Clinical and Radiology Evaluation of Open Flap Debridement-Only and Bone Graft+Membrane Treatments

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Abstract

Periodontitis with a deep pocket can be treated with open flap debridement, and regenerative therapy can be done if there is an intrabony defect. The aim of this study was to compare the clinical and radiographic outcomes of flap surgeries with or without bone graft+membrane. Forty-eight chronic periodontitis patients underwent flap surgery with or without bone graft+membrane. All patients had a probing pocket depth (PPD) of ≥6mm. Secondary data from each patient's dental record was used to obtain initial PPD, clinical attachment loss (CAL), gingival recession (GR) and bone height (BH) via radiography. After treatment, we re-examined patients to measure these data. Mean scores for PPD, ΔGR, CAL and BH non-bone graft groups were 3.93±2.05 mm, 1.64±1.73 mm, 2.28±2.52mm and 1.27±1.29mm; the bone graft group's mean scores were 3.95±1.59mm, 1.10±1.26mm, 2.85±1.9 mm and 2.28±2.23. A Mann-Whitney test showed that PPDs between groups were not significantly different. CAL, GR and BH showed a significant difference between the bone graft and non-bone graft groups. The results of this research show that periodontal surgery with and without bone graft+membrane can reduce pocket size, and bone graft + membrane offers an additional benefit in terms of CAL gain, GR loss and BH gain

Clinical article (J Int Dent Med Res 2017; 10(Special Issue: pp. 701-706)

Keywords: Clinical evaluation, radiographic evaluation, periodontal flap surgery, bone graft.

Received date: 17 August 2017 **Accept date:** 19 September 2017

Introduction

Periodontitis is an infectious disease marked by inflammation within the supporting tissues of the teeth, progressive attachment loss and bone loss. This disease results in pocke forrmation and GR. Around 70–80% of adults in the world have periodontal disease, and 95% of those affected have chronic periodontitis.[1]

Periodontitis treatment's initial aim is to eliminate causal bacteria and etiology factors of periodontitis, so that disease progression can be stopped.[2] After successful cause-related therapy, the surgical treatment of persisting pockets is recommended to re-establish a periodontal anatomy able to sustain periodontal health after treatment. Surgical cleansing of the defect and the root surface can re-establish periodontal health when proper plaque control is established.[3] A treatment approach has been developed to aid in decision making called evidence-based health care; in periodontology it is called evidence-based periodontology. Evidenced-based periodontology may help the patient choose the best treatment based on the success rate of the treatment.[4] The measurements used to evaluate the result of periodontal flap surgery are reduced pocket depth, bone resorption at ease and increased clinical attachment.[5]

At the Clinic of Periodontics, Dental Teaching Hospital, Faculty of Dentistry Universitas Indonesia (RSKGM FKG UI), we treated deep pocket and bone defects with periodontal flap surgery with or without regeneration therapy. We conducted open flap debridement to treat deep pockets with horizontal bone loss, and on the other side we conducted open flap debridement (OFD) + regenerative therapy with bone graft +

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membrane for deep pockets with an intrabony defect. We have done many periodontal surgeries with and without bone graft + membrane, but research has not been conducted to evaluate the result of periodontal flap surgery with and without bone graft + membrane at RSKGM FKG UI. In this study, researchers intended to evaluate the results of periodontal flap surgeries performed with and without bone graft + membrane at RSKGM FKG UI during 2011–2016.

Methods

This research study is a clinical epidemiology with primary and secondary data. The type of research is analytic epidemiology. Ethical submission was sent to the Research Ethic Commission FKGUI and accepted in October 2016. We searched patients' dental recordes for those who had been treated with flap surgery with and without bone graft and resorbable membrane from 2011–2016, had complete data including a good quality radiograph that matched the inclusive criteria and could be recalled to be evaluated. The data we collected from patients' dental record included Oral Hygiene Index Score (OHIS), GR, PPD, CAL and BH obtained by radiograph. We recalled patients to come for evaluation, informed them about the study and asked them to approve and sign the informed consent form. We did evaluation after flap surgery with and without bone graft + membrane then collected OHIS, GR, PPD, CAL and BH data. All data is analysed using SPSS.

PPD was measured with a PUNC 15 probe. CAL was measured by adding pocket depth and GR. GR was assessed based on the distance between gingival margins and cementoenamel junction (CEJ). BH was evaluated only on the mesial and distal sides of the teeth by periapical radiograph, measured from the peak of the alveolar bone to the CEJ using digital calipers (Nankai, China).

