between the knowledge and fabrication prospects of maxillofacial prosthesis in post covid mucormycosis patients.

MATERIALS AND METHOD

1) A cross-sectional questionnaire study was performed on a virtual platform to assess the relationship between theoretical knowledge of maxillofacial prosthesis given in mucormycosis patients and the clinical experience amongst the prosthodontists. A 20 variable, close ended questionnaire was developed to elicit various information regarding rehabilitation of mucormycosis patients. The sample size was selected using method. A total of 200 Prosthodontists and Postgraduates all over India completed the questionnaire through google forms. The questionnaire that was prepared was in English language. It is based on the various level of challenges that the prosthodontists face during the fabrication of maxillofacial prosthesis. It has enlightened the clinician's selection of various impression materials, prosthetic materials and methods of shade matching. A four member expert panel was set up. All the items were readable and explicit and none were modified or deleted. The content validity index for items (I-CVI) was 0.86 for 13 items and 0.88 for 7 items. Scale-level content validity index universal agreement was 0.978 suggesting the construct had good operationalization. Raw data was tabulated in Microsoft Excel and descriptive analysis was estimated. The Chi Square test was performed using 20 variables between three groups based on the year of experience –

Group A = < 5 years

Group B = 5-10 years

Group C = >10 years

RESULTS AND DATA ANALYSIS

The descriptive statistical analysis was conducted through counts and percentages and by using online software IBM SPSS Statistics (Version 20.0. IBM Corp., Armonk, NY, USA). The data obtained was subjected to statistical analysis using Statistical Package for the Social Sciences (SPSS Version 23; Chicago Inc., IL, USA). Data comparison was done by applying specific statistical tests to find out the statistical significance of the comparisons.

To test for awareness level, Kolmogorov –Smirnov and Shapiro Wilk tests were performed to determine the normality of the data, Both the tests showed no significant differences and hence confirmed that the data obtained were normally distributed.

Variables were compared using numbers and percentages. The proportion for different variables or items of questionnaire between the groups of dentists with various degrees of clinical experience was compared using Chi square test. P level lesser than 0.05 is considered statistically significant.

The results are formulated in a tabular form for each of the 20 variables. Table 1 represents the involved criteria in the present study with respect to the years of experience. The Chi square value and P value has been formulated for each of the 20 variables.

DISCUSSION

Mucormycosis has been observed in our population for a very long time but its prevalence was very low. In PostCovid patients, the black fungus rose to its mark due its opportunistic behavior. Therefore, an in-depth knowledge of the maxillofacial rehabilitation procedure is very important amongst the prosthodontists.¹⁰ In this study, an overall knowledge of the fabrication procedure and its co-relation to clinical and laboratory aspects of maxillofacial prosthesis has been discussed.

A significant difference of $p = 0.02$ was observed for the number of mucormycosis treated by dentists, with more number of cases treated with increasing years of practice. It was observed that after postsurgical treatment, patients were more referred to dental hospitals rather than to private practitioners. The awareness scale of prosthetic treatment option was very low. It was found that only 30% of mucormycosis affected patients were aware about rehabilitation as against 70%, which is very discouraging, but when compared between years of clinical experience of dentists, no significant difference was noted (Graph 1). Mucormycosis is highly fulminant and invasive. Therefore, most of the clinicians have given Extraoral prosthesis(38.5%) followed by a combination of both intraoral and extraoral(35%)(Graph 2). Prosthodontists most commonly employed the conventional method (i.e. 77.5%) of fabricating prosthesis followed by digital type (12%)irrespective of clinical experience(Graph3). The advancement in technology improved the prosthetic design and increased the accuracy of the prosthesis.⁷ But the accessibility of the same was limited to the metro cities which can be attributed to low percentage for digital method of fabrication. Moving forward with the first step of restoring midfacial defect – impression making. The selection of Impression material for such large defects was confined by the rheology, availability and cost of the material. A combination of alginate, elastomeric, impression compound and digital impression was used by all professionals, with no significant difference at $p=0.632$. The sole reason for using a combination of the materials could be the variability of the type of case treated by the clinicians.

Several methods have been used to fabricate an midfacial prosthesis when a preoperative cast is not available. Most of these methods are simple and cost-effective but matching and sculpting the symmetrical morphology of the remaining anatomical structure remains a challenge.¹¹ In this study, 47% practitioners have used wax as the pattern material followed by sculpting clay with a percentage of 27%, Plastolene (15%) and Others (6%). Group B (5-10 yrs) showed the highest value in all the cases. The present criteria was quite significant with a p- value of 0.035. Wax and sculpting clay are the most common pattern material that are being used, since most of the prosthodontists are using conventional method for the fabrication of the prosthesis.

