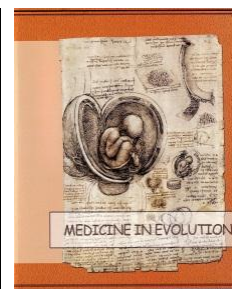


Tooth loss and survival rate in chronic moderate to severe periodontitis. A synthetic search of non-surgical therapy studies.



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Abstract

Introduction: in patients suffering of chronic severe generalized periodontitis, there are teeth at borderline, rising up the question of retaining or extracting. According to systems for assigning periodontal prognosis, these are classified as having questionable, unfavorable or hopeless prognosis. It has been shown, that the prognosis can be improved in most of the cases.

Objective of this research was to review in a synthetic search the literature reporting the survival analysis (survival rate, tooth loss) of teeth with severe reduced attachment apparatus, and to assess, according to this literature, the ability of long term supportive periodontal care to modify the prognosis from hopeless to unfavorable or questionable.

Methods: articles were electronically searched in PubMed and in relevant scientific journals. The filters used referred to full text articles and human studies. The query used in the advanced search offered 1,486 results. Studies were considered for inclusion if limited to patients with moderate to severe periodontitis, who underwent active periodontal therapy (APT) and followed a supportive periodontal care (SPT) program for at least 5 years. Also, they had to report data on tooth loss, diagnosis, prognosis, treatment approach, supportive periodontal treatment, treatment outcome.

Results: from the electronic database search and the screening of the reference list of included publications, 18 articles were selected and grouped according to the treatment approach: non-surgical; surgical, non-regenerative therapy; surgical regenerative therapy. 3 articles were selected for the topic non-surgical therapy, and 15 for surgical therapy. In patients treated with non-surgical procedures alone, the **conclusions** were: 1. patients highly susceptible to periodontitis exhibit a tooth loss rate almost 6 times higher than patients with normal susceptibility; 2. the decision for tooth extraction may also reflect the experience, knowledge, skills of the dentist and economical aspects of the treatment, and not only the factors related to the tooth or the patient; 3. even teeth initially classified as questionable or hopeless can be retained in the majority of patients; 4. prognostic factors for tooth loss in SPT remain confirmed: the patient's age, the bone loss, the maximum PD after APT, multirrooted teeth and the smoking habits. Studies in this first part of the paper were selected for the non-surgical treatment regimen, and data are synthesized and briefly commented.

Keywords: survival rate, tooth loss, long term survival, maintenance, chronic periodontitis, severe periodontitis, questionable teeth, hopeless teeth, non-surgical treatment

INTRODUCTION

The first studies on the importance of supportive periodontal care program were conducted by Oliver (1) and Ross et al. (2). In 1978, Hirschfeld & Wasserman (3) stated that "the main goal of periodontal treatment is the retention of as many teeth as possible in health, function and comfort". Periodontal maintenance care (PMC), also known as supportive periodontal therapy (SPT), is an essential part of the long-term success periodontal treatment, and immediately follows the completion of active periodontal therapy (APT). Periodic recall visits form the base of the maintenance program. Preservation of periodontal health status acquired in the active periodontal phase needs time and efforts from the part of the dentist and the staff. Another essential component is compliance, and this belongs to the patient.

In a systematic review from 2008, Gaunt et al. (4) find that supportive periodontal care delivered in specialist compared with general dental practice will likely result in greater periodontal stability and higher tooth survival rates. In the same review, the cost evaluation analysis based on the Axelsson & Lindhe article from 1981 (5) showed that, for the patient the difference between SPT delivered by the general dentist is an extra 210€ (equivalent) per extra tooth per year over 30 years. PMC includes a group of procedures: update of medical and dental history, extra- and intra-oral soft tissue examination, dental examination, periodontal evaluation, radiographic review, removal of biofilm and calculus, treatment of new or recurrent sites of periodontal disease, establishment of an individualized interval for periodontal maintenance treatment. The purpose of these procedures is to prevent the progression or recurrence of periodontal disease, to reduce the incidence of tooth loss and to increase the probability of diagnosing and treating other diseases found within the oral cavity (AAP 2001). Long-term tooth retention is a fundamental objective of periodontal therapy. Most patients with a history of generalized severe chronic periodontitis that has been recently treated and stabilized are initially placed on a periodontal maintenance therapy program with a 3-month recall interval. The basis for this relatively short interval is the fact that people with a history of severe disease are, by nature, at high risk for recurrence. (6). The predictability of maintenance care program may be associated with diverse conditions, mainly when a patient is exposed to one or more risk factors that influence the host response (7,8). It is worldwide acknowledged that poor compliance with the recall and recare intervals is associated with recurrence/progression of periodontal disease, clinical attachment loss, increasing of probing depths, root caries and tooth loss (5).

