Tooth Loss in Periodontal Patients

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Abstract

Objective: *To compare tooth loss between patients who received surgical therapy for chronic periodontitis and those who received nonsurgical therapy alone.*

Methods: *A retrospective chart study was conducted at Dalhousie University. All patients who had periodontal treatment and were active cases for at least 10 years were included (n = 335). The sample consisted of 120 males (35.8%) and 215 females (64.2%). Ages ranged from 16 to 77 (mean = 46.1 ± 12.0 years). All patients received nonsurgical therapy; 44.8% received periodontal surgery as well. Variables recorded were demographics, initial attachment loss, treatment type, recall frequency, patient compliance and history of extracted teeth. Independent t-tests or chi-squared tests were used to compare these for surgical and nonsurgical patients. ANOVA was used to test for interactions between initial attachment loss, age, gender, compliance and type of therapy a patient received as reasons for tooth loss.*

Results: *521 teeth were lost in 69 patients (20.6% of sample). Of teeth lost, 61.8% were due to periodontal disease; 24.8% to caries; 13.2% to other reasons. Patients initially diagnosed with early attachment loss lost an average of 0.37 (± 1.33) teeth. Patients diagnosed with moderate attachment loss lost an average of 1.50 (± 2.54) teeth and those diagnosed with advanced attachment loss lost an average of 3.11 (± 3.01) teeth. Those who received surgical therapy lost more teeth (mean = 1.31 ± 2.36) than those who received nonsurgical treatment (mean = 0.68 ± 1.87; p = 0.001). However, initial attachment loss was the only factor that could predict tooth loss. The type of therapy (surgical or nonsurgical) was not statistically significant.*

Conclusions: *Most periodontal patients (79.4%) who received treatment at this dental school clinic did not lose any teeth due to periodontal disease over at least 10 years. Although patients who had surgical therapy lost more teeth than those who had nonsurgical therapy alone, this was not an important predictor of tooth loss.*

MeSH Key Words: *periodontitis/complications; periodontal diseases/therapy; tooth loss/etiology*

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Chronic periodontal disease is an infectious disease characterized by inflammation and subsequent destruction of the supporting structures of the teeth. The prevalence and severity of attachment loss and bone loss increases with age.[1] Management of chronic periodontitis generally consists of a combination of surgical and nonsurgical therapies. Nonsurgical therapy involves scaling and root planing to remove subgingival plaque and calculus. There is some evidence that conjunctive use of antibiotics in the treatment of certain types of periodontal disease may be of benefit to some patients,[2] but it is considered to provide no additional advantage over scaling and root planing alone in the treatment of adult chronic periodontitis.[3] Numerous surgical techniques are available to treat the destruction caused by this disease. However, the goal of all techniques is to eliminate the local etiology (i.e., plaque and plaque retentive factors) and produce an environment conducive to health.

The success of periodontal therapy is usually measured in terms of maintenance or improvement in clinical attachment levels. Comparisons of the efficacy of surgical and nonsurgical therapies are equivocal. Some studies have shown that surgery produces better attachment levels after 6 months;[4,5] others have found nonsurgical therapy to be more efficacious.[6] (In the latter study, teeth were often root planed for up to 45 minutes each, and patients were recalled every 2 weeks). Long-term (4-6 years) results range from no difference[4,7] to improved attachment levels after root planing.[5] A meta-analysis[8] found that, in the short term, the initial amount of attachment loss was the important factor

in determining the final outcome. Patients with early and moderate attachment loss received the most benefit from nonsurgical treatment, whereas those with advanced disease benefited more from surgery. After 5 years, however, there was no difference between the 2 therapies, regardless of initial attachment level.

