

Impact of Bariatric Surgery and Diet Modification on Periodontal Status: A Six Month Cohort Study

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ABSTRACT

Background: Nutrition is an essential component of oral health and improper nutrition is an important aetiological factor in the development of obesity as well.

Aims and Objectives: This study aimed to evaluate effect of diet modification and oral hygiene maintenance after bariatric surgery on the periodontal status of Class III and IV obese patients.

Materials and Methods: Two hundred and twenty four patients between the age ranges of 18 -64 years, from both sexes, were subjected to complete periodontal examination prior to bariatric surgery and 6 months post surgery. Patients were advised diet modification which included more fibrous food intake & decreased intake of soft and sugary food along with supragingival scaling &

oral health care regime after bariatric surgery with a 6 month follow up. No periodontal surgical intervention was performed.

Results: The patients showed a mean differences in the bleeding score, plaque and gingival index which was found to be statistically significant ($p < 0.001$). The improvement in clinical attachment level and probing pocket depth before and after surgery were found to be statistically insignificant ($p > 0.05$).

Conclusion: Thus we conclude that fibrous diet along with good periodontal care can help to improve the oral hygiene status of patients undergoing bariatric surgery, even if periodontal surgical intervention is not performed resulting in freedom from periodontitis, thus improving quality of life of the patient.

Keywords: Bleeding on probing, Dental plaque index, Gingival index, Periodontitis

INTRODUCTION

Periodontitis, by definition is a chronic inflammatory disease of bacterial origin that affects the surrounding supporting structures of teeth and remains one of the most ubiquitous diseases of mankind [1]. An association between obesity and periodontitis was first noted in a rat model by Perlstein and Bissada (1977), Since then several epidemiological studies have supported this observation [2].

Obesity is defined as a body mass index (BMI) $> 30.0 \text{ Kg/m}^2$. It is described as unhealthy accumulation of body fat, which is due to imbalance between food eaten and energy expended [3].

Several methods have been proposed for weight loss in obese patients, like dieting, physical exercise, pharmacologic treatment, and surgical intervention. A recent systematic review concluded that bariatric surgery is an effective and cost efficient intervention for moderate to severely obese individuals when compared to non surgical interventions available [4-7].

Time and again it has been emphasized that nutrition holds the key to health but literature lacks a study which has documented this correlation. Hence, the aim of the present study was to verify alterations in periodontal status in patients before and after bariatric surgery, and to evaluate if a correlation exists between diet modification, oral prophylaxis and periodontal status of these patients.

MATERIALS AND METHODS

A prospective cross-sectional study was conducted in the Department of Periodontics, Sri Aurobindo College of Dentistry, Indore. Two hundred and fifty patients were evaluated who opted for bariatric surgery at Mohak hi-tech hospital, Indore from 2013 to 2015. The participants were recruited based on the inclusion criteria: (1) Age > 18 years; (2) Diagnosis of periodontitis classified as mean clinical attachment loss of $> 2 \text{ mm}$; (3) More than 20 teeth present; (4) BMI $> 30 \text{ kg/m}^2$. Patients were excluded from the study if they were: (1) pregnant; (2) Corticosteroid users; (3) Patients who had undergone any periodontal therapy less than 1 year before study.

A total of 234 patients met the inclusion-exclusion criteria out of which 224 subjects agreed to participate in the study and were selected by non-probability sampling technique. Ethical approval was obtained and prior consent of patients for the publication of the clinical details were taken into account. The diagnosis of obesity was made by two physicians using established clinical and medical practice and calculation of BMI.

Data was collected from all participants pertaining to age, sex, medical history, BMI and details of medications used, if any. The baseline data was collected by a calibrated examiner (DL) who evaluated the Probing pocket depth, Clinical attachment level, (at four sites per tooth), Gingival index (Loe & Silness), Plaque index (Loe H) and Percentage of sites with bleeding on probing [8,9].

Inter and intraclinical examiner reliability analyses were performed on five randomly selected patients who were unrelated to the study till no significant difference in the correlation between measurements was noted.

Before bariatric surgery the periodontal parameters such as probing pocket depth (PPD), clinical attachment level (CAL), gingival index (GI), plaque index (PI) and percentage of bleeding sites (% BS) were recorded and were treated as baseline measurements. Pre-surgical scaling (prior to bariatric surgery) was performed and the patients were given a diet chart which comprised of a more fibrous diet with less fatty and sugary components. The patients were instructed to comply with the chart for six months.