Inclusion criteria were 26 years and older (adult age according to the Indonesian Ministry of Health), patients with a diagnosis of chronic periodontitis that had been treated with periodontal flap surgery with and without bone graft+membrane, a PPD of more than 5 mm, a BH of more than 3 mm and patients who could be contacted to come for evaluation control. Exclusion criteria were patients with aggressive periodontitis, necrotizing ulcerative gingivitis (NUG), necrotizing ulcerative periodontitis (NUP), systemic disorders, patients using orthodontic appliances, smokers and radiographs that were not readable (faded, yellowish and/or too dark). The indications of OFD-only are a horizontal bone defect and suprabony pocket. The indications of OFD with bone graft + membrane are an angular/vertical bone defect and infrabony pocket.

Results

The study was conducted in 48 patients with 70 operating regions and consisted of 249 sides teeth, including mesial, buccal, distal, and palatal/lingual. From 249 sides, consist of 126 sides were open flap debridement (OFD) only, meanwhile 123 sides were OFD and bone graft + membrane. Table 1 shows analysis of before and after OFD from pocket depth, gingival recession, clinical attachment loss and bone height.

Table 2 shows analysis of before and after open flap debridement with bone graft and membrane from pocket depth, gingival recession, clinical attachment loss and bone height. Table 2 shows there are significant differences before and after OFD + bone graft and membrane for clinical parameters (pocket depth, gingival recession, CAL, BH).

There are decreased PD, increased GR, increased CAL, and increased alveolar BH. Table 3 shows analysis differences of PD, GR, CAL, and BH between OFD and OFD with bone graft and membrane. Table 3 shows there is no significant difference for pocket depth reduction between OFD only and OFD + bone graft and membrane, but there are significant differences for recession increase, CAL gain, and BH gain.

Table 1. Analysis of Differences in Pocket Depth, Gingival Recession (GR), Clinical Attachment Level (CAL) and Bone Height (BH) before and after Open Flap Debridement (OFD).

OFD	N	Mean (SD) (mm)	Median (mm)	Min–Max *p* value (mm)
Pocket Depth				.00
Before	126	7.26 (1.84)	7	6–15
After	126	3.36 (1.66)	3	1–13
GR				.00
Before	126	1.30 (1.83)	8	0–9
After	126	3.00 (1.44)	6	0–9
CAL				.00
Before	126	8.57 (2.78)	0	6–20
After	126	6.33 (2.26)	3	2–17
BH				.00
Before	135	6.51 (2.06)	6	3–14
After	135	5.22 (1.62)	5	2–10

Table 2. Analysis of Differences in Pocket Depth, GR, CAL and BH before and after OFD+Bone Graft+Membrane.

OFD+Bone Graft+membrane	N	Mean (SD) (mm)	Median (mm)	Min–Max *p* value (mm)
Pocket Depth				‘.00
Before	123	7.04 (1.22)	7	6–10
After	123	3.10 (1.32)	3	1–9
GR				‘.00
Before	123	0.71 (1.12)	0	0–4
After	123	1.77 (1.33)	2	0–5
CAL				‘.00
Before	123	7.75 (1.66)	7	6–13
After	123	4.89 (1.69)	5	1–11
BH				‘.00
Before	115	7.97 (3.11)	7	4–17
After	115	5.53 (1.98)	5	2–10

Wilcoxon Test; p = <.05 significant difference.

Table 3. Differences in Pocket Depth Reduction, Increase of Recession, CAL Gain, and BH Gain of Open Flap Debridement between Groups with and without Bone Graft+membrane.

Open Flap Debridement	Mean (SD)	Median	Min–Max	p value
	(mm)	(mm)	(mm)	
Pocket Depth Reduction				0.51
OFD	3.93 (2.05)	4	0–14	
OFD+bone graft+membrane	3.95 (1.59)	4	0–8	
Increase of Recession				.01*
OFD	1.64 (1.73)	2	(-4)–5	
OFD+bone graft+membrane	1.10 (1.26)	1	(-2)–5	
CAL Gain				.01*
OFD	2.28 (2.52)	2	(-2)–13	
OFD+bone graft+membrane	2.85 (1.91)	3	(-1)–9	
BH Gain				.01*
OFD	1.27 (1.29)	1	(-1)–5	
OFD+bone graft+membrane	2.28 (2.23)	2	(-2)–8	

Mann-Whitney test; p = <.05 significance difference.

