CLINICAL RESEARCH

Implant-Supported Facial Prostheses Provided by a Maxillofacial Unit in a U.K. Regional Hospital: Longevity and Patient Opinions

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Purpose: **The aim of this study was to acquire information on the types and longevity of implant-retained facial prostheses and the opinions of patients on several factors related to their prostheses.**

Materials and Methods: **A survey of 75 maxillofacial prosthetic patients currently under treatment and review at the Maxillofacial Unit, Morriston Regional Hospital was conducted through a 23-question postal questionnaire. These patients were selected as representative of a group of individuals receiving treatment or under review for the fabrication of maxillofacial prostheses.**

Results: **Of the prosthetic replacements, 83% were ear prostheses, 8% nose, 6% eye, and 2% combination prostheses. Of the 47 respondents, 8 (17%) reported that they were currently wearing their original prostheses. The remaining 39 (83%) respondents had all been provided with at least 1 replacement prosthesis. The mean lifetime of the prostheses was found to be 14 months (range: 4–36 months). The majority of replacement prostheses in this study were provided as a result of color fade or wear of the silicone material of the previous prosthesis. Individuals with no previous experience wearing a prosthesis had an unrealistic expectation of their prosthesis longevity, with a mean value of 17.8 months. In comparison, individuals with previous experience had reduced expectations, with a mean of 14.4 months. In terms of the patients' opinions of the overall quality of their prostheses, the results demonstrated that a large number of patients were satisfied. Thirty-five patients rated their prostheses as excellent and 9 as good. At 7–12 months, 4 patients rated their prostheses as excellent and 8 as good. At 13 months, 4 patients rated their prostheses as excellent and 5 as good.**

Conclusions: **It is important that advice be given to patients on the expected average longevity of their prostheses, together with information on factors affecting the longevity (i.e., environmental staining, cosmetics, and cleaning regimes). In this study, 26% of the replacement prostheses were provided due to color fading of the original prosthesis. This highlights the need for continuing research in the development of materials used for the construction of facial prostheses with improved properties, and in particular, improved color stability.**

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MAXILLOFACIAL prosthetics is concerned with the restoration and/or replacement of stomatognathic and associated facial structures by artificial substitutes that may or may not be removable.[1] It has been suggested that the area in and around the mouth is emotionally charged and strongly connected with self image. As an instrument of speech and eating, as well as a mirror of emotions, the mouth also has unique social and psychological implications and symbolic meaning.

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Disfigured individuals, lacking eyes, nose, ears, or facial tissues, may not be socially acceptable.[2] 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.[3]

Maxillofacial prostheses aim to improve the esthetics of patients, and to restore, improve, and maintain the health of the hard and soft tissues. The effective accomplishment of these objectives should expedite patients' return to society.[4] Although many facial defects are rehabilitated for cosmetic and psychological reasons, oral defects also require rehabilitation for physiological reasons. There is often a need to restore separation between the oral/nasal structures that assist the individual in speech and swallowing. Maxillofacial prostheses play an important part in rehabilitation following ablative surgery, congenital deformity, or trauma (Figs 1A–C and 2A–C). The psychological benefits and lifestyle improvement offered by maxillofacial prostheses have been well documented.[5,6] The physical and mental well-being of these patients demand good organization and communication among the health professionals involved in their treatments. This is best achieved by multidisciplinary teams working in established centers. Maxillofacial prosthetic rehabilitation is a team effort involving restorative dentists, maxillofacial technicians, dieticians, speech and language therapists, physiotherapists, general medical practitioners, specialist nurses, and social workers.[4]

The clinical and laboratory production of a maxillofacial prosthesis is a time-consuming, labor-intensive, costly process. At Morriston Regional Hospital, Swansea, United Kingdom, the costs incurred for the provision of an orbital or auricular prosthesis have been calculated to be approximately £1,000–£1,500. This figure does not take into account additional costs incurred for repairs or remakes of prostheses. Replacement of prostheses may require patient appointment times of 4–5 hours. With the clinical, laboratory, and patient time expended in the construction of a prosthesis, it is essential that all factors are taken into account to maximize the longevity of the prosthesis. Prostheses with a short life span cannot only lead to patient disillusionment with the treatment, but also to excessive use of healthcare resources.