Although clinical attachment levels are considered the gold standard in outcome measurement, they do not reflect issues that may be important to patients. In periodontics, as in other areas of health care, patients are playing an increasing role in deciding which therapy is best for them. Quality of life issues such as pain and discomfort, changes in esthetics or function, costs of therapy and tooth loss are seen by patients to be more relevant than attachment levels or probing depths. For example, in the short term, surgery produces significantly more postoperative pain and swelling than nonsurgical procedures and results in more days missed from work as a result of the procedure.[9] Periodontal surgery can be more costly than nonsurgical treatment[10] in both direct costs (fees) and indirect costs (short-term pain and discomfort, long-term esthetic changes). However, scaling and root planing alone are often inadequate to resolve or prevent recurrence of the disease in some patients.[11]

Research has found that patients who have had periodontal surgery and are regularly maintained in a periodontal office lose an average of 0.06 to 0.96 teeth per year.[12-15] To date, no studies have compared surgical and nonsurgical therapies in terms of tooth loss. The risk of tooth loss is likely an important factor in the decisions of patients and their clinicians. The objective of this study, therefore, was to compare tooth loss between periodontal patients who had received surgical therapy for the treatment of chronic periodontitis and those who had received nonsurgical therapy alone.

Materials and Methods

A retrospective chart study was conducted on patients at the undergraduate and graduate dental clinic at Dalhousie University, Halifax, Nova Scotia. Only patients who had been active cases for at least the past 10 years and had some type of periodontal treatment were included. As chart entries were many and varied, a period of standardization between 2 of the authors (DM and CS) ensured that appropriate charts were included. Questionable entries were reviewed by both authors to reach a consensus. Approval from the Human Ethics Committee, Faculty of Dentistry, was received before the study began.

The following variables were recorded: demographics, initial attachment loss, type of periodontal treatment the patient received, recall frequency, patient compliance with the proposed recall schedule, and history of extracted teeth. Initial diagnosis was entered as the degree of attachment loss that affected the majority of the dentition (i.e., early, moderate, or advanced attachment loss). Periodontal surgery was categorized as surgery to treat periodontal disease (i.e., flap surgery with or without osseous surgery, or gingivectomy), mucogingival surgery (i.e., connective tissue graft, free gingival graft, or frenectomy) or preprosthetic surgery (i.e., crown lengthening, ridge augmentation). Recall frequency was based on the average recall interval of the patient in months. Patient compliance was determined over the whole course of the patient's treatment at the clinic. Patients with more than 3 consecutive cancellations were deemed to be noncompliant. If teeth were extracted, the reasons for the extractions were classified as follows: periodontal disease, caries, orthodontics, prosthodontic needs, and other (i.e., trauma and endodontics). Teeth deemed hopeless at the initial diagnosis or extracted within the first year for prosthodontic reasons were excluded from the analysis.

Statistical analysis was performed using SPSS. Descriptive statistics were done for all variables. Independent *t*-tests or chi-squared tests were performed to compare variables between surgical and nonsurgical patients. Factorial ANOVA was used to test for interactions between initial attachment loss, age, gender, compliance and type of therapy (i.e., surgical or nonsurgical) as reasons for tooth loss.

Results

The records for all current periodontal patients from the Dalhousie University dental clinic were reviewed for this study. Of these, 370 were in the maintenance phase of periodontal therapy. Only patients who had been active cases for at least 10 years (mean = 16.1 ± 6.4; range 10-38 years) were included. Thirty-five of the patients were diagnosed with gingivitis and were excluded from the sample. Thus, 335 patients met the selection criteria. The sample included 120 males (35.8%) and 215 females (64.2%) at an average age of 46.1 ± 12.0 years (range 16-77 years).

Most of the patients (84.8%) complied with the recall schedule. Of these, 70% missed no clinic appointments; 30% were away from the clinic for some interval.

All patients received nonsurgical periodontal therapy (i.e., scaling, root planing or both). Nearly half (44.8%, n = 150) were treated with periodontal surgery: 23.6% (n = 79) of the total sample had mucogingival surgery and 12.5% (n = 42) had preprosthetic surgery.

A total of 520 teeth were lost in 69 patients, due to all causes. Thus, 79.4% of all patients lost no teeth while attending the dental clinic for care. Periodontal disease accounted for 61.8% (n = 322) of the teeth lost, caries 24.8% (n = 129) and all other causes accounted for 13.2% (n = 69). Averaging tooth loss over all patients, the mean annual tooth loss due to periodontal reasons per patient was 0.06/year.