Discussion

Based on the PPD in both groups in this study, there were improvements in the periodontal dental record as shown by a significant decrease in pocket depth. This corresponds with the goal of periodontal surgical treatment, which is eliminating pockets to limit local risks in creating re-infection.[6–8]

Based on GR, only the OFD group showed significant increase, indicating that all periodontal defects will experience GR after periodontal flap surgery. This is related to the healing process of periodontal tissue after surgical therapy.[8]

Periodontal tissue healing after surgical therapy without using regenerative material inhibits maturation of fibrin clots, thereby preventing the migration of connective tissue attachment and supporting the migration and proliferation of epithelial cells along the root surface.[9] These unstable fibrin clots can inhibit wound healing and affect the stability of gingival margins.[10] It occurs because the periodontal flap surgery treatment will produce GR. The clinical attachment also decreases due to the significantly increased GR.

The BH in the OFD-only group experienced a 1-mm increase. This was consistent with the study by Jentsch in that the lack of supracrestal bone growth in the periodontal fibre is due to a lack of available space under the gingival flap on supra-alveolar type defects to allow for new bone formation.[11]

Regenerative material prevents the formation of junctional epithelium, which is usually formed after conventional flap surgery.[12,13] According to McClain and Schallhorn, using a combination of bone graft material and membrane is better for long-term stability. The membrane's function is to prevent the formation of long functional epithelium and the bone graft's

function is to fill defects and support the membrane so it will not collapse.[14] In our research, we found that the regenerative materials most frequently used are allograft and bovine pericardium membrane. Many residents used these materials because numerous studies have experienced a good success rate with them, and experienced the benefits of unlimited graft material, affordability and no need for a second site for taking an autograft.[15-18]

Predictable periodontal regenerative therapy is influenced by the patients' oral hygiene, the operator's surgical skill and the form of the bone defect. Plaque control after operation and professional maintenance greatly affects optimal healing.[3,19]

Wound and stability clot is the key to a successful regenerative therapy, and failure of wound closure is associated with imperfect clinical results.[12,20,21] The two-walled and three-walled bone defects are the most predictable defects that can be treated with regenerative therapy.[22]

This study shows that both the OFD-only group and the OFD with regeneration therapy group result in improved clinical measurements, characterized by a significant decrease in PPD, increase in CAL and increase in BH. Flap surgery has been used as a standard to manage residual pockets after cause-related therapy. Some systematic reviews have shown that access flap surgery results in shallower pockets and an increase in CAL.[23,24] Both surgery with and without bone graft + membrane showed an increase in GR. This indicates that all periodontal defects experienced a GR after periodontal flap surgery and this is related to the healing process of periodontal tissue after surgical therapy.

The CAL and the recession showed significant differences between the OFD-only group and the OFD + bone graft + membrane group, but the PPDs showed no significant differences. This because when periodontal tissue heals after surgical therapy without the use of regenerative material, the maturation of fibrin clots is inhibited, thereby preventing the migration of connective tissue attachment and supporting the migration and proliferation of epithelial cells along the root surface. These unstable fibrin clots can inhibit wound healing and affect the stability of the gingival margins. Therefore, the OFD-only group showed more recession than OFD with regenerative material. This effect also decreased the CAL in the OFD-only group as compared to the OFD with regenerative material group.

Conclusion

The clinical evaluation of the OFD-only group and the OFD with regenerative material group showed significant differences in GR and CAL values. There were no significant differences in PPD values. Improvement in both clinical and radiographic periodontal dental record could be achieved through maintaining oral hygiene and regular visits to the dentist.

Acknowledgement

The publication of this manuscript is supported by Universitas Indonesia.

Declaration of Interest

The authors report no conflict of interest.

References

1. Armitage GC, Cullinan MP. Comparison of the Clinical Features of Chronic and Aggressive Periodontitis. Periodontol 2000. 2010;53:12-27.
2. Jönsson B, Ohrn K, Lindberg P, Oscarson N. et. al. Evaluation of an Individually Tailored Oral Health Educational Programme on Periodontal Health. J Clin Periodontol. 2010:37(10):912-9.
3. Stabholz A, Soskoline WA, Shapira L. Genetic and Environmental Risk Factors for Chronic Periodontitis and Aggressive Periodontitis. Periodontol 2000. 2010;53:138-53.
4. Kale TA, Mirchandani NM, Raghavan MF. Evidence Based Periodontology: An Overview. IOSR J Dent Med Sci. 2015;14(7):47-58.
5. Varughese V, Mahendra J, Thomas AR, et.al. Ambalavanan N. Resection and Regeneration? A Novel Approach in Treating A Perio-Endo Lesion. J Clin Diagn Res. 2015;9(3):8-10.
6. Merin R. Supportive Periodontal Treatment. In: Carranza's Clinical Periodontology. 11th ed. Missouri: Elsevier, Saunders. 2012:746.
7. Chhina S. A 12 Months Clinical and Radiographic Study to Assess the Efficacy of Open Flap Debridement and Subepithelial Connective Tissue Graft in Management of Supracrestal Defects. J Int Oral Health. 2015;7(8):108-13.
8. Sculean A, Nikolidakis D, Schwarz F. Regeneration of Periodontal Tissues: Combinations of Barrier Membranes and Grafting Materials – Biological Foundation and Preclinical Evidence: a Systematic Review. J Clin Periodontol. 2008;35(Suppl 8):106-16.