The longevity of a prosthesis is dependent on several factors, including the materials from which it is constructed and the behavioral factors of the wearer. The problems associated with the materials available for maxillofacial prostheses such as color fade, cracking, and splitting,

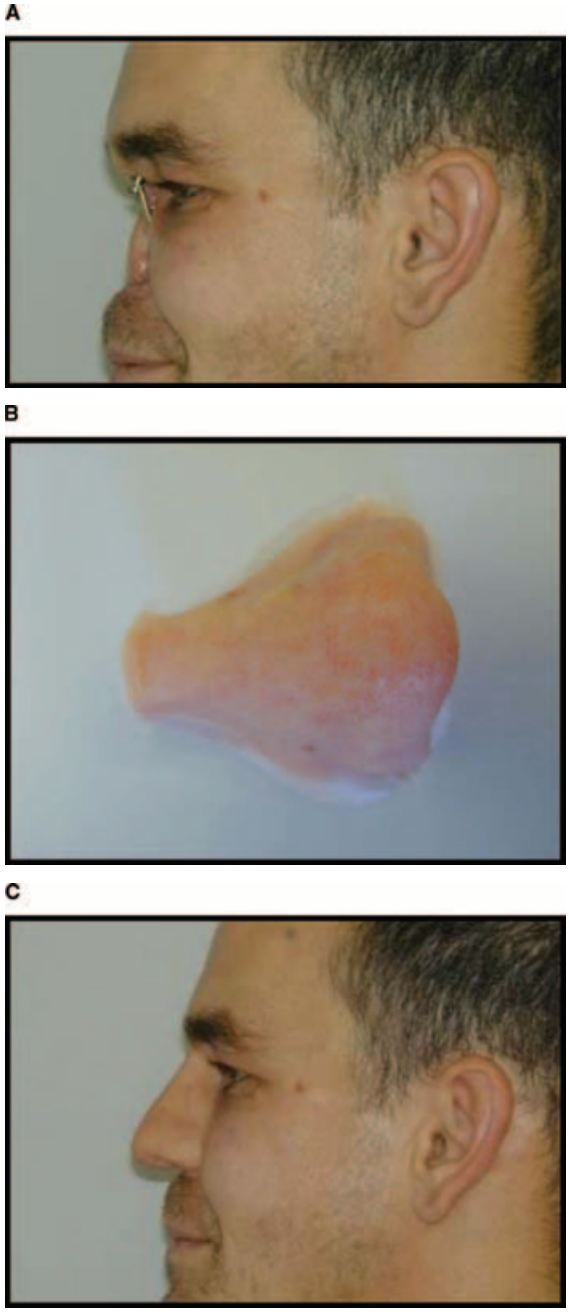

Figure 1. (*A*) Lateral view demonstrating a nasal defect and the position of dental implants for the retention of the nasal prosthesis. (*B*) Nasal prosthesis that will be attached to the implants shown in Figure 1A. (*C*) Implant-retained nasal prosthesis *in situ*.

