SCALE AND POLISH FOR CHRONIC PERIODONTAL DISEASE

A West Midlands Development and Evaluation Service Report

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West Midlands Health Technology Assessment Group

The West Midlands Health Technology Assessment Group (HTAG) produce rapid systematic reviews about the effectiveness of healthcare interventions and technologies, in response to requests from West Midlands Health Authorities or the HTA programme. Reviews usually take 3-6 months and aim to give a timely and accurate analysis of the quality, strength and direction of the available evidence, generating an economic analysis (where possible a cost-utility analysis) of the intervention.

About InterTASC

West Midlands HTAG is a member of InterTASC which is a national collaboration with three other units who do rapid reviews: the Trent Working Group on Acute Purchasing; the Wessex Institute for Health Research and Development; York Centre for Reviews and Dissemination. The aim of InterTASC is to share the work on reviewing the effectiveness and cost-effectiveness of health care interventions in order to avoid unnecessary duplication and improve the peer reviewing and quality control of reports.

Contributions of authors

Karen Elley undertook the collection and collation of the evidence for this review. Lisa Gold and Amanda Burls are both members of the West Midlands DES team and acted as main editors of the review, gave advice about formulation of the question and overall process of the review and read and commented on the draft report. Margaret Gray undertook duplicate extraction on a sample of papers.

Conflicts of Interest

This work has been undertaken by people funded by the NHS. The authors have received no funding from any sponsor in this work.

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West Midlands Regional Evaluation Panel Recommendation:

The recommendation:

Quarterly dental scaling is not supported in specialist units. The effectiveness of quarterly scaling over annual scaling in primary care is not proven.

Anticipated expiry date

- **This report was completed in January 2000**
- **The searches were completed in December 1998**
- **Expiry date for this report is 2002, unless evidence from suitably designed RCTs is reported prior to this date.**

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ACKNOWLEDGEMENTS

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Question
This review addressed the effectiveness of dental scaling on adults with chronic periodontitis. It set out to establish whether scaling every 3 months was more effective than annual scaling and to address the costs and consequences of a change in policy on interval between dental scaling.

Background
In the 1988 UK Adult Dental Survey 95% of adults were found to have at least one of the periodontal conditions recorded (bleeding on probing gums, calculus or pocketing). Most people have progressive periodontal disease which if left untreated increases in severity with age until the affected teeth are extracted.

Data extraction
Data was obtained by a systematic search to a pre-determined data extraction strategy. The quality of each study was reviewed and recorded. Data for the outcomes of change in pocket depth, change in attachment level and change in the proportion of sites which bled on probing were collated for moderate, deep and shallow initial pocket depths.

Studies found
Generally the quality of studies was poor. Randomised control trials did not meet the basic quality criteria as now required by quality journals (e.g. BMJ and BDJ). Only a minority of published studies included variance data, so it was not possible to say whether the changes in reported outcome measures were statistically significant or not. Most studies were undertaken in a specialist setting or on specialist groups.

Findings
In the reviewed studies, there was found to be some positive effect of dental scaling in most cases. However, the magnitude of differences between quarterly and annual scaling after 1 year were small and at levels which would not be clinically detectable with the equipment usually used for measuring them in primary dental care. The existing studies relate to specialist settings or groups which may not be representative of NHS General Dental Practice. Evidence confirming the above findings in the general dental population is required before a change in policy on dental scaling interval can be recommended.

Cost
The expected annual cost difference of reduction of scaling from quarterly to annual would be £28.20 per GDS patient. Using the likely actual distribution of costs per person derived from NHS General Dental Services data, change in scaling interval from 3 months to annual could release up to £52-75 million of NHS GDS expenditure in England for alternative dental interventions. This suggests research to confirm effectiveness results in the General Dental Practice population would be a cost-effective use of research funds.

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Abbreviations

GDS	General Dental Service
CDS	Community Dental Service
HDS	Hospital Dental Service
DPB	Dental Practice Board
TBI	Toothbrush instruction
NHS	National Health Service
QATYs	Quality adjusted tooth years
OHI	Oral Hygiene Instruction
Sextant	One sixth of the mouth
RCT	Randomised control trial

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1 Introduction

How the question arose

The Regional Dental Committee is a focus for clinical effectiveness issues for Dentistry in the West Midlands Region. After scoping the relevant current issues widely amongst the profession they have identified a need for more information about the effectiveness of treatment for periodontal disease, especially dental scaling.

The White Paper Improving NHS Dentistry 1994[1] expressed concern that some items of treatment "are done or at least done so frequently, principally because they earn a fee". It went on to say that "there must be some real doubt whether the 14.6 million scale and polishes done in 1993/94 in the UK at the cost of £108 million were all essential on clinical grounds".

At the national level, the NHS spent £143 million in 1997/98 in England on scaling and polishing in the General Dental Service (source DPB annual report 1998).[2] Information about the effectiveness of dental scaling in primary and secondary care is essential to ensure that outcomes justify the investment.

Separate discussions between the reviewer and the lead NHS Consultant in Restorative Dentistry with a special interest in Periodontology at Birmingham Dental Hospital took place. These also indicated that outcomes of periodontal treatment were an area in which there was a need to address the evidence and would be useful in informing decisions about patient discharge from secondary care.

At the local level, the demand for periodontal care at Birmingham Dental Hospital is rising. The increase in referrals and the lack of non-University Consultant grade staff has resulted in recent increased investment by West Midlands Health Authorities via the Dental Hospital subscription contract for periodontal Consultant services.

Statement of question to be addressed by this review

The specific questions which this review addresses, on the basis of existing research and routine data are:

1. What are the effects of mechanical tooth cleaning (including dental scaling and root planing) on adults with chronic periodontitis (most adults)?

2. Is scaling every 3 months more effective than scaling once a year?

3. What would be the costs and consequences of a change in policy on interval between dental scaling?

NB In this report the term dental scaling will be used to include all methods of mechanical removal of dental calculus, staining, infected cementum, and rough dentine on root surfaces. That is, dental scaling will encompass the procedure of root planing as well as scaling.

2 Background

2.1 Nature of the problem[3]

Chronic adult periodontitis results from a polymicrobial infection of the tooth supporting structures. It is characterised by loss of alveolar (i.e. tooth supporting) bone. Periodontal pocket formation provides a historical record of periodontal disease around a tooth. Gum tissue becomes inflamed if dental plaque accumulates on the tooth tissue. Probing depth will increase when gums become inflamed and swollen. In the early stages probing depth will reduce if oral hygiene improves. Diagram 1 shows the anatomy of tooth supporting structures in health and disease. Chronic periodontal disease does not affect an individual's normal functioning until either it becomes so advanced that the teeth become loose and eating becomes difficult or an acute periodontal abscess forms and the pain and swelling may cause sleep loss and time lost from work to seek treatment.

Pockets form if the inflammation spreads into the functional epithelium which in health attaches the tooth root to the surrounding structures. In a healthy periodontium there is no loss of this epithelial attachment and the crevice between the gum and the tooth is less than 2 mm in depth. Diseased gums can have pockets as large as the distance from the gum margin to the apex of the tooth. The presence of periodontal pockets does not necessarily indicate that the disease is progressing, some detachment may have occurred in the past but may not be progressing. Tooth sites with pockets that do not bleed are unlikely to be in an active phase of periodontal destruction.

Current concepts of periodontal disease show that most gingival inflammation does not always progress to periodontitis. If it does the consequence is usually shallow pockets. Deep pockets are infrequent. The rate of rate of progression of loss of attachment is very slow and not consisitent occuring in bursts of activity. Most adults have periodontal pockets in a small number of sites, on a few teeth. Most adults have contained gingivitis which does not progress.

2.2 Measuring probing depth and attachment level

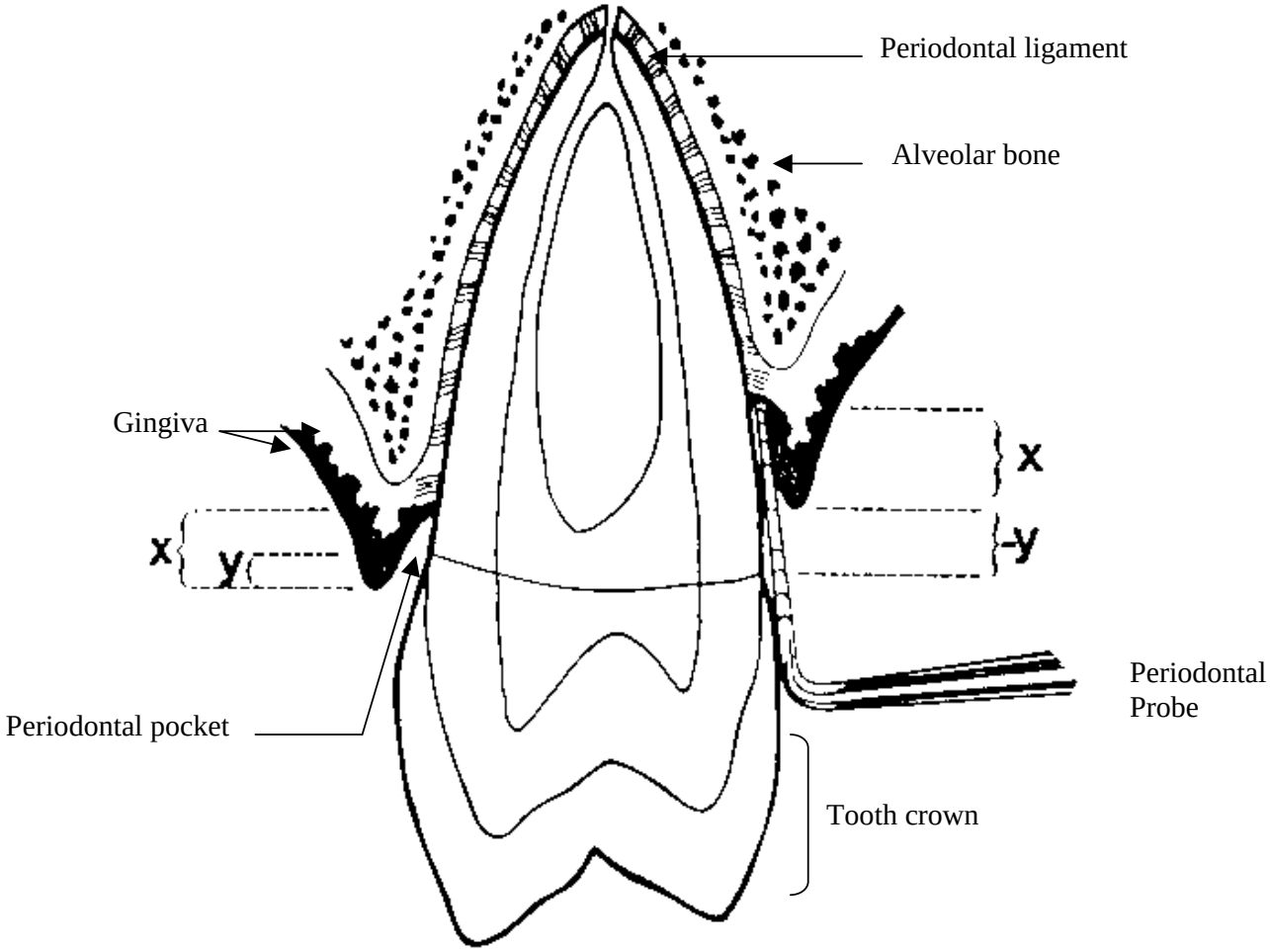
Probing depth is defined as the change in depth from the most coronal (i.e. near the tooth crown) margin of the gingiva to the most apical penetration (i.e. nearest to the root tip). This is shown in diagram 1 as **x.** If pockets get deeper the probing depth increases. It is desirable that pockets become shallower after treatment, that is the probing depth decreases i.e. the change in probing depth has a negative value.

The attachment level is the distance from a fixed reference point (often the cemento-enamel junction) to the most apical penetration of the probe. In the healthy mouth this is represented as **x-y** on the left side of diagram 1. In the situation where the gingival margin has receded following an episode of periodontal disease this is represented by **x+y** as in the right hand side of diagram 1. After treatment it is desirable that the attachment level moves towards the crown of the tooth. A good outcome is therefore that the change in attachment level has a positive value.

Reproducibility of measurement of the depth of periodontal pockets is a problem. Pocket depth will appear to vary depending on the force put on the probe. The criteria for measurement of periodontal conditions varies between studies, which has even resulted in different criteria being used in the 1968, 1978 and 1988 UK adult dental health survey.[4] Attempts are made in research studies to standardise probing force. Electronic probes are now available which measure with standardised force and are able to measure probing depth more accurately. Some have automated measurement and computerised data capture. These are used in specialist surgery based research projects but are not used in epidemiological studies in the field or generally in the dental surgery. Measurements in clinical practice are therefore likely to be less accurate and less reproducible.

Diagram 1

Plan of a tooth and supporting structures to show measurements of probing depth and attachment level.



2.3 Prevalence

The 1988 UK Adult Dental Health Survey[4] indicated that 69% of the population with teeth had some periodontal pockets. Only 5% had none of the periodontal conditions recorded i.e. bleeding, calculus, or pocketing. 10% had deep pockets, which in this survey were defined as more than 5 ½ mm deep. The prevalence was found to be slightly higher in the "Midlands" (as defined this area included the East Midlands and East Anglia as well as the West Midlands), with 74% of dentate people having some pockets and only 2% having none of the periodontal conditions. The survey did however suggest that this variation may be influenced in part by variation between examiners in the assessment of periodontal condition.

The periodontal condition of people who had not been to a dentist for 10 years or more was worse than the general population: 84% had some pockets and 23% had some deep pockets. Of people who reported to clean less often than once a day 80% had some pockets and 19% had deep pockets. People in social classes I, II, and III non manual (defined by occupation of head of household) had better periodontal health (with 67% having some pockets) than those in groups IV and V (with 70% having some pockets).

Periodontal health declines with increasing age. 77% of people aged 65 and over had some pockets compared to 51% of 16-24 year olds. The overall prevalence of periodontal disease is affected by the patterns of tooth loss, as once teeth have been extracted periodontal disease can no longer exist. People now keep their own natural teeth for longer than in the past, which accounts for some rise in periodontal treatment provision. This trend will continue as fewer teeth are lost in the future.

The number of teeth extracted may provide a further indication of chronic periodontal disease, as teeth may be removed when they become loose due to advanced disease. Teeth are however also likely to be lost due to decay and failed restorations, or by people in more deprived groups who are more willing to accept tooth loss or who are unwilling or unable to pay for advanced dental care. In the 1988 UK study 16-24 year olds had an average of 17.7 teeth with healthy gums; this reduced to 5.1 in the over 65's.

2.4 Natural History of the disease

Incidence data is limited. Longitudinal studies indicate that periodontal disease increases with age but that considerable variation exists between patients. Severe disease is often restricted to a small section of the population and often then to a small number of sites. [5, 6, 7] There is therefore a problem for the clinician in predicting which sites are likely to deteriorate in the future. Clinicians often use bleeding of the gingiva when probing an individual site as evidence of an active disease process at that site.

Researchers are reluctant to include untreated sites or patients as controls in long term clinical studies concerned with treatment of inflammatory periodontal disease for ethical reasons.

2.5 Risk factors

Risk factors are multi-factoral and include tooth type, initial periodontal health at baseline, presence of subgingival calculus, age and smoking.[8, 9]

Some systemic diseases such as diabetes, kidney disease, HIV and AIDs and some general health treatments (e.g. radiotherapy and chemotherapy) also cause an increase in periodontal disease.

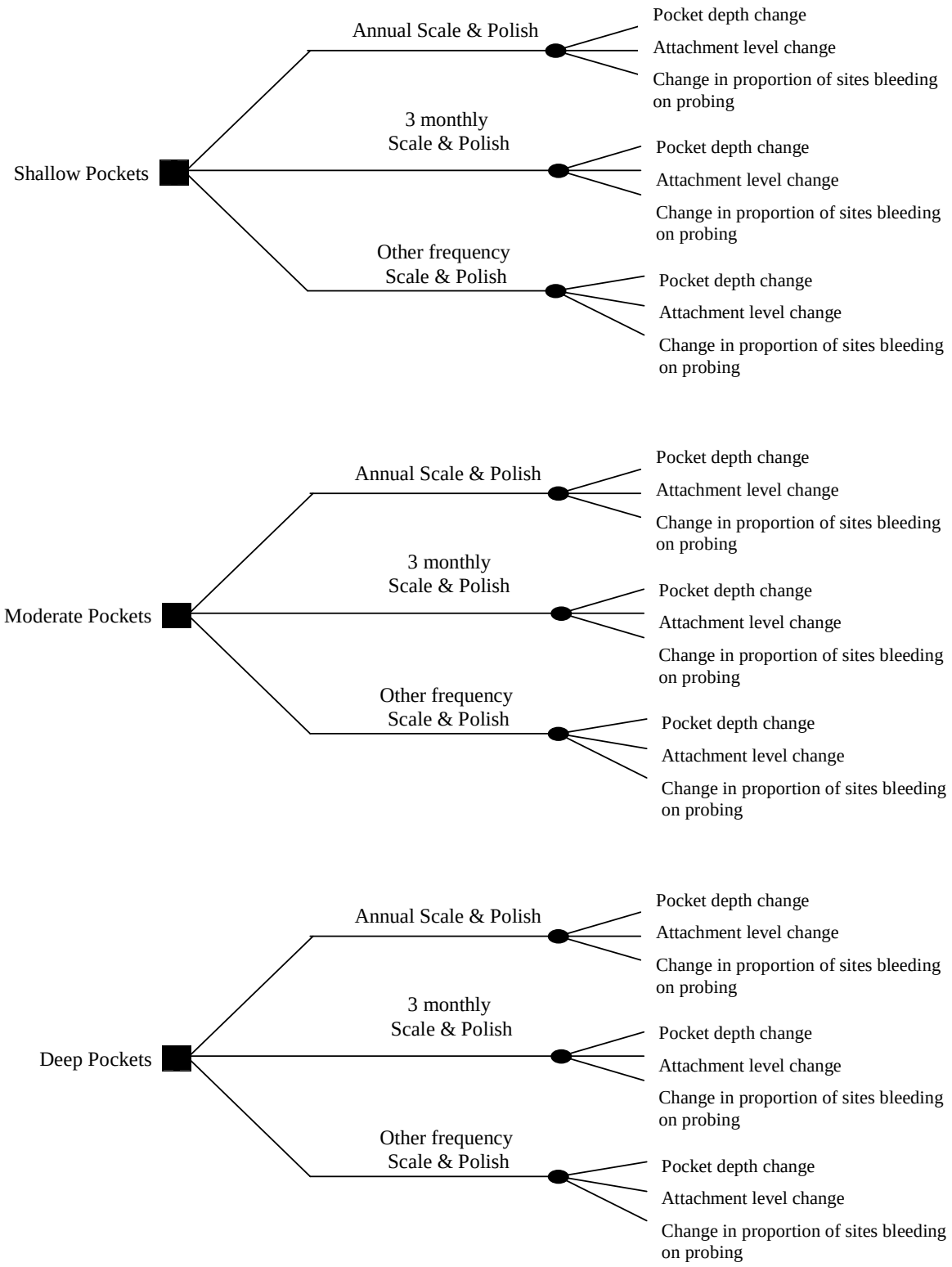
3 Treatment of chronic periodontitis

The most common and very widespread treatment for chronic periodontitis is regular dental scaling and root planing. This is the thorough removal of deposits on the tooth and root surface (plaque, calculus and stain) and removal of cementum or surface dentine that is rough, impregnated with calculus or contaminated with toxins or micro-organisms. Maintenance of good oral hygiene by the patient is essential to stop disease progression.[10] Removal of calculus is thought to be important as it is a factor in plaque retention. Antimicrobial mouthwashes, pocket irrigation, anti-calculus toothpaste use, materials to stimulate tissue regeneration, systematic antimicrobials and laser therapy have all been used as treatment for this condition. Periodontal surgery which involved lifting flaps of gum tissue with or without resection of some gum tissue was also popular previously. However, lack of evidence of the effectiveness of surgery over other methods has now resulted in a reduction in provision of surgical treatment. [11]

3.1 Decision Tree

A pre-requisite for judging overall effectiveness and cost effectiveness of alternative strategies for dental scaling is an explicit statement of the events and outcomes which appear to be of the greatest importance. These are expressed in the framework of the decision tree in Figure 2 and form the basis of the overall judgement of effectiveness and cost-effectiveness. It is important to stress that selection of these key factors inevitably involves implicit value judgements about which outcomes are truly important and which are not.

Decision tree for the main options and outcomes in the management of chronic periodontitis



Current Service Provision

Eighty percent of dental treatment occurs in primary care, which includes the majority of treatment for periodontal disease. Most takes place in the General Dental Service (GDS), with a very small proportion in the Community Dental Service (CDS) or Personal Dental Service (PDS).

