Appraising the true value of Decision – Making Process for Tooth Retention or Extraction

by Prof Dr med dent Liviu Steier

A vil et al. state that the decision tree introduced “...was developed upon available scientific literature”. This last phrase may be misleading to the general dental practitioner.

The author of the current paper has written this paper to avoid confusion among the profession.

Scientific papers published in peer reviewed journals should have a similar framework:

• Introduction – to emphasise the topic / question / hypothesis raised by the paper.
• Methods – to explain the approach, topic / question that should be highlighted.
• Conclusions – to conclude if results / findings / answer of the question introduced are applicable to.

Accumulation of knowledge today is based on what information is supplied. Textbooks represent an excellent resource of information. They will mostly update you on different concepts, techniques, and approaches. Appraisal of procedures, techniques and concepts can be performed based on scientific papers published in peer reviewed journals.

Correct, comprehensive and adequate appraisal of the literature is decisive for the outcome of contemporaneous papers.

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Appraisal of the literature is decisive for the outcome of contemporaneous papers. The paper published by Avila et al. in 2009: “A novel decision – making process for tooth retention or extraction” in the JOP is intended as “…a reference guide for dentists when making the decision to save or extract a compromised tooth”.

The authors’ intention was to offer “…a reference guide for dentists when making the decision to save or extract a compromised tooth”.

Why has this paper been published?

Fast on-going research has extended multiple fold treatments options in modern Dentistry: Bioengineering, three dimensional diagnosis (radiology), CAD CAM technique as well as dental materials ensure more support for diseased hard and soft tissue. Reviewing treatability in the context of disease stadium was the major goal of the paper.

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Correct, comprehensive and adequate appraisal of the literature is decisive for the outcome of contemporaneous papers.
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- International Journal of Maxillofacial Surgery - 1
- Journal of Dentistry - 1
- Journal of Prosthetic Dentistry - 1
- Clinical Oral Implants Research - 1
- International Journal of Periodontics and Restorative Dentistry - 1
- Annals of Periodontology - 1
- Journal of Endodontics - 6
- Australasian Endodontic Journal - 1
- International Journal of Oral Maxillofacial Surgery - 1
- Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology - 2
- Aeta Odontologica Scandinavica - 2
- Dental Clinics of North America - 1
- Journal of Dental Research - 1

Dentofacial Orthopaedics - 1
- International Journal of Maxillofacial Implants - 5
- Journal of Dentistry - 1
- Operative Dentistry - 1
- Quintessence International - 1
- Journal of Contemporary Dental Practice - 1
- Scandinavian Journal of Dental Research - 2
- Journal Bone Miner. Res. - 5
- Endodontology - 1
- Journal of Dental Education - 1
- Cochrane Database - 1
- Clinical Oral Investigation - 1
- Journal of Oral Investigation - 1
- Journal of Orofacial Orthopaedics - 1
- European Journal of Orthodontics - 1
- Journal of American Dental Association - 1
- Clinical Anatomy - 1
- Current Opinions in Dentistry - 1
- Journal of Evidence Based Dental Practice - 1
- International Endodontic Journal - 1

The authors successfully managed to build a first decision tree for the general practitioner when appraising the question: to save or to extract?

Results
Avila et al. have built a “color-based decision-making chart with six different levels...” which they present to their readership.

Conclusion
The task to decide on the save ability of tooth is a multidisciplinary decision. The authors have taken the profession a great step forward by analysing decision criteria from different specialties. Out of 150 referenced papers, 67 were written by periodontists, five by prosthodontists, six by endodontists and one by an orthodontist, etc. This is an uneven distribution.

As an example: Endodontics has come a long way in the past decade to offer a wide variety of treatment options for compromised teeth. The panel of authors should have been expended by the expertise and the knowledge of an endodontist.

The authors successfully managed to build a first decision tree for the general practitioner when appraising the question: to save or to extract? The decision-making chart will benefit by revision and introduction of additional levels. The American Association of Endodontics published in 2008 a “case difficulty assessment”. Similar cases of difficulty assessments would be beneficial for the different specialties. Placing case difficulty assessments at the forefront of any specialist decision tree will help differentiate between treatment offered by the general practitioner and the one granted by specialists.

The reduced number of referenced endodontic, prosthetic and orthodontic papers when compared to the number of periodontic papers, prove the high specialty bias of the current paper.

The discussed paper can be considered a helpful but not exclusive tool for general practitioners when evaluating treatment options for diseased teeth. Multidisciplinary decision making enhancements should be offered to the profession to guarantee highest level of evidence. Addition of case difficulty assessments to differentiate between treatments options performed by general practitioners and specialists will compliment the presented reference guide.