The patients were recalled every month for monitoring of the diet, however no intervention was performed. Six months after bariatric surgery re-assessment of periodontal status was performed by the same examiner, who was blinded to the patient detail and previous reading taken so as to eliminate bias.

STATISTICAL ANALYSIS

Statistical analyses included both descriptive and inferential methods. The data was analysed by using statistical software SPSS version

Body Mass Index (Kg/M ²)	Classification of BMI	Before Bariatric Surgery		After Bariatric Surgery		
		Male N=144 (%)	Female N=80 (%)	Male N=144 (%)	Female N=80 (%)	
25.0-29.9	Normal	-	-	44 (30.6)	36 (45.0)	
30.0-34.9	I (High)	47 (32.6)	34 (42.5)	41 (28.5)	14 (17.5)	
35.0-39.9	II (Very High)	39 (27.1)	16 (20.0)	39 (27.1)	23 (28.8)	
≥40.0	III (Extremely High)	58 (40.3)*	30 (37.5)	20 (13.9)	7 (8.8)	
Variable	Parameter	Range		95% CI of the Diff		t-value (p value)
		Mean±SD		LB	UB	
Body Mass Index (kg/m ²)	Baseline	38.34±5.72		4.63	5.05	46.20 (p<0.001)
	After	33.51±5.57				
	Mean Difference	4.83**kg/m ²				

[Table/Fig-1]: Body Mass Index at baseline before and after Bariatric Surgery

Figure in parenthesis () denotes the corresponding percentage

*The mean difference is highly significant at the 0.001 level of significance. **The mean difference is not significant (Insignificant) at the 0.05 level of significance. [Degrees of freedom is 223; CI-Confidence Interval; Diff-Difference; UB-Upper Bound; LB-Lower Bound]

11.0. Prevalence of an outcome variable along with 95% confidence interval was calculated. Continuous variables were expressed as mean ± standard deviation (or range). Non-continuous variables were expressed as number of occurrences and percentage. Z-test and one-way ANOVA was used to compare the mean values of periodontal status between baseline and after measurements. The probability value p<0.05 was considered as significant while p<0.001 was considered as highly significant.

RESULTS

It was observed that more than half (64.3%) of the subjects were males while rest were females. The age of patients was observed to be between 18 to 64 years with a spread of mean age 48.79±9.27 years for males and 46.48±10.22 years for females.

[Table/Fig-1] reveals that after bariatric surgery subjects showed significantly reduced body mass index. After bariatric surgery, only 13.9% males and 8.8% females were identified with ≥40.0 Kg/M² BMI as compared to 40.3% males and 37.5% females before surgery. At baseline, none of the subject were in the normal BMI range but after bariatric surgery 30.6% male and 45.0% female were identified with normal BMI. The spread of body mass index of subjects after bariatric surgery was 33.51±5.57 kg/m² which was significantly lower as compared to baseline measurements that measured 38.34±5.72 kg/m². This difference was strongly (p<0.001) significant as confirmed on statistical grounds.

[Table/Fig-2] shows that the clinical attachment level as seen in males and females at baseline and after bariatric surgery was the same. A total of 80.6% male and 81.3% female were observed to have severe periodontitis (≥5 mm) while moderate periodontitis was found in some (19.4% and 18.8%).

[Table/Fig-3] shows the mean plaque index (PI) and gingival index (GI) of patients after bariatric surgery which was 1.23±0.32 mm and 1.39±0.32 mm respectively which was significantly lower in comparison to baseline measurements (1.62±0.36 mm and 1.81±0.43 mm respectively).

The mean differences of 0.39mm in PI and 0.42mm in GI was strongly significant (p<0.001). At baseline and after bariatric surgery measurements, the mean differences of 0.01 in clinical attachment level (CAL) and 0.002 in pocket probing depth (PPD) were identified to be insignificant (p>0.05) on statistical grounds.

The mean percentage of bleeding sites (% BS) of patients after bariatric surgery was (37.44±10.56 %) which was found to be significantly reduced as compared to baseline measurements (46.71±12.29 %). The mean differences of 9.27% in % BS was found to be highly significant (p<0.001).