Most adults will have a scale and polish following every check up. It is so routine that it is classified by the Dental Practice Board (DPB) in the data they provide to Health Authorities as part of the "no intervention" treatment category.

Primary care dentists refer some cases in the West Midlands to Birmingham Dental Hospital for Consultant opinion or treatment. As more people keep their teeth for longer and become less willing to accept tooth loss, the referrals for Consultant opinion for periodontal conditions to Birmingham Dental Hospital are increasing.

Some primary care dentists employ dental hygienists who undertake routine scaling and oral hygiene instruction, others carry out the treatment themselves. Birmingham Dental Hospital employs dental hygienists and student hygienists in training who undertake similar routine scaling procedures for hospital patients, including those referred to Consultants.

People from lower socio-economic groups attend the dentist less regularly: in 1988 51% of people from a non-manual socio-economic group reported to have a regular check up, compared with 23% of those from a manual socio-economic group.[C] Older people report less regular dental attendance than younger people: 56% of 35-44 year olds report attending for a regular check-up compared to 7% of the over 75s.[c] Therefore people who are likely to have more disease are less likely to attend the dentist.

4 NHS Expenditure on dental scaling

4.1 Hospital and Community Services

Hospital provision is minimal outside Dental Hospitals, but would be provided pre-operatively for some people and routinely for people who have their routine dental care in a hospital setting due to co-existing medical conditions e.g. haemophilia, anti-coagulant therapy etc. Community Dental Services (CDS) provide primary dental care to those who cannot or do not access the GDS, or who are unsuitable by nature of their special needs for treatment in that service. There are no separate expenditure data available for provision of scaling in Hospital and Community Dental Services. Overall NHS expenditure on these services is smaller than that on the GDS, and provision of periodontal treatment forms a small part of the service overall. Therefore cost savings are likely to be much smaller for the Hospital and Community Dental Services than in the GDS.

4.2 General Dental Services

In 1997/98 £150.9 million was spent in England and Wales on periodontal treatment for adult patients under NHS GDS regulations (Source DPB Annual Report 1998).[12] This forms 17% of total GDS Adult Expenditure, a rise from 15.4% in 1993/94.

Since 1992 many dentists have increased the amount of care they provide privately. Consequently, private provision of scale and polish is likely to incur additional patient expenditure. It is not possible to quantify this expenditure as much of it is by individual arrangements between dentists and patients on a fee for item payment system. Recently advertised rates by Boots dentists set their private fee at the level of £25. It is likely that private dental fees will vary according to the local market situation.

Expenditure on NHS GDS is partly funded by the NHS, but patient contribution amounted to 34% of the total expenditure in England in 1997/98.[13] Total NHS GDS expenditure in England was £1,271 million, with £388 million paid by the patient. 73.9% of adults in England pay dental charges.

Dentists are paid £9.40 for simple periodontal treatment including scaling and polishing and oral hygiene instruction (level 1).[14] The fee rises to £22.80 (level 2) for treatment of periodontal disease requiring more than 1 visit, which may also include marginal correction of fillings. More prolonged and complicated treatment over at least 3 visits (level 3), including root-planing and possible syringing of periodontal pockets and subgingival curettage, may attract a fee of £46.95 plus £5.85 for each of six possible sections of the mouth (total maximum approximately £82). Patient charges, when due, are 80 per cent of these amounts. Simple (level 1) scale and polish only attracts a fee when at least two complete clear calendar months have elapsed since the last time that fee was claimed for the same patient. Level 2 or 3 scaling requires at least nine complete calendar months to have expired between claims. Level 3 courses of treatment require 23 clear calendar months to have expired since the last time that fee was paid.

It is assumed that the severity of periodontal disease and the amount of calculus present in a particular patient dictate the number of treatment visits in a course, the exact nature of the care given and therefore the fee. At all fee levels total calculus removal would be expected.

At December 1998 45% of the adult population in England [15] (17.3 million) were registered with an NHS dentist, which means they attended at least once during the preceding 15 months. As the registration period is 15 months in length there is no information available about how many people attend the dentist each year. Some people will only visit once in this period, but some will attend more often. During 1997/98 25.3 million claims for NHS adult dental care were claimed.[16] By comparing the numbers of registrations with the number of claims it can be assumed that there were about 8 million courses of treatment which formed a second or more course within a 15 month period.

A direct enquiry to the Dental Practice Board (DPB) produced the more detailed information about the detailed breakdown of GDS expenditure in England on periodontal treatment, shown in the following table.

About 58% of courses of GDS treatment during 1997/98 therefore included non-surgical periodontal treatment. Of these over 89% were at level 1, 10% at level 2 and the rest at level 3.

GDS Expenditure Adult Periodontal Treatment (England) 1997/98

Non Surgical Periodontal Treatment

Treatment	Number	NHS GDS Expenditure(£)
Scaling and polishing (level 1)	12,714,133	109,255,860
Periodontal treatment (level 2)	1,407,081	29,219,104
Total	**14,121,214**	
Chronic perio trt (level 3)-1-4 teeth	2,941	77,061
-5-9 teeth	1,795	57,569
-10-16 teeth	4,520	170,072
-17 or more	57,434	2,430,405
Total expenditure level 3		**4,657,331**
Additional fee per sextant	366,837	1,922,224
Pre 1996-Pre-operative scaling	18	80
Splinting compromised teeth	250	9,369
	14,555,008	**143,141,744**

Surgical Treatment

Treatment	Number	NHS GDS Expenditure (£)
Gingivectomy	12,132	147,082
Flap surgery	19,645	179,439
Other periodontal surgery	40,844	228,067
Total	**72,622**	**554,589**

Source: DPB Direct Enquiry

5 Methods

5.1 Development of the Protocol

The protocol for the report was developed using the literature identified through a scoping review. This research base was used to inform the background to the review, to formulate the question and to refine the final search strategy.

Existing reviews on the topic do exist. [17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31] The majority of these are narrative reviews which serve as useful sources of background reading, but are not systematic in their approach or comprehensive in their coverage of the current literature.

One review[32] does take a more systematic approach and attempts to summarise much of the published and unpublished data on the intervention. This review pooled data to give mean changes in probing depth and attachment level, however these were not calculated at specific periods of time from the start of the study. Final outcomes only were included.

It became clear that scale and polish appeared as a control intervention in many randomised control trials of other interventions e.g. surgery, chemical treatment etc. It was therefore decided to undertake a separate search to capture a sample of these studies. It was felt that the results for the dental scaling arm may be less open to bias where this was the control treatment rather than the intervention of interest.

A compromise had to be made between those events for which reliable information was available and those where it was not. For example, ideally information about the impact of dental scaling on patient quality of life would be included as outcome measures. As well as clinically measurable outcomes it would be desirable to measure how individuals perceive their mouth and gums feel, whether they perceive themselves to have halitosis etc. Although tools are developed for measuring these final outcomes, the scoping search indicated they have not been widely used in dental research into periodontal treatment. Despite this these outcomes were included in the final search for completeness. Dental research has focused more on intermediate tooth related clinical outcomes rather than what this means for the patient.

5.2 Search Strategy

A broad comprehensive search strategy was developed which was designed to identify relevant material on dental scaling and root planing.

1. Intervention studies - The key elements of this search were:

   - Electronic search of MEDLINE for all types of study, using terms as given in Appendix 1 (pX).

   - Electronic search of the Cochrane Oral Health Group Specialist register of Trials (Appendix 2,pX).

- Contact with other individuals currently undertaking periodontal systematic reviews in the UK (Appendix 3,pX).

- Citation checking of all articles obtained.

All sources were searched from 1976 onwards. No language exclusion criteria were applied.

2. RCTs with scaling as a control intervention

A second search was undertaken to capture randomised controlled trials looking at treatments for chronic periodontitis which include control sites subjected to scaling and polishing only. The key elements of this search were

- Electronic Search - search of MEDLINE for RCTs (Appendix 4).

- Articles which were retrieved as potential included studies in section 1 above which turned out to be RCTs of other treatments with scaling in control.

5.3 Making inclusion & exclusion decisions

Inclusion or exclusion decisions were made independently of the detailed scrutiny of the results of the studies. Details of inclusion and exclusion criteria are shown in Appendix 5.

5.4 Population

The population considered was adults with chronic periodontitis. Hence studies including people with systemic conditions, which may affect periodontal health directly or by the treatment given, were not considered. These conditions included diabetes, kidney disease, HIV infection and AIDs. Any studies of juvenile periodontitis were also excluded due to the different disease process in this condition.

5.5 Intervention

The intervention considered was dental scaling.

5.6 Outcome

The outcomes considered were:

1. Probing depth change

2. Attachment level change

3. Proportion of sites which bled when probed using a periodontal probe.

All study designs except expert opinion were included.

The lead author scanned the abstracts of all identified articles. Papers that originated from the same source as other studies, where there was suspicion that their analysis included some or all of the same patients, were collated. The paper with the greatest amount of data on the required outcomes was used.

The capture of RCT studies with scaling as a control was not intended from the outset to include all such studies. It was intended that some of these should be acquired to enable comparison of results of these studies, where scaling was not the intervention of key interest, with the results of the included studies when it was. This may give an indication of the extent of publication bias, which may result in those studies having positive results being published in preference to those that do not.

5.7 Quality assessment strategy

The quality of the studies was recorded using a pre-determined proforma (Appendix 6) to record the following objective criteria:

5.8 Trials

- Was assignment to treatment groups random?
- Was relatively complete follow-up achieved?
- Were the outcomes of people who withdrew described and included in the analysis?
- Were those assessing outcomes blind to the treatment allocation?
- Were the control and treatment groups comparable at entry?
- Was follow up long enough?
  Quality criteria met in part - follow up 1-2 years
  Quality criteria met in full – follow up over 2 years

5.9 Longitudinal surveys or case series

- Is the study based on a random sample from a suitable sampling frame?
- Are inclusion criteria clearly identified?
- Did all individuals enter the survey at a similar point in their disease progression?
- Was an adequate proportion of the group followed up?
- Was follow up long enough?
  Quality criteria met in part - follow up 1-2 years
  Quality criteria met in full – follow up over 2 years

Symbols were used to give the reader an instant impression of the overall quality of the paper.

The symbols were used to represent:

○ Quality criteria not met or it was not possible to establish from the paper whether they were met

◎ Quality criteria met in part

● Quality criteria met in full

5.10 Data extraction strategy

The data from studies was extracted using a standard data extraction form (Appendix 7,pX). A second reviewer extracted the data from a random sample of 10 studies. Any discrepancies were resolved by discussion. The discrepancies found were only of a minor isolated nature and it was therefore considered not necessary to further check another sample of studies.

If the numbers of individuals included in the study were only reported at the outset and at completion of the study, the initial number was used as a proxy until a point chronologically half way through the study and then the final number was used.
In studies where data were reported by graphs only with no data presented in tables the graph was photocopied to maximum size. The results were then calculated by measurement on the enlarged graph.

5.11 Data synthesis

The outcomes from identified studies were collated for pre-determined time intervals of 3 months, 6 months, 1 year, 2 years, 3 years, 4 years, 5 years and 6 years from the initial dental scaling intervention. Studies in which scaling was repeated at common intervals were collated as were studies in which scaling was carried out at the start of the study only i.e. initial scaling.

In data collation if data were not available for the exact time period required, but were available for a time period which differed by a matter of weeks only, then the nearest time period was used e.g. data at 10 weeks could be used to represent data at 3 months. When collating data in this way data were always put in the next time period, not the preceding one.

Data were collated for patients with periodontal disease of the same severity or results were presented for groups of sites of the same severity. For these purposes shallow pockets were defined as under 4 mm deep, moderate pockets were defined at 4-6 mm and deep pockets were defined as more than 6 mm. These divisions were used as these had commonly been used in papers found in the scoping search. Several studies separated pockets of 5 mm or more. The mean probing depth in these studies was often under 6 mm so these results were also included in the ‘moderate’ category. Data were combined by calculating a weighted mean effect for outcome at 3 months and 1 year.

5.12 Number of papers and studies found

Table 1 shows the numbers of papers and studies identified and included. There were 23 intervention studies and 30 RCTs where dental scaling was in the control arm.

Table 2 shows the characteristics of the studies selected. Of the 23 intervention studies 5 were RCTs, 7 were other trials, 10 were longitudinal studies and 1 was a retrospective case series. The majority of studies are undertaken in specialist settings, where the study populations have been referred from primary care. Studies not in a specialist setting have mainly involved selected groups, such as military personnel.

Appendix 8 shows the reason for exclusion of papers. Appendix 9 shows linking of multiple papers referring to the same study and identifies which paper was used for the extraction of data. The results of the quality assessment of included studies is shown in table 3.

Table 1 - Papers identified as a result of searches

	Abstracts identified	**Papers retrieved as possibly relevant**
Medline	4292	84
Medline re RCTs	163	38
Cochrane (additional studies identified)	54	6
From ref lists		59
Total retrieved		187

NB Some papers were identified by multiple routes. Numbers of papers counted by source of first identification.

Table Studies identified and types

Designation	**Identified**
Intervention studies included	23
RCTs included, Scaling in control	30
Excluded (reasons given in appendix 8,pX)	65
Excluded but useful	26

5 papers were in Foreign Languages – 2 German; 2 Japanese; 1 Chinese

NB some studies are reported by multiple papers - see appendix 7 for which papers relate to which studied

Table 2 - Intervention studies

	CHARACTERISTICS OF STUDY										
Paper	**Study Design**	**Total Number individuals included**	**Groups**	**Number at completion of study**	**Frequency of intervention**	**Country**	**Description of participants**	**Length of study**	**Mean age**	**Age Range**	**Inclusion Criteria**	**Comments**
Suomi, Greene, Vermillion et al; 1971[33]	Matched Trial	163 163 163 out of 1248 study participants	Test Control		2-4 months Annual	USA	Telephone Company Employees	3 years	31.1 ± 4.7 31.4 ± 5.02	18-40		
Axelsson & Lindhe; 1981[34]	Trial	375 310	Test Control	180 146	2-3 months Annual	Sweden	Clinic Attendees	15 years	-	-		Control group discontinued after year 6
Listgarten, Schifter & Laster; 1985[35]	RCT	69 ?	Test Control	30 31	According to bacteriological status 6 monthly	USA	Clinic Attendees	3 years	38 36	20-73 20-67	No pockets >6 mm	
Suomi, Smith, et al 1973[36]	RCT	 ?	1 2 3	 423	Annual 6 monthly 4 monthly	USA	Air Force Cadets	3 years		17-22		
Badersten, Nilveus & Egelberg; 1984[37]	Trial	13			Initial, 3 months, 6 months	Sweden	Clinic Attenders	24 months		30-55	Pockets ≥ 5 mm or more on 2 or more aspects of each tooth	Unable to pool data ∵ intervention period varies
Chapple, Walmsley, Saxby, & Moscrop; 1995[38]	RCT, full v / half power ultrasonic scaling	17		14	Initial	UK	Clinic Attenders	6 months				Attachment loss 3-9 mm in all 4 quadrants and a minimum of 6 teeth in each quadrant
Loos, Kiger & Egelberg 1987[39]	Trial	10		10	Initial	USA	Clinic Attenders	1 year		35-65		Split mouth design using sonic and ultrasonic scalers
Turner, Ashley & Wilson; 1994[40]	Trial	10		9	Initial	UK	Clinic Attenders	12 weeks		29-50		Split mouth design – half OH alone, half with root planing
Laurell; 1990[41]	RCT	15			Initial	Sweden	Clinic Attenders	7 months		30-61	Minimum 30 sites 4-7 mm	Scaling both arms using different sonic scalers

* TBI=tooth brushing instruction

CHARACTERISTICS OF STUDY

PAPER	STUDY DESIGN	Total Number individuals included	Groups	Number at completion of study	Frequency of intervention	Country	Description of participants	Length of study	Mean age	Age Range	Inclusion Criteria	Comments
Gaare, Rolla, Aryadi & Van der Ouderaa; 1990[42]	RCT	95 41	OHI & S+P OHI only*	92 36	Initial	Indonesia	Soldiers	2 months		20-25	CPITN ≤ 10 and pockets <3 mm	One arm S+P and OHI, one arm OHI only
Sato, Yoneyama, Okamoto et al; 1993[43]	Trial	62			Initial	Japan	Town Residents	1 year		20-75		62 people from a study of untreated perio disease had half mouth scaling
Lavanchy, Bickel, Baehni; 1987[44]	Trial	7			Initial	Switzerland	Clinic Attenders	70 days	49	4-60	Pocket > 6mm	Half mouth had 3 weekly OHI + prophylaxis and ½ mouth had usual OHI*
Haffajee, Cugini, et al; 1997[45]	Longitudinal	57		36	3 monthly	USA	Clinic Attendees	9 months	47 ± 11	23-71	8 sites >3 mm	
Hammerle, Joss & Lang; 1991[46]	Longitudinal	68		-	Every 4 weeks	Switzerland	Clinic Attendees	5 months		26-78	Moderate to advanced disease	
Lightner, O'Leary Drake et al; 1971[47]	Longitudinal	713	1 2 3 4A B Total	108 121 110 64 67 470	Annual No TBI Annual +TBI 6 monthly + TBI 3 monthly + TBI 3 monthly No TBI*	USA	Air Force Cadets	4 years				
Vanooteghem, Hutchens, Bowers et al; 1990[48]	Longitudinal	11		11	Initial, then 3 monthly after 1 year	USA	Clinic Attendees	2 months		34-53	At least 10 sites ≥ 6 mm and 2 furcation sites involved	
Nordland, Garrett, Kiger et al; 1987[49]	Longitudinal	19			Initial, 15, 18, 21 months	USA	Clinic Attenders	2 years	45	29-68	No treatment for five years. At least 2 molar furcations periodontally involved.	Unable to pool data ∵ intervention period varies
Hou, Tsai & Weisgold; 1997[50]	Longitudinal	51			1-3 monthly	China	Clinic Attendees	6 years	36.5 ± 8.3	21-61	Moderate to advanced periodontitis	

* OHI=Oral hygiene instruction

	CHARACTERISTICS OF STUDY										
Paper	**Study Design**	**Total Number individuals included**	**Groups**	**Number at completion of study**	**Frequency of intervention**	**Country**	**Description of participants**	**Length of study**	**Mean age**	**Age Range**	**Inclusion Criteria**	**Comments**
Harper, Robinson,1987[51]	Longitudinal			16	Initial	USA	Clinic Attenders	1 week		24-66	At least 4 sites ≥ 50% bone loss & ≥ 6 mm pockets	
Caton, Proye, & Polson; 1982[52]	Longitudinal	10			Initial	USA	Clinic Attenders	16 weeks			Pocket 3-7 mm	
Cercek, Kiger, Garrett & Egelberg;1983[53]	Longitudinal	7			Initial	USA	Clinic Attenders	9-12 months		35-64	Pocket ≥ 5 mm	
Kawanami, Sugaya, Kato et al; 1988[54]	Longitudinal	12			Initial	Japan	Clinic Attenders	4 weeks			No previous perio treatment	
Bragger, Hakanson & Lang; 1992[55]	Retrospective case series	52		52	Variable	Switzerland	Clinic Attendees	7 years	53.7 $\pm$ 12.6			

* OHI=Oral hygiene instruction

RCTs – Scaling as control

Paper	Other interventions in RCTS	Total Number included in study	Number in scaling group	Number at completion of study	Frequency of scaling	Country	Description of participants	Length of study	Mean age	Age Range	Inclusion Criteria	Comments
Becker, Becker, Ochsenbein et al; 1988[56]	Surgery	16	16		3 monthly	Canada	Clinic Attenders	1 year	42	30-57	2 or more sites ≥ 6 mm in posterior segments	
Ramfjord, Caffesse, Morrison et al; 1987[57]	Surgery	90	90	72	3 monthly	USA	Clinic Attenders	2 years	45	24-48	Pockets ≥ 4 mm and at least 20 treatable teeth	
Phillstrom, Ortiz-Campos & McHugh; 1981[58]	Surgery	17	17	10	3 monthly	USA	Clinic Attenders	4 years	43	22-59	Moderate to advanced periodontitis	
Kaldahl, Kalkwarf, Patil et al; 1988[59]	Surgery	82	75	82	3 monthly	USA	Clinic Attenders	2 years	43.5		Moderate to advanced periodontitis	
Waite; 1976[60]	Surgery	28			12 weeks and 12 weekly to 48 weeks	UK	Clinic Attenders	48 weeks		21-49	Interproximal pockets > 3 mm	Unable to pool data as scaling interval varies
Lindhe, Westfelt, Nyman et al; 1982[61]	Surgery	15			2 weekly for 6 months then 3 monthly	Sweden	Clinic Attenders	2 years	47.9	32-57		Unable to pool data as scaling interval varies
Echevema, Cafesse; 1983[62]	Surgery		15	15	Initial	USA	Clinic Attenders	9 weeks	28	25-38	Pocket > 5 mm	Split mouth design
Lindhe, Nyman; 1985[63]	Surgery		15	15	Initial and then variable	Sweden	Clinic Attenders	12 months	52	42-59	Severe pockets > 6 mm	Unable to collate as variable interval time
Trombelli, Scabbia, Carotta et al; 1996[64]	Tetracycline irrigation and tetracycline fibre application	12			Initial	Italy		60 days	418	27-63	At least 3 sites ≥ 5 mm	