Applying the Hirschfeld and Wasserman classification scheme[12] to our data, we found that the majority of tooth loss due to periodontal disease occurred in a minority of

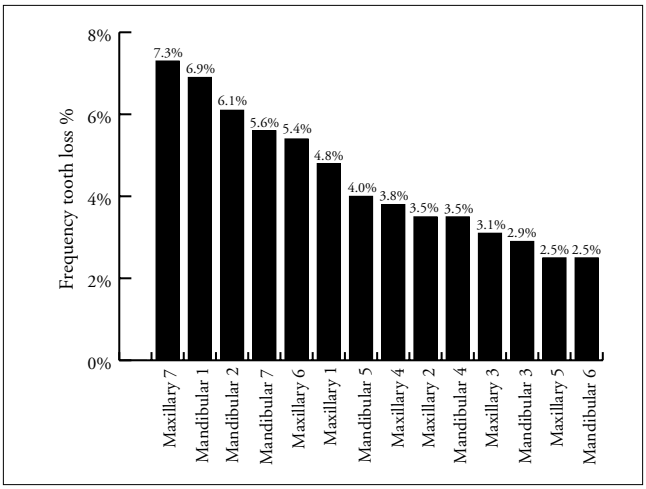

Figure 1: *Frequency of tooth loss due to periodontal reasons.*

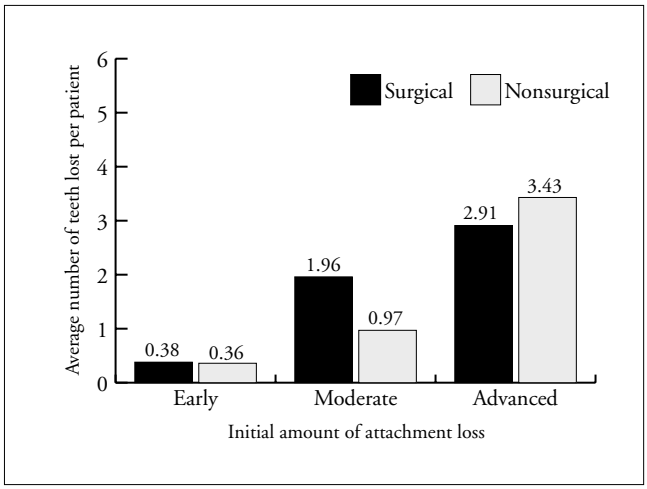

Figure 2: *Average tooth loss by degree of initial attachment loss.*

patients. Most patients (91.2%, $n = 306$) lost ≤ 3 teeth over the course of the study (i.e., were considered "well maintained"), 7.2% ($n = 24$) of patients lost 4-9 teeth (i.e., "downhill"), and 1.5% ($n = 5$) of patients lost ≥ 10 teeth (i.e., "extreme downhill").

Figure 1 lists the frequency of tooth loss due to periodontal disease by tooth type. Maxillary second molars were the most common teeth lost (7.3% of all teeth). Cuspids were among the most resistant to disease.

Patients who received surgical periodontal treatment lost more teeth than patients who received nonsurgical periodontal treatment; mean tooth loss per patient was 1.31 ± 2.36 for surgical treatment compared with 0.68 ± 1.87 for nonsurgical treatment ($p = 0.001$, independent t-test). Patients who had surgical therapy were more likely to have advanced disease compared with those who had nonsurgical therapy only ($p < 0.01$; **Fig. 2**). However, no difference in tooth loss was seen in surgical patients versus nonsurgical patients with advanced attachment loss. Nor was there a difference in those with early attachment loss ($p > 0.1$). Patients with moderate attachment loss who had surgery were more likely to lose teeth than those who did not; mean tooth loss per patient with surgery was 1.96 ± 2.78, without surgery it was 0.97 ± 2.14 ($p = 0.03$).

Compliance ($p > 0.1$), gender ($p > 0.1$) and smoking ($p > 0.1$) had no effect on tooth loss. However, patients who had surgery were recalled more frequently (mode = 4 months) and tended to visit the clinic more regularly than patients who received nonsurgical therapy alone.

