

Treatment of Gingival Recession: An Analysis of Current Literature and Recommendations

Community 300Y

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Gingival recession is defined as the apical migration of the junctional epithelium with exposure of root surfaces¹. It is a common condition and its extent and prevalence increase with age. It has been estimated that 50% of the population has 1 or more sites with 1mm or more of such root exposure. This prevalence rate increases to greater than 88% for individuals who are 65 years or older¹. There are various etiological factors and complications that make gingival recession a concern for patients. Etiological factors include, but are not limited to, malaposition of teeth, poor oral hygiene, aggressive toothbrushing and orthodontic treatment.¹ Gingival recession puts the patient at risk for root caries and abrasion/erosion of roots due to exposure to the oral environment. The chief complaint of patients who present to dental offices with gingival recession are dentin hypersensitivity and esthetic distress as a result of etiological factors and their sequelae.

Periodontal plastic surgery and non-surgical treatments for gingival recession have been reviewed in the dental literature. The aim of this paper is to assess the validity and use of surgical and non-surgical treatment for gingival recession, and to provide the practitioner with the knowledge required in making patient-centred, evidence based decisions with respect to the treatment of gingival recession.

The surgical modalities assessed include Connective Tissue Graft (CTG), Free Gingival Graft (FGG), Guided Tissue Regeneration (GTR) and the Coronally Advanced Flap (CAF). Systematic reviews and current research are used to assess the efficacy of these procedures, and to provide dentists with recommendations as to the best form of surgery for gingival recession. Furthermore, non-surgical treatment using scaling, root planing and polishing is also assessed and compared to surgical modalities.

METHODS:

A systematic method was established to search for articles relating to the topics of surgical and non-surgical treatments for gingival recession. The search involved the use of PubMed, Medline and Cochrane databases to search for review papers written in English, based on human studies for the treatment of gingival recession. Other inclusion criteria included publication dates ranging from January 1990 to December 2005 that were available at or through the University of Toronto Libraries in hardcopy or e-journal format. The target population for this paper was healthy, non-smoking adults with a Miller Class 1 or 2 type defect. Search terms for the surgical treatment group included combinations of the following terms: Surgical treatment, gingival recession, Connective tissue graft, Guided Tissue Regeneration, Coronally advanced flap and Free gingival graft. Search terms for non-surgical treatments included: Non-surgical treatment, gum recession, gingival recession and periodontal recession. There were a total of 3 reviews that met the criteria for surgical treatment modalities.^{4,5,6} One RCT met the scoring cutoffs for non-surgical treatment.⁷ Articles deemed relevant to this paper were independently analyzed by each of the authors and assessed based on the CTFPHC criteria², and included only if they reported pre and post treatment root coverage statistics, had a 95% confidence interval, evaluated a minimum of 15 articles and had no more than one deduction on the checklist for review articles³. Table 1 summarizes the breakdown of papers that met the inclusion criteria at each of the 4 stages of reading.

	# of titles found matching article	# of articles rejected at title stage	# of articles rejected at abstract stage	# of articles retrieved and copied for review	# of articles rejected after reading	# of articles scored	# of articles meeting scoring cutoffs
Surgical Treatment and Gingival recession	67	59	5	3	0	3	3 ^{4,5,6}
Non-surgical treatment and gingival recession	13	11	1	1	0	1	1 ⁷
Non-surgical treatment and gum recession	0	0	0	0	0	0	0
Non-surgical treatment and periodontal recession	16	13	1	2	1	1	1 ⁷

Table 1- Summary of findings based on search topics and scoring cutoffs.

The 3 review articles that were determined to be relevant were scored according to the CTFPHC “Checklist for a Review Article”.³ The highest possible score was 9. In addition, 4 studies,^{8,9,10,11} each utilized and referenced by all 3 review articles, were randomly retrieved and scored using the CTFPHC “Checklist to Assess Evidence of Efficacy of Therapy or Prevention” to test the validity of the reviews’ resources. The highest possible score was 16. A summary of the rating of the 4 articles is presented below in Table 2.