Paper	Other interventions in RCTS	Total Number included in study	Number in scaling group	Number at completion of study	Frequency of scaling	Country	Description of participants	Length of study	Mean age	Age Range	Inclusion Criteria	Comments
Taner, Ozcan, Doganay et al; 1994[65]	Doxycycline resorbable base materials	11	11		Initial	Turkey	Clinic Attenders	10 weeks	44	37-45	At least 4 sites ≥ 5 mm	Split mouth design
Stelzel & Flores-de-Jacoby; 1997[66]	Metronidazole gel	30	30	24	Initial	Germany	Clinic Attenders	2 years	57	36-66	One pocket ≥ 5 mm in each quadrant	Split mouth design, teeth with pockets ≥ 5 mm treated
Pedrazzoli, Kilian & Karring; 1992[67]	Metronidazole gel	24	24		Initial	Denmark	Clinic Attenders	6 months	49	22-71	One pocket ≥ 5 mm in each quadrant	Split mouth design, teeth with pockets ≥ 5 mm treated
Awanti & Zulqarnain; 1998[68]	Metronidazole gel	13	13	12	Initial	Saudi Arabia	Clinic Attenders	14 weeks	37.3	28-57	One pocket ≥ 5 mm in each quadrant	Split mouth design
204 **– Reinhardt, Johnson, Dubois; 1991[69]**	Scaling with papilla reflection fibre optic illumination		15	15	Initial	USA	Clinic Attenders	6 months	42.3		Pocket > 5 mm	Unable to collate as moderate and advanced not separated
Soskoline, Heasman, Stabholz et al; 1997[70]	Local Chlorhexidine	118	118	94	Initial	UK & Israel	RAF staff	6 months	47.5	30-65	One pocket 5-8 mm in each of 2 maxillary quadrants	Split mouth design 3 centres
Taggart, Palmer & Wilson; 1990[71]	Chlorhexidine as coolant in ultrasonic scaling	10	10	10 (9 at 6 weeks)	Initial	UK	Clinic Attenders	10 weeks		28-51	At least 1 pair of pockets 4-6 mm and 7 mm and over in contralateral quadrants	Split mouth design
Ainamo, Lie, Ellingsen et al; 1992[72]	Metronidazole gel	206	206	199	Initial	Norway, Finland, Sweden and Denmark	Clinic Attenders	24 weeks	48	22-75	One pocket in each quadrant ≥ 5 mm	Split mouth design 9 centres involved
Jeong, Han, Lee & Magnusson; 1994[73]	Tetracycline/ Citric Acid gel	16	16		Initial	Korea	Clinic Attenders	12 weeks		28-58	One pocket on single rooted tooth of 4-6 mm in each quadrant	Split mouth design

Paper	Other interventions in RCTS	Total Number included in study	Number in scaling group	Number at completion of study	Frequency of scaling	Country	Description of participants	Length of study	Mean age	Age Range	Inclusion Criteria	Comments
183 – Klinge, Attstrom & Karring; 1992[74]	Topical metronidazole	61	61	60	Initial	Denmark Sweden	Clinic Attenders	12 weeks	49	28-70	One pocket in each quadrant ≥ 5 mm	Split mouth design
Maze, Reinhardt, Agarwal et al; 1995[75]	Tetracycline strips	10	10		Initial	USA	Clinic Attenders	26 weeks	59.3	42-72	Pockets ≥ 5 mm with radiographic bone loss. At least 5 non-adjacent teeth	Split mouth design
Lie, Bruum & Boe; 1998[76]	Topical metronidazole and tetracycline	18	18		Initial	Norway	Clinic Attenders	6 months		36-77	Moderate to severe periodontitis, probing depths ≥ 5 mm	Split mouth design
Radvar, Pourtaghi & Kinane; 1996[77]	Local antibiotic therapy	67	13	54	Initial	UK	Clinic Attenders	6 weeks			Patients with persistent pockets ≥ 5 mm	Allocation of patients to 4 groups
Rudhart, Purucker, Kage et al; 1998[78]	Local metronidazole	46	46		Initial	Germany	Clinic Attenders	175 days		27-63	At least one tooth with interproximal pockets ≥ 5 mm	Split mouth design
Tonetti, Cortellini, Carnevale et al; 1998[79]	Tetracycline fibres	127	61	60	Initial	Italy	Private periodontal practice attenders	6 months	49.7		At least one mandibular furcation with bleeding on probing	Split mouth design Multicentre involving 6 centres, treating furcations
Drisko, Cobb, Killoy et al; 1995[80]	Tetracycline fibres	122	122	116	Initial	USA	Clinic Attenders	12 months	45.1	25-73	Have at least 1 or 2 non adjacent sites in each quadrant ≥ 5 mm	Split mouth design 4 centres

Paper	Other interventions in RCTS	Total Number included in study	Number in scaling group	Number at completion of study	Frequency of scaling	Country	Description of participants	Length of study	Mean age	Age Range	Inclusion Criteria	Comments
Palmer, Matthews & Wilson; 1998[81]	Topical and systemic metronidazole	90	27	84	Initial	UK	Clinic Attenders	24 weeks		35-65	Probing depths ≥ 5 mm, clinical attachment loss ≥ 2 mm. Bone loss ≥ 4mm	Subjects allocated to treatment groups
Flemmig, Milian & Klaiber; 1998[82]	Systemic metronidazole and amoxycillin	48	20	38	Scaling as necessary	Germany	Clinic Attenders	12 months	54.4		Microbiological criteria and 4 pockets ≥ 6 mm	Allocation to treatment groups. Unable to pool data as intervention period varies
Wilson, McGuire & Greenstein; 1997[83]	Tetracycline	113	113	26	Initial and then not specified	USA	Clinic Attenders	5 years			2 non-adjacent sites 5-8 mm	Subgroup only followed for 5 years Unable to pool data as scaling interval varies
Persson, Alves, Chambers et al; 1995[84]	Perioguard used to identify enzyme levels	96 30	Test Control	91 ?	Initial	USA	Clinic Attenders	28 days	42.3 33			3 Centre trial to determine enzyme levels in crevicular fluid in health and disease

Table 3 - Quality Assessment

Part I Included Studies

Paper	Study Design Comments	Trials						Longitudinal Surveys Or Case Series				
		Was assignment to treatment gps random?	Was relatively complete follow-up achieved?	Were the outcomes of people who withdrew described and included in the analysis?	Were those assessing outcomes blind to the treatment allocation?	Were the control and treatment gps comparable at entry?	Was follow up long enough?	Is the study based on a random sample from a suitable sampling frame?	Are inclusion criteria clearly identified?	Did all individuals enter the survey at a similar point in their disease progression?	Was follow up long enough?	Was an adequate proportion of group followed up?
Suomi, Greene, Vermillion et al; 197133	Matched Trial	○	○	○	○	●	◎					
Axelsson & Lindhe; 1981[85]	Trial	○	○	○	○	○	●					
Listgarten, Schifter & Laster; 1985[86]	RCT	●	●	○	○	◎	◎					
Haffajee, Cugini, et al; 1997[8]	Longitudinal							●	●	●	○	○
Hammerle, Joss & Lang; 1991[46]	Longitudinal							●	●	●	○	○
Lightner, O'Leary Drake et al; 1971[47]	RCT	○	○	○	●	○	◎					
Suomi, Smith, et al; 1973[87]	RCT	○	○	○	●	●	◎					
Bragger, Hakanson & Lang; 1992[55]	Retrospective case series							○	○	○	●	
Vanooteghem, Hutchens, Bowers et al; 1990[48]	Longitudinal							●	●	●	◎	●
Chapple, Walmsley, Saxby, & Moscrop; 1995[68]	RCT	●	◎	○	●	●	○					
Loos, Kiger & Egelberg 1987[39]	Trial	●	●	○	●	●	○					
Turner, Ashley & Wilson; 1994[40]	Trial	●	◎	○	○	●	○					

○ Quality criteria not met or insufficient information in paper
◎ Quality criteria met in part
● Quality criteria met in full

Paper	Study Design Comments	Trials						Longitudinal Surveys Or Case Series				
		Was assignment to treatment gps random?	Was relatively complete follow-up achieved?	Were the outcomes of people who withdrew described and included in the analysis?	Were those assessing outcomes blind to the treatment allocation?	Were the control and treatment gps comparable at entry?	Was follow up long enough?	Is the study based on a random sample from a suitable sampling frame?	Are inclusion criteria clearly identified?	Did all individuals enter the survey at a similar point in their disease progression?	Was follow up long enough?	Was an adequate proportion of gp followed up?
Laurell; 1990[41]	RCT	●	●	○	●	●	○					
Gaare, Rolla, Aryadi & Van der Ouderaa; 1990[42]	RCT	○	◉	○	○	◉	○					
Sato, Yoneyama, Okamoto et al; 1993[43]	Trial	●	○		○	●	◉					
Caton, Proye, & Polson; 1982[52]	Longitudinal							◉	●	●	○	
Cercek, Kiger, Garrett & Egelberg;1983[53]	Longitudinal							◉	●	●	○	
Lavanchy, Bickel, Baehni; 1987[44]	Trial	●	●	○	○	●	○					
Kawanami, Sugaya, Kato et al; 1988[54]	Longitudinal							◉	◉	○	○	
118 – Nordland, Garrett, Kiger et al; 1987[88]	Longitudinal							◉	◉	◉	○	
Badersten, Nilveus & Egelberg; 1984[37]	Trial	◉	●	○	●	●	◉					
Harper, Robinson; 1987[51]	Longitudinal							○	●	●	○	○
Hou, Tsai, Weisgold; 1997[50]	Longitudinal							◉	◉	◉	●	○

○ Quality criteria not met or insufficient information in paper
◉ Quality criteria met in part
● Quality criteria met in full

Quality Assessment

Part II RCTs – Scaling in control

Paper	Study Design	RCTS					
		Was assignment to treatment gps random?	Was relatively complete follow-up achieved?	Were the outcomes of people who withdrew described and included in the analysis?	Were those assessing outcomes blind to the treatment allocation?	Were the control and treatment gps comparable at entry?	Was follow up long enough?
Wilson, McGuire & Greenstein; 1997[63]	RCT, scaling as control	●	○	○	●	○	○
Becker, Becker, Ochsenbein et al; 1988[56]	RCT, scaling as control	●	○	○	○	●	○
Ramfjord, Caffesse, Morrison et al; 1987[57]	RCT, scaling as control	●	◉	●	○	●	●
Pihlstrom, Ortiz-Campos & McHugh; 1981[58]	RCT, scaling as control	●	○	●	○	●	●
Kaldahl, Kalkwarf, Patil et al; 1988[59]	RCT, scaling as control	●	●	●	○	●	◉
Waite; 1976[60]	RCT, scaling as control	○	○	○	○	●	○
Lindhe, Westfelt, Nyman et al; 1982[61]	RCT, scaling as control	●	○	○	○	●	◉

○ Quality criteria not met or insufficient information in paper
◉ Quality criteria met in part
● Quality criteria met in full

Paper	Study Design	RCTS					
		Was assignment to treatment gps random?	Was relatively complete follow-up achieved?	Were the outcomes of people who withdrew described and included in the analysis?	Were those assessing outcomes blind to the treatment allocation?	Were the control and treatment gps comparable at entry?	Was follow up long enough?
Trombelli, Scabbia, Carotta et al; 1996[64]	RCT, scaling as control	●	○	○	●	●	○
Taner, Ozcan, Doganay et al; 1994[65]	RCT, scaling as control	●	○	○	○	●	○
Stelzel & Flores-de-Jacoby; 1997[66]	RCT, scaling as control	●	◉	◉	◉	●	◉
Pedrazzoli, Kilian & Karring; 1992[67]	RCT, scaling as control	●	○	○	○	●	○
Soskoline, Heasman, Stabholz et al; 1997[70]	RCT, scaling as control	●	◉	○	○	●	○
Taggart, Palmer & Wilson; 1990[71]	RCT, scaling as control	●	◉	●	○	●	○
Ainamo, Lie, Ellingsen et al; 1992[72]	RCT, scaling as control	●	◉	●	○	●	○
Jeong, Han, Lee & Magnusson; 1994[73]	RCT, scaling as control	●	○	○	○	●	○

○ Quality criteria not met or insufficient information in paper
◉ Quality criteria met in part
● Quality criteria met in full

Scale and polish for chronic periodontal disease

Paper	Study Design	RCTS					
		Was assignment to treatment gps random?	Was relatively complete follow-up achieved?	Were the outcomes of people who withdrew described and included in the analysis?	Were those assessing outcomes blind to the treatment allocation?	Were the control and treatment gps comparable at entry?	Was follow up long enough?
Klinge, Attstrom & Karring; 1992[74]	RCT, scaling as control	○	●	○	○	●	○
Maze, Reinhardt, Agarwal et al; 1995[75]	RCT, scaling as control	●	○	○	○	●	○
Lie, Bruum & Boe; 199876	RCT, scaling as control	●	○	○	○	●	○
Pedrazzoli/Kilan/Karring[67]	RCT, scaling as control	●	●	○	○	●	○
Radvar, Pourtaghi & Kinane; 1996[77]	RCT, scaling as control	●	◎	◎	○	●	○
Rudhart, Purucker, Kage et al; 1998[78]	RCT, scaling as control	○	○	○	●	●	○
Tonetti, Cortellini, Carnevale et al; 199851	RCT, scaling as control	●	●	●	●	●	○
Drisko, Cobb, Killoy et al; 1995[89]	RCT, scaling as control	●	●	◎	●	●	◎
Palmer, Matthews & Wilson; 1998[81]	RCT, scaling as control	●	◎	○	●	○	○

○ Quality criteria not met or insufficient information in paper
◎ Quality criteria met in part
● Quality criteria met in full

Paper	Study Design	RCTS					
		Was assignment to treatment gps random?	Was relatively complete follow-up achieved?	Were the outcomes of people who withdrew described and included in the analysis?	Were those assessing outcomes blind to the treatment allocation?	Were the control and treatment gps comparable at entry?	Was follow up long enough?
Flemmig, Milian & Klaiber; 1998[82]	Trial scaling as control	◎	◎	○	○	◎	
Lindhe, Westfelt, Nyman et al; 1982[61]	Trial scaling as control	●	○	○	○	◎	○
Awartani/Zulqarnain; 1998[68]	RCT, scaling as control	●	◎	○	○	●	○
Echeverria/ Caffesse; 1983[62]	RCT, scaling as control	●	○	○	○	●	○
Persson, Alves, Chambers et al; 1995[84]	Trial	○	◎	◎	○	○	○
Reinhhardt, Johnson, Dubo; 1991[69]	RCT, scaling as control	●	◎	○	●	●	○
Lindhe, Nyman; 1985[63]	RCT, scaling as control	●	○	○	○	●	◎

○ Quality criteria not met or insufficient information in paper
◎ Quality criteria met in part
● Quality criteria met in full

Summary of Quality Assessment

- Generally quality of studies poor

- RCTs often did not meet basic quality criteria as now often required by quality journals e.g. BMJ and BDJ.

6 Data extraction and collation

Appendix 11 contains a collation of data for each included study for the change in proportion of sites which bleed on probing, change in attachment level and change in probing depth at all points in time set in the method. Table 8 lists the studies for which data could not be combined and the reason for that.

Table 4 shows the data for all specified outcomes at 3 months and 1 year only. The graphs show data for probing depth and attachment level at 3 months and 1 year.

Table 5 gives a summary of weighted mean values for these outcomes in both RCT studies with scaling as a control and in intervention studies, separately identified. Table 5 also gives the range for each outcome and the outcome data combined for both types of study.

Table 4 - Collation of data available at 3 months and 1 year - Moderate pockets

Intervention studies-initial scaling (numbers in brackets indicate variance before and after from which SE of change was calculated)

Probing depth							**Attachment change**							**Bleeding on probing-change in proportion**				
Study ID	Mean change at 3 months	Number in study	SE	Mean change at 1yr	Number in study	SE	Study ID	Mean change at 3 months	Number in study	SE	Mean change at 1yr	Number in study	SE	Study ID	Mean change at 3 months	Number in study	Mean change at 1yr	Number in study
39	-1.2	10		-1.3	10		52	0.7	10					205	-61.0	15		
52	-1.4	10					51	0.1	7		0.1	7			-59.0	15		
51	-1.0	7	(0.8,0.7) 0.4	-0.7	7	(0.8,0.9) 0.32	40	0.0	9					43			-58.0	62
							39	0.0	10		0.0	10					-47.0	62
														52	-34.0	10		
														53	-22.5	7	-19.1	7
														110	-47.0	9		
mean changes	**-1.2**	**27**		**-1.1**	**17**			**0.2**	**36**		**0.1**	**17**			**-48.6**	**56**	**-50.7**	**131**

Intervention studies-3 monthly scaling

Probing depth							**Attachment change**							**Bleeding on probing-change in proportion**				
Study ID	Mean change at 3 months	Number in study	SE	Mean change at 1yr	Number in study	SE	Study ID	Mean change at 3 months	Number in study	SE	Mean change at 1yr	Number in study	SE	Study ID	Mean change at 3 months	Number in study	Mean change at 1yr	Number in study
50	-0.7	51		-1.5	51		50	0.6	51		1.1	51						
45	-0.4	57	(0.01,0.01) 0.00				45	0.3	57									
mean changes	**-0.5**	**108**		**-1.5**	**51**			**0.4**	**108**		**1.1**	**51**						

Initial scaling in RCTs

Probing depth							**Attachment change**							**Bleeding on probing-change in proportion**				
Study ID	Mean change at 3 months	Number in study	SE	Mean change at 1yr	Number in study	SE	Study ID	Mean change at 3 months	Number in study	SE	Mean change at 1yr	Number in study	SE	Study ID	Mean change at 3 months	Number in study	Mean change at 1yr	Number in study
66							61				0.5	15		67				
67							64	1.6	12					64	-31.0	12		
64	-1.8	12												80				
														74	-41.0	60		
70	-0.6	111	0.05				70	0.2	111	0.06								
71	-0.8	9	(0.5,0.7) 0.29				73	1.6	16	(1.03,0.74) 0.31				71	-33.2	10		
							87	-0.2	18	(1.8,2.2) 0.66				73	-26.7	16		
83	-1.0	113	0.11															
73	-1.7	16	(0.62,0.65) 0.22															
74	-1.3	60					89	0.6	122	0.05	0.8	116	0.05					
75																		
65	-1.4	11	(1.1,1.2) 0.49															
76	-1.4	18	(1.2,1.3) 0.42															
78																		
68	-1.5	12																
81																		
89	-1.0	122	0.05	-1.0	116	0.05												
89				-0.4	116													
mean changes	**-1.0**	**484**		**-0.7**	**232**			**0.5**	**279**		**0.7**	**131**			**-36.6**	**98**		

3 monthly scaling in RCTs

Probing depth							**Attachment change**							**Bleeding on probing-change in proportion**				
Study ID	Mean change at 3 months	Number in study	SE	Mean change at 1yr	Number in study	SE	Study ID	Mean change at 3 months	Number in study	SE	Mean change at 1yr	Number in study	SE	Study ID	Mean change at 3 months	Number in study	Mean change at 1yr	Number in study
56				-0.9	16	0.65												
233	-1.2	82	0.06	-1.4	78	0.07	233	1.0	82	0.08	1.1	78	0.09					
25				-1.3	89	0.65	25				0.3	89	0.61					
118				-0.8	17		118				0.4	17						
mean changes	**-1.2**	**82**		**-1.2**	**200**			**1.0**	**82**		**0.6**	**184**						

Table 4b - Collation of data - deep pockets

Intervention studies-single (numbers in brackets indicate variance before and after from which SE of change was calculated)

Probing depth							**Attachment change**							**Bleeding on probing-change in proportion**				
Study ID	Mean change at 3 months	Number in study	SE	Mean change at 1yr	Number in study	SE	Study ID	Mean change at 3 months	Number in study	SE	Mean change at 1yr	Number in study	SE	Study ID	Mean change at 3 months	Number in study	Mean change at 1yr	Number in study
39	-2.5	10		-2.8	10		39	1.0	10		1.0	10		43			-41	62
44	-2.7	7	(0.8,0.8) 0.43				44	2.5	7	(1.1,1.3) 0.64								
mean changes	**-2.6**	**17**		**-2.8**	**10**			**1.6**	**17**		**1.0**	**10**					**-41**	**62**