DISCUSSION

Association between obesity and periodontitis was first noted in a rat model by Perlstein and Bissada [2]. A hyper-inflammatory state was

CAL (mm)	Classification of CAL	Clinical Attachment Level (CAL)			
		Before Bariatric Surgery		After Bariatric Surgery	
		Male N=144 (%)	Female N=80 (%)	Male N=144 (%)	Female N=80 (%)
1-2	Mild Periodontitis	-	-	-	-
3-4	Moderate Periodontitis	28 (19.4)	15 (18.8)	28 (19.4)	15 (18.8)
≥5	Severe Periodontitis	116 (80.6)*	65 (81.3)	116 (80.6)	65 (81.3)

[Table/Fig-2]: Clinical Attachment Level at baseline and after Bariatric Surgery.

*Figure in parenthesis () denotes the corresponding percentage

Variable	Parameter	Range	95% CI of the Diff		t-value (p value)
		Mean±SD	LB	UB	
Plaque Index (mm)	Baseline	1.62±0.36	0.35	0.42	22.71 (p<0.001)
	After	1.23±0.32			
	Mean Difference	0.39**mm			
Gingival Index (mm)	Baseline	1.81±0.43	0.39	0.45	26.84 (p<0.001)
	After	1.39±0.32			
	Mean Difference	0.42**mm			
Clinical Attachment Level	Baseline	5.55±1.16	-0.003	0.021	1.42 (p>0.05)
	After	5.54±1.16			
	Mean Difference	0.01*			
Pocket Probing Depth	Baseline	3.24±1.00	-0.009	0.54	1.39 (p>0.05)
	After	3.22±0.99			
	Mean Difference	0.02*			
% of Bleeding Sites	Baseline	46.71±12.29	8.66	9.88	29.94 (p<0.001)
	After	37.44±10.56			
	Mean Difference	9.27%**			

[Table/Fig-3]: Comparison in periodontal status at baseline and after bariatric surgery

**The mean difference is highly significant at the 0.001 level of significance. *The mean difference is not significant (Insignificant) at the 0.05 level of significance. [Degrees of freedom is 223; CI-Confidence Interval; Diff-Difference; UB-Upper Bound; LB-Lower Bound]

Phase	Diet	Duration
1	Clear liquid	2 to 4 days
2	Full liquid	4 days to 3 weeks
3	Pureed	2 weeks to 1 month
4	Soft	1 month to 6 to 8 weeks
5	Normal	Begin at week 8. This will be your lifelong way of eating.

[Table/Fig-4]: Diet chart prescribed for patients treated by bariatric surgery

1	Drink liquids 30 minutes before meals or 30 minutes after meals, not during meals.
2	Eat protein first. It is essential that you get enough protein for healing, nutrition and to prevent loss of lean muscle mass. You will need a minimum of 50 grams
3	Eat balanced meals. A balanced meal includes vegetables, fruits and whole grains. These foods are higher in fiber, which will help keep you feeling satisfied. Eating foods in this category can also reduce constipation.
4	Eat three meals each day.
5	Avoid foods that are high in sugar or fat. Eat foods with less than 10 grams of sugar per serving. Choose low-fat foods with 3 grams of fat or less per serving.
6	Take small bites and chew food well. Foods that are not chewed well may cause nausea and/or vomiting.
7	Stop eating when you feel satisfied.
8	Drink at least 6 to 8 cups of non-calorie liquids between meals.

[Table/Fig-5]: Tips given to patient to improve nutritional status

proposed as a mechanism to explain this association. In our study we tried to prove this theory, we found that post surgically the patients showed a decreased body mass index and along with this also demonstrated decrease in PI and bleeding on probing which is in accordance with Lakkis et al., who found that those patients who had lost significant weight after bariatric surgery showed improved response to non surgical periodontal therapy compared to those who did not undergo bariatric surgery and had not lost weight by non surgical treatment modalities [10].

Our results are contrasting to Pataro et al., who found high grade of periodontitis in both preoperative and postoperative follow up [11]. This could be due to the diet modification employed by us as an additional tool which according to our survey has not been used by any researcher as a tool so far.

Al Zahrani et al., have shown that patients who underwent bariatric surgery were more likely to be motivated to adopt health enhancing behaviors such as diet improvement and physical exercise [12,13]. We wanted to evaluate if this is true and hence only non surgical oral prophylaxis along with diet modification which advised increased intake of fibrous food along with decreased consumption of fatty and sugary food was used as a treatment regimen for evaluating the effect bariatric surgery and diet on periodontal health [Table/Fig-4,5], rather than employing periodontal surgical interventions, so that whatever changes occur could be attributed only to hygiene maintenance and diet.