Factorial ANOVA was performed to determine the most likely reason or reasons for the tooth loss. The factors entered in the model included initial attachment loss, type of periodontal treatment (surgical or nonsurgical), age, and gender. The only significant factor was the initial amount of attachment loss ($p < 0.001$). Patients with early attachment loss lost an average of 0.37 (± 1.33) teeth; those with moderate attachment loss lost 1.50 (± 2.54) teeth, and patients with advanced attachment loss lost an average of 3.11 (± 3.01) teeth.

Discussion

Hirschfeld and Wasserman[12] examined 600 patients in a private periodontal practice setting who were treated and maintained for at least 15 years. As with our study, they found tooth retention was more closely related to the case type than the type of surgery performed. In their study, the average number of teeth lost per patient per year was 0.06. This is similar to the result of other studies.[16-18] Although our figures are lower, our study included patients with early attachment loss, a group least likely to lose teeth from periodontal disease if they are treated and maintained. Unlike the other studies, we found that the mandibular first molar was the tooth least likely to be lost due to periodontal disease. This may be because we did not account for teeth lost by patients prior to attending our clinic (which most likely included mandibular first molars) and the small number of people who accounted for the majority of the tooth loss.

Most of the patients in this sample did not lose any teeth during the course of this study. This finding is in concordance with our current understanding of the progression of periodontal attachment loss. Periodontitis can be distinguished by the rate of progression in different forms of the disease. In most patients, mean annual bone loss is less than 1 mm.[19] More susceptible people demonstrate rapid attachment loss and bone destruction. This aggressive form of periodontitis is relatively rare, affecting less than 5% of the population.[20] It is likely that this latter group of patients accounts for the majority of the tooth loss in this study.

Patients in our study who received surgical therapy lost more teeth than those who had nonsurgical treatment alone. Surgical patients lost an average of 1.3 teeth over 16 years (1 tooth every 12.3 years), whereas those who received nonsurgical therapy lost an average of 0.68 teeth over 16 years (1 tooth every 23.5 years). However, this fact was confounded by the severity of disease. The amount of attachment loss at initial presentation seemed to be a more important predictor of tooth loss than the type of periodontal therapy. This finding is in agreement with McLeod and others[19] who found that the type of treatment did not significantly

affect tooth retention; rather, the initial diagnosis was the important variable. Other studies have noted that compliance,[3,14] age,[20,21] and gender[22] are major factors in tooth loss; none of these was found to be significant here. This is most likely due to the fact that dental students are inexperienced in developing and maintaining periodontal recall schedules for their patients. It may also be due to a different sample of patients than is found in a private practice situation.

Although smoking has been shown to be a significant risk factor for the progression of periodontitis,[22,23] we found no significant relation between smoking and tooth loss. This is not to say that smoking is not a risk factor for periodontal disease. Our results are most likely due to inherent flaws in a retrospective study. It may be a result of the inclusion of patients with early attachment loss. It is more likely due to the possibility of incomplete entries into the charts.

Not all patients will choose to have surgical therapy even if it is prescribed for them, because of the economic burden, fear of the procedure, or other factors. Ideally, a study comparing a group of patients who chose not to have surgery with those who did would give us less biased data in terms of tooth loss from nonsurgical therapy alone. However, a prospective trial of this nature would be extremely expensive in terms of time and money.

As with most retrospective studies, the one conducted here is subject to many biases. Patients were probed and treatment planned by different undergraduate students and their instructors, all of whom bring their own biases to the clinic. Diagnoses and treatments may not have been accurately recorded. Thus, the results of this study cannot be generalized beyond this particular group of patients.

Nonetheless, the topic of treatment efficacy is one that has been debated in the scientific literature for some time. Our results confirm what clinicians know — that often the amount and extent of attachment loss is a more important consideration than the type of therapy prescribed for an individual patient. ◆

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References

1. Grossi SG, Zambon JJ, Ho AW, Koch G, Dunford RG, Macthei EE, and others. Assessment of risk for periodontal disease. I. Risk indicators for attachment loss. *J Periodontol* 1994; 65(3):260-7.

2. Loesche WJ, Giordano JR, Hujoel P, Schwarcz J, Smith BA. Metronidazole in periodontitis: reduced need for surgery. *J Clin Periodontol* 1992; 19(2):103-12.