Intervention studies-3 monthly

Study ID	Mean change at 3 months	Number in study	SE	Mean change at 1yr	Number in study	SE	Study ID	Mean change at 3 months	Number in study	SE	Mean change at 1yr	Number in study	SE	Study ID	Mean change at 3 months	Number in study	Mean change at 1yr	Number in study
50	-1.4	51		-2.8	51		50	0.6	51		1.4	51						
45	-0.9	57	(0.1,0.25) 0.04				45	0.9	57	(0.2,0.2) 0.04								
mean changes	**-1.1**	**108**		**-2.8**	**51**			**0.8**	**108**		**1.4**	**51**						

RCT-single

Study ID	Mean change at 3 months	Number in study	SE	Mean change at 1yr	Number in study	SE	Study ID	Mean change at 3 months	Number in study	SE	Mean change at 1yr	Number in study	SE	Study ID	Mean change at 3 months	Number in study	Mean change at 1yr	Number in study
70	-0.8	111	0.13															
89	-2.3	122	0.1	-2.5	116	0.10	70	0.2	111	0.15								
							89	1.4	122	0.2	1.4	116	0.2					
mean changes	**-1.6**	**233**		**-2.5**	**116**			**0.8**	**233**		**1.4**	**116**						

RCT-every 3 months

Study ID	Mean change at 3 months	Number in study	SE	Mean change at 1yr	Number in study	SE	Study ID	Mean change at 3 months	Number in study	SE	Mean change at 1yr	Number in study	SE	Study ID	Mean change at 3 months	Number in study	Mean change at 1yr	Number in study
56				-1.5	16	0.95												
233	-2.2	75	0.11	-2.4	71	0.14	233	1.7	75	0.12	1.9	71	0.13					
25				-2.9	33	1.91	25				1.0	33	1.6					
118				-1.7	17		118				1.2	17						
mean changes	**-2.2**	**75**		**-2.3**	**137**			**1.7**	**75**		**1.5**	**121**						

Table 4c - Collation of data - shallow pockets

Intervention studies-single (numbers in brackets indicate variance before and after from which SE of change was calculated)

Probing depth							**Attachment change**							**Bleeding on probing-change in proportion**				
Study ID	Mean change at 3 months	Number in study	SE	Mean change at 1yr	Number in study	SE	Study ID	Mean change at 3 months	Number in study	SE	Mean change at 1yr	Number in study	SE	Study ID	Mean change at 3 months	Number in study	Mean change at 1yr	Number in study
39	0.0	10		0.0	10		39	-0.4	10		-0.4	10		185	-29	95		
														43			-46	62
mean changes	**0.0**	**10**		**0.0**	**10**			**-0.4**	**10**		**-0.4**	**10**			**-29**	**95**	**-46**	**62**

Intervention studies-3 months																		
Study ID	Mean change at 3 months	Number in study	SE	Mean change at 1yr	Number in study	SE	Study ID	Mean change at 3 months	Number in study	SE	Mean change at 1yr	Number in study	SE	Study ID	Mean change at 3 months	Number in study	Mean change at 1yr	Number in study
50	-0.1	51		0.0	51		50	-0.1	51		-0.1	51						
45	0.0	57	(0.05,0.05) 0.00				45	0.0	57									
mean changes	**0.0**	**108**		**0.0**	**51**			**0.0**	**108**		**-0.1**	**51**						

RCT single																		
Study ID	Mean change at 3 months	Number in study	SE	Mean change at 1yr	Number in study	SE	Study ID	Mean change at 3 months	Number in study	SE	Mean change at 1yr	Number in study	SE	Study ID	Mean change at 3 months	Number in study	Mean change at 1yr	Number in study
76	-0.7	18	(1.1,0.9) 0.33															
84	-0.2	100					76	0.4	18	(1.6,1.4) 0.50								
68	-0.5	12																
mean changes	**-0.3**	**130**						**0.4**	**18**									

RCT-every 3 months																		
Study ID	Mean change at 3 months	Number in study	SE	Mean change at 1yr	Number in study	SE	Study ID	Mean change at 3 months	Number in study	SE	Mean change at 1yr	Number in study	SE	Study ID	Mean change at 3 months	Number in study	Mean change at 1yr	Number in study
56				0.0	16	0.25												
233	-0.4	82	0.03	-0.4	78	0.04	223	0.3	82	0.05	0.3	78	0.06					
25				-0.2	89	0.42	25				-0.3	89						
118				-0.1	17		118				-0.2	17						
mean changes	**-0.4**	**82**		**-0.2**	**200**			**0.3**	**82**		**0.0**	**184**						

Table 5 – Summary of outcomes at 3 months and 1 year

Pocket depth change

Shallow									
		3 months	**number**	**Range from**	**Range to**	**1yr**	**number**	**Range from**	**Range to**
Initial	RCTs	-0.3	130	-0.2	-0.7	x	x	x	x
	Intervention studies	0.0	10	0.0	1 study	0.0	10	0.0	1 study
	Combined	**-0.3**	**140**	**0.0**	**-0.7**	**0.0**	**10**	**0.0**	1 study
3 monthly	RCTs	-0.4	82	-0.4	1 study	-0.2	200	0.0	-0.4
	Intervention studies	0.0	108	0.0	-0.1	0.0	51	0.0	1 study
	Combined	**-0.2**	**190**	**0.0**	**-0.4**	**-0.2**	**251**	**0.0**	**-0.4**

Moderate									
		3 months	**number**	**Range from**	**Range to**	**1yr**	**number**	**Range from**	**Range to**
Initial	RCTs	-1.0	484	-0.8	-1.7	-0.7	232	-0.4	-1.0
	Intervention studies	-1.2	27	-1.0	-1.4	-1.1	17	-0.7	-1.3
	Combined	**-1.0**	**511**	**-0.8**	**-1.7**	**-0.7**	**249**	**-0.4**	**-1.3**
3 monthly	RCTs	-1.2	82	-1.2	1 study	-1.2	200	-0.8	-1.4
	Intervention studies	-0.5	108	-0.7	-0.4	-1.5	51	-1.5	1 study
	Combined	**-0.8**	**190**	**-0.4**	**-1.2**	**-1.3**	**251**	**-0.8**	**-1.5**

Table 5a continued

Deep									
		3 months	**number**	**Range from**	**Range to**	**1yr**	**number**	**Range from**	**Range to**
Initial	RCTs	-1.6	233	-0.8	-2.3	-2.5	116	-2.5	1 study
	Intervention studies	-2.6	17	-2.5	-2.7	-2.8	10	-2.8	1 study
	Combined	**-1.7**	**250**	**-0.8**	**-2.7**	**-2.5**	**126**	**-2.5**	**-2.8**
3 monthly	RCTs	-2.2	75	-2.2	1 study	-2.3	137	-1.5	-2.9
	Intervention studies	-1.1	108	-0.9	-1.4	-2.8	51	-2.8	1 study
	Combined	**-1.6**	**183**	**-0.9**	**-2.2**	**-2.4**	**188**	**-1.5**	**-2.9**

Numbers refer to total number of patients in studies, figures show the mean change and range from baseline to 3 months or I year in mm

Table 5b - Summary of outcomes at 3 months and 1 year

Attachment level change

Shallow									
		3 months	**number**	**Range from**	**Range to**	**1yr**	**number**	**Range from**	**Range to**
Initial	RCTs	0.4	18	0.4	1 study	x	x	x	x
	Intervention studies	-0.4	10	-0.4	1 study	-0.4	10	-0.4	1 study
	Combined	**0.1**	**28**	**0.4**	**-0.4**	**-0.4**	**10**	**-0.4**	1 study
3 monthly	RCTs	0.3	82	0.3	1 study	0.0	184	-0.2	0.3
	Intervention studies	0.0	108	0.0	-0.1	-0.1	51	-0.1	1 study
	Combined	**0.1**	**190**	**-0.1**	**0.3**	**0.0**	**235**	**-0.1**	**0.3**

Moderate									
		3 months	**number**	**Range from**	**Range to**	**1yr**	**number**	**Range from**	**Range to**
Initial	RCTs	0.5	279	-0.3	1.5	0.8	131	0.8	0.5
	Intervention studies	0.2	36	0.1	0.7	0.0	17	0.0	0.0
	Combined	**0.5**	**315**	**-0.3**	**1.5**	**0.7**	**148**	**0.0**	**0.8**
3 monthly	RCTs	1.0	82	1.0	1 study	0.6	184	0.3	1.1
	Intervention studies	0.4	108	0.3	0.6	1.1	51	1.1	1 study
	Combined	**0.7**	**190**	**0.3**	**1.0**	**0.7**	**235**	**0.3**	**1.1**

Table 5b continued

Deep									
		3 months	**number**	**Range from**	**Range to**	**1yr**	**number**	**Range from**	**Range to**
Initial	RCTs	0.8	233	0.2	1.4	1.4	116	1.4	1 study
	Intervention studies	1.6	17	1.0	2.5	1.0	10	1.0	1 study
	Combined	**0.9**	**250**	**0.2**	**2.5**	**1.4**	**126**	**1.0**	**1.4**
3 monthly	RCTs	1.7	75	1.5	1 study	1.5	121	1.0	1.9
	Intervention studies	0.8	108	0.6	0.9	1.4	51	1.4	1 study
	Combined	**1.2**	**183**	**0.6**	**1.7**	**1.5**	**172**	**1.0**	**1.9**

Numbers refer to total number of patients in studies,figures show the mean change and range from baseline to 3 months or I year in mm

Table 5c – Summary of outcomes at 3 months and 1 year

Change in proportion of sites which bleed on probing

Shallow									
		3 months	**number**	**Range from**	**Range to**	**1yr**	**number**	**Range from**	**Range to**
Initial	RCTs								
	Intervention studies	-29.0	95	-29.0	1 study	-46.0	62	-46.0	1 study
	Combined	**-29.0**	**95**	**-29.0**	1 study	**-46.0**	**62**	**-46.0**	1 study
3 monthly	RCTs								
	Intervention studies								
	Combined								

Moderate									
		3 months	**number**	**Range from**	**Range to**	**1yr**	**number**	**Range from**	**Range to**
Initial	RCTs	-36.6	98	-26.7	-41.1	x	x	x	x
	Intervention studies	-48.6	56	-22.5	-61.0	-50.7	131	-19.1	-58.0
	Combined	**-41.0**	**154**	**-22.5**	**-61.0**	**-50.7**	**131**	**-19.1**	**-58.0**
3 monthly	RCTs								
	Intervention studies								
	Combined								

Table 5c continued

Deep									
		3 months	**number**	**Range from**	**Range to**	**1yr**	**number**	**Range from**	**Range to**
Initial	RCTs								
	Intervention studies					-41.0	62	-41.0	1 study
	Combined					**-41.0**	**62**	**-41.0**	1 study
3 monthly	RCTs								
	Intervention studies								
	Combined								

Numbers refer to total number of patients in studies, figures show the mean change and range from baseline to 3 months or I year in mm

Summary of Effects Found

These effects should be viewed in the light of the following:

- The quality of the majority of the research base was poor. Variance was not routinely reported. Lack of this meant that statistical significance and confidence limits could not be calculated for many of the included studies and, therefore, for the weighted mean estimate of outcomes.

- The majority of the studies were of referred patients treated in specialist units which would not necessarily be representative of the situation in NHS General Dental Practice in England.

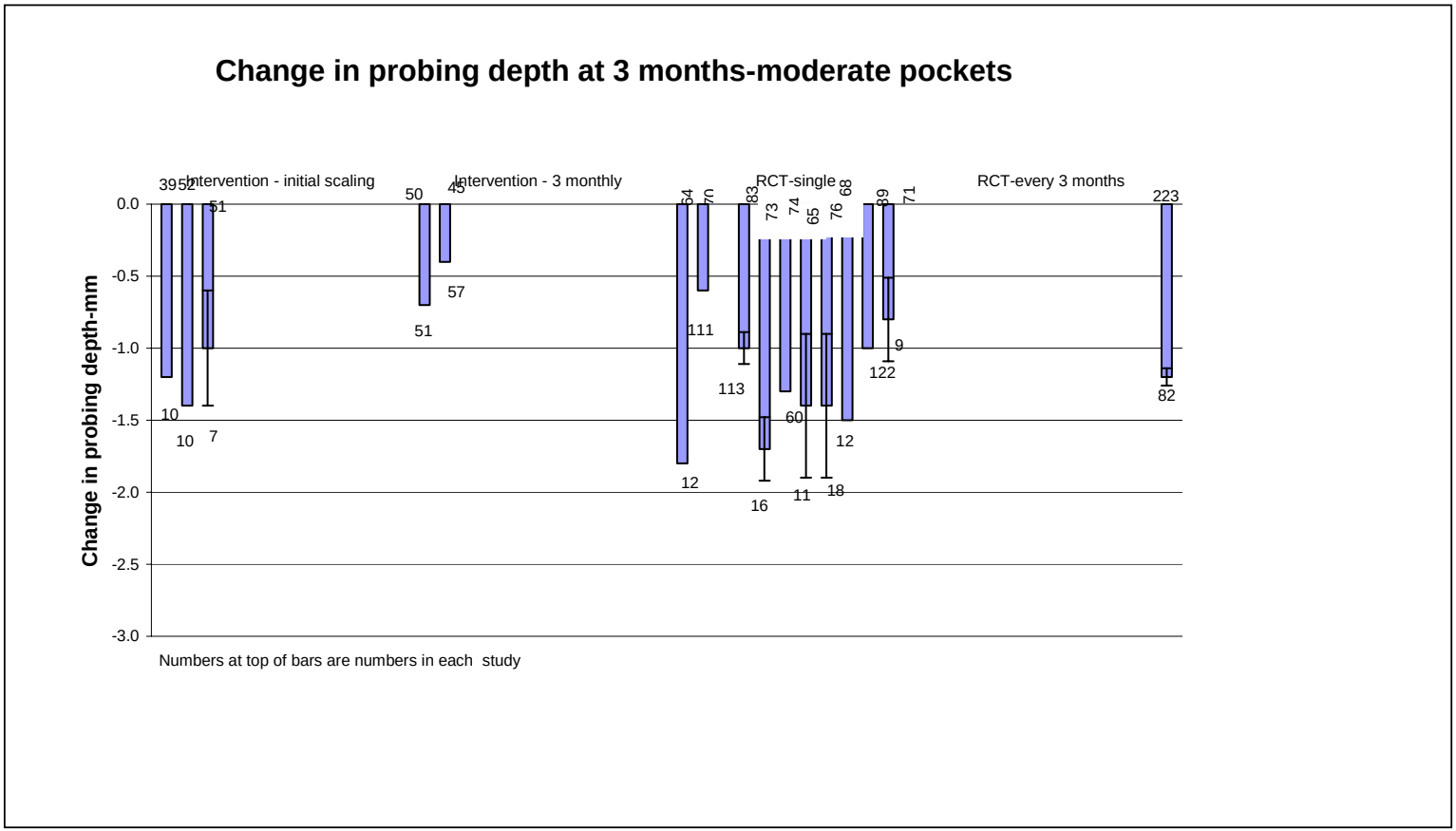
7 Direction and size of effect

7.1 Probing depth

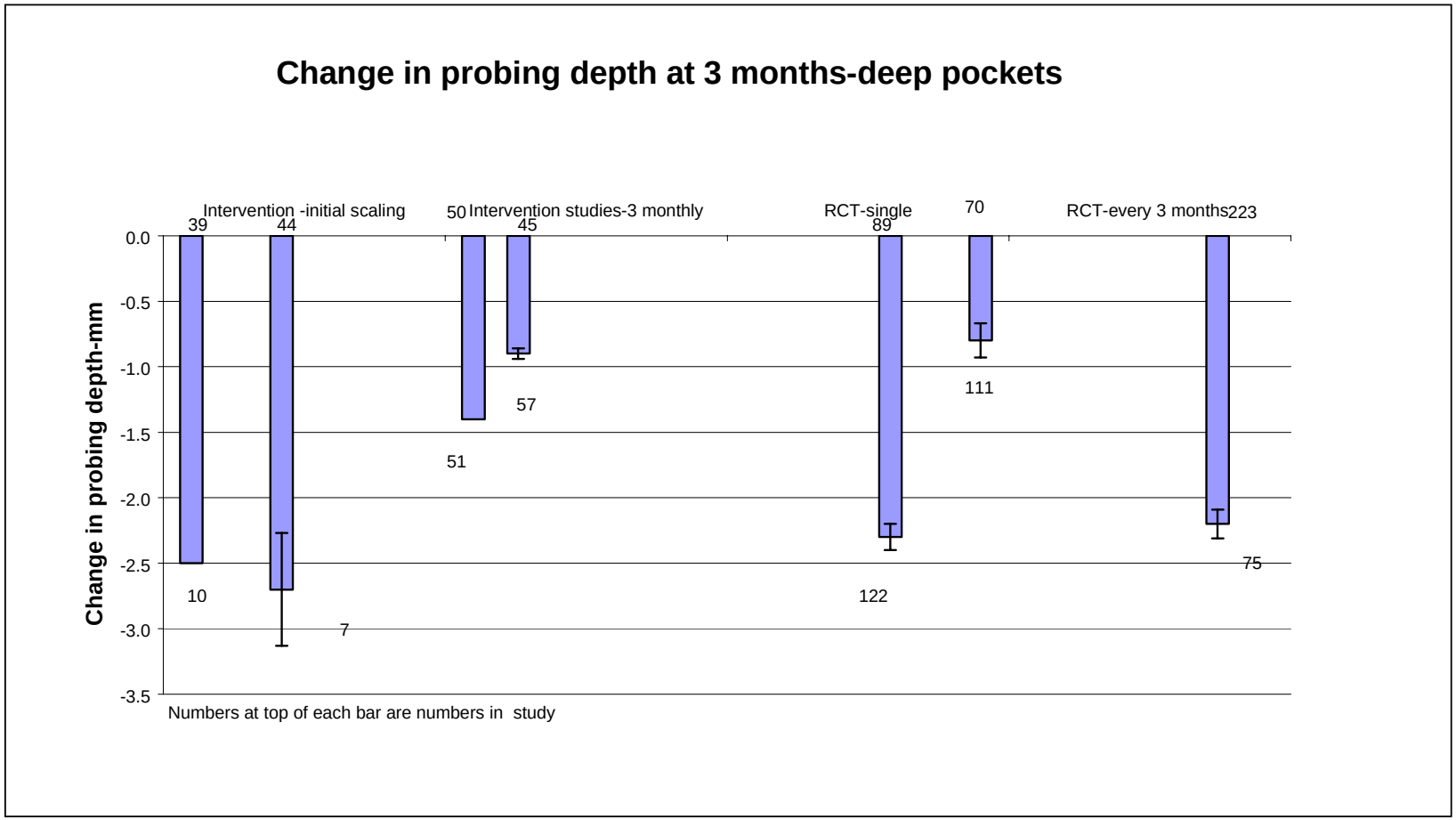
The graphs show that all studies showed a decrease in probing depth for moderate and deep pockets. There was some difference between the results for RCTs where scaling formed the control and intervention studies. However for many of the categories the numbers were small. There appeared more reduction in deep pockets than shallow pockets, although this could be the effect of regression to the mean.

The mean pocket depths for combined studies showed more reduction with 3 monthly scaling than in initial scaling after one year (i.e. a proxy for annual scaling) in the moderate and shallow groups. The mean excess reduction after one year was 0.6 mm or less.

