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Asian Journal of Oral Health and Allied Sciences

Original Article

Effect of progressive tissue contracture on functionality of obturator prosthesis: A 3-year follow-up

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Received : 24 August 2022
Accepted : 18 October 2022
Published : 17 November 2022

DOI
10.25259/AJOHAS_13_2022

Quick Response Code:

ABSTRACT

Objectives: This clinical report describes the long-term effect of tissue contracture on functionality of obturator prosthesis.

Material and Methods: Eleven patients who underwent maxillectomy confined only to the hard palate and rehabilitated sequentially with immediate surgical obturator followed by interim closed bulb hollow obturator were included in the study. These patients were followed up every 3 months for 3 years and obturator prosthesis was relined at each appointment. All patients were evaluated for retention, resonating frequency, and percentage nasality after wearing obturator prosthesis at every 3 months following relining till 3 years.

Results: At baseline, mean retention score ± SD (Median), % nasality, and resonating frequency were 7.25 ± 0.62 (7), 12.00 ± 0.74 (12), and 0.12 ± 0.05 (0.115) kHz, respectively. During follow-up intervals, mean retention scores showed a gradual increase from 6-month follow-up itself (7.50 ± 0.52) and reached to the peak value at 24 months (9.17 ± 0.83). With respect to change in % nasality and resonating frequency at different follow-up periods as compared to baseline, a declining trend was observed from the first follow-up (6 months). This declining trend continued in subsequent intervals too with the values reaching to their nadir at 30 months.

Conclusion: Literature regarding detrimental effects of tissue contracture exists; however, little has been talked about the beneficial role of tissue contracture on the obturator function. This paper provides an insight about the usefulness of tissue contracture as related to obturator function and retention.

Keywords: Maxillectomy, Maxillary obturator, Tissue contracture

INTRODUCTION

Surgical defects created in maxilla may be in the form of partial or radical maxillectomy. A radical maxillectomy entails resection of entire maxilla up to the midline whereas partial maxillectomy is less encompassing and may create a smaller defect.[1] An inevitable effect of maxillary defect includes progressive tissue contracture that ultimately results in soft-tissue collapse and contorted facial profile.[2]

Prosthodontic rehabilitation of such defect involves fabrication of an obturator prosthesis. However, with rapid tissue contracture, retention, support, and stability of obturator prosthesis are always at compromise.[3] The cheek surface and scar band at the junction of the skin graft and the oral mucosa tend to stretch with time. The posterior margin of the defect is also subject to change if it extends into the area of velopharyngeal function.[4] In addition, the medial bony margin of the defect remodels and becomes rounded. These changes further accentuate the

existing problem with obturator prosthesis and demand frequent relining of obturator bulb, especially during initial 18 months following surgery.[5]

In the previous study, it was found that efficacy of obturator prosthesis in reducing the nasality was more in smaller defects as compared to larger defects. Defects with larger diameters (diameter > 28.50 mm) when obturated did not show a similarly effective trend in reduction of nasality.[6] However, inevitable tissue contracture over years may result in reduction of defect size, thereby affecting nasality and overall functionality of obturator.

However, the literature lacks evidence related to long-term effects of tissue contracture. Hence, the present study was planned to evaluate the long-term effect of tissue contracture on functionality of obturator prosthesis.

MATERIAL AND METHODS

The present study was conducted in the Department of Prosthodontics, Saraswati Dental College and Hospital, Lucknow, in collaboration with Lucknow Cancer Institute. Prior approval of the Institutional Ethical Committee had been obtained from both the concerned institutions.

Eighteen patients (12 males and six females) who underwent maxillectomy confined only to the hard palate (Aramany's Class I and Class II defect) between 2012 and 2015 and rehabilitated sequentially with immediate surgical obturator followed by interim closed bulb hollow obturator were included in the study. These patients were followed up every 3 months for 3 years and obturator prosthesis was relined at each appointment. Seven patients were lost in the follow-up. Thus, the sample size constituted 11 patients (eight males and three females). All patients were evaluated for retention, resonating frequency, and percentage nasality after wearing obturator prosthesis at every 3 months following relining till 3 years. Written informed consent was obtained from all the patients.

Method of recording retention of the obturator prosthesis

Retention of the obturator was subjectively measured by visual analog scale. The patients were asked to score the retention of the obturator prosthesis on a scale of 0–10 with "0" depicting no retention and "10" depicting highest retention.

Resonating frequency and percentage nasality were calculated using PRAAT software.[6]

Data were analyzed using Statistical Package for the Social Sciences version 21.0. As the sample size was small and some of the data were ordinal in nature, a non-parametric evaluation plan was adopted. Wilcoxon signed-rank test was used to compare the baseline retention score, % nasality, and resonating frequency with follow-up values of corresponding variables. The confidence level of the study was kept at 95%; hence, "P" < 0.05 was considered statistically significant.

RESULTS

At baseline, mean retention score ± SD (Median), % nasality, and resonating frequency were 7.25 ± 0.62 (7), 12.00 ± 0.74 (12), and 0.12 ± 0.05 (0.115) kHz, respectively. During follow-up intervals, mean retention scores showed a gradual increase from 6-month follow-up itself (7.50 ± 0.52) and reached to the peak value at 24 months (9.17 ± 0.83). At last follow-up, the mean value was 9.08 ± 0.51. Significant change from baseline was observed from 9-month period when mean retention scores were 7.92 ± 0.51 (P = 0.011). The significance of change from baseline was maintained throughout the subsequent follow-up periods (P < 0.05) [Table 1].