9. Susin C, Wikesjo UM. Regenerative Periodontal Therapy: 30 Years of Lessons Learned and Unlearned. Periodontol 2000 2013;62(1):232-42.
10. Chavan RS, Tiwari IR, Bhongade ML, et.al. Jaiswal P, Deo VDS. Open Flap Debridement in Combination with Subepithelial Connective Tissue Graft (SCTG) for the Prevention of Post-Operative Gingival Recession: A Report on a Series of Cases. Perio. 2008;5(4):275-80.
11. Jentcsh. A Clinical Study Evaluating the Treatment of Supra-Alveolar-Type Defects with Access Flap Surgery with and without An Enamel Matrix Protein Derivative: A Pilot Study. J Clin Periodontol. 2008;35(8):713-8.
12. Graziani F, Gennai S, Cei S, et al. Clinical Performance of Access Flap Surgery in the Treatment of the Intrabony Defect. A Systematic Review and Meta-Analysis of Randomized Clinical Trials. J Clin Periodontol. 2012;39(2):145-56.
13. Chen ST, Darby IB, Reynolds EC. A Prospective Clinical Study of Non-Submerged Immediate Implants: Clinical Outcomes and Esthetic Results. Clin Oral Implants Res. 2007;18(5):552-62.
14. Bosshardt DD, Sculean A. Does Periodontal Tissue Regeneration Really Work? Periodontol 2000 2009;51:208-19.
15. Cortellini P, Tonetti MS. Regenerative Periodontal Therapy. In: Clinical Periodontology and Implant Dentistry. Wiley. 2008:901-48.
16. Kher VK, Bhongade ML, Shori TD, Kolte AP, Dharamthok SB, Shrirao TS. A Comparative Evaluation of the Effectiveness of Guided Tissue Regeneration by Using A Collagen Membrane with or without Decalcified Freeze - Dried Bone Allograft in the Treatment of Infrabony Defects: A Clinical and Radiographic Study. J Indian Soc Periodontol. 2013;17(4):484-9.
17. Keles GC, Sumer M, Cetinkaya BO, Tutkun F, Simsek SB.et.al. Effect of Autogenous Cortical Bone Grafting in Conjunction with Guided Tissue Regeneration in the Treatment of Intraosseous Periodontal Defects. Eur J Dent. 2010;4(4):403-11.
18. Gothi R, Bansal M, Kaushik M, Khattak BP, Sood N, Taneja V. et.al. A Comparative Evaluation of Freeze Dried Bone Allograft and Decalcified Freeze Dried Bone Allograft in The Treatment of Intrabony Defects: A Clinical and Radiographic Study. J Indian Soc Periodontol. 2015;19(4):411-5.
19. Sculean A, Kiss A, Miliauskaite A, Schwarz F, Arweiler NB, Hannig M. et.al. Ten-Year Results Following Treatment of Intra-Bony Defects With Enamel Matrix Proteins and Guided Tissue Regeneration. J Clin Periodontol. 2008;35(9):817-24.
20. AlGhamdi AS, Shibly O, Ciancio SG. Osseous Grafting Part I: Autografts and Allografts for Periodontal Regeneration--A Literature Review. J Int Acad Periodontol. 2010;12(2):34-8.
21. AlGhamdi AS, Ciancio SG, Shibly O. Osseous Grafting Part II: Xenografts and Alloplasts for Periodontal Regeneration–A Literature Review. J Int Acad Periodontol 2010;12(2):39-44.
22. Nevins M, Kao RT, McGuire MK, et al. Platelet-Derived Growth Factor Promotes Periodontal Regeneration in Localized Osseous Defects: 36-Month Extension Results from A Randomized, Controlled, Double-Masked Clinical Trial. J Periodontol. 2013;84(4):456-64.
23. Cortellini P, Tonetti MS. Clinical and Radiographic Outcomes of the Modified Minimally Invasive Surgical Technique with and without Regenerative Materials: A Randomized-Controlled Trial in Intra-Bony Defects. J Clin Periodontol. 2011;38(4):365-73.
24. Esposito M, Grusovin MG, Papanikolaou N, Coulthard P, Worthington H V. et.al. Enamel Matrix Derivative (Emdogainò) for Periodontal Tissue Regeneration in Intrabony Defects. Eur J Oral Implantol. 2009;2(4):247-66.