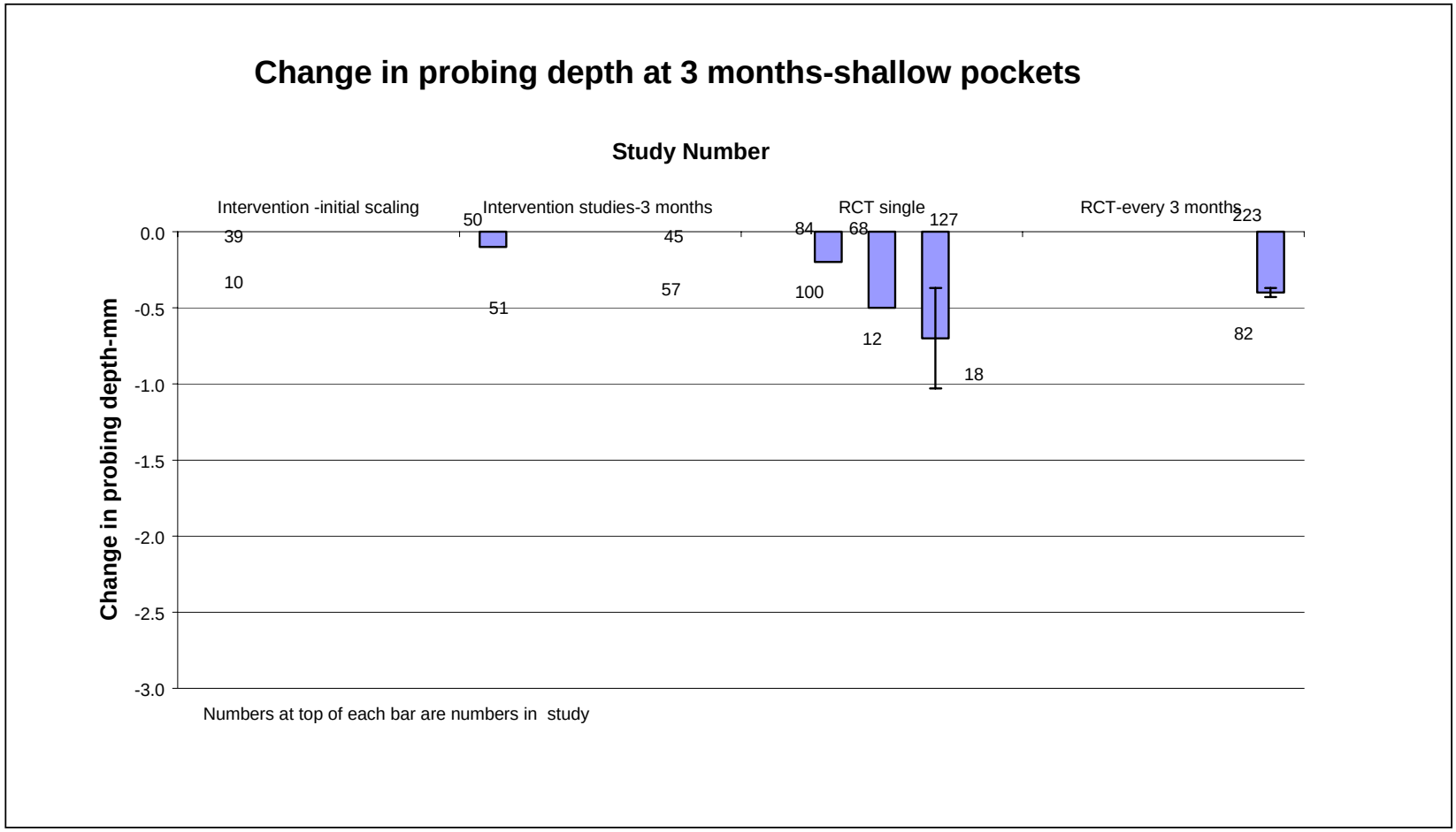
Graph 1 – Change in probing depth at 3 months-moderate pockets



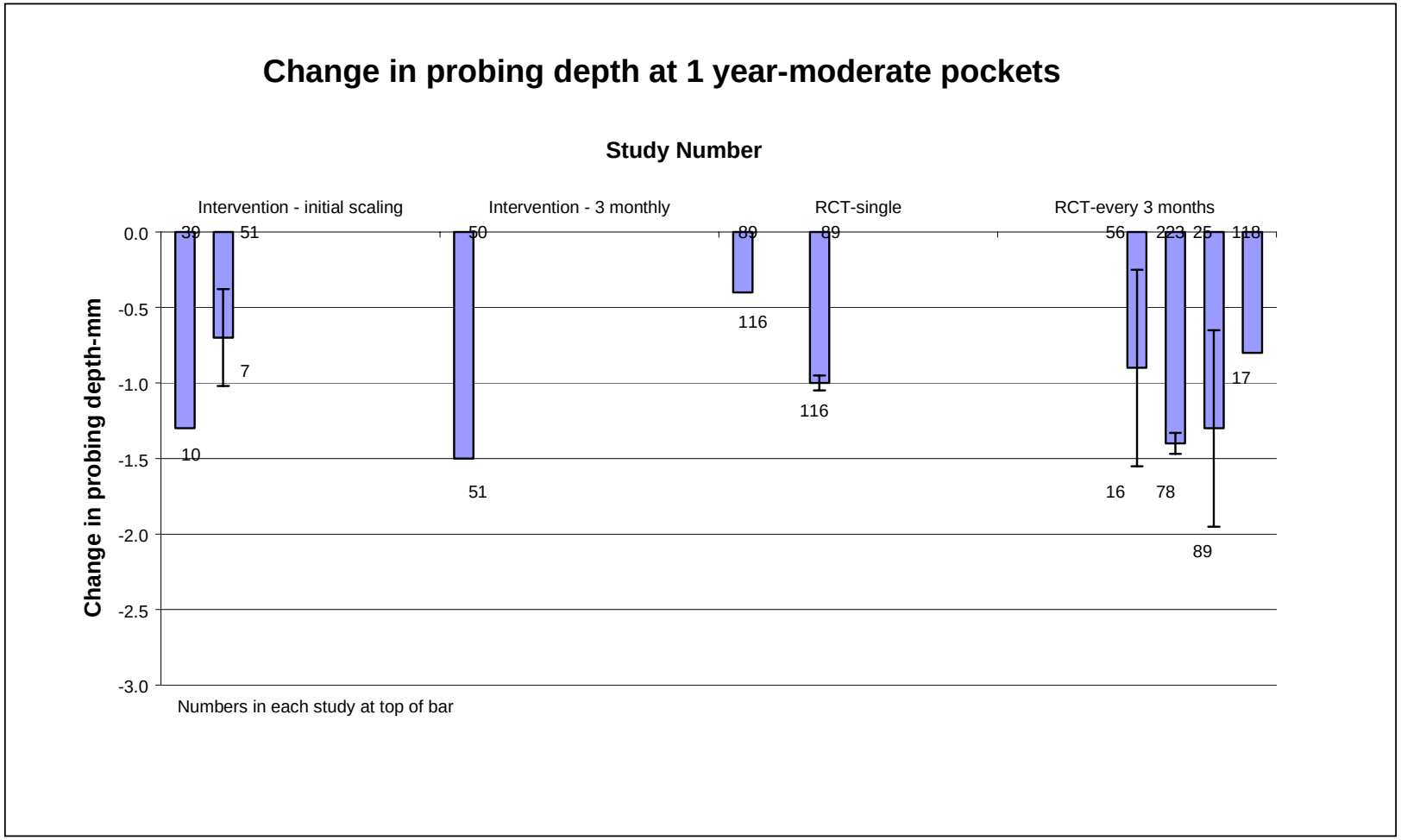
Graph 2 – Change in probing depth at 3 months-deep pockets



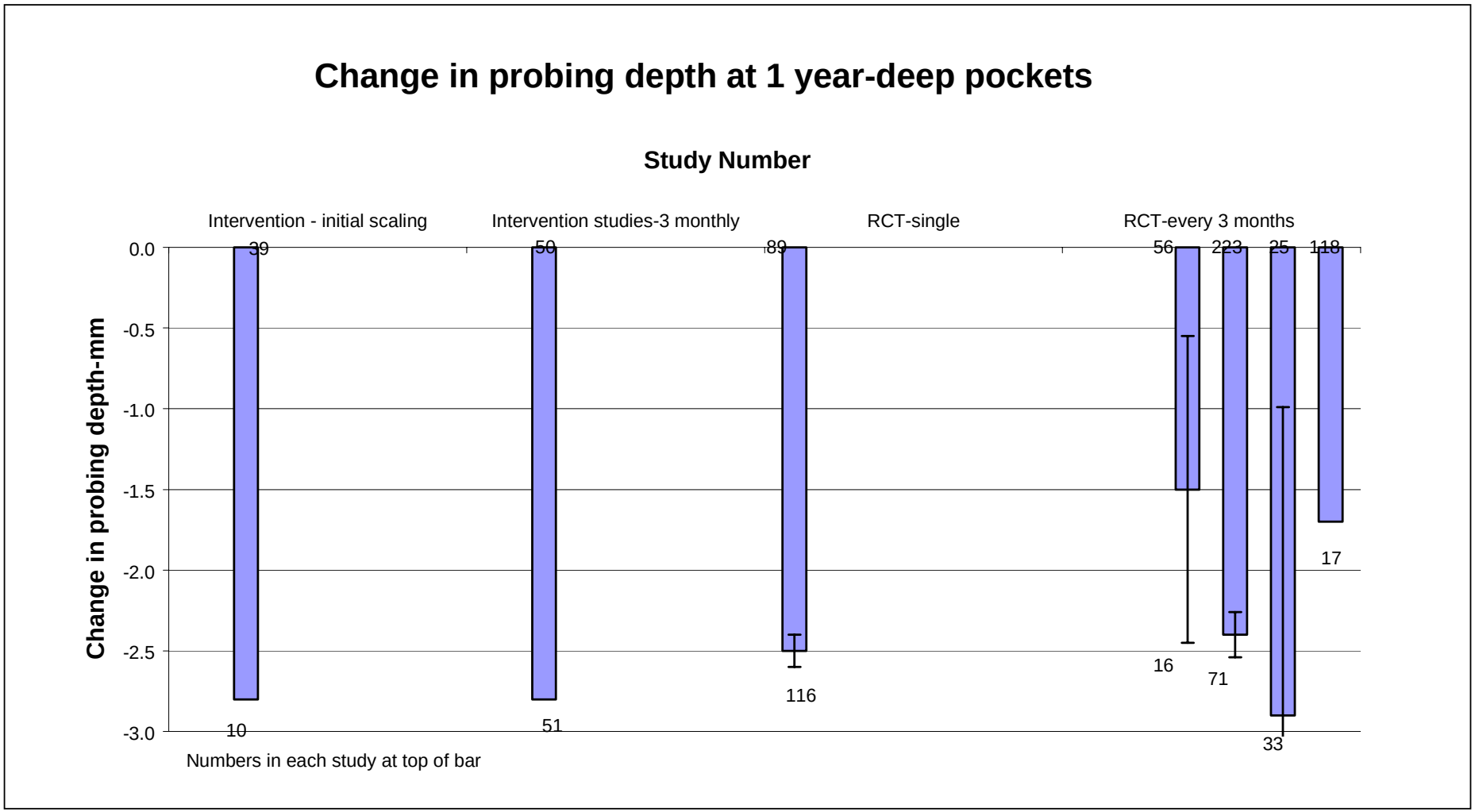
Graph 3 – Change in probing depth at 3 months-shallow pockets



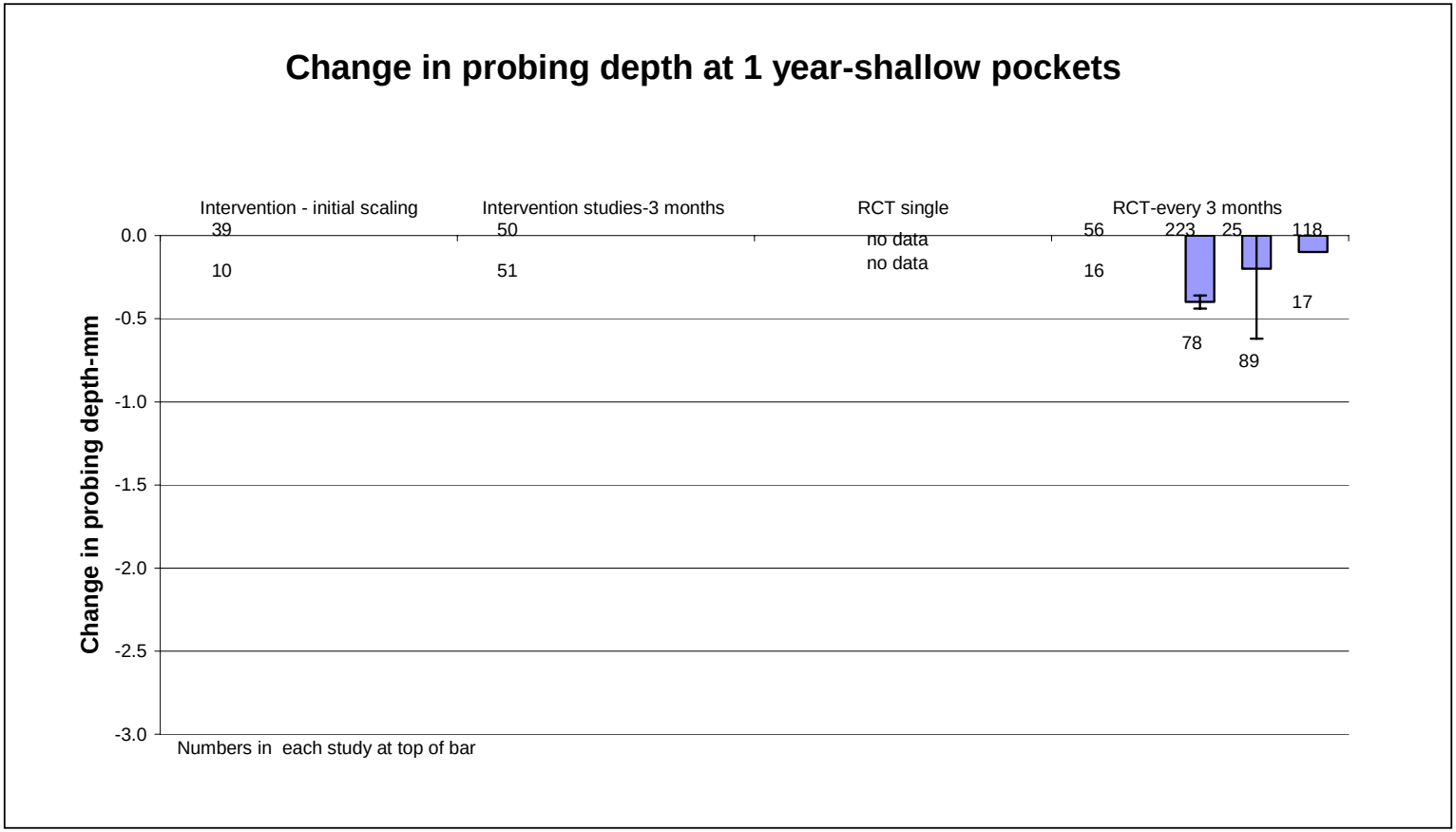
Graph 4 – Change in probing depth at 1 year-moderate pockets



Graph 5 – Change in probing depth at 1 year-deep pockets



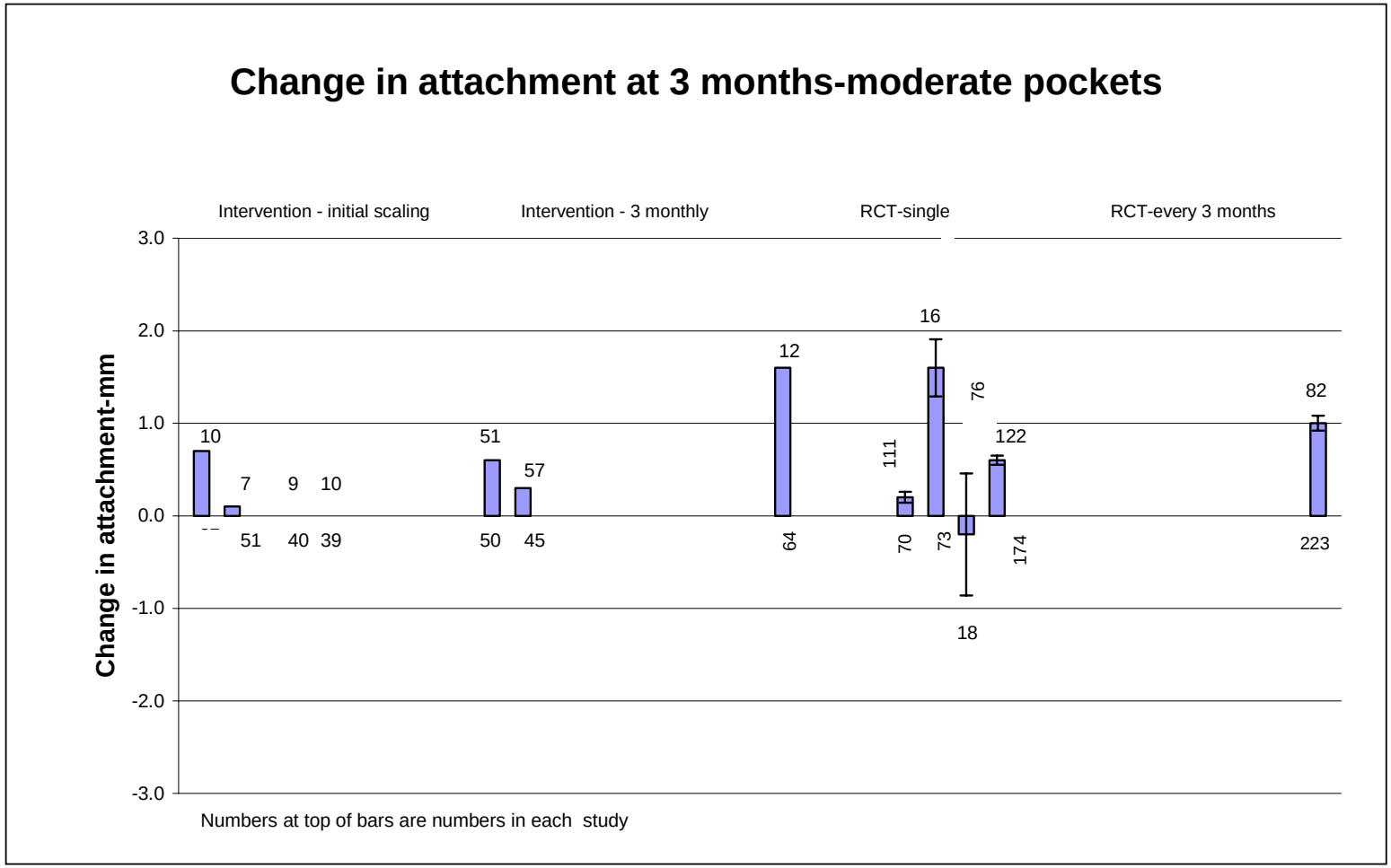
Graph 6 – Change in probing depth at 1 year-shallow pocketsAttachment level



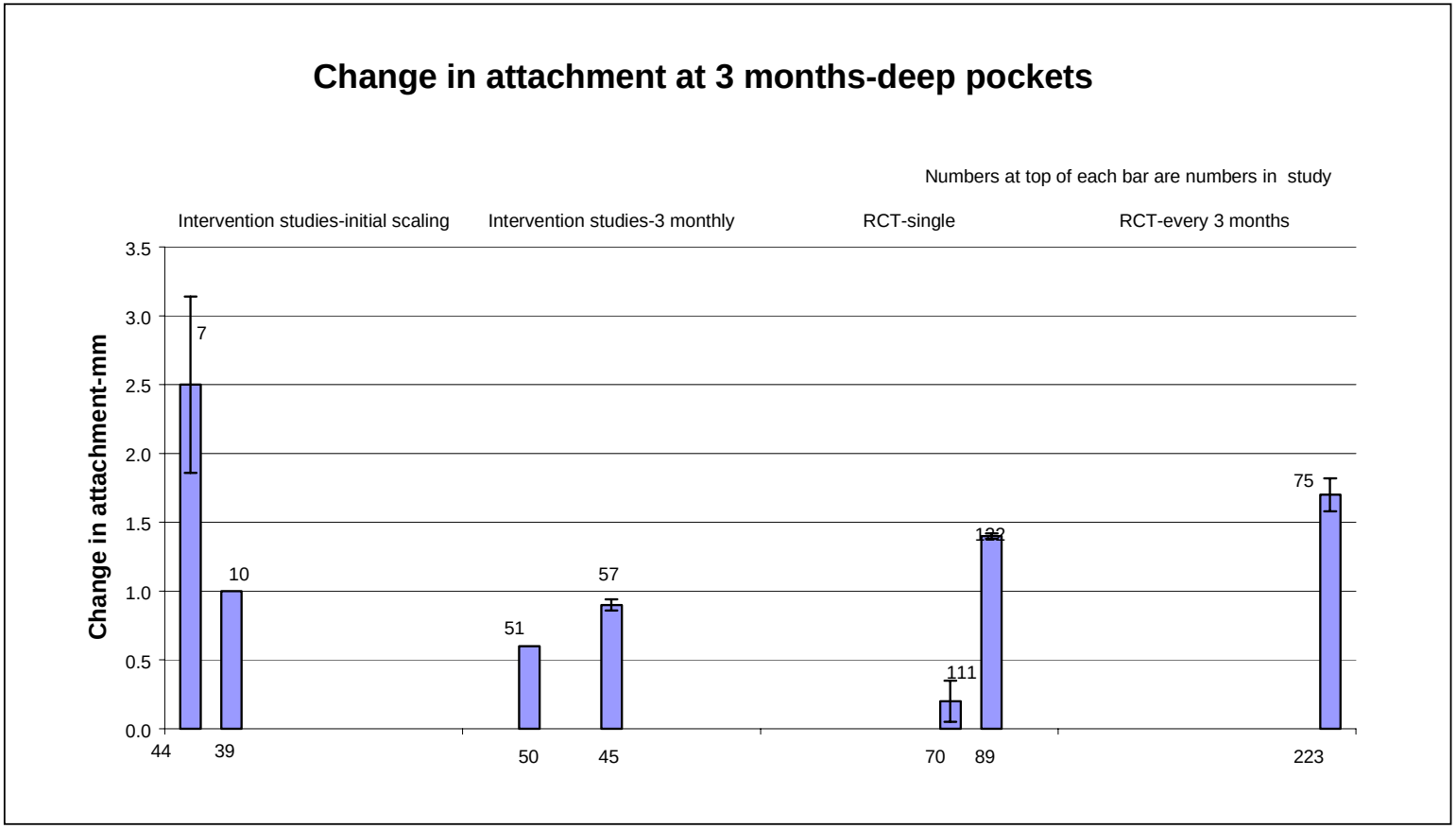
In moderate and deep pockets RCTs with scaling as a control showed more attachment gain than in intervention studies.