ARTICLE	CRITICAL APPRAISAL SCORE	WEAKNESS
Trombelli L, Scabbia A, Tatakis DN, Calura G. Subpedicle connective tissue graft versus guided tissue regeneration with bioabsorbable membrane in the treatment of human gingival recession defects. J Periodontol 1998;69:1271-1277	15/16	Similarity of groups at start of trial
Zucchelli G, Clauser C, De Sanctis M et al. “Mucogingival Versus Guided Tissue Regeneration Procedures in the Treatment of Deep Recession Type Defects. J Periodontol 1998;69:138-145	15/16	Not clear about ethical approval ie. “informed consent”
Modica F, Del Pizzo M, Rocuzzo M, Romagnoli R (2000) Coronally advanced flap for the treatment of buccal gingival recession with and without enamel matrix derivative. A split-mouth study. Journal of Periodontology 71:1693-1698	15/16	Study population too small (12 patients, 24 sites)
Paolantonio, M., di Murro, C., Cattabriga, A., Cattabriga, M. Subpedicle connective tissue graft versus free gingival graft in the coverage of exposed root surfaces. A 5-year clinical study. Journal of Clinical Periodontology 1997; 24: 51-56.	14/16	It was uncertain whether drop-outs/losses were accounted for in the study. Blinding of patients and examiners was not considered feasible.

Table 2- Critical Appraisal of Randomly selected papers used to confirm validity of review articles related to Surgical Treatment of Gingival Recession.

By assessing the quality of randomly selected research papers used in the reviews by Clauser et al., Oates et al. and Rocuzzo et al., we can conclude that each of these reviews was conducted under acceptable conditions.

Lastly, 4 RCTs published since 2002 and directly relevant to the PICO question were evaluated.^{12,13,14,15} Their validity was assessed using the same CTFPHC “Efficacy of Therapy Checklist” and their results were compared to those presented in each systematic review. In determining that the outcomes of the more recent studies are consistent with the reviews, we can be confident that no new advances have been made in periodontal plastic surgery, that would otherwise need to be addressed.. A summary of these articles is presented in Table 3 below.

Study	Population	Intervention	Control	Outcome (95%CI)	Appraisal	Within review parameters
Tozum TF. et al. (2005) ¹²	21fm, 10m Non-smoker Healthy	Modified tunnel N=14	Langer & Langer N=17	RC(MT): 3.36mm, 96.43% (LL) 2.56mm, 75.53%	15/16 on checklist Grade A, Level 1	Yes (CTG)
Paolantonio M, (2002) ¹⁴	32m and 38f, pockets >4 mm, non smoker	GTR N=15	BT N=15 CPRT N=15	GTR: 81.1%, BT: 90.0%, CPRT: 87.12%	15/16 on Checklist, Grade A, Level 1	Yes(GTR)
Del Pizzo M, et al (2005) ¹³	4 m, 11 fm Non-smoker Healthy	CAF + enamel matrix derivative	CAF alone	Recession reduction: 3.60 mm (90.67% RC, test grp), 3.53 mm (86.67% RC, control grp)	15/16 on checklist, Grade A Level 1	Yes(CAF)
Leknes KN et al. (2005) ¹⁵	Mean=38.4 years old, 10M, 10F generally healthy	20GTR+ Coronally positioned flap	20CPF	1.9mm in GTR and 2.3 CPF 6 year follow up: 0.5mm GTR and 1mm CPF	15/16 Grade A Level 1	Yes (GTR)

Table 3- Evidence table summary of research papers since 2002 assessing the use of surgical treatments for gingival recession.

By assessing the 3 review papers, 4 randomly selected papers and the 4 recent research articles, we were able to confirm that the statistical findings of the review papers were valid and that recent research has confirmed these results.

RESULTS:

Table 3 is an evidence table that presents the findings for 4 studies that were published in recent years (2002-2005). The table presents 4 RCTs with Grade A, level 1 evidence to support the use of surgical therapy as a treatment modality for gingival recession. Connective Tissue Graft (CTG), Free Gingival Graft (FGG), Guided Tissue Regeneration (GTR) and the Coronally Advanced Flap (CAF) were all shown to improve the % root coverage of treated teeth in these reports. These findings coincide with the findings in the literature reviews conducted by Oates et al.(2002) and Rocuzzo et al (2003).