Correct and comprehensive appraisal of literature published and used by the profession is mandatory. It should be taken as highly recommended advice to never relay on non-critically appraised papers no matter from which source of publication.

About the author
Dr. med. dent. Liviu Steier, FICOL, FIRD, FING, FIADR Liviu Steier received his Dr. med. dent. (PhD) in 1992. He is Specialist for Prosthodontics (Germany) and Specialist for Endodontics (GDC-UK). He is Honorary Clinical Associate Professor at Warwick Dental Institute, Warwick Medical School – University of Warwick, and course director of the MSc in Endodontics. He holds a Visiting Professorship at Tufts School of Dental Medicine – Boston (US) in the Department of Postgraduate Endodontics, as well as a Visiting Professorship at Florence School of Dental Medicine (Italy) – Restorative Department. He is a member of the Scientific Board of the Journal of Endodontics, Editor-in-Chief of REALITY ENDO (www.realendodent.com), and Clinical Editor of Dental Tribune UK and maintains private practices in 28 Wimpole Street, London (www.msdentistry.co.uk) and Mayen, Germany (www.drschneider.de).

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A prevention-based approach

Mhari Coxon looks at moving your practice to prevention based dentistry as best practice

With growing evidence showing common sense links with our systemic health (if you had an inflamed, suppurating, bacteria covered area on your arm the size of an egg you would expect to feel ill so why would it not be the same for the same size lesion in the mouth?) and our oral health as a profession need to improve our prevention led practice. This is clearly best practice.

“But we do it already” I hear us all cry. “You are reinventing the wheel Mhari!” If this was the case then the incidence of periodontal disease and caries in the population would be decreasing, as would the incidence of litigation against dental professionals in relation to periodontal issues and undiagnosed caries. It is not easy to look at what we are not doing and seek to improve but it is the only way we, as clinicians and as practices can develop and progress.

The right foundations

The first time your patient spends time with you is that they feel happier and your day as a dentist more rewarding.

Examples of questionnaire questions: When was that last time you had any dental treatment? What was your main reason for your visit today? Do you feel you have good dental health? Do your gums bleed? Are you sensitive to hot/cold/sweet? Do you have any worries about your mouth or treatment?

Changing attitudes

Dentistry has been a ‘see the problem - name the problem - fix the problem’ profession for a very long time. We were conditioned that way while in our safe institutions and find it hard to move to a preventative approach to our health care when we transition to general practice and the time constraints and attitudes that come with it.

With growing evidence showing common sense links with our systemic health (if you had an inflamed, suppurating, bacteria covered area on your arm the size of an egg you would expect to feel ill so why would it not be the same for the same size lesion in the mouth?) and our oral health as a profession need to improve our prevention led practice. This is clearly best practice.

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1 • Two-piece 3mm design offers restorative flexibility in narrow spaces
• 3mm threadform shown to be effective when immediately loaded.
• Laser-Lok microchannels create a physical connective tissue attachment (unlike Sharpey fibers).
dent’s behavioural change and treatment acceptance. Do you
think saying “you have some gum problems and the hygienist will see you for a scale and polish” conveys a preventative
message? Does that show that the patient has to make a commitment to their treatment by supporting with their home rou-
tine? Or does it make it sound as though the patient has a “prob-
lem” that you have “named” that
the hygienist will “fix” and so the cycle continues. Our principal
talks about the gums and bone as the foundation to any dental work and without solid founda-
tions he can’t work. He also ex-
plains how the biggest health benefit we can give patients is
their oral health assessment and advice programme, which al-
ways follows an examination and is precursor to any further treat-
ment. If you as “The Dentist” are telling them they need this
then they will feel it has some
value and are more likely to be
advice to your team. Communication prevention
So, how do we change our pa-
tient’s behaviour? By changing
our own behaviour of course. If
what we were saying RIGHT now in practice worked, then almost
all our patients would be regular
maintenance patients with a good
level of understanding of their
health and stability in their oral
health for the majority. If this is
not the case then what have you
got to lose by trying something new? Communication at that ini-
tial examination can make all the
difference. It doesn’t need to be a
long session, you just have to fine
tune how you talk and listen to patients. Some good rules are:
• If you ask a question, REALLY listen to the answer...and
don’t interrupt!! (harder than it
sounds, I know)
• Ask about the patient’s knowl-
edge about the topic you wish
to discuss. This can open up the
discussion in a non-confronta-
tional manner
• Be positive...but realistic about
your treatment needs
• Ask the patient if what you have said makes sense to them. Are
you sure they understand the message you are trying to con-
vey?
• Praise the talents of your team. “Sell” their care to your patient and
watch as your treatment accept-
ance increases with little effort
A picture speaks 1000 words
Every working environment is
different and has restrictions, but
preventative dental care is very cost-effective so we do not have an excuse as
a profession. For those with good
budget to change the practice dy-
namics, you will save time and
increase compliance with the
addition of a microscope. This
should be linked to a live screen
so the patient can see what you
see. Taking a sample of your pa-
tient’s plaque and showing them
what is growing there is very
powerful and motivating. Back-
ing this up with a few photos of
inflamed gum or early decay
with an explanation can be all it
takes to get that oral health ad-
vice appointment booked.