With respect to change in % nasality at different follow-up periods as compared to baseline, a declining trend was observed from the first follow-up (6 months) itself when mean % resonance value was 9.17 ± 1.03 and this declining trend continued in subsequent intervals too with the values reaching to their nadir at 30 months (4.08 ± 1.08). At subsequent follow-up intervals (33 months and 36 months), the mean values remained stable (4.08 ± 1.08%). In terms of statistical significance, at all the follow-up intervals, the mean change was significant statistically (P = 0.002) [Table 2].

On evaluating the pattern of change in resonating frequency at different follow-up periods as compared to baseline, a declining trend was seen from first follow-up at 6 months (0.08 ± 0.03 kHz) which continued in subsequent follow-up intervals too. The nadir of resonating frequency was achieved at 27 months when mean value was 0.03 ± 0.01. Mean values

Table 1: Retention scores at baseline and different follow-up intervals.

S. No.	Time interval	Mean	SD	Median	Significance of difference from baseline	
					z	"*P*"
1.	Baseline	7.25	0.62	7		
2.	6 months	7.50	0.52	7.5	1.732	0.083
3.	9 months	7.92	0.51	8	2.530	0.011
4.	12 months	7.92	0.51	8	2.138	0.033
5.	15 months	8.42	0.67	8.5	2.697	0.007
6.	18 months	8.67	0.49	9	3.017	0.003
7.	21 months	8.83	0.58	9	3.002	0.003
8.	24 months	9.17	0.83	9	2.969	0.003
9.	27 months	9.17	0.83	9	2.969	0.003
10.	30 months	9.08	0.51	9	3.115	0.002
11.	33 months	9.08	0.51	9	3.115	0.002
12.	36 months	9.08	0.51	9	3.115	0.002

remained unchanged at subsequent follow-up intervals too. In terms of statistical significance, at all the follow-up intervals, the mean change was significant statistically ($P = 0.002$) [Table 3].

DISCUSSION

Dimensional changes in tissue continue to occur for at least a year secondary to scar contracture and further organization of the wound.[7-12] Numerous authors have advocated the use of immediate surgical obturator to minimize scar tissue contracture and subsequent facial disfigurement.[13-16] These contractures not only necessitate frequent relining of the obturator but also create small undercut areas that become potential source of increased hypernasality and nasal resonance even after successful obturation.[12]

Table 2: % Resonance at baseline and different follow-up intervals.

S. No.	Time interval	Mean	SD	Median	Significance of difference from baseline	
					z	"*P*"
1.	Baseline	12.00	0.74	12		
2.	6 months	9.17	1.03	9	3.084	0.002
3.	9 months	7.58	1.16	8	3.089	0.002
4.	12 months	7.08	1.62	7.5	3.071	0.002
5.	15 months	6.42	1.78	7	3.077	0.002
6.	18 months	5.58	1.51	6	3.077	0.002
7.	21 months	5.08	1.44	5.5	3.077	0.002
8.	24 months	4.58	1.24	4.5	3.084	0.002
9.	27 months	4.17	1.03	4	3.081	0.002
10.	30 months	4.08	1.08	4	3.081	0.002
11.	33 months	4.08	1.08	4	3.081	0.002
12.	36 months	4.08	1.08	4	3.081	0.002

Table 3: Resonating frequency at baseline and different follow-up intervals (kHz).

S. No.	Time interval	Mean	SD	Median	Significance of difference from baseline	
					z	"*P*"
1.	Baseline	0.12	0.05	0.115		
2.	6 months	0.08	0.03	0.09	3.070	0.002
3.	9 months	0.07	0.03	0.07	3.066	0.002
4.	12 months	0.06	0.03	0.065	3.069	0.002
5.	15 months	0.05	0.03	0.055	3.063	0.002
6.	18 months	0.04	0.02	0.04	3.066	0.002
7.	21 months	0.04	0.02	0.04	3.065	0.002
8.	24 months	0.03	0.02	0.03	3.063	0.002
9.	27 months	0.03	0.01	0.025	3.062	0.002
10.	30 months	0.03	0.01	0.025	3.061	0.002
11.	33 months	0.03	0.01	0.025	3.062	0.002
12.	36 months	0.03	0.01	0.025	3.062	0.002

In the present study, nearly all patients had a rapid decrease in the mean resonating frequency and percentage nasality in first 9 months that became gradual in the next 24 months with no change thereafter. A study by Kar and Tripathi[4] has found that even with the delayed obturation, optimal restoration of esthetics and function is achievable despite a time lag in prosthodontic therapy after surgery.

Another appealing phenomenon was increased retention of obturator prosthesis. The mean retention scores showed a gradual increase from 6 months and reached to the peak value at 24 months. The improved retention might be due to increased tension of lateral scar band following rapid tissue contracture. A longitudinal scar band formed at the junction of the skin graft and the oral mucosa created a retentive pocket above and support area below the band. Engaging the scar band superiorly and inferiorly with the obturator prosthesis enhanced its retention. There are two intrinsic areas within the defect that provide retention to the obturator itself: The lateral scar band and the height of the lateral wall of the defect. With tissue remodeling within defect, the height of the lateral wall deceases and the scar band tends to stretch. This stretching may necessitate frequent relining of the prosthesis.[2] In the present study, relining was done every 3 months and the result showed increased retention of the obturator prosthesis.

CONCLUSION

Literature regarding detrimental effects of tissue contracture exists; however, little has been talked about the beneficial role of tissue contracture on the obturator function. This paper provides an insight about the usefulness of tissue contracture as related to obturator function and retention.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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How to cite this article: Tripathi A, Gupta A, Rai P, Dwivedi R. Effect of progressive tissue contracture on functionality of obturator prosthesis: A 3-year follow-up. Asian J Oral Health Allied Sci 2022;12:12.