Rhino-cerebral Mucormycosis is an aggressive disease which grows rapidly affecting the midfacial region. Only 16.5% of the total study population have given bicomponent prosthesis which included both intraoral and extraoral component, connected with a special attachment. Though various attachments are available in the market but the most commonly used attachment was the bar clip($n = 12$). It can be due to larger and even distribution of force between the components.¹² Another commonly used attachment is the OT cap ($n = 9$) which is an extracoronar stud attachment system that consist of castable radicular component, castable mono

OT Box[®] and retentive caps of various rigidities. The least type of attachment incorporated in bicomponent prosthesis was the brass cylinder which could be due to the increase in the weight of the prosthesis. CAD CAM was the most commonly employed material for extra oral prosthesis in bicomponent cases. The higher use for CAD/CAM technology in such cases is because of the ease of fabrication in compound defects, which is very difficult to get restored with conventional techniques.

The level of difficulty in the fabrication process depends on the complexity of the defect and the number of components in the prosthesis. The fabrication process was found to be moderate in 109 (54.5%) and difficult in 73 (36.5%) which was significant at $p=0.00$ (Graph 4). Only 77 (38.5%) of the study population had no difficulty in availability of materials which was significant at $p=0.002$ that could be due to the lower availability of materials and patient health conditions.

Another clinical feature appreciated in postcovid Mucormycosis cases was the reoccurrence of the disease. In this survey it was seen that in 5-10% of the cases, the disease relapsed. Further, it was also observed in 84.5% of cases that the disease progressed during the fabrication procedure itself which affected the size of the defect. Also, in some cases the defect size decreased during the fabrication prosthesis thereby altering the fit of the prosthesis. This further led to the relining of the intraoral prosthesis. In about 26% of the cases, relining was performed within a time span of 45 days. A lot of adjuvant materials are used to increase the retention of the prosthesis. In this study it was observed that 37.5% clinicians have used a combination of adhesives, magnets, undercuts and spectacles based on the complexity of the defect (Graph 5). However, each has its own specifications and limitations. Adhesives and double-sided tape have been associated with skin infections, breakdown of margin, and difficulty in prosthesis positioning.¹³ Therefore, most of the clinicians refer retentive undercuts as the best method for retention in non-implant cases.

In the present study, it was observed that a combination dental materials (50%) were used for intraoral prosthesis followed by Resin (20%). Due to the extensive damage caused by black fungus, rehabilitation of the maxillofacial defect is difficult through conventional approach. Therefore, with the advancement of technology, CAD/CAM prosthesis (59%) was most commonly seen.

One of the major difficulty in the fabrication of maxillofacial prosthesis is the Shade matching procedure. About (78%) of prosthodontists felt that there was a significant difference in the shade of the prosthesis during trial and insertion appointment at $p=0.046$. The increase in the discrepancy can be related to the lack of knowledge of shade selection and inadequate communication amongst the clinicians. Around 38% of the practitioners are applying the conventional technique for shade matching. This method has been well documented in literature. However, the most recent method for shade selection is mobile colorimeter which is been used by around 31% of the clinicians.

Matting is an important step in the fabrication of maxillofacial silicone prosthesis. It gives a natural look by reducing the glossiness of the prosthesis. In this study , it was observed that only 50% of the clinicians have performed this procedure.

Black fungus is a debilitating disease. It affects patients psychology to a greater extent. In 66% of the cases, patient counseling had a positive impact on the acceptance of the prosthesis. So, even after fabricating an aesthetically pleasing prosthesis, patient counseling is still considered the utmost priority for the complete success of the treatment.

In this study, it was observed that rehabilitating a mucormycosis patient requires a combined effort of theoretical knowledge of maxillofacial prosthesis along with clinical experience, communication & awareness about the recent advances and technologies in the fabrication of such prosthesis. It also played an important role in achieving pleasing results in the reconstruction of post-covid mucormycosis cases.

Since the outbreak of Mucormycosis was in the last year itself, therefore long term follow up is still needed. The data that was collected was mostly relevant to prosthodontists. But there are general practitioners who are also rehabilitating such patients.

CONCLUSION

Though dentistry is moving towards the digital media, its application is limited to the cosmopolitan cities. Most of the prosthodontist are practicing conventional techniques. But in this study. it was appreciated that the rehabilitation of mucor cases was through a mixed approach.

The awareness for the prosthetic management of such cases is still very low .Therefore, The IDA and IPS should organize various educational programs for encouragement of restoration of maxillofacial defects by fixed prosthesis.

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