Be positive
We all respond better to positive
suggestion as a rule and so how
we discuss this with the patients
can affect their attitude towards
their health and your team’s part
in it. I do not like to be lectured
or scolded by anyone - an au-
tomatic wall comes up; so why
would I use this method with
my patients. Yes there are “prob-
lems” in their mouths. Yes you
can “name” those problems. But
you and your team cannot “fix”
their problems. You can help the
patient to find solutions and at-
tain and maintain health. This is
ultimately more beneficial than
fixing the problem then trying
to modify the behaviour. That is
like feeding the donkey the car-
rot and then asking it to carry the
load.

So to summarise:
Use your team to glean informa-
tion and discuss patient needs,
fears and expectations; Question the patient gently to develop con-
versation about their health; Em-
phasize the importance of pre-
vention in dental health and the
benefits of this; Show your pa-
tients what is happening; Be posi-
tive, explain that they can make a
difference with their home rou-
tine; “Sell” your team and their
part in preventative care in
the practice.

Obviously, if the patient is
immediate pain or risk then this
should be dealt with. Otherwise
resist carrying out treatment un-
til the preventative routine has
been introduced.

For any questions please
e-mail me at mhari.coxon@cpd-
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A. Ransing

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Application of PAD in clinical dentistry and the literature evidence

Liviu Steier takes a closer look at Photo Activated Disinfection and its uses in differing areas of clinical dentistry

Spread of antibiotic resistance among pathogenic bacteria is alarming the medical science. Inappropriate prescription of antibiotics in the dental profession could add to this. Oral bacterial infection can commonly be considered of local origin. Several attempts have been undertaken in dentistry to try and maintain antimicrobial treatment regimens restricted locally.

The combination of dyes and visible light has proven to kill microorganisms about 100 years ago. Harmless dyes sensitive to light are delivered locally (soft and hard tissue) and exposed to light at certain predetermined wavelength are highly successful in disinfection. Key is presence of oxygen to excited state of the Photosensitizer enhancing transfer of electrons to the ground state of molecular oxygen resulting in reactive oxygen like singlet oxygen and hydroxyl radicals. The latest two have lethal effect on pathogenic microorganisms. The process described is called photo activated disinfection when related to dentistry. Resistance to Photo Activated Disinfection (PAD) has been researched in periodontology but could not be induced artificially (Lauro et al. 2002).

Dai et al. (2009) reviewed literature on Photodynamic therapy (PDT) in regards to localised infections. Key points of interest were:

- Photosensitisers and their interaction with different bacterial strains.
- Photodynamic therapy at different tissue structures.

As a result one can state that bactericidal action was achieved by neutral or cationic PS molecules on Gram positive flora when compared to cationic in combination with non cationic ones on Gram negative (Nitzan et al. 1992, Merchat et al. 1996),. Santamaria et al. (1972) listed more than 400 compounds demonstrating photosensitising properties. Usacheva et al. has proven in 2001 that: “TB exhibits a greater bactericidal activity than MB against most bacteria in dark and light conditions.”

Cohen et al. (1995) cited by Messel et al. (2005) summarised the photobiological principles of light involved in the process:

- The Grothus-Draper law: discusses the wavelength of light requested.
- The Stark–Einstein law: discusses intensity and duration of light applied.
- The Bunsen – Roscoe law: considers the amount of absorbed light.

Photo-activated disinfection provides proven high level disinfection for the treatment of root canals, periodontal disease, peri-implantitis and caries, eliminating 99.99% of all species of oral bacteria, on demand, in a matter of seconds.

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Results were achieved by Braham et al. (2000). An in vivo study by Siguachi et al. (2010) showed “that the adjuvant application of the described PDT method is appropriate to reduce periodontal inflammatory symptoms and to successfully treat infection with F. nucleatum.”

The results of Allan et al. (2007) using Toluidine blue “indicate that PDT may be an effective alternative to conventional modalities in the treatment of periodontal disease.”