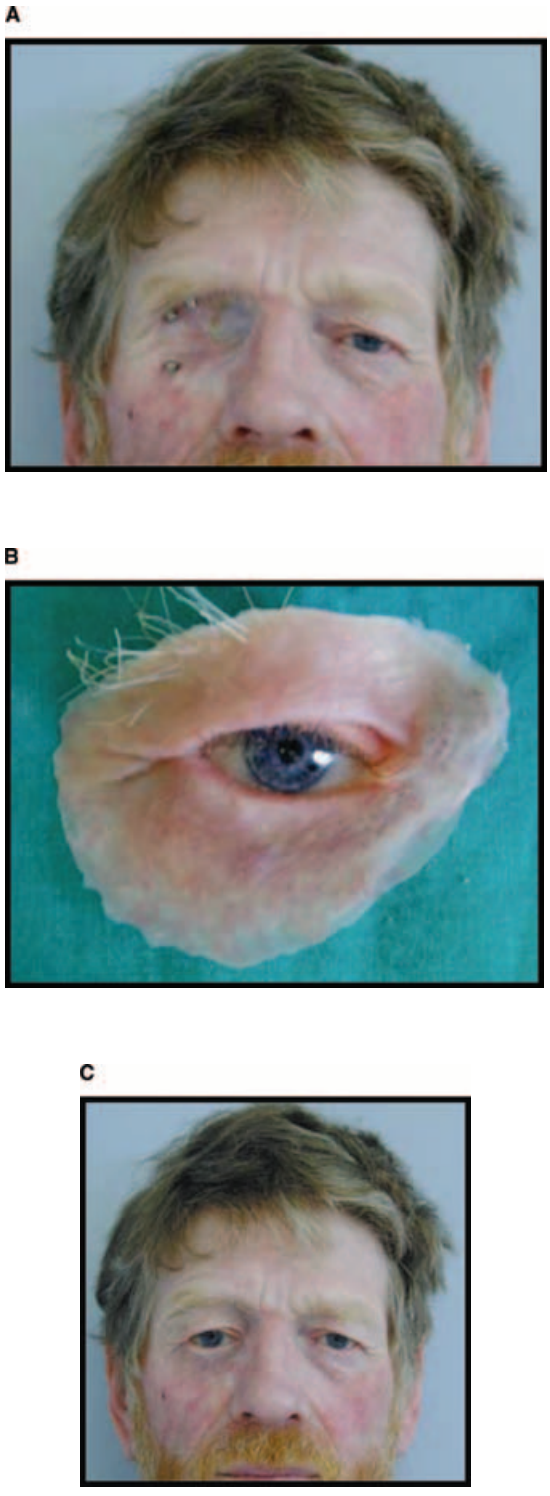

Figure 2. (*A*) Orbital defect with 3 implants *in situ*. (*B*) Orbital prosthesis that will be retained by the implants shown in Figure 2A. (*C*) Orbital prosthesis *in situ*.

together with the need for the development of improved materials, have been discussed by several authors.[7-11] Materials used for the fabrication of facial prostheses must ideally accept and retain intrinsic and extrinsic coloration. The appearance and mechanical strength must not be affected by sunlight or other environmental factors.[11] The ideal properties for materials used for the construction of prostheses should include compatibility with human tissue, flexibility, lightness, chemical and physical inertness, moldability, easy cleansing, durability, and ability to accept colorants.

Over the years, there have been several studies on the longevity of maxillofacial prostheses. Chen et al[12] reported an average prosthesis life of 10 months. Jani and Schaff[11] reported that 69.6% of prostheses needed renewal within 1 year, with an additional 17.6% requiring renewal within an 18-month period. Jebreil,[14] however, reported renewal times of 6–9 months. Since publication of these studies, a number of advancements in the clinical techniques associated with the provision of maxillofacial prostheses and the materials from which they are constructed have been made. Significant advances in the field of material science has led to the production of new silicones with improved characteristics and improved methods of prosthesis coloration.[15]

A major change has been the increased use of extraoral endosseous implants, resulting in improved retention and stability of maxillofacial prostheses.[16] The use of dental implants for the retention and stability of facial prostheses has been shown to be effective and has eliminated the need for the use of adhesive tape. The use of implants has had a major impact on patients in that they are able to function in society, confident their defects may be less noticeable. The accumulation of the positive effects as a result of the use of implant-retained prostheses has undoubtedly improved the quality of life of patients.

The demand for maxillofacial prostheses is high, and there is a need to periodically evaluate the services provided. Many prostheses are rejected by patients due to patients' high expectations and lack of information provided regarding the prostheses.[15] It is through such investigations that factors related to success and failure of the prostheses may be identified, and the results used to produce prostheses with increased longevity

and patient acceptability. The purpose of this study was to acquire information on the types and longevity of implant-retained facial prostheses and to assess the opinions of patients on several factors related to their prostheses from a group of patients currently under the care of the Maxillofacial Unit, Morriston Regional Hospital, Swansea.

Materials and Methods

An initial pilot study was undertaken with questionnaires sent to 5 randomly selected maxillofacial patients currently under treatment and review at the Maxillofacial unit, Morriston Hospital. The survey was mailed to patients at their current addresses.

These patients were asked to complete the questionnaire, to comment on the design, and to identify any problems experienced in completing the questionnaires. An accompanying letter was written to explain the nature of this survey and inform the respondents that their replies would be anonymous and confidential. A stamped addressed envelope for reply was included. The results of the pilot study did not identify any problems with the questionnaire, the questionnaires were completed satisfactorily, and no changes were recommended. The remaining 70 questionnaires were posted, for a total of 75 surveys. The questionnaire was multiple choice, with structured tick-boxes. The number of free text responses was limited. The questionnaire was designed to obtain a patient history in terms of the maxillofacial prosthesis, i.e., prosthesis type, longevity of the prosthesis, possible reasons for prosthesis replacement, period of wear, and cleaning regimen.

Results

Of the 75 questionnaires sent, 47 were returned (32 males and 15 females), for a 63% response rate. The results were subjected to a statistical analysis using χ^2 and *t*-test. The results are presented in Tables 1–7.

The ages of respondents were grouped in 10-year groups from a 10–19 years group to a 90–100 years group. The age distribution of respondents is given in Table 1. In terms of employment status, 16 were recorded as employed, 19 retired, 10 in full-time education, and 2 as other.

The proportion of each type of prosthesis was ear 39 (83%), nose 4 (8.3%), orbit 3 (6.4%), and nose/orbit 1 (2.1%).