Oates et al (2003) reviewed 10 articles related to CTG and found that there was a mean gain in root coverage (RC) of 2.68 ± 0.45 mm, which corresponded to a percentage gain of $77.9 \pm 10\%$. They also found that CTG treatment of gingival recession yielded a 100% root coverage in $37.4 \pm 19\%$ of procedures. Similarly, Rocuzzo et al (2003), found that CTG resulted in a 3.10mm gain in root coverage at treated sites (95% CI=2.16, $P < 0.001$). This finding by Rocuzzo et al. corresponds to an increase in root coverage ranging from 64.7-95.6% at the site of recession.

Both Oates et al (2002) and Rocuzzo et. al (2003) analyzed the literature with respect to Guided Tissue regeneration (GTR), and found that this treatment also yielded significant improvements in root coverage. In the review by Oates, 17 GTR studies were examined and it was found that the mean root coverage was $76.4 \pm 11.3\%$ and 100% root coverage was achieved in $33.1 \pm 20.4\%$ of procedures. The mean gain in clinical attachment was 3.20 ± 1.14 mm and probing depth was reduced by 0.53 ± 0.41 mm. Similarly, in the review by Rocuzzo, 21 studies were considered and a mean gain in RC was 3.70mm (95% CI 2.99, $P < 0.001$) with the % gain ranging from 48% to 98.6%. The largest reported 100% coverage occurred in 46.7% of subjects and the mean clinical attachment gain was 2.84mm (95% CI 1.76, $P < 0.001$). The Leknes study, which also looks at the success of GTR, found that a 6-year follow up showed no significant gains for the GTR group. This leads one to believe that although GTR may provide significant results initially, those results are lost within 6 years. Undoubtedly, this is something that should be examined further and considered by clinicians when recommending treatments to their patients.

In the analysis of the Coronally Advanced Flap (CAF) a reduction of 2.68mm in gingival recession was reported, with a mean percentage root coverage of 55-91%.⁵ In the test group (CAF + enamel matrix derivative), the recession reduction, CAL reduction, mean root coverage, and percentage of complete root coverage were 3.36 ± 1.55 mm, 3.57 ± 1.55 mm, $91.2 \pm 13.2\%$, and 64% respectively.¹³ In the control group (CAF alone), the recession reduction, CAL reduction, mean root coverage, and percentage of complete root coverage were 2.71 ± 1.20 mm, 2.79 ± 1.19 mm, $80.9 \pm 21.3\%$, and 50% respectively.¹³ The meta-analysis performed in the systematic review combined the results of 4 different studies on CAF and reported the recession reduction and CAL reduction to be 2.68 mm (95% CI: 1.78 mm, 3.58 mm) and 2.44 mm (95% CI: 1.49 mm, 3.40 mm) respectively.⁵ Again, these findings suggest that the CAF, like the GTR and CTG, is a viable option for the practitioner when it comes to the treatment of gingival recession.

The fourth and final surgical treatment assessed by the reviews of Oates et. al (2002) and Roccuzzo et al. (2003), is the Free Gingival Graft (FGG). As with the CTG, GTR and CAF, the FGG was also found to provide a significant improvement in root coverage. Oates et al. found a root coverage increase of 48.1 ± 7.1 mm, with 100% root coverage (RC) occurring in $9.3 \pm 1\%$ of procedures. Roccuzzo et al. found similar results with a percentage root coverage range of 48-85.3%.