Some studies showed that shallow pockets showed a loss of attachment which may be as a result of natural progression of disease or possibly harm from treatment. This is an important possibility, which must be considered. Moderate pockets showed the same attachment gain at one year with quarterly or annual scaling. The range of attachment gain varied between studies by a considerable amount.

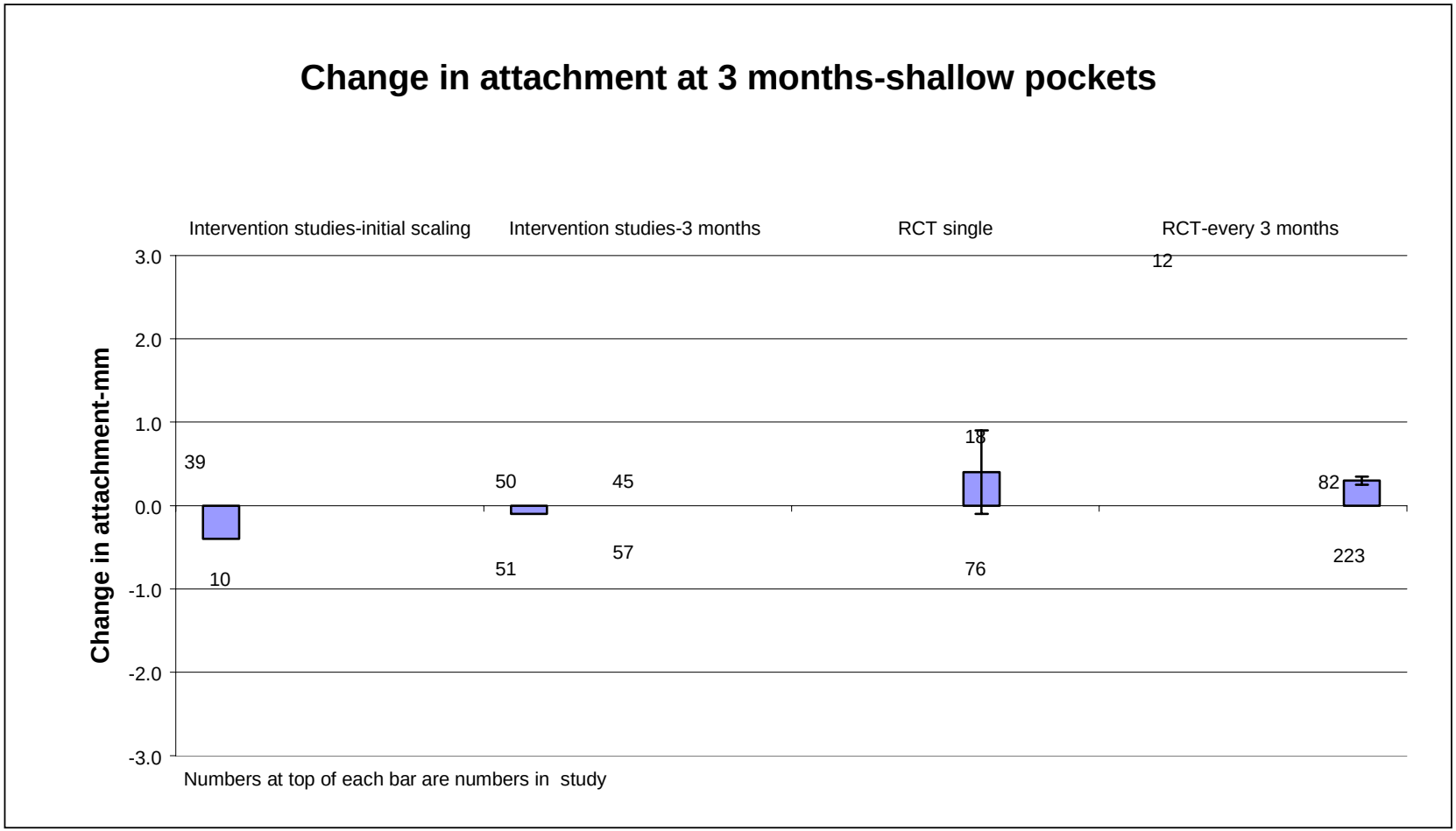
Graph 7 – Change in attachement at 3 months-moderate pockets



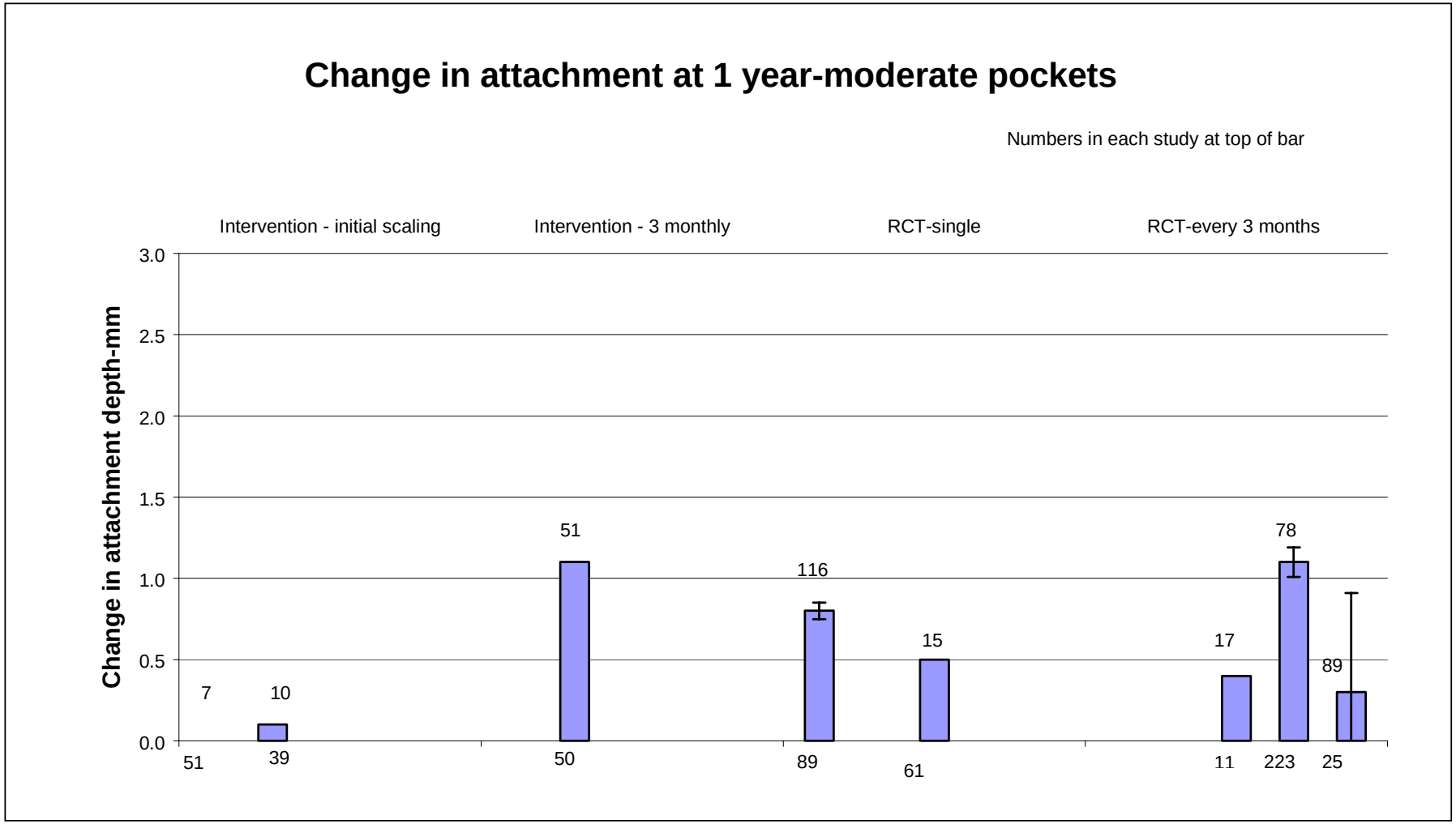
Graph 8 – Change in attachment at 3 months-deep pockets



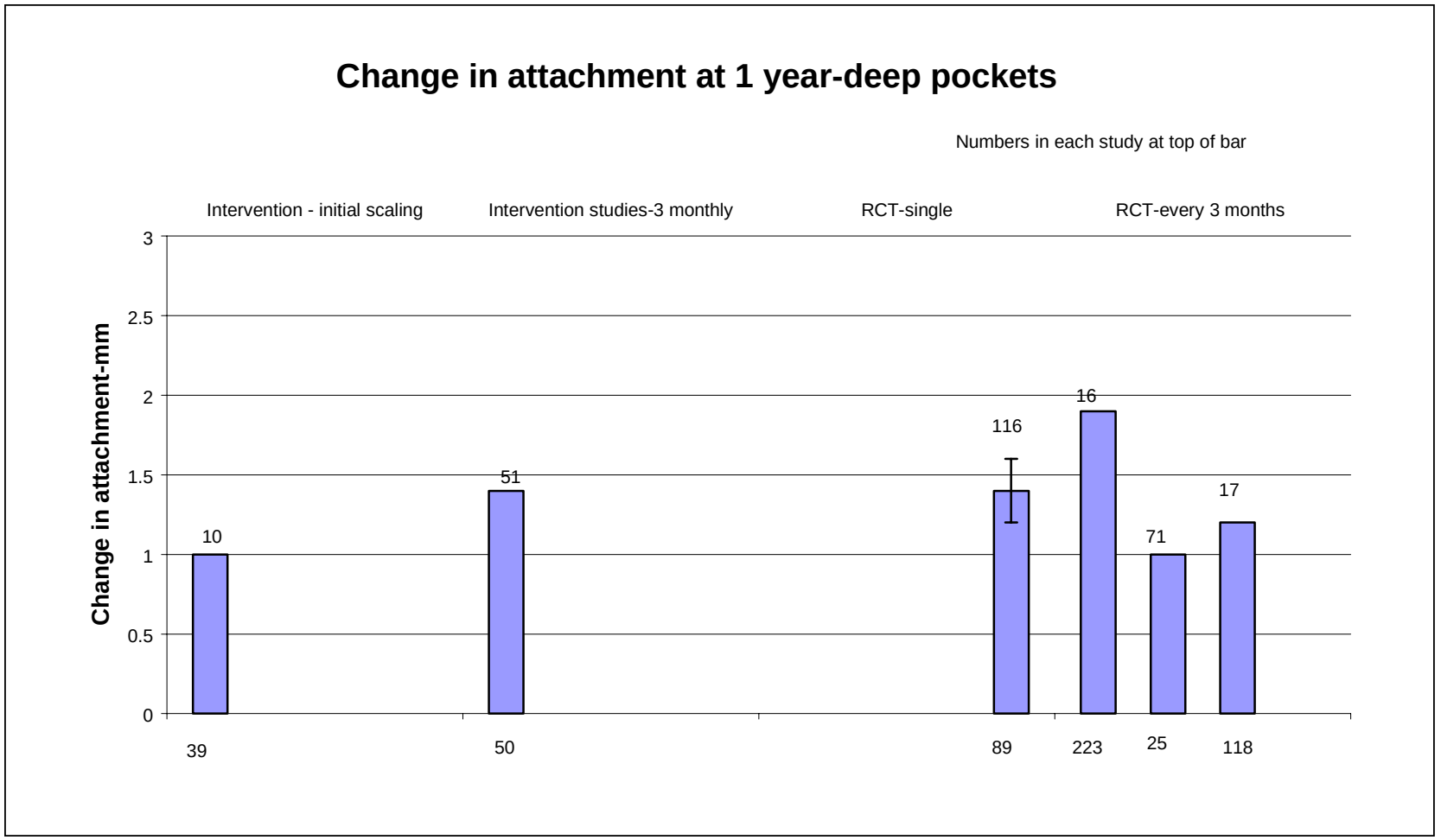
Graph 9 – Change in attachment at 3 months-shallow pockets



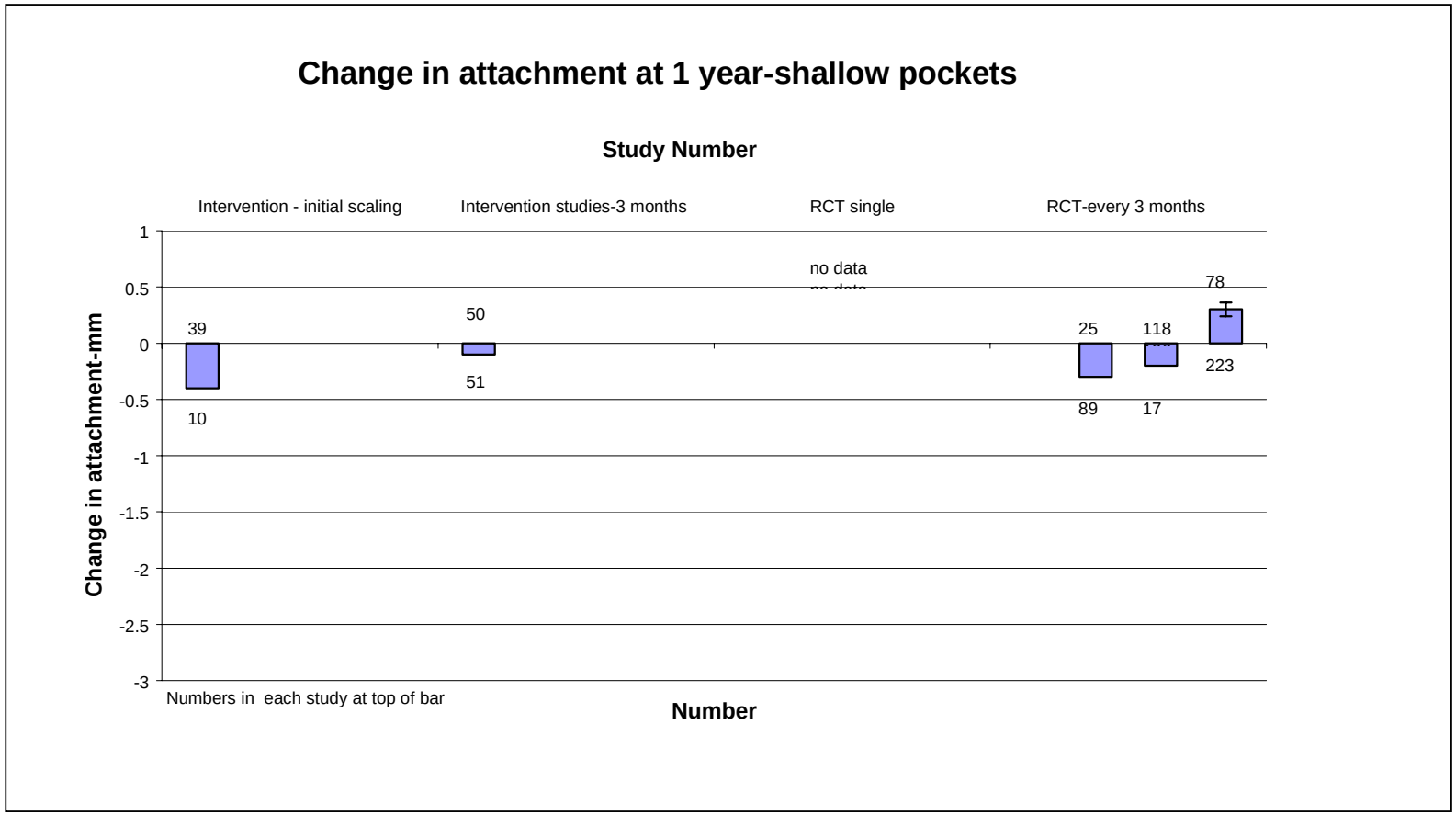
Graph 10 – Change in attachment at 1 year-moderate pockets



Graph 11 – Change in attachement at 1 year-deep pockets



Graph 12 – Change in attachment at 1 year-shallow pockets



7.2 Bleeding on probing

No studies collected the proportion of sites which bled on probing with 3 monthly scaling. Data was sparse in studies which had featured initial scaling. However all studies showed a reduction in sites bleeding on probing following treatment, although the magnitude of this reduction varies a great deal.

Patient centred outcomes

There were no studies that looked at patient centred outcomes.

8 Statistical Significance

Only a minority of studies included variance data. Table 6 shows the number of studies in each category and the numbers in which variance data was presented or could be calculated. For some studies the standard error of the change in measurement was included and in some further studies the standard error of the change could be calculated from the standard deviation of baseline and follow-up measurements. Where variance data was given (in all cases except one) the results were mostly statistically significant at the 95% level of significance. The exceptions are starred in Table 6. Statistical significance could not be established in the majority of studies due to the lack of variance data. In the cases where this was not reported it is impossible to say whether the changes reported in the outcome measures were statistically significant or not.

8.1 Statistical significance of combined data

It was possible to calculate weighted mean changes for all studies in a particular category for moderate, shallow, and deep pockets. As there was no variance data in many studies it was not possible to calculate the statistical significance of these mean values.

Table 6 Number of studies in which variance data is available

POCKET DEPTH	INITIAL SCALING IN INTERVENTION						QUARTERLY IN INTERVENTION						INITIAL IN RCTs						QUARTERLY IN RCTs					
	Change at 3 months			Change at 1 year			Change at 3 months			Change at 1 year			Change at 3 months			Change at 1 year			Change at 3 months			Change at 1 year		
	Number of studies	Number of studies where SE is given in paper	Number of studies where SE could be calculated	Number of studies	Number of studies where SE is given in paper	Number of studies where SE could be calculated	Number of studies	Number of studies where SE is given in paper	Number of studies where SE could be calculated	Number of studies	Number of studies where SE is given in paper	Number of studies where SE could be calculated	Number of studies	Number of studies where SE is given in paper	Number of studies where SE could be calculated	Number of studies	Number of studies where SE is given in paper	Number of studies where SE could be calculated	Number of studies	Number of studies where SE is given in paper	Number of studies where SE could be calculated	Number of studies	Number of studies where SE is given in paper	Number of studies where SE could be calculated
Moderate	3	0	1	3	0	1	2	0	1	1	0	0	10	3	4	2	0	0	1	0	0	4	3*	0
Deep	2	0	1	1	0	0	2	0	1	1	0	0	2	2	0	1	1	0	1	1	0	4	3	0
Shallow	1	0	0	1	0	0	2	0	1	1	0	0	3	0	1	0	0	0	1	1	0	4	3	0

* not significant for one of these studies

Table 6 Number of studies in which variance data is available

ATTACHMENT LEVEL	INITIAL SCALING IN INTERVENTION						QUARTERLY IN INTERVENTION						INITIAL IN RCTs						QUARTERLY IN RCTs					
	Change at 3 months			Change at 1 year			Change at 3 months			Change at 1 year			Change at 3 months			Change at 1 year			Change at 3 months			Change at 1 year		
	Number of studies	Number of studies where SE is given in paper	Number of studies where SE could be calculated	Number of studies	Number of studies where SE is given in paper	Number of studies where SE could be calculated	Number of studies	Number of studies where SE is given in paper	Number of studies where SE could be calculated	Number of studies	Number of studies where SE is given in paper	Number of studies where SE could be calculated	Number of studies	Number of studies where SE is given in paper	Number of studies where SE could be calculated	Number of studies	Number of studies where SE is given in paper	Number of studies where SE could be calculated	Number of studies	Number of studies where SE is given in paper	Number of studies where SE could be calculated	Number of studies	Number of studies where SE is given in paper	Number of studies where SE could be calculated
Moderate	4	0	0	2	0	0	2	0	0	1	0	0	5	2	2*	2	1	0	1	1	0	3	2	0
Deep	2	0	1	1	0	0	2	0	1	1	0	0	2	2	0	1	1	0	1	1	0	3	2	0
Shallow	1	0	0	1	0	0	2	0	0	1	0	0	1 #	0	1	0	0	0	1	1	0	3	2*	0

* SE not significant for one of these two studies
# Not significant

9 Effectiveness

Information was only available about outcomes from initial scaling after one year as a proxy for annual scaling. No studies were found where annual scaling was carried out over a long period.