Of the 47 respondents, 8 (17%) reported they were currently wearing their original prostheses.

Table 1. Study Population of Age Distribution

Age Grouping (Years)	*Frequency*	*Percentage of Total*
0–9	0	0
10–19	10	21.3
20–29	2	4.3
30–39	5	10.6
40–49	9	19.1
50–59	5	10.6
60–69	7	14.9
70–79	5	10.6
80–89	3	6.4
90–100	1	2.1

The remaining 39 (83%) respondents had been provided with at least one replacement prosthesis. For the 39 patients who had been provided with replacement prostheses, the mean life span of their previous prostheses is given in Table 2. The mean lifetime of the prostheses was found to be 14 months (range: 4–36 months). Orbital prostheses had the longest life span (28 months), followed by ears (13 months), nose (12 months), and finally combination prostheses (4 months). Reasons for replacement prostheses included deterioration in color (12 (26%)), wear and tear (17 (36%)), poor fit (2 (4%)), prosthesis lost (2 (4%)), replacement at annual review (1 (2%)), and no response (13 (28%)). Respondents provided more than one answer to the question.

In terms of prosthesis daily wear, 4 (8%) of the respondents reported they wore the prostheses continuously, 30 (63%) during the day, 2 (4%) at school, 8 (17%) for social outings, 2 (4%) on other occasions, and 1 (2%) did not provide a response. The number of hours per day that prostheses were worn was 0–3 (3 (6%)), 4–7 (4 (9%)), 8–11 (13 (28%)), 12–15 (19 (40%)), 16–19 (6 (13%)), 20–24 hours (1 (2%)), and no response (1 (2%)).

The results for difficulty associated with cleaning the implants were presented as a 5-point Likert Scale with a score of 1 for easy and 5 for difficult. Eighteen respondents reported a score of 1 (38%), 9 (19%) a score of 2, 12 (26%) a score of 3, 4 (9%) a score of 4, and 2 (4%) a score of 5. Two respondents did not provide a response.

The degree of difficulty experienced when inserting or removing the prosthesis was recorded using the Likert scale. Forty-one (87%) respondents reported no difficulty with a score of 1, 4 (9%) a score of 2, 1 (2%) a score of 4, and 1 (2%) a score of 5.

Table 2. Longevity of Prosthesis

Prosthesis Type	*All Prostheses*	*Nose*	*Ear*	*Orbit*	*Nose/Orbit*
Mean lifetime	14 months	12 months	13 months	28 months	4 months
Min. lifetime recorded	4 months	12 months	4 months	12 months	4 months
Max. lifetime recorded	36 months	12 months	24 months	36 months	4 months

Patients' perceptions of the quality of fit of the prostheses at the edges are presented in Table 3. Patients' perceptions of degree of comfort are presented in Table 4. In terms of realism of color match of the prosthesis, the results are presented in Table 5. Patients' opinions of shape and fine detail of their prostheses when new are provided in Table 6. Patients were asked to give their prostheses overall scores for quality when new and at the present time. Scores were gathered as excellent, good, adequate, or poor. Each category was given a numerical value to enable a mean score to be calculated. The results are presented in Table 7.

Discussion

In many instances our results were similar to previous studies, with a few exceptions. The distribution by patient gender (68% male, 32% female) demonstrated similar proportions of the sexes as reported in previous studies.[10,11] Previous studies reported a higher number of nose prostheses than the 8% here.[10,11]

The mean prosthesis life span in this survey, 14 months, was slightly longer than the values reported in previous studies.[12-14] A possible reason for this could be the introduction and use of improved materials for maxillofacial prostheses. Despite this improvement, the life spans of the prostheses were relatively short. The majority of replacement prostheses in this study were provided as a result of color fade or wear of the silicone material of the previous prostheses. No significant differences were attributed to sex or age of the respondents. One might expect an increase in longevity for ear prostheses provided for females with long hair, due to a possible reduction in environmental exposure as a result of protection by the hair. The limited longevity of facial prostheses can often be attributed to deterioration of the material from which they are constructed, and, in particular, due to color instability. Studies have reported that color fading is a common reason for patients disliking their prostheses. The discoloration of facial prostheses may be the result of intrinsic or extrinsic colorations secondary to environmental factors. It is a complex multifactorial phenomenon and may include several factors such as the intrinsic characteristics of the material, pigments, personal habits (cleaning regimes and use of cosmetics), and environmental staining (climate, fungal, and body oil accumulation).[10] It is important that research continues in this field.

