Short Communication

Implant-Retained Auricular Prostheses: An Assessment of Implant Success and Prosthetic Complications

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The aims of this study were to evaluate the success rates and peri-implant soft tissue responses of auricular implants, to assess prosthetic complications, and to calculate the survival rate of silicone auricular prostheses. Twenty-nine extraoral implants were placed in 10 patients with 11 auricular defects. Implant failure was defined as clinically detectable implant mobility, and a 5-point scale was used to record the health of peri-implant soft tissues. Prosthetic complications were assessed, and the survival rate of silicone auricular prostheses was calculated using Kaplan-Meier analysis. The implant success rate was 100%. A few soft tissue problems were noted. The overall cumulative survival rate for the first prostheses of the patients was 70% after 18 months. The mean survival time was 17 months. Extraoral implants had a very high success rate in the mastoid region. Prosthetic assessment indicated that although experience with wearing prostheses reduces retention degradation, discoloration and reduced quality of fit at the prosthesis edge over time remain the major problems in maxillofacial prosthetics. *Int J Prosthodont 2008;21:241–244.*

An auricular defect can be caused by several conditions, including trauma, congenital malformation, or surgical removal of a neoplasm.[1,2] The replacement of a missing external ear may be accomplished prosthetically or surgically using an array of techniques. Surgical reconstruction often requires numerous surgical procedures spanning several years. The resulting structure may not closely resemble the contralateral ear or be positioned to provide facial balance. Prosthetic replacement may produce an anatomically correct and esthetically pleasing prosthesis.[3] Historically, retention of maxillofacial prostheses was provided by adhesives, anatomic undercuts, or connection to eyeglasses.[3,4] The use of craniofacial implants for retention of extraoral prostheses can provide excellent support and retentive abilities and improve a patient's appearance and quality of life. The aims of this study were *(1)* to determine the success rates and soft tissue reactions of 29 extraoral implants placed in the mastoid bone to retain and stabilize the auricular prostheses of 10 patients, *(2)* to assess prosthetic complications, and *(3)* to calculate the cumulative survival rate of silicone auricular prostheses.

Materials and Methods

This prospective study included 10 patients treated with osseointegrated implant-retained auricular prostheses. Patients with any condition that affected healing or who failed to return for follow-up examinations were excluded from the study. Extraoral implants (EO implant, Straumann) were placed along an arc posterior to the external auditory meatus. The implants were left unloaded for approximately 3 months to allow osseointegration. At stage 2 surgery, short or long abutments (EO conical abutment short/long, Straumann) were connected to

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Fig 1a Implant sites following an approximately 4-week healing period. Implant abutments are in place before impression making.

Fig 1b Dolder bar in place with passive and accurate fit.

Fig 1c Silicone auricular prosthesis in place.

the implants according to the peri-implant soft tissue thickness. The implant sites were allowed to heal for approximately 4 weeks (Fig 1a). A Dolder bar (no. 048.411, Straumann) was fabricated to splint the implants together (Fig 1b). Retention was obtained with Dolder bar matrix (no.048.413, Straumann). The auricular prostheses were fabricated from silicone (Cosmesil, Principality Medical) (Fig 1c). Patients were instructed in hygiene procedures when the prostheses were delivered.

After prosthetic reconstruction, a clinical follow-up examination was carried out every 6 months by the same examiner. Patients were examined twice in the first 6 months. Implant failure was defined as clinically detectable implant mobility. The implant abutments were assessed manually for the presence of any mobility and recorded as positive or negative after removal of the Dolder bar. Since it was difficult to take standardized radiographs in the facial region, bone loss was not used as a criterion for implant success. Peri-implant tissue reactions were recorded according to the criteria proposed by Holgers et al.[3] Each visit/site unit was assigned one of the following scores:

- 0 = no irritation
- 1 = slight redness
- 2 = red and slightly moist tissue
- 3 = granulation, red and moist tissue
- 4 = infection

Prosthetic complications included bar fracture, retention degradation, substructure fracture, wear/tear of the prosthesis, and discoloration. Clinical assessments were undertaken by the same examiner for reproducibility of the measurements. Patients were questioned about the quality of retention and color match at periodic intervals. Responses were recorded as satisfied or unsatisfied. Bar fracture, substructure fracture, wear/tear of the prosthesis, and quality of fit at the prosthesis edge were recorded as positive or negative. The criteria to end the life span of a prosthesis were wear/tear of the prosthesis, decrease in quality of fit at the prosthesis edge, and dissatisfaction of the patient and examiner with the color match. Kaplan-Meier analysis was carried out to reveal the survival rate of the first silicone auricular prostheses. The sample size was inadequate to define survival rates of the second and third prostheses using Kaplan-Meier analysis.

Results

Patient and implant characteristics are shown in Table 1. One implant was buried. No implant failures were noted during the observation period (100% success rate). The peri-implant skin reactions are summarized in Table 2. For the study period, 130 visits/sites were scored in terms of the soft tissue condition. Prosthetic complications are summarized in Table 3. The life span of the prosthesis ended when the patient and examiner were unsatisfied with the color match or quality of fit at the prosthesis edge. No bar fractures, acrylic resin substructure failures, or wear/tear of the prostheses were observed. The cumulative survival rate for the first prostheses of the patients was 70% after 18 months according to Kaplan-Meier analysis (SE: 0.75; 95% confidence interval) (Fig 2). The mean survival time of the silicone prostheses was 17 months.