Authors (and study design)	Year	Population	Treatment	Effect on Root Coverage
Oates et al. ⁴	2003	General population Miller Class I/II recession	1. CTG 2. GTR 3. FGG	1. 2.68 ± 0.45 mm, or 77.9% gain in root coverage 2. $76.4 \pm 11.3\%$ gain in root coverage. 3. Mean % RC gained was $48.1 \pm 7.2\%$
Roccuzzo et al. ⁵	2002	General population Miller Class I/II recession	1. CTG 2. GTR 3. CAF 4. FGG	1. Mean gain in root coverage of 3.10mm (95% CI) 2. Mean gain in RC of 3.70mm. 3. Mean gain in RC of 2.68mm. 4. Mean gain in RC was unavailable. Percentage root coverage in the range of 43-85.3%
Clauser et al. ⁶	2003	General population Miller Class I/II recession	1. CTG 2. GTR 3. CAF 4. FGG	Significantly greater Clinical Root Coverage for non-randomized studies, but each surgical procedure yielded significant post-op complete root coverage

Table 4- Evidence Table for Review articles assessing Surgical treatment modalities for gingival recession.

The Evidence table provided in Table 4 summarizes the findings of the review papers. It is obvious from the results presented here that each of the surgical interventions provides significant improvements in root coverage. The data reported from the review articles, as well as the data from the Evidence Table (table 3) show that each of the surgical methods could be used to address the problem of gingival recession.

These findings beg the question, which surgical procedure is the best form of treatment? Or alternatively, is there any one type of surgical treatment that is better than the others with respect to the treatment of gingival recession?

All 3 reviews determined, through meta-analysis, that connective tissue grafts resulted in significantly ($p < 0.05$) greater gains in root coverage than guided tissue regeneration^{4,5,6}. One review performed odds ratios calculations from 5 RCTs comparing CTG to GTR⁶. An OR > 1 indicated that better complete root coverage was achieved using CTG in 3 of the 5 studies (table 5), however heterogeneity was not confirmed by the P value and the power of the test was poor due to small sample sizes. No conclusion can be made when comparing other surgical treatments because of study inconsistencies precluding any meta-analysis. Further research using RCT design must be conducted to compare CTG with CAL and FGG.

Study	OR	CI (95%)
1	4.00	1.20-13.29
2	11.00	1.06-114.1
3	1.00	0.19-5.16
4	1.00	0.24-4.20
5	3.57	0.53-23.96

Table 5- Odds Ratio calculated from 5 RCTS comparing effectiveness of CTG vs GTR in achieving complete root coverage. OR > 1 indicates CTG yields significantly greater increases in CRC than GTR.

Thus far we have assessed the research with respect to surgical treatment of gingival recession. Now, we must turn our attention to the evidence for non-surgical treatments of gingival recession. Currently, there is 1 RCT in the literature that assesses the outcomes of non-surgical treatment.⁷ The Aimetti et al.(2005) study involved 14 females and 10 males who were healthy, with no periodontitis and no smoking history. The participants had presence of 2 bilateral Miller Class 1 buccal recession < 2mm, absence of plaque and no bleeding at treatment sites. Each of the participants had radiographic evidence of sufficient interdental bone, Identifiable CEJ, absence of malposition, caries or restorations in area of treatment and no indications for surgery. The study was carried out in a split mouth design to ensure that the oral environment was consistent among control and experimental sites. The control group received polishing only, while the experimental group received scaling, root planing and polishing throughout the 12-month study period.

Aimetti et al.(2005) found that treatment of shallow recession (< 2mm) with polishing, root planing and scaling results in a significant improvement in recession depth and recession width. The results are summarized below in Tables 6 and 7.

	Recession Depth (mm)	Recession Width (mm)	Probing Depth (mm)	Attachment level	Keratinized tissue width
Baseline	1.64 ±0.37	2.65±0.84	0.98±0.31	2.60±0.30	2.51±1.28
12 months	0.78±0.60	2.00±1.39	0.92±0.41	1.67±0.70	3.09±1.40
Difference between baseline and 12 months	0.86±0.54	0.65±1.19	0.06±0.22	0.93±0.69	-0.58±0.36
P(p<0.05 is significant)	<0.0001	0.014	0.185	<0.0001	<0.0001

Table 6- Aimetti et al. (2005). Experimental Group Results (mean +/- SD)

	Recession Depth	Recession Width	Probing Depth	Attachment level	Keratinized tissue width
Baseline	1.43±0.42	2.74± 1.05	1.08±0.38	2.48±0.55	2.76±1.18
12 months	1.34± 0.45	2.65±1.01	1.02±0.45	2.36±0.49	2.81±1.17
Difference between baseline and 12 months	0.09±0.18	0.10±0.30	0.06±0.37	0.11±0.39	0.05±0.13
P(p<0.05 is significant)	0.023	0.173	0.417	0.173	-0.076

Table 7- Aimetti et al., (2005). Control Group (mean +/- SD)

Although further research is required with respect to non-surgical treatment of gingival recession, the evidence provided by Aimetti et al. shows that surgery is not necessarily the only route of treatment when a patient presents with gingival recession. This is especially true with recession that is limited to <2mm.