Patient expectation of the longevity of their current prostheses did not significantly vary from the longevity of previous prostheses. Males had a mean prosthesis longevity of 11.4 months with an expectation of longevity of 14.3 months. Therefore, men tended to have an overestimated expectation of the longevity of their prostheses. Females had lower expectation of prosthesis longevity

Table 3. Patients' Perception of Quality of Fit of the Prosthesis at the Edges

Quality of Edge	*1 (Excellent)*	*2*	*3*	*4*	*5 (Poor)*
New (n = 45)	31	12	2	0	0
0–6 months (n = 14)	4	6	3	1	0
7–12 months (n = 19)	5	5	4	4	1
13+ months (n = 12)	3	1	5	2	1

Applying the χ^2 test between results for: new and 0–6 months, $p = 0.014$; 0–6 months and 7–12 months, $p = 0.655$; 7–12 months and 13+ months, $p = 0.646$.

Table 4. Patients' Perception of the Degree of Comfort of Prosthesis

Comfort	*1 (Excellent)*	*2*	*3*	*4*	*5 (Poor)*
New (n = 45)	33	9	1	1	1
0–6 months (n = 14)	9	4	0	0	1
7–12 months (n = 19)	11	4	2	2	0
13+ months (n = 12)	8	1	3	0	0

Applying the χ^2 test between results for: new and 13+ months, $p = 0.08$.

Table 5. Patients' Perception of the Realism of Color Match

Color Match	*1 (Excellent)*	*2*	*3*	*4*	*5 (Poor)*
New (n = 45)	34	9	2	0	0
0–6 months (n = 14)	5	4	5	0	0
7–12 months (n = 19)	9	1	5	4	0
13+ months (n = 12)	3	1	3	4	1

Applying the χ^2 test between results for: new and 0–6 months, $p = 0.003$; 0–6 months and 7–12 months, $p = 0.097$; 7–12 months and 13+ months, $p = 0.545$.

Table 7. Patients' Overall Opinion of Prosthesis

Overall Opinion	*Excellent*	*Good*	*Adequate*	*Poor*
New (n = 45)	35	9	0	0
0–6 months (n = 14)	5	7	1	1
7–12 months (n = 19)	4	8	6	1
13+ months (n = 12)	4	5	2	1

Applying the χ^2 test between results for: new and 0–6 months, $p = 0.196$; 0–6 months and 7–12 months, $p = 0.288$; 7–12 months and 13 + months, $p = 0.178$.

(15.8 months) than the life spans of previous prostheses worn (17.8 months).

A significant difference was observed in expected prosthesis life span among patients who had worn prostheses previously and those who were wearing their first prosthesis. The results demonstrated that those individuals with no previous experience had unrealistic expectations of prosthesis longevity, with a mean value of 17.8 months. In comparison, individuals with previous experience had reduced expectations with a mean of 14.4 months. This was an important finding, as unrealistic expectations of prosthesis longevity could be a potential cause of patient dissatisfaction with treatment. Average prosthesis longevity should be discussed during the formulation of the treatment plan for the achievement of realistic goals within the treatment provided.

Another problem identified by first-time wearers of prostheses was difficulty inserting and removing the prostheses. First-time wearers found this task significantly more difficult than patients with previous maxillofacial prostheses. This finding highlighted the importance of sufficient instruction in insertion and removal of the prosthesis.

In terms of quality of fit at the prosthesis edges, the results demonstrated that the patients' perceptions of the quality of fit was good upon insertion of the prosthesis and decreased with time. Regarding the degree of comfort (Table 4), the patient opinions demonstrated a high satisfaction with their new prostheses and decreased satisfaction as the prostheses aged. This is in agreement with a previous study.[17]

In terms of the patients' opinions of the overall quality of their prostheses, the results demonstrated that a large number of patients were satisfied, giving a score of excellent or good for their prosthesis.

Table 6. Patients' Perception of Realism of Prosthesis Shape and Reproduction of Fine Detail

	1 (Excellent)	*2*	*3*	*4*	*5 (Poor)*
Realism of shape (n = 45)	34	8	2	1	0
Realism of fine detail (n = 45)	34	9	2	0	0

Conclusions

Fabrication of maxillofacial prostheses is time-consuming, labor intensive, and costly. The results of this study demonstrated that for some patients the expected longevity of their prosthesis is higher than the actual longevity of the prosthesis. It is important, therefore, that advice is given to patients on the expected average longevity of their prosthesis, together with information on factors affecting the longevity at the first appointment. Many of the replacement prostheses were provided due to color fading of the original prostheses, highlighting the need for continuing research in the development of materials used for the construction of facial prostheses with improved properties—particularly improved color stability.

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