3. Ellen RP, McCulloch CA. Evidence versus empiricism: rational use of systemic antimicrobial agents for treatment of periodontitis. *Periodontology 2000* 1996;10:29-44.

4. Lindhe J, Nyman S. Long-term maintenance of patients treated for advanced periodontal disease. *J Clin Periodontol* 1984; 11(8):504-14.

5. Pihlstrom B, Oliphant TH, McHugh RB. Molar and nonmolar teeth compared over 6 1/2 years following two methods of periodontal therapy. *J Periodontol* 1983; 55(9):499-504.

6. Isidor F, Karring T, Attstrom R. The effect of root planing as compared to that of surgical treatment. *J Clin Periodontol* 1984; 11(10):669-81.

7. Ramfjord SP, Knowles JW, Nissle RR, Shick RA, Burgett FG. Longitudinal study of periodontal therapy. *J Periodontol* 1973; 44(2):66-72.

8. Antczak-Bouckoms AA, Joshipura K, Burdick E, Tulloch JF. Meta-analysis of surgical versus non-surgical methods of treatment for periodontal disease. *J Clin Periodontol* 1993; 20(4):259-68.

9. Matthews DC, McCulloch CA. Evaluating patient perceptions as short term outcomes of periodontal treatment: a comparison of surgical and non-surgical therapy. *J Periodontol* 1993; 64(10):990-7.

10. Antczak-Bouckoms AA, Weinstein MC. Cost-effectiveness analysis of periodontal disease control. *J Dent Res* 1987; 66(11):1630-5.

11. Caffesse RG, Sweeney PL, Smith BA. Scaling and root planing with and without periodontal flap surgery. *J Clin Periodontol* 1986; 13(3):205-10.

12. Hirschfeld L, Wasserman B. A long-term survey of tooth loss in 600 treated periodontal patients. *J Periodontol* 1978; 49(5):225-37.

13. Wood WR, Greco GW, McFall WT. Tooth loss in patients with moderate periodontitis after treatment and long-term maintenance care. *J Periodontol* 1989; 60(9):516-20.

14. Wilson TG, Glover ME, Malik AK, Schoen JA, Dorsett D. Tooth loss in maintenance patients in a private periodontal practice. *J Periodontol* 1987; 58(4):231-5.

15. McFall WT. Tooth loss in 100 treated patients with periodontal disease. A long-term study. *J Periodontol* 1982; 53(9):539-49.

16. Becker W, Berg L, Becker BE. The long-term evaluation of periodontal treatment and maintenance in 95 patients. *Int J Periodontics Restorative Dent* 1984; 4(2):54-71.

17. Nabers CL, Stalker WH, Esparza D, Naylor B, Canales S. Tooth loss in 1535 treated periodontal patients. *J Periodontol* 1988; 59(5):297-300.

18. Bostanci HS, Arpak MN. Long-term evaluation of surgical periodontal treatment with and without maintenance care. *J Nihon Univ Sch Dent* 1991; 33(3):152-9.

19. McLeod DE, Lainson PA, Spivey JD. The effectiveness of periodontal treatment as measured by tooth loss. *JADA* 1997; 128(3):316-24.

20. Brown LJ, Oliver RC, Loe H. Periodontal diseases in the U.S. in 1981: prevalence, severity, extent, and role in tooth mortality. *J Periodontol* 1989; 60(7):363-70.

21. Miller AJ, Brunelle JA, Carlos JP, Brown LJ, Loe H. Oral Health of United States Adults: The National Survey of Oral Health in U.S. Employed Adults and Seniors, 1985-86. Bethesda, MD: Department of Health and Human Services, Public Health Service, *National Institutes of Health* 1987: NIH publication no. 97-2868.

22. Grossi SG, Genco RJ, Machtei EE, Ho AW, Koch G, Dunford R, and others. Assessment of risk for periodontal disease. II. Risk indicators for alveolar bone loss. *J Periodontol* 1995; 66(1):23-9.

23. Holm G. Smoking as an additional risk for tooth loss. *J Periodontol* 1994; 65(11):996-1001.