DISCUSSION:

Given the high rate of gingival recession defects among the general population, it is imperative that dental practitioners have an understanding of the etiology, complications and treatments of the condition. The aim of this paper has been to elucidate the current body of research in a manner that is clinically applicable and relevant. Furthermore, we have sought to analyze the sources cited in the current literature, to ensure that their conclusions are based on sound scientific methodology, so that practitioners are not misled with respect to the best treatment options for their patients.

The reviews by Oates et al. (2002), Rocuzzo et al. (2003) and Clauser et al.(2002) have proven to be invaluable sources of information summarizing the body of knowledge presented in the literature. Their findings have been validated by the more current research of Tozum et al (2005), Paolantonio et al. (2002), Del Pizzo et al. (2005) and Leknes et al. (2005). The findings of the review articles have been validated in this paper by the thorough assessment of 4 articles that were used in each of the reviews, and thus proven to be ideal sources of information^{8,9,10,11}. The consistencies across the findings of the RCTs, review papers and current literature allow us to confidently recommend therapeutic interventions for gingival recession. There is extensive data in the literature to show that each of the four surgical methods assessed in this paper can provide a significant improvement in root coverage. There is also limited data that suggests the superiority of Connective tissue Grafts (CTG) relative to the other surgical

modalities⁶. Further statistical analysis and research is required to definitively prove the superiority of the CTG over GTR, FGG and CAL.

Research focusing on different measures of success in the treatment of gingival recession is also necessary. The current literature focuses on the degree of root coverage as the main indicator of success. This is understandable, given the difficulty in objectively measuring esthetic improvements and decreases in sensitivity. However, we must attempt to form more precise and accurate tools to measure these parameters, given that they are the source of patient complaints, and the motivation of patients who pursue treatment of gingival recession defects.

Also of great importance in this field is the re-emergence of research in the role of non-surgical treatments for gingival recession defects⁷. Given the focus placed on conservative therapies in modern dentistry, it is crucial for dentists to be aware of the risks and benefits of the 'no treatment' option for all conditions that they are presented with. The work by Aimetti et al.(2005) provides a basis upon which a conscientious practitioner can rest his or her recommendations. Of course, 1 RCT is not sufficient to confirm or disprove a therapeutic intervention, and further research is required before dentists can accurately understand the beneficial aspects of non-surgical treatments. Nevertheless, it is a reliable form of therapy for patients with limited recession, and for patients who want to avoid extensive, invasive dental surgery.

CONCLUSION:

So, what do we do when a patient walks in complaining of gingival recession and its symptoms?

Before undertaking surgical or non-surgical forms of therapy for gingival recession, we must address the etiology of the problem. It goes without saying, that therapeutic interventions will be undermined in the long run if the cause of the problem is not removed. Once the etiology of the condition has been uncovered and addressed, we may proceed to plan a treatment to arrest or reverse the gingival recession. The treatment plan will be based on the severity of symptoms, the goal of the patient and the body of knowledge in the current literature. A patient with minimal symptoms will benefit from education about the etiology along with preventive therapy, whereas a patient with severe sensitivity and esthetic concerns will likely elect to have surgical treatment.

Given the focus on conservative therapy in modern dentistry, preventive therapy in the form of proper dietary and oral hygiene instruction should be the first line of defense against gingival recession. Prevention can be supplemented with scaling, polishing and root planing at appropriate intervals based on patient risk factors.