The main observed effects of dental scaling were:

- There was found to be some positive effect of dental scaling in most cases, with reduction in pocket depths and reduction in bleeding on probing.
- It may be hard for a clinician to justify quarterly scaling over annual scaling as the magnitude of the differences in probing depth and attachment level were small.
- It was not possible to test statistical significance of mean changes of the outcomes due to the lack of reporting of variance data in many studies.
- There is a possible adverse effect on attachment levels of dental scaling in shallow pockets although this may be natural progression of the disease or a non-significant chance occurrence.

Clinical significance

In addition to considering the numerical and statistical differences in a change in interval between treatments there is a need to consider what this will mean in clinical terms.[90] The degree of change over time in probing depth and clinical attachment is between 0 and 1mm for shallow or moderate pockets. The type of measuring probes commonly used in general dental practice in the UK are only capable of measuring distances to the nearest 1mm. Hence differences of under 1mm would not be clinically detectable. Changes of this sort of magnitude are therefore not clinically significant. For deep pockets the change in outcomes over time are between 1 and 2.5 mm which are clinically significant.

This review did not find studies with annual scaling given over a period of several years. Therefore the results of studies with initial scaling after one year were used to consider the effect of annual scaling after one year. It is possible that the small improvements in clinical outcomes after one year are cumulative in which case they would be clinically significant after several years.

Generalisability of results to General Dental Practice

The findings of this review can be applied to General Dental Practice only if the populations involved are similar. However, it may be that patients treated in a specialist setting are better motivated than those who have all their treatment in primary care. Consequently, they may be more likely to maintain the best possible standard of oral hygiene.

Less motivated patients may be disinclined to maintain a strict self-care regime and therefore may have worse oral hygiene. For these people, regular scaling may have a greater initial beneficial effect, but this would then reverse more quickly than if good oral hygiene were maintained.

Given the current uncertainty around the relative motivation of patients in the specialist settings assessed in the existing evidence compared to those in General Dental Practice, effectiveness findings cannot be generalised to primary care. Further research is required to confirm or reject the hypothesis that the lack of additional clinical effect of quarterly over annual dental scaling found in specialist settings is repeated in General Dental Practice.

10 Economic Analysis

10.1 Introduction

QATYs (Quality Adjusted Tooth Years) are often used in the economic evaluation of dental interventions. However it is not possible to use these as the outcomes in this review as studies did not include tooth loss as the time scale of the studies was too short.

In dental research, including periodontal research, most reported outcome indicators are intermediate outcomes, often clinical measurements. There has been little attention paid to the impact on general health and patient quality of life of changes in such outcomes.

This section will use the NHS scale of charges as the best available proxy for actual costs to the NHS. Originally these charges were based on an estimate of the length of time taken to provide the specified item and the staff costs, facilities and materials used. Although the methodology for setting the level of charges has moved away from this recently, the NHS scale of fees however still remains the best proxy for actual costs and forms the basis of actual NHS expenditure. It is not the aim of a DES review to undertake primary research to calculate actual costs. In this review the lack of evidence on effectiveness did not suggest it would be worthwhile to estimate costs by a bottom up approach.

10.2 Costs and consequences of increasing scaling interval

This section presents a cost-consequences analysis of a change in scaling interval from quarterly to annual dental scaling. Since this review found no evidence on the effectiveness of dental scaling in General Dental Practice, the consequences presented below strictly apply only to specialist care settings or to the care of specialist groups. Future research is required to confirm the effectiveness findings of this review in the General Dental Practice population. However, we present the analysis as an indication of the costs and consequences that would arise should these effectiveness findings be confirmed.

10.2.1 Consequences

There are concerns about the quality of data available on effectiveness of dental scaling. Many studies are poorly designed and do not report variance data and therefore statistical significance can not be ascertained. This review of evidence available indicates the mean differences in probing depth and attachment level resulting from a change from quarterly to annual dental scaling would be under 1mm. This order of change would not actually be clinically detectable with the periodontal probes usually used in a typical dental surgery in the UK. The worst case scenario compares the best outcomes in the study with quarterly scaling after one year to the worst outcomes for annual scaling. The worst possible case scenario indicates that quarterly scaling may give some clinically detectable improvement over annual scaling of a small amount. The worst case would be that moderate pockets would be 1.1 mm deeper and there would be 1.1 mm less attachment gain. For shallow pockets there would be 0.4mm less pocket reduction and 0.7mm less attachment gain for annual compared to

quarterly scaling. For deep pockets there would be 0.4mm less pocket reduction and 0.9mm less attachment gain for annual compared to quarterly scaling.

The effectiveness data did not often include variance data so the significance of possible changes was not able to be established. There may be no difference in outcomes for the two treatment strategies. As no data was available for annual scaling over a long period there is no information about continuance of outcome differences over time. In other words, there is no information about whether there is a potential 1mm increase in probing depth each year from a policy of annual versus quarterly scaling. However, data available with quarterly scaling indicate that improvement may continue beyond one year, but not at the same rate as in the first year.

10.3 Cost Differences

10.3.1 Potential cost savings

The possible range of the annual cost of dental scaling at a 3 monthly interval could lie in the following range (depending on the level of treatment required):

Minimum £9.40x4 = **£37.60**
Maximum £82 + (3x£9.40) = **£110.20**

The possible range of annual cost for a person receiving dental scaling annually could lie in the following range (depending on the level of treatment required):

Minimum **£9.40**
Maximum **£82**

Patients who pay for dental treatment pay 80% of those costs themselves and the NHS pays 20%. The NHS pays the full amount for exempt patients.

The evidence data in this review compares annual and quarterly scaling. No data was found for actual costs of these alternative strategies but NHS fees can be used as a proxy for actual costs. Using this as a proxy may be satisfactory given the poor quality of the evidence found.

Using the maximum possible costs for the different frequency of intervention cost savings per patient would be £28.20 per year; the possible range is from a cost saving of £100.80 to an additional cost of £44.40. A change from quarterly to annual scaling would give the worst possible scenario of an increase in average pocket depth of 1mm and 1.1mm less attachment gain.

Table 12: COST-CONSEQUENCES ANALYSIS: DENTAL SCALING FOR CHRONIC PERIODONTAL DISEASE

Change in frequency from quarterly scaling to annual scaling

	Annual Cost Differences
Cost consequences at the individual level of alteration of scaling interval	£28.20 (Range -£44.40 to £100.80)

Estimation of net benefits (best case scenario-worst case scenario from individual studies)

Expected outcomes at one year using study mean changes	Pocket depth changes Moderate – 0.6mm less reduction in pocket depth (0.5mm more-1.1mm increase is pocket depth) Deep – 0.1mm less reduction in pocket depth (1.3mm more-0.4mm increase in pocket depth) Shallow– 0.2 mm less reduction in pocket depth (no difference- 0.4mm increase in pocket depth) Attachment level changes Moderate – No change (0.5mm more attachment gain-1.1mm less attachment gain) Deep – 0.1 mm less attachment gain (0.4mm more gain-0.9mm less) Shallow – 0.4 mm less attachment gain (0.2mm less attachment loss-0.7mm less attachment gain)

Predicting the actual cost impact of a change in policy

Whilst the cost savings could be theoretically about £28 for every person treated in the General Dental Services, in reality few people actually attend for a 3 monthly dental scale. Data is not readily available from the DPB linking scaling to first or subsequent visits in a year. There is no specific data available on the number of second or later scalings in a year. Therefore, assumptions have to be made in order to draw conclusions about the order of financial savings probable with a change in policy.

The likely distribution of annual costs per person can be estimated from expenditure data.

11 Modelling

11.1 Methods

Best case scenario

DPB data shows that in 1997/98 25.3 claims were submitted for 17.3 million adults registered with a NHS dentist in England. Therefore 8 million people attended the dentist for a second course of treatment. The assumption could be made that some of these courses included a scale and polish of some type. Some second courses (if more than 9 months have elapsed) will be at level 2, but some courses will not include a scale and polish. An assumption could be made that the additional cost of these level 2 payments cancelled out those where no Scale and polish fee was claimed for a patients second course.

Making these assumptions and by limiting GDS provision to 1 scale and polish per year could reduce GDS expenditure on scale and polish by £75.2 million (i.e. 8 million x £9.40).

Worst case scenario

It is possible that no one currently has more than one scale and polish in the 15 month period. For the 17 million adults registered there are about 14.5 million claims for non-surgical periodontal treatment. If this is the case there would be no cost savings from reducing the frequency to annually.

Most likely scenario

The assumption could be made that not all of these 8 million courses included a scale and polish. Assuming 58% did (based on % of exams which have non-surgical periodontal treatment included) 4.6 million courses would include a scaling.

Assuming 89% of these were level 1 (4.1 million courses) and 10% (0.5 million courses) were level 2, using the breakdown of all fees in 1997/98 the cost savings for scaling every year could be:

4.1 million x £9.40	=	£38.5 million
0.5 million x £26.80	=	£13.4 million
	Total	£51.9 million

11.2 West Midlands Implications

In 1997/98 total expenditure on the GDS in England and Wales was £1344 million. GDS gross fees for treatment provided by West Midlands dentists totalled £127 million. Consequently the West Midlands accounted for 9.4% of England and Wales GDS expenditure.

A change in scaling frequency to every year would reduce West Midlands Expenditure by between £7.1 million (Method One) and £4.9 million (Method two).

The reduction could be greater than this as the National Adult Dental Health surveys suggest that periodontal disease in the West Midlands may be above the mean for England. However, increasing disease does not necessarily mean more patients seek more regular treatment.

Summary – Consequences

Reduction in scaling interval from quarterly to annual would result in changes of desired outcomes of reduced probing depth and increased attachment gain of under 1 millimetre which is the minimum change clinically measurable with the type of periodontal probes commonly used in dental practice. Even using the worst case scenario comparing the results of the study with the best outcome for quarterly scaling with the study with the worst outcome for annual scaling these outcomes would only vary by a maximum of about 1 millimetre. Further research is required to confirm these findings for the General Dental Practice population.

Summary - Expenditure implications for NHS

A change from quarterly to annual scaling would result in a reduction of NHS fees claimed of around £28 per person which results in savings in NHS expenditure and savings to the patient due to the patient charge element if that applies. However, data shows that most people do not have a dental scaling every 3 months.

Given the number of assumptions made in evaluating the cost implications of dental scaling in NHS General Dental Practice from currently available data, it could be that the magnitude of savings made on expenditure on scaling is of a different magnitude than calculated. However using the assumptions made in this report up to £52 -£75 million could be saved by reducing scaling interval to 15 months (reduced further for annual scaling).

12 Conclusion

12.1 Study design

- There are numerous studies on this subject, however varying study design and inconsistency in treatment interval makes comparisons and combining findings difficult.

- The quality of research about periodontal disease was poor in terms of study design, quality of reporting and statistical reporting of data.

- The existing studies relate to specialist settings or groups which may not be representative of NHS General Dental Practice

12.2 Biases

- Most of the studies had very small sample size. In larger samples different rates of progression in different people (due to the intermittent nature of periodontal disease) and different reactions to treatment would occur in some of the people studied. The small sample size in many periodontal studies could mean that the disease or treatment effect is lost or exaggerated.

12.3 Results

- Reports of attachment level change varied a great deal between studies. Difficulties in recording this outcome cannot be completely discounted.

- Reports of change in proportion of sites which bleed on probing varied even more, and consistency of probing pressure may be an issue.

- The magnitude of mean differences in probing depth and change in attachment level between quarterly and annual scale and polish were very small and the marginal benefit of a 3 monthly scale over an annual scale is minimal.

- There is little periodontal research using patient centred outcomes. It may be that dental scaling is more an issue of hygiene than direct oral health. Further research is required on the impacts of periodontal disease and treatment on patients' well being. It may be that more regular dental scaling has an effect on patient centred outcomes such as perception of good oral health, wellbeing, attractiveness, halitosis etc. These outcomes would in turn have indirect health benefits.

12.4 Implications of the Review

Clinical Implications

Annual dental scaling helps reduce probing depth and gives an improvement in attachment level.

Based on the outcomes of probing depth and clinical attachment of this review there is no evidence that quarterly dental scaling improves periodontal health over annual scaling by clinically significant levels except possibly in the case of deep pockets. There was however little evidence reporting outcomes for annual scaling over time and most researchers used a 3 monthly interval for repeated intervention.

It is possible that the standard of oral hygiene may have a significant impact on the outcomes measured in these studies regardless of scaling interval.

Further research is required to determine the generalisability of these findings to General Dental Practice.

Policy Implications

Despite the lack of evidence of benefit of quarterly dental scaling, it is currently available on the NHS. This involves substantial NHS spending (including NHS charges paid directly by the patient) in addition to direct out of pocket expenditure by individuals on private treatment. If the effectiveness findings reported here were found to be generalisable to General Dental Practice, there is potential for cost-saving by increasing the routine recommended interval to one year. This could be achieved by altering the payment system.

It is possible with a 3 level payment system for dental scaling that simply limiting the treatment to an annual event would result in an increase in type 2 scaling claims, as there may be a perception by dentists that the scaling would take longer and therefore more visits. Clear clinical criteria for each type of treatment need to be agreed. It may be considered that the capitation payment (called continuing care payment for adults) could be enhanced to include annual scaling.

During 1997/98 8.7% of General dental practitioner income from adult care was from capitation payments. The remainder was paid on a fee per item basis.
Payment for dental scaling in the GDS is related to the number of patient visits required. It would seem that, at a minimum, work needs to be done at a national level to agree protocols for clinical indications for dental scaling at different levels of fee. A total revision of the GDS fee scale could address the possibility of maintaining periodontal health, rather than payment for individual procedures at possibly inappropriate intervals. This adjustment could release substantial amounts of NHS resources to encourage expansion of, or access to, proven clinically effective treatments, or other schemes to improve quality of dental practice premises or total population coverage by the service.

As periodontal disease is exacerbated by smoking, it would seem sensible that dentists were required to record smoking status and to give initial advice about smoking cessation as part of

the treatment package. Referral could then be made to other members of the primary health care team to aid the smoking cessation process. Dentists may well see a different section of the population than those who routinely visit GPs so the dental profession could in this way contribute to general health promotion and play a bigger part themselves in reducing oral cancer.

12.5 Policy Recommendations

- The quality of periodontal research and reporting should be improved. In future this should always include evaluation of patient centred outcomes.

- Research is required in a General Dental Practice setting to confirm or reject the hypothesis that there is no additional clinical effect of quarterly over annual dental scaling. This research must follow up patients for at least one year. Research should also evaluate the resultant change in oral health and patient perception of oral wellbeing.

- Conditional on the results of such further research, there may be scope for changing the treatment interval between dental scaling episodes.

- There may be scope in changing the payment system for non- surgical periodontal treatment in the GDS. This could include an outcome based payment system, should include protocols for classification of disease by severity rather than by the numbers of treatment visits required, and should include recording smoking status and giving initial smoking cessation advice. Patient participation in improving oral hygiene is essential. Ways in which the GDS payment system can be constructed should be explored, to ensure that professionally administered hygiene is an adjunct to and does not replace the patients self care following adequate instruction and reinforcement.

- Any changes in policy in the GDS should be reflected by corresponding changes for the Hospital and Community Dental Services.

Appendix 1

Electronic search strategy – Intervention Studies

Medline Search 1976 – 1998 (on Pub Med)

Dental Prophylaxis

OR: Dental Scaling
OR: Root Planing
OR: Periodontitis AND THERAPY

NOT

Lasers AND Surgery

OR: Periodontitis AND Surgery
OR: Periodontal pocket AND Surgery
OR: Surgical flaps
OR: Anti-infective agents
OR: Antibiotics
OR: Periodontal – diseases AND drug therapy
OR: Dentifrices AND Therapeutic use
OR: Toothpaste and therapeutic use
OR: Guided tissue regeneration
OR: Juvenile periodontitis

Appendix 2

Cochrane Oral Health Group Specialised Register

The Cochrane Oral Health Group's Specialised Register of Trials is a collection of clinical trials related to the scope of the group which may be of interest to reviewers undertaking Cochrane Systematic Reviews. Essentially the register is a database of Randomised Controlled Trials (RCTs) and Controlled Clinical Trials (CCTs) and associated material such as published correspondence; conference proceedings; research abstracts etc. The details of unpublished trials are increasingly included.

The register is continually being expanded as new material is identified. Another major source of material is that obtained from the Oral Health Group's programme of hand-searching journals to identify relevant trials that do not get picked up by electronic searches due to lack of detail in titles and abstracts.

The register is maintained and managed by the Oral Health Group's Editorial base at the University of Manchester.

Search for:

Dental Prophylaxis

OR: Dental Scaling
OR: Root Planing

AND NOT: Laser surgery

OR: Anti-infective agent
OR: antibiotics
OR: chlorhexidine
OR: periodontitis AND Drug AND therapy
OR: dentifrice
OR: toothpaste
OR: mouthrinse
OR: guided AND tissue AND regeneration
OR: minocycline
OR: tetrocycline
OR: omidozole
OR: juvenile periodont*
OR: renal
OR: kidney
OR: diabet*
OR: HIV
OR: children
OR: keywords = antibodies OR antimicrobial treatment or toothpaste – therapeutic use OR Dentifrices – therapeutic

OR: Anti-infective agents

OR: antibiotics OR Furcation – defects – surgery OR surgical flaps OR periodontal – Pocket – Drug therapy

Appendix 3

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Appendix 4

Electronic search strategy – RCTs with scaling as control

Medline Search 1976 – 1998 (on Pub Med)

Dental Scaling

AND: Randomized control trials

Appendix 5

(A) Inclusion and exclusion criteria for intervention studies

Inclusion		**Exclusion**
Population	- Adults	Juvenile Periodontitis Diabetes HIV infection or AIDs Kidney Disease
Intervention	- Dental scaling and root planing	Chemical methods of calculus removal. Laser treatment Anti-microbials Teflon Surgery
Outcome	- Probing depth change. Attachment level change. Proportion of sites which bleed on probing. Any patient centred outcome.	
Study design	- All	Reviews with expert opinion only.
Study Design	- RCTs Control Trials Case series Cohort studies Reviews	

(B) Inclusion and exclusion criteria for RCTs with scaling as control

Inclusion		**Exclusion**
Population	- Adults	Juvenile Periodontitis Diabetes HIV infection or AIDs Kidney Disease
Intervention	- Dental scaling and root planing in control subjects or part of mouth	
Outcome	- Probing depth change Attachment level charge % of sites which bleed on probing. Any patient centred outcome	
Study Design	- RCTs with more than 10 subjects in Scale and Polishing arm of study	

Appendix 6

PAPER	STUDY DESIGN	26 RCTs					27 Cohort Studies				Case control studies 28 (Retrospective)		Longitudinal surveys or case series			
		Was assignment to treatment GPs really random?	Was relatively complete follow-up achieved?	Were the outcomes of people who withdrew described and included in the analysis?	Were those assessing outcomes blind to the treatment allocation?	Were the control and treatment gps comparable at entry?	Was outcome assessment blind to exposure status?	Was follow up long enough?	Was an adequate proportion of cohort followed-up?	Were drop outs similar in exposed and unexposed groups?	Were the cases and controls well matched?	Is there potential for selection bias?	Is the study based on a random sample from a suitable sampling frame?	Are inclusion criteria clearly identified?	Did all individuals enter the survey at a similar point in their disease progression?	Was follow up long enough?