Andersen et al. (2007) compared the use of Pad to SRP and concluded that “Within the limits of the present study, it can be concluded that SRP combined with photodisinfection leads to significant improvements of the investigated parameters over the use of SRP alone.”

Milenze de Almeida et al. (2008) compared periodontal bone loss in rats by ligature and treated with Pad. Their conclusion: “PDT may be an effective alternative for control of bone loss in furcation areas in periodontitis.” Kimerik et al. (2003) researched the lethal action of Toluidine blue as PS on Porphyromonas Gingivalis and concluded “The results of this study show that Toluidine blue-mediated lethal photosensitisation of P. gingivalis is possible in vivo and that this results in decreased bone loss. These findings suggest that photodynamic therapy may be useful as an alternative approach for the antimicrobial treatment of periodontitis.”

Hayek et al. (2005) published a study that compared conventional therapy versus Pad for treatment of peri-implantitis in dogs. They concluded that the non invasive PDT technique could be used to reduce pathological microwe- nium in peri-implants.

Sibishi et al. (2005) examined the efficacy of Pad application alone in ligature induced peri-implantitis in dogs and concluded that complete elimination of pathogens was achieved in some cases.

Dörtludak et al. (2001) researched microbial decontamination on peri-implantitis affected IMZ implants in vivo and identified a significant reduction after Pad application. Baron et al. (2000) reviewed 29 papers on regenerative methods in regards to regeneration of peri-implantitis affected sites and concluded: “Of all tested treatment methods, the combination of guided bone regeneration and augmenta- tion with demineralised freeze-dried bone resulted in the most favorable results regarding bone gain and reossseointegration.”

Application in Periodontology

Use of Pad in Periodontology is multifaceted as an adjuvant after non-surgical or in conjunction with surgical approaches.

Interestingly, Azarpazhooh et al. (2010) performed a systematic review and meta analysis for the use of Pad in Perio-dontology and concluded: “PDT as an independent treatment or as an adjunct to SRP was not superior to control treatment of SRP. Therefore, the routine use of Pad for clinical management of periodontitis cannot be recommended.”

Once one understands mechanisms of action of Pad, as briefly discussed above, and starts to critically appraise the systematic review performed by the group of Azarpazhooh et al. a major shortcoming becomes eminent – there was no appraisal of the studies included, in regards of suitable selection of photosensitiser, adequate light source and timing. Correct conclusion would have re-ferred to the kind of PS used and the question if photobiological principles of light have been disregarded.

It is sad to admit that even applying the highest crite- ria for appraisal according to the Cochrane library one may generate confusing con- clusions if authors are not fa- miliar with the review topic.

In 2009, Ramos de Oliveira et al. managed to demonstrate a statistically significant reduc- tion in TNE a level 50 days following treatment when Pad used without SRP. Similar re- sults were achieved by Braham et al. (2009).

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Application for treatment of Peri-implantitis

Hayek et al. (2005) published a study that compared conventional therapy versus Pad for treatment of peri-implantitis in dogs. They concluded that the non invasive PDT technique could be used to reduce pathological microwe- nium in peri-implants.

Sibishi et al. (2005) examined the efficacy of Pad application alone in ligature induced peri-implantitis in dogs and concluded that complete elimination of pathogens was achieved in some cases.

Dörtludak et al. (2001) re- searched microbial decontamina- tion on peri-implantitis aff- ected IMZ implants in vivo and identified a significant reduction after Pad application. Baron et al. (2000) reviewed 29 papers on regenerative methods in regards to regeneration of peri-implantitis affected sites and concluded: “Of all tested treatment methods, the combination of guided bone regeneration and augmenta- tion with demineralised freeze-dried bone resulted in the most favorable results regarding bone gain and reossseointegration.”

Application in Cariology

Williams et al. (2002) researched the bactericidal efficacy of Tolui-idine blue and variable energy on Streptococcus mutans. The results were extremely encour- aging: “The system was highly effective in killing TBO-treated Streptococcus mutans NCTC 10449 in stirred planktonic suspension, killing at least 109 cfu/ml. Antibacterial action in- creased as the delivered energy dose increased.”

The study of Lima et al. (2009) “evaluated the effect of PACT (Photodynamic anti- microbrial therapy) on dentine car- ries produced in situ.” They came to the following conclusions: “PACT was effective in killing oral microorganisms present in dentine caries produced in situ and may be a useful technique for eliminating bacteria from dentine carious lesions before restoration.”