Table 1 Patient and Implant Characteristics

Patient	Sex	Age (y)	Observation period (mo)	Defect etiology	No. of implants	Abutment length (mm)	Soft tissue around implants	Implant failure
1	Male	48	33	Trauma	2	2 × 3.5	Skin	–
2*	Male	47	20	Burn	6	2 × 3.5 4 × 5.5	Dorsal skin graft	–
3	Male	21	32	Congenital	2	2 × 3.5	Skin	–
4	Male	32	27	Trauma	3	3 × 3.5	Skin	–
5	Male	26	15	Congenital	3	2 × 5.5	Skin	1 buried
6	Male	32	38	Trauma	2	2 × 3.5	Skin	–
7	Male	26	35	Burn	3	3 × 3.5	Burned skin	–
8	Male	21	18	Congenital	3	2 × 5.5 1 × 3.5	Skin	–
9	Male	10	20	Congenital	2	2 × 3.5	Skin	–
10	Male	28	14	Trauma	3	3 × 5.5	Skin	–

*Bilateral defects.

Table 2 Summary of Soft Tissue Reactions Around the Implants According to a Visit/Site Unit (N = 130) for Each Implant Site

	Score				
Patient	0	1	2	3	4
1	10	2	–	–	–
2	–	6	14	4	–
3	12	–	–	–	–
4	12	3	–	–	–
5	6	–	–	–	–
6	14	–	–	–	–
7	6	6	1	5	–
8	12	–	–	–	–
9	8	–	–	–	–
10	9	–	–	–	–
Total	89 (68.5%)	17 (13.1%)	15 (11.5%)	9 (6.9%)	–

Table 3 Summary of Prosthetic Complications

	Assessment time						
	3 mo	6 mo	12 mo	18 mo	24 mo	30 mo	36 mo
Bar fracture	-	-	-	-	-	-	-
Retention degradation	Patient 3 Patient 6 Patient 8 Patient 9	Patient 1 Patient 2# Patient 10	Patient 8	-	-	Patient 6*	-
Substructure failure	-	-	-	-	-	-	-
Wear/tear of the prostheses	-	-	-	-	-	-	-
Discoloration	-	-	Patient 2# Patient 3 Patient 7	Patient 1 Patient 4 Patient 6 Patient 9*	-	Patient 3* Patient 7**	Patient 6*
Decrease in quality of fit of the prostheses at the edges	-	Patient 7	Patient 2# Patient 3	Patient 7* Patient 4	-	Patient 7**	-
Renewal of the prostheses	-	Patient 7*	Patient 2#* Patient 3*	Patient 1* Patient 4* Patient 6* Patient 7** Patient 9*	-	Patient 3**	Patient 6**

#Bilateral defects.
*Second prosthesis; **third prosthesis.

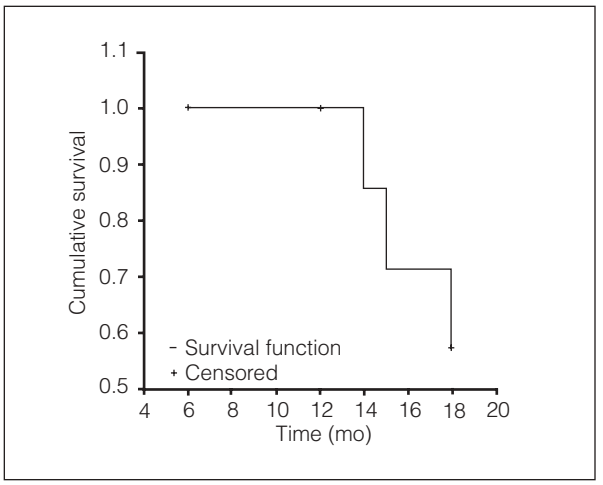

Fig 2 Survival analysis of the first prostheses of 10 patients after 18 months (SE: 0.75; 95% confidence interval).

Discussion

The implant success rate found in this study is in accordance with previous studies.[2,3,5] The mastoid process provides excellent bone quality and volume. Major peri-implant soft tissue had complications were noted in 2 patients. These patients had suffered severe burns, which led to the loss of their external ears. Peri-implant soft tissues of the patients therefore consisted of scar tissue caused by these burns. Some of the other patients had minor soft tissue complications, which were most commonly associated with lapses in hygiene. Symptoms resolved when the patients improved their hygiene compliance. Other studies have described hygiene as a determinant factor in maintaining peri-implant tissue health.[3,5]

The most frequent prosthetic complication was the retention degradation of the retentive elements. This problem was observed in some of the patients at the 3- and 6-month follow-ups. Retention was improved by activating the Dolder bar matrix with the activator device, and the patients were re-instructed on the insertion and removal of the prostheses. The results of the subsequent examinations revealed fewer retention problems. Hooper et al[4] reported that first-time wearers had difficulty inserting and removing their prostheses. In the current authors' opinion, experience wearing prostheses reduces the damage of prostheses. Wear or tear of prostheses was not observed in any case. This may be a result of the introduction and use of improved materials for maxillofacial prostheses. Despite this improvement, discoloration and decrease in quality of fit at the prosthesis edges over time remain the major problems. In this study, the majority of replacement prostheses were provided as a result of discoloration and decrease in quality of fit.

Conclusion

Implants placed in the mastoid region to restore auricular defects had a high survival rate. Hygiene is the most important factor in mantaining peri-implant soft tissue health. Thin and immobile soft tissues around the implant site facilitate hygiene procedures. Patients should be informed about the expected longevity of the prosthesis as well as any potential prosthetic complications.

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