Appendix 7

DATA EXTRACTION:-

ID
AUTHORS
YEAR

TYPE OF STUDY
AGE OF PARTICIPANTS (RANGE)_____ (MEAN) _____

TIMING OF SCALE & POLISH

LOCATION

INCLUSION CRITERIA FOR SUBJECTS

TOTAL NUMBER IN STUDY – START

TOTAL NUMBER IN STUDY – FINISH

RCT WITH SCALING AS CONTROL – STUDY INTERVENTION:

	Definition	N(People)	N(sites)	Baseline	3 mths	6 mths	9 mths	12 mths
Subgroup 1								
Probing depth								
Probing depth change								
Recession								
Attachment level								
Attachment change								
% sites with BOP								
Subgroup 2								
Probing depth								
Probing depth change								
Recession								
Attachment level								
Attachment change								
% sites with BOP								
Subgroup 3								
Probing depth								
Probing depth change								
Recession								
Attachment level								
Attachment change								
% sites with BOP								
Gingival index								
Subgroup 4								
Probing depth								
Probing depth change								
Recession								
Attachment level								
Attachment change								
% sites with BOP								

(All measurements in mm)
NOTES

Appendix 8

Reason for exclusion of papers

Number of Study and Authors	Excluded but useful	Reason for Exclusion
Nyman, Lindhe[91]		Intervention included surgery
Watts[92]	✓	Review
Lovdal, Arno et al[93]		About gingivitis
Ramfjord, Knowles et al[43]		Intervention included surgery
Lindhe, Nyman[94]		Intervention included surgery
Lindhe, Nyman[95]		Intervention included surgery
Macgregor, Regis, Balding[96]		About dental health behaviour
Van Palen, Lembaritii et al[97]		Natural history
Consensus report[98]		Review
Chapple[99]	✓	Review
Bellamy, Brickley, McAndrew[100]	✓	Patient utility scores
Claffey, Kelley et al[101]		Does not include required outcomes
Magnusson, Persson et al[102]		Does not include required outcomes
Anderson, Palmer et al[103]		In vitro
Westfelt[104]		Review
Neiman, Siren et al[105]		Does not include required outcomes
Hamp, Nyman, Lindhe[106]		Intervention included surgery
Brown, Garcia[107]		Does not include required outcomes
Rosling, Nyman, Lindhe[108]		Intervention included surgery
Rateitschak[109]		Does not fit inclusion criteria
Checchi, Pelliccioni et al[110]		Intervention included surgery
Newman, Kornman, Holtzman[111]		Does not include required outcomes
Rawlinson, Walsh[112]		Review
Lang, Farghaly, Ronis[113]		About dental health behaviour
Axelsson[114]		Intervention, outcome criteria not met
Ramfjord[115]	✓	Review
Corbet, Vaughan, Kiesar[116]		Review
Hujoel, Baab, DeRouen[117]	✓	Statistical issues paper
Bragger, Hakanson, Lang[55]		
Philstrom[118]	✓	About probing methods
Rawlinson, Walsh[119]		Review
Greenwell, Bissada, Wittwer[120]	✓	Background
Strohmenger, Cerati et al[121]		Does not include required outcomes
Fleiss, Turgeon et al[122]	✓	Statistical issues paper
Papapanou, Wannstrom[123]		Radiographic exam only
Lindhe, Okamoto et al[124]		Natural history
Listgarten, Levin, Schifter et al[125]		Intervention included surgery
Lang, Joss, Orsanic et al[126]		Intervention included surgery
Ramfjord, Caffesse et al[127]		Intervention included surgery
Jenkins, Macfarlane, Gilmour[128]		Intervention included surgery

Number of Study and Authors	Excluded but useful	Reason for Exclusion
Listgarton, Sullivan et al[129]		Intervention included surgery
Mandel, Gaffar[130]	✓	Review
Badersten, Nilveus, Egelberg[131]		Does not include required outcomes
Badersten, Nilveus, Egelberg[132]		Does not include required outcomes
Badersten, Nilveus, Egelberg[133]		Does not include required outcomes
Becker, Becker, Berg[134]		Intervention included surgery
[61] Becker, Berg, Becker[135]	✓	Natural history
Ramford, Knowles et al[136]		Relates to tooth type but unable to combine as numbers in each type not specified
Van der Velden[137]	✓	Discuss issue re probing force
Lembarti, Vant'Hof et al[138]	✓	Natural history
Walters[139]		Review
Zappar[140]		Review
Ismail, Lewis[141]	✓	Review
Sternig[142]		Case report includes splinting
Dini, Castellanos[143]	✓	Cost estimates
O'Hehir[144]		Does not include required outcomes
Bader[145]		Does not include required outcomes
Hartmann, Klinger, Neudert[146]		Does not include required outcomes
Pattison[147]		Paper about scaler design
Cobb[148]	✓	Review
Glavind[149]		Does not include required outcomes
Knowles, Ramfjord et al[150]		Intervention not clearly defined
Am Acad Perio[151]	✓	Review
Greenstein[152]	✓	Review
Gmur, Saxer, Guggenheim[153]		Includes pocket flushing
Levin, Green[154]		Does not include required outcomes
Axelson[155]		About children
Drisko[156]		Review
Matsuo[157]		Does not include required outcomes
Sandhu, Salloum, Stakiw[158]		Review
Brothwell, Jutai, Hawkins[159]	✓	Review
Ramfjord[160]		Review
Cao, Yan[161]		Does not include required outcomes
Abe[162]		Does not include required outcomes
Buckley, Crowley[163]		Does not include required outcomes
Loe, Anerud et al[164]	✓	Natural history
Papapanou, Wannstrom, Grondhal[165]	✓	Natural history
Albandar[166]		Radiographic assessment
Ismail, Morriso et al[167]	✓	Natural history
Baelum, Wen-Min et al[168]	✓	Natural history
Haffajee, Socansky et al[169]	✓	Risk factors for attachment loss
Grbc, Lamsteret al[170]	✓	Does not include required outcomes
Jeffcoat, Reddy[171]	✓	Natural history

Number of Study and Authors	Excluded but useful	Reason for Exclusion
Becker, Berg, Becker[172]		Incorrect reference-unable to locate
Goldman, Ross, Goteiner[173]		Measures tooth loss
Wood, Greco, McFall[174]		Does not include required outcomes
Lisgarton, Lindhe, Hellden[175]		RCT with less than 10 in control
al-Joburi, Quee, Lautar[176]		RCT where control had another intervention
Loesche, Schmidt et al[72]		RCT where control had another intervention
Axelson, Lindhe[177]		Intervention included surgery
Knowles, Burgett et al[178]		Intervention included surgery
Axelson, Lindhe[179]		Population includes children
Persson, Alves et al[180]		
Kerr[181]		Intervention included surgery
Lindhe, Nyman[182]		Does not include required outcomes
Lindhe, Okamoto et al[183]	✓	Natural history
Yoneyama et al[184]		Epidemiological methods
Nyman, Lindhe[185]		Includes surgery
Lindhe, Westfelt et al[186]		Does not include required outcomes
Cullinan, Powell et al[187]		Does not include required outcomes
Timmerman, Van der Weijden et al[188]		RCT where control had another intervention
Kaldahl, Kalkwarf et al[189]		Does not include required outcomes
Jones, Kornman et al[190]		RCT where control had another intervention
Sigurdsson, Holbrook et al[191]		RCT where control had another intervention
Bain, Beagrie et al[192]		RCT where control had another intervention
Shaw, Shaw[193]		Does not include required outcomes
Minabe, Takeuchi et al[194]		RCT with less than 10 in control
Soder, Frithiof et al[195]		RCT where control had another intervention
Addy, Hassan et al[196]		Single site in S&P group in each patient
Gieders-Leeper, Selipsky, Williams[197]		Some had surgery
Westfelt, Bragd et al[198]		Unable to ascertain how many people had each intervention
Draggo[199]		Teeth extracted
Dorfman, Kennedy, Bird[200]		Concerns teeth with small amount attached gingivae only

Appendix 9

A: Papers reporting same study- Intervention Studies

Used	Linked
Loos, Kiger, Elberg 1987[39]	Claffey, Loos et al 1988[201] Loos, Claffey, Egelberg 1988[202] Claffey, Nyland et al 1990[203] Loos, Nyland et al 1989[204]
Laurell 1990[41]	Laurrel, Petterson 1988[205]
Caton, Proye, Polson 1982[52]	Proye, Caton, Polson 1982[206]
Axelson, Lindhe 1981[34]	Axelson, Lindhe, Nystrom 1991[207] Axelson, Lindhe 1978[208]
Listgarton, Schifter, Laster 1985[35]	Listgarten, Schifter 1982[209]
Badersten, Nilveus, Egelberg 1984[37]	Badersten, Nilveus, Egelberg 1981[210] Badersten, Nilveus, Egelberg 1984[211] Badersten, Nilveus, Egelberg 1985[212] Becker, Berg, Becker 1979[213] Badersten, Nilveus, Egelberg 1990[214]

A: Papers which appear to be linked to same study – RCTs with Scaling as Control

Used	Linked
Drisko, Cobb et al 1995[89]	Michalowicz, Philstrom et al 1995[215]
Ainamo, Lie, Ellingsen 1992[80]	Ainamo, Lie et al 1992[216]
Newman, Kornama, Doherty 1994[83]	Wilson, McGuire et al 1997[217]
Philstrom, Ortiz-Cambell, McHugh 1981[58]	Philstrom, Oliphant, McHugh 1984[218] Philstrom, McHugh et al 1983[219]
Ramfjord, Caffesse et al 1987[57]	Hill, Ramfjord, Morrison et al 1981[220]
Kaldahl, Kalkwarf et al 1988[189]	Kalkwarf, Kaldahl, Patil 1989[221] Kalkwarf, Kaldahl, Patil 1988[222] Kaldahl, Kalkwarf et al 1996[223]
Stezel, Flores-de-Jacoby 1997[66]	Stezel, Flores-de-Jacoby 1996[224]

Appendix 10

Papers for which data could not be combined

A - Intervention studies

Paper	Reason
Badersten, Nilveus, Egelberg 1984[211] Badersten, Nilveus, Egelberg 1981[210] Badersten, Nilveus, Egelberg 1984[211] Badersten, Nilveus, Egelberg 1985[212] Becker, Berg, Becker 1979[172] Badersten, Nilveus, Egelberg 1990[214] Suomi, Greene, et al 1971[33] Listgarton, Schifter, Laster 1985[35] Bragger, Hakanson, Lang 1992[55] Vanooteghem, Hutchens et al 1990[48] Norland, Garrett, Kiger 1987[49]	Scaling interval varied
Lightner, O'Leary et al 1971[47]	All pocket depths combined

B - RCTs with Scaling as Control

Paper	Reason
Reinhhardt, Johnson, Dubois 1991[69]	Data for Moderate/Severe combined
Lindhe, Westfelt et al 1982[61]	Scaling interval varied
Flemming, Milian et al 1998[82]	Scaling interval varied
Waite 1976[60]	Scaling interval varied
Hou, Tsai, Weisgold 1996[225]	Scaling interval varied
Lindhe, Nyman 1985[63]	Scaling interval varied

Appendix 11A - Change in probing depth

Intervention studies

Initial scaling

Study ID	1month	number	3months	number	6months	number	1 year	number	2 years	number	3 years	number	4 years	number	5 years	number	6 years	number
Moderate																		
39			-1.2	10	-1.3	10	-1.3	10										
52			-1.4	10														
51			-1.0	7	-0.9	7	-0.7	7										
54	-2.1																	
40	-0.7	9																
Mean changes	**-0.7**	**9**	**-1.2**	**27**	**-1.1**	**17**	**-1.1**	**17**										
Deep																		
39			-2.5	10	-2.8	10	-2.8	10										
44			-2.7	7														
mean changes			**-2.6**	**17**	**-2.8**	**10**	**-2.8**	**10**										
Shallow																		
39			0.0	10	0.0	10	0	10										
mean changes			**0.0**	**10**	**0.0**	**10**	**0**	**10**										

3 monthly scaling

Study ID	1month	number	3months	number	6months	number	1 year	number	2 years	number	3 years	number	4 years	number	5 years	number	6 years	number
Moderate																		
50			-0.7	51	-1.3	51	-1.5	51	-1.6	51	-1.7	51	-2.0	51	-2.0	51	-1.9	51
45			-0.4	57	-0.4	36												
mean changes			**-0.5**	**108**	**-0.9**	**87**	**-1.5**	**51**	**-1.6**	**51**	**-1.7**	**51**	**-2.0**	**51**	**-2.0**	**51**	**-1.9**	**51**
Deep																		
50			-1.4	51	-2.3	51	-2.8	51	-2.6	51	-2.5	51	-2.4	51	-2.4	51	-2.3	51
45			-0.9	57	-1.3	36												
mean changes			**-1.1**	108	**-1.9**	87	**-2.8**	51	**-2.6**	51	**-2.5**	51	**-2.4**	51	**-2.4**	51	**-2.3**	51
Shallow											0.0							
50			-0.1	51	-0.1	51	0.0	51	0.0	51	0.1	51	0.1	51	0.1	51	0.0	51
45			0.0	57	0.0	36												
mean changes			**-0.1**	**108**	**0.0**	**87**	**0.0**	**51**	**0.0**	**51**	**0.1**	**51**	**0.1**	**51**	**0.1**	**51**	**0.0**	**51**

Change in probing depth- RCTs with scaling in control.

Initial scaling

Study ID	1month	number	3months	number	6months	number	1 year	number	2 years	number	3 years	number	4 years	number	5 years	number	6 years	number
Moderate																		
66					-1.5	30			-0.6	24								
67					-0.9	24												
64	-1.8	12	-1.8	12														
89							-0.4	116										
70			-0.6	111	-0.7	94												
71			-0.8	9														
80					-1.5	199												
83			-1.0	113	-1.1	105												
73			-1.7	16														
74			-1.3	60														
75					-1.0	10												
65	-0.8	11	-1.4	11														
76			-1.4	18	-1.1	18												
77	-0.6	13																
78					-1.6	46												
68	-1.1	13	-1.5	12														
81	-1.6	84			-1.7	84												
89	-0.9	122	-1.0	122	-1.0	116	-1.0	116										
62	-0.3	15																
mean change	**-1.1**	**281**	**-1.0**	**484**	**-1.2**	**726**	**-0.7**	**232**	**-0.6**	**24**								
Deep																		
70			-0.8	111	-1.1	94												
89	-2.1	122	-2.3	122	-2.2	116	-2.5	116										
mean change	**-2.1**	**122**	**-1.6**	**233**	**-1.7**	**210**	**-2.5**	**116**										
Shallow																		
84	-0.2	100																
68	-0.4	13	-0.5	12.0														
127			-0.7	18.0	-0.7	18												
mean change	**-0.2**	**113**	**-0.6**	**30.0**	**-0.7**	**18**												

Change in probing depth- 3 monthly scaling

Study ID	1 month	number	3months	number	6months	number	1 year	number	2 years	number	3 years	number	4 years	number	5 years	number	6 years	number
Moderate																		
56					-1.0	16	-0.9	16										
223			-1.2	82			-1.4	78	-1.3	75								
87							-1.3	89	-1.2	80	-1.0	83	-1.0	75	-1.1	72		
118					-1.0	17	-0.8	17	-0.8	10	-0.7	10	-0.7	10				
mean change			**-1.2**	**82**	**-1.0**	**33**	**-1.2**	**200**	**-1.2**	**165**	**-1.0**	**93**	**-0.9**	**85**	**-1.1**	**72**		
Deep																		
56					-1.8	16	-1.5	16										
223			-2.2	75			-2.4	71	-2.3	69								
25							-2.9	33	-2.8	32	-2.9	30	-2.5	29	-2.9	28		
118					-1.7	17	-1.7	17	-1.4	10	-1.6	10	-1.2	10				
mean change			**-2.2**	**75**	**-1.7**	**33**	**-2.3**	**137**	**-2.4**	**111**	**-2.6**	**40**	**-2.2**	**39**	**-2.9**	**28**		
Shallow																		
56					-0.1	16	0.0	16	-10.2									
223			-0.4	82			-0.4	78	-0.2	75								
25							-0.2	89	0.0	80	-0.1	83	-0.1	75	-0.1	72		
118					-0.1	17	-0.1	17	0.0	10	0.1	10	0.2	10				
mean change			**-0.4**	**82**	**-0.1**	**33**	**-0.2**	**200**	**-0.1**	**165**	**-0.1**	**93**	**-0.1**	**85**	**-0.1**	**72**		

Appendix 11B - Change in attachment level
Intervention studies

Initial scaling

Study ID	1month	number	3months	number	6months	number	1 year	number	2 years	number
Moderate										
52			0.7	10						
51			0.1	7	0.1	7	0.1	7		
39			0.0	10	0.0	10	0.0	10		
40	0	9	0.0	9						
mean changes	**0**	**9**	**0.2**	**36**	**0.0**	**17**	**0**	**17**		
Deep										
44			2.5	7						
39			1.0	10	1.0	10	1.0	10		
mean changes			**1.6**	**17**	**1.0**	**10**	**1.0**	**10**		
Shallow										
39			-0.4	10	-0.4	10	-0.4	10		

3 monthly scaling

Study ID	1month	number	3months	number	6months	number	1 year	number	2 years	number	3 years	number	4 years	number	5 years	number	6 years	number
Moderate																		
50			0.6	51	1.0	51	1.1	51	1.1	51	1.0	51	1.0	51	0.9	51	0.7	51
45			0.3	57	0.3	36												
mean changes			**0.4**	**108**	**0.7**	**87**	**1.1**	**51**	**1.1**	**51**	**1.0**	**51**	**1.0**	**51**	**0.9**	**51**	**0.7**	**51**
Deep																		
50			0.6	51	1.0	51	1.4	51	1.3	51	1.2	51	1.1	54	0.8	51	0.7	51
45			0.9	57	1.1	36												
mean changes			**0.8**	**108**	**1.0**	**87**	**1.4**	**51**	**1.3**	**51**	**1.2**	**51**	**1.1**	**51**	**0.8**	**51**	**0.7**	**51**
Shallow																		
50			-0.1	51	-0.1	51	-0.1	51	-0.1	51	-0.1	51	-0.1	51	-0.2	51	-0.2	51
45			0.0	57	0.0	36												
mean changes			**0.0**	**108**	**-0.1**	**87**	**-0.1**	**51**	**0.0**	**51**	**0.0**	**51**	**0.1**	**51**	**0.1**	**51**	**0.1**	**51**

(continued) RCTs with scaling in control

Initial scaling

Study ID	1month	number	3months	number	6months	number	1 year	number	2 years	number								
Moderate																		
61					0.4	15	0.5	15	0.3	15								
64	1.5	12	1.4	12														
81	0.4	27			0.5	27												
70			0.2	111	0.3	94												
73			1.6	16														
76			-0.2	18	0.2	18												
77	0.3	13																
78					0.5	46												
68																		
89	0.5	122	0.6	122	0.8	116	0.8	116										
62	0.0	15																
mean changes	**0.5**	**189**	**0.5**	**279**	**0.6**	**301**	**0.8**	**131**	**0.3**	**15**								
Deep																		
70			0.2	111	0.3	94												
89	1.1	122	1.4	122	1.4	110	1.4	116										
mean change	**1.1**	**122**	**0.8**	**233**	**0.9**	**204**	**1.4**	**116**										
Shallow																		
76			0.4	18	0.7	18												
mean change			**0.4**	**18**	**0.7**	**18**												

3 monthly scaling

Study ID	1month	number	3months	number	6months	number	1 year	number	2 years	number	3 years	number	4 years	number	5 years		number	
Moderate																		
223			1.0	82			1.1	78	0.8	75								
25							0.3	89	-0.1	80	-0.3	83	-0.3	72	-0.3	72		
118					0.7	17	0.4	17	0.3	17	0.2	10	0.4	10				
mean change			**1.0**	**82**	**0.7**	**17**	**0.6**	**184**	**0.3**	**172**	**-0.2**	**93**	**-0.2**	**82**	**-0.3**	**72**		
Deep																		
223			1.7	75			1.9	71	1.6	68								
25							1.0	33	0.5	32	0.7	30	0.3	29	0.6	28		
118					1.5	17	1.2	17	0.9	17	1.2	10	1.1	10				
																28		
mean change			**1.7**	**75**	**1.5**	**17**	**1.5**	**121**	**1.2**	**117**	**0.8**	**40**	**0.5**	**39**	**0.6**			
Shallow																		
223			0.3	82			0.3	78	0.0	0								
25							-0.3	89	-0.5	80	-0.7	83	-0.8	72	-0.9	72		
118					-0.2	17	-0.2	17	-0.4	17	-0.4	10	-0.2	10				
mean change			**0.3**	**82**	**-0.2**	**17**	**0.0**	**184**	**-0.5**	**97**	**-0.7**	**93**	**-0.7**	**82**	**-0.9**	**72**		

Appendix11C - Bleeding on probing (change in proportion of sites which bleed on probing)

Intervention studies

Initial scaling Study ID	1month	number	3months	number	6months	number	12months	number	24 months	number
Moderate										
205 soniflex			-61.0	15	-64.0	15				
205 titan			-59.0	15	-60.0	15				
43							-58.0	62		
							-47.0	62		
52			-34.0	10						
53			-22.5	7	-19.4	7	-19.1	7		
54	-71.5	69								
110	-25.0	9	-47.0	9						
mean change	**-66.1**	**78**	**-48.6**	**56**	**-53.9**	**37**	**-50.7**	**131**		
Deep										
43							-41.0	62		
mean change							**-41.0**	**62**		
Shallow										
185			-29.0	95						
43							-46.0	62		
mean changes			**-29.0**	**95**			**-46.0**	**62**		

3 monthly-no data

RCTs scaling in control

Initial Study ID	1month	number	3months	number	6months	number	12months	number	24 months	number
Moderate										
67					-13.0	24				
64	-21.0	12	-31.0	12						
80					-39.0	199				
74			-41.0	60						
71			-33.2	10						
73			-26.7	16						
75					-60.0	10				
77	-35.3	13								
mean change	**-28.4**	**25**	**-36.6**	**98**	**-37.2**	**233**				
Deep	no data									
Shallow	no data									
3 monthly-no data										

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