Due to their invasive nature, surgeries are a last source of treatment, and should be used in patients who present with severe recession and/or extensive sensitivity and esthetic concerns. Based on the current body of knowledge, the connective tissue graft (CTG) is the surgery that we would recommend for surgical treatment of gingival recession.

REFERENCES

1. Kassab MM, Cohen RE. The etiology and prevalence of gingival recession. *J Am Dent Assoc.* 2003; 134: 220-5
2. CTFPHC Recommendations Grades for Specific Clinical Preventive Actions. Available from URL: www.ctfphc.org. Accessed March 1, 2006.
3. Leake JL, Department of Biological and Diagnostic Sciences, Faculty of Dentistry, University of Toronto. Unpublished document. Evidence based care module, Students' manual, Course 300Y 2005. The checklist was adapted from Fletcher RH, Fletcher SW, Wagner EH. Clinical epidemiology. The essentials. 3rd ed. Baltimore: Williams and Wilkins, 1996; and Sacket DL, Richardson WS, Rosenberg W, Haynes RB. Evidence based medicine: how to practice and teach. EBM. 2nd ed. New York: Churchill Livingstone, 1997.
4. Oates T, Robinson M, Gunsolley J. Surgical Therapies for the Treatment of Gingival Recession. A Systematic Review. *Ann Periodontol*, 2003; 8: 303-320
5. Rocuzzo M, Bunino M, Needleman I, Sanz M. Periodontal plastic surgery for treatment of localized gingival recessions: A systematic review. *J Clin Periodontol*, 2002; 29: 178-194.
6. Clauser C, Nieri M, Franceschi D, Pagliaro U, Pini-Prato G. Evidence-Based Mucogingival Therapy. Part 2: Ordinary and Individual Patient Data Meta-Analysis of Surgical Treatment of Recession Using Complete Root Coverage as the Outcome Variable. *J Periodontol*, 2003; 74: 741-756
7. Aimetti, M., Romano, F., Peccolo, D.C., Debernardi, C. Non-Surgical Periodontal Therapy of Shallow Gingival Recession Defects: Evaluation of the Restorative Capacity of Marginal Gingiva After 12 Months. *J Periodontol*, 2005; 76: 256-261
8. Trombelli L, Scabbia A, Tatakis DN, Calura G. Subpedicle connective tissue graft versus guided tissue regeneration with bioabsorbable membrane in the treatment of human gingival recession defects. *J Periodontol*, 1998; 69: 1271-1277
9. Zucchelli G, Clauser C, De Sanctis M et al. "Mucogingival Versus Guided Tissue Regeneration Procedures in the Treatment of Deep Recession Type Defects. *J Periodontol*, 1998; 69: 138-145
10. Modica F, Del Pizzo M, Rocuzzo M, Romagnoli R. Coronally advanced flap for the treatment of buccal gingival recession with and without enamel matrix derivative. A split-mouth study. *J Periodontol*, 2000; 71: 1693-1698
11. Paolantonio, M., di Murro, C., Cattabriga, A., Cattabriga, M. Subpedicle connective tissue graft versus free gingival graft in the coverage of exposed root surfaces. A 5-year clinical study. *J Clin Periodontol*, 1997; 24: 51-56.
12. Tozum TF, Keceli HG, Guncu GN, Hatipoglu H, Sengun D. Treatment of gingival recession: comparison of two techniques of subepithelial connective tissue graft. *J Periodontol*. 2005 Nov;76(11):1842-8
13. Del Pizzo M, Zucchelli G, Modica F, Villa R, Debernardi C. Coronally advanced flap with or without enamel matrix derivative for root coverage: a 2-year study. *J Clin Periodontol*, 2005; 32: 1181-1187
14. Paolantonio, M. Treatment of gingival recessions by combined periodontal regenerative technique, guided tissue regeneration, and Subpedicle connective tissue graft. A comparative clinical study. *J Periodontol*, 2002; 73: 53-62
15. Leknes KN, Amarante ES, Price DE, Boe OE, Skavland RJ, Lie T. Coronally positioned flap procedures with or without a biodegradable membrane in the treatment of human gingival recession. A 6-year follow-up study. *J Clin Periodontol*, 2005; 32: 518-529.