Due to the frequency of severe periodontitis among Romanian patients, and the amount of extractions performed by general dentists in severe compromised periodontal patients, a synthetic search was conducted in the literature, in order to assess the predictability of different type of periodontal treatment (non-surgical; surgical non-regenerative; surgical regenerative) and the outcomes of these clinical procedures. Therefore, the objective of this paper is to characterize the quantity and quality of the available literature in order to show that severely compromised teeth can be predictably long-term maintained if they are included in a qualitative supportive periodontal treatment.

METHODS

Development of a protocol

This synthetic search was conducted following with modifications a protocol imagined by Miron et al. (9), made prior to the initiation of this search. This protocol included definition of the focused question; a PICO (patient, intervention, comparison, outcome) question; a defined search strategy; study inclusion criteria; determination of outcome measures; screening methods, data extraction and comparison.

A hand search was conducted through the Journal of Clinical Periodontology, Journal of Periodontology, Journal of Periodontal Research, Periodontology 2000 from November 2016, until August 2017. The reference list of the selected articles was screened.

Criteria for study selection and inclusion

All the studies selected had to be written in English. They had to be full-text articles and to be human studies. No reviews were included. Studies were considered for inclusion if were limited to patients with moderate to severe periodontitis, who underwent active periodontal therapy (APT) and followed a supportive periodontal care (SPT) program for at least 5 years. Also, they had to report data on tooth loss, survival rate, diagnosis, prognosis, treatment approach, supportive periodontal treatment, treatment outcome. In the end, from the electronic database search and the screening of the reference list of included publications, 18 articles were selected. The 18 articles were grouped according to the treatment approach: non-surgical therapy; surgical, non-regenerative therapy; surgical regenerative therapy.

Outcome measure determination

The main outcome was tooth loss during SPT. Second endpoints were the change of prognosis and the survival rate.

Screening method

Titles and abstracts of the selected articles were screened by the first author (VR) based on the question: "which are the long term results of different treatment procedures involving non-surgical/surgical but non-regenerative/surgical regenerative procedures at severely periodontal compromised patients? Full-text articles were obtained if the follow-up period was at least 5 years, and if the outcome of the treatment was described in at least two terms of the following: tooth loss during SPT, tooth loss during APT, change of prognosis, survival rate.

Data extraction and analysis

The following data were extracted: the main author's name, the study design, the number of patients, the number of teeth, the setting where the clinical procedures were performed, the presence of systemic diseases, initial SPT prognosis, last SPT prognosis, the period of SPT, recall intervals, compliance, administration of antibiotics, the population of the study description (age range, mean age, gender), smoking habits, inclusion of the third molar, if the teeth considered in the study were abutment teeth or not, the furcation involvement, the kind of treatment the patient underwent, initial extraction, tooth loss during SPT and which of them were lost for periodontal reason and survival rate. Due to the reduced number of articles, no meta-analysis was performed. Instead, the data is reported in a synthetic fashion with an overview of all studies fitting the search descriptions. The articles selected for this synthetic search were summarized in 3 tables, according to the type of the treatment the patient underwent: non-surgical/surgical, non-regenerative/surgical, regenerative.

RESULTS AND DISCUSSIONS

From the articles generated by the initial search strategy, only 44 articles were kept for further examination. 12 were eliminated for their irrelevance of the follow-up period. From the total of 32 articles kept, 14 articles were left apart, because the variables and the data that are looked up in this review were not described. Only 18 articles kept for data extraction and data comparison: 3 for non-surgical treatment and 15 for surgical treatment. The following studies were selected for the non-surgical treatment regimen. Data are synthesized and briefly commented.

In 2001, Rosling et al. (10) assessed the longitudinal periodontal tissue alterations during supportive therapy after exclusive non-surgical periodontal therapy approach. They

used two groups: a "normal" group (NG: exhibiting a normal susceptibility of periodontal disease, 225 subjects) and a high susceptibility group (HSG: patients treated for advanced periodontal disease, 109 subjects). In both HSG and NG were lost teeth. In the first group the main reason was caries, endodontic complications and trauma and in the second one, teeth loss was associated with advanced and progressive periodontal disease. In the NG 74% of subjects retained all teeth during the 12 year interval, while in HSG 64% experienced tooth loss and 24% lost more than 4 teeth. 80% of the HSG subjects under regular supportive periodontal therapy (SPT) maintained the bone and CAL stable over a 12 year period. Under the same conditions, in the NG > 95% of the subjects prevented major tooth, bone and attachment loss and only a small subgroup experienced a significant amount of disease progression. NG lost 0.3 teeth during the 12 year period, while tooth loss corresponding to HSG was 1.9.