We found that in spite of not performing any aggressive periodontal treatment the percentage of bleeding sites, gingival index and plaque index were significantly reduced post-surgery as compared to the pre-surgical recording, the difference of which was found to be statistically significant. Thus we can confirm that these could be attributed to the positive changes in lifestyle of patients which included a healthy diet.

No significant changes were found in PPD and CAL. The reason was this finding could be that these parameters often change only after periodontal surgical therapy, which was not performed in our study; hence there were no changes as such.

LIMITATIONS OF STUDY

The limitation of this study is that all the patients were given the same diet modification so direct comparison between modified and unmodified diet could not be evaluated. Also, effect of surgical and non surgical intervention for obesity on periodontal health could not be assessed.

Clinical Significance

Periodontitis is a systemic disorder and so is obesity. Obesity has been linked with periodontal diseases. Treating obesity will not be enough to improve the quality of life of a patient. For overall rehabilitation of patient education regarding oral hygiene maintenance, diet modification and periodontal awareness must be included in the treatment regimen to provide the patient a life free of obesity and periodontitis.

CONCLUSION

The maintenance of oral health is very important before and after bariatric surgery, considering that after surgery patients need to chew slowly and for a longer time to prevent adverse effects, such as nausea and vomiting. Hence we suggest that diet modification and oral prophylaxis must be incorporated as a protocol for patients undergoing bariatric surgery to reduce the side-effects of surgery and improve the overall quality of life of patients before and after the intervention.

FURTHER SCOPE

Future research using surgical and non surgical periodontal therapy should be employed along with modified and unmodified diet to elucidate the role of surgical maneuver and diet on oral health. Additionally, longitudinal monitoring of these individuals is recommended at least upto 5 years for better significance.

REFERENCES

- [1] Krejic C, Bissada NF. Obesity and periodontitis : A link. *General Dentistry*. 2013; 61(1):60-63.
- [2] Perlstein MI, Bissada NF. Influence of obesity and hypertension on the severity of periodontitis in rats. *Oral Surg Oral Med Oral Pathol*. 1977;43:707-19.
- [3] The American academy of periodontology. Glossary of periodontal terms. 4th ed. Chicago, IL: *The American academy of periodontology*; 2001:38.
- [4] Lau DC, Douketis JD, Morrison KM, et al. Canadian clinical practice guidelines on the management and prevention of obesity in adults and children[summary]. *CMAJ*. 2007;176:S1-S13.
- [5] Hussain SS, Bloom SR. The pharmacological treatment and management of obesity. *Postgrad Med*. 2011;123:34-44.
- [6] Picot J, Jones J, Colquitt JL, et al. The clinical effectiveness and cost effectiveness of bariatric (weight loss)surgery for obesity: A systematic review and economic evaluation. *Health Technol Assess*. 2009;13:1-190, 215-357.
- [7] Shikora SA, Kim JJ, Tarnoff ME. Nutrition and gastrointestinal complications of bariatric surgery. *Nutr Clin Pract*. 2007;22:29-40.
- [8] Loe H, Silness J. Periodontal diseases in pregnancy, I- prevalence and severity. *acta odonta Scand*. 1963;21:533-51.
- [9] Loe H. The gingival Index, the Plaque index and the retention index system. *J Periodontology*. 1967;38(6):610-16.
- [10] Lakkis D, Bissada N, Saber A, Khaitan L, Palomo L, Narendran S, et al. Response to periodontal therapy in patients who had weight loss after bariatric surgery and obese counterparts: A pilot study. *J Periodontol*. 2012;83:684-89.
- [11] Pataro A, Costa F, Corte S, Cortellii J, Souza A, Abreu M, et al. Influence of obesity and bariatric surgery on the periodontal condition. *J Periodontol*. 2012;83:3: 257-66.
- [12] Al Zahrani MS, Borawski EA, Bissada NF. Periodontitis and three health enhancing behaviours:maintaining normal weight engaging in recommended level of exercise and consuming a high quality diet. *J Periodontol*. 2005;76:1362-66.
- [13] Al Zahrani MS, Borawski EA, Bissada NF. Increased physical activity reduces prevalence of periodontitis. *J Dent*. 2005;33:703-10.

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FINANCIAL OR OTHER COMPETING INTERESTS: None.

Date of Submission: **Apr 26, 2015**

Date of Peer Review: **Jun 09, 2015**

Date of Acceptance: **Aug 03, 2015**

Date of Publishing: **Sep 01, 2015**