Ravald et al. in 2012 (11) investigated periodontal conditions, root caries, number of lost teeth and causes for tooth loss during 11.14 years after active periodontal therapy (APT) in 64 patients. At baseline, there were 1,537 teeth, and during the observation period 211 teeth were lost, of which 153 were lost due to periodontal disease. It represents a mean of 3.3 teeth/patient or 0.23 teeth/year. The authors concluded that the decision for tooth extraction may also reflect the experience, knowledge, skills of the dentist and economical aspects of the treatment and not only the factors related to the tooth or the patient.

In 2016, Graetz et al. (12) aimed to assess the risk of tooth loss under non-regenerative treatment and aimed to identify prognostic factors for tooth loss. The longitudinal study was built on a database of 315 patient diagnosed with chronic periodontitis, treated in a university setting. During APT, no pocket elimination surgery, osseous resection, augmentation of intrabony defects or any other regenerative therapy were undertaken. The mobile teeth were splinted and adjunctive metronidazole/ amoxicillin antibiotics were prescribed. SPT followed an individualized interval of 3-12 months. During the observation period, 1167 teeth of 8009 were extracted, 351 during APT and 816 during SPT, 18.5% in the maxilla versus 11.3% in the mandible. The results confirmed that tooth retention seems feasible in periodontitis patients even over long periods and that a small group of patients lost the majority of teeth- so called downhill or extreme downhill patients using a non-regenerative treatment concept. The authors considered the tooth loss in APT versus SPT a controversial topic, mentioning that "even teeth initially classified as questionable or hopeless can be retained in the majority of patients; extractions during APT should be performed with caution". Prognostic factors for tooth loss in SPT were confirmed in this study: the patient's age, bone loss (teeth with bone loss >70% survived 19.8 years, while teeth without bone loss survived 29.8 years), maximum PPD after APT, multirrooted teeth and smoking.

Table 4. Details of the included studies: non-surgical treatment

Study	Rosling et al.	Ravald et al.	Graetz et al.
Year of publication	2001	2012	2016
Study design	Retrospective	Retrospective	Retrospective
Number of patients	NG(normal group) 225 HSG(high susceptibility) 109	64	315
Number of teeth	NG/HSG: mean nr of tooth present 24 in both groups	1537	8009
Operator	University	Not reported	University
Diagnosis	HSG: advanced periodontal disease NG: various dental lesions	Periodontal disease	Chronic Periodontitis
Systemic disease	Not reported	Diabetes mellitus Rheumatic diseases Coronary heart disease	Not reported
Initial SPT Prognosis	Not reported	Not reported	Not reported
Last SPT Prognosis	Not reported	Not reported	Confirmed prognostic

			factors: patient's age, smokers, bone level, maximum PPD, multi-rooted teeth
SPT	12 years	Not reported	9-31years Mean 18.3 years
Recall interval	3-4 months	Not reported	
Compliance	Compliers	Not reported	
Antibiotics	Not reported	Not reported	9.2% cases
Age range	Not reported	49-91	26- 73
Mean age	NG/ HSG: 41.8/ 45.5	64	48.5
Gender	NG/HSG: 46%/ 42%	30 males, 34 females	Male 136, female 179
Smoking	Not reported	1-9 cigarettes/ day 7 >10 cigarettes/ day 11	Active/ former/ nonsmokers: 31/75/209
3rd molar inclusion	Excluded	Not reported	Excluded
Abutment teeth	Not reported	Not reported	
Furcation involvement	Included	Included	Tunneling Root resection
Treatment	Non-surgical	Non- surgical	OFD
Initial extraction (APT)	Not reported	Not reported	351
Teeth loss during SPT	Ng/HSG: 0.3/1.9 80% in HSG lost 0-3 teeth	211	816
No of teeth loss during SPT/ year/ patient	PAL(probing attachment level) loss in HSG/NG: 0.06/ 0.04mm/tooth surface/ year	3.3/ patient 0.23/ year	0.15
Periodontal reason	At molar sites HSG/NG exhibited deepened pockets: 18.1- 34.3/ 2.4- 16.1	153	Not reported
Survival rate	NG/HSG: 74%/ 36%	Not reported	Not reported

CONCLUSIONS

The studies selected in this synthetic search underline that patients highly susceptible to periodontitis exhibit a tooth loss rate almost 6 times higher than patients with normal susceptibility, after having underwent non-surgical periodontal therapy. The decision for tooth extraction may also reflect the experience, knowledge, skills of the dentist and economical aspects of the treatment, and not only the factors related to the tooth or the patient. Even teeth initially classified as questionable or hopeless can be retained in the majority of patients. The known prognostic factors for tooth loss in SPT remain confirmed: the patient's age, the bone loss, the maximum PPD after APT, multirooted teeth with furcations and the smoking habits.

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