Steier et al. researched the efficacy of Pad bovine root ca- nal dentine previously infected with Enterococcus Faecalis and treated with Pad. Their results: “Within the limits of the present study, researched the antimicrobial effects of Tolu- dine blue and variable energy on Streptococcus mutans. The results were extremely encour- aging: “The system was highly effective in killing TBO-treated Streptococcus mutans NCTC 10449 in stirred planktonic suspension, killing at least 109 cfu/ml. Antibacterial action in- creased as the delivered energy dose increased.”

The research hypothesis of Bergmans et al. (2007) was: “To test the hypothesis that photo-activated disinfection (PAD) has a bactericidal effect on patho- gens inoculated in root canals, with emphasis on biofilm for- mation/destruction.” Their con- clusions were: Photo-activated disinfection is not an alternative but a possible supplement to the existing protocols for root canal disinfection as the interaction between light (diode laser) and associated dye (TBO) provides a broad spectrum effect.”

The research goal of Garrez et al. (2008) was: “To compare the effectiveness of antimicrobi- al photodynamic therapy (PDT), standard endodontic treatment and the combined treatment to eliminate bacterial biofilms present in infected root canals.”

Their results: “Endodontic therapy alone reduced bacterial biofilm cariobacterium by 90 per cent while PDT alone reduced biofilm cariobacterium by 95 per cent. The combination reduced biofilm cariobacterium by >98 per cent, and importantly the bacterial re- growth after 6 months after treatment was much less for the combination (P<0.0005) than for either single treatment.”
The in vitro study of Soukos et al. (2006) ended with the conclusion that “PDT may be developed as an adjunctive procedure to kill residual bacteria in the root canal system after standard endodontic treatment.”

Pinheiro et al. (2007) study was to “evaluate photodynamic therapy in deciduous teeth with necrotic pulp by means of fully quantifying viable bacteria, before and after instrumentation and after the use of photodynamic therapy”. They concluded that “Photodynamic therapy is recommended as adjunct therapy for microbial reduction in deciduous teeth with necrotic pulp.”

The research group around Lim (2009), calling the PAD process “Light Activated Disinfection” (LAD) used “biofilms of Enterococcus faecalis at two different stages of maturation” and extracted teeth. The results of the study showed “Sodium hypochlorite and improved LAD showed the ability to significantly inactivate bacteria in four-day-old biofilms when compared to the control and LAD (p < 0.05). Inactivation of bacteria from deeper dentine was higher in improved LAD than sodium hypochlorite. In four-week-old biofilms, a combination of chemomechanical disinfection and improved LAD produced significant bacterial killing compared to either chemomechanical disinfection or improved LAD alone.”

Souza et al (2010) compared the efficacy of Methylene blue as PS, Fimple et al. (2008) concluded “that PDT can be an effective adjunct to standard endodontic antimicrobial treatment when the PDT parameters are optimised.”

When using Methylene blue as PS, Fimple et al. (2008) concluded “that PDT can be an effective adjunct to standard endodontic antimicrobial treatment when the PDT parameters are optimised.”

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Souza et al (2010) compared the efficacy of Methylene blue and Toluidine blue as an adjunct in root canal disinfection. Their conclusions were “These in vitro results suggest that PDT with either MB or TB may not exert a significant supplemental effect to instrumentation/irrigation procedures with regard to intracanal disinfection. Further adjustments in the PDT protocol may be required to enhance predictability in bacterial elimination before clinical use is recommended.” It may be noted that the culture media for E. faecalis may play a role in the different outcomes.

Based on current knowledge and evidence the author suggests the implementation of PAD in root canal disinfection once conventional protocol completed.

**Conclusion**

PAD is not at all a new concept. It has proven its efficacy in action over almost the last hundred years. New microbiologic knowledge is continuously compensated with advanced research in light emitting sources. Intensive work is committed into the identification process of correlating adequate PS to specific bacterial infection, enhancing dye penetration, adjusting light exposure time, etc.

On the other side numerous new applications arise. Confirming treatment efficacy is a demanding and highly time-, resource- and finance-consuming process. Rewards are amazing taking under consideration the huge added benefits in regards of antibiotic resistance.
References

One of the most important parts of the job of any dental practitioner is the education of their patients with regards to maintaining a good oral care regime. Some of the most important parts of the mouth in this respect are the interdental areas, which experts agree are an ideal breeding ground for pathogenic bacteria and a high-risk area for the development of caries. The self-care regimens taught by practitioners are crucial in the prevention of gum disease, but patients can struggle to maintain their good work outside of the dentist’s office and often slip back into bad habits. Worryingly, the British Dental Health Foundation now estimates that a mere 21 per cent of the British public use dental floss.

In recent years, researchers have amassed a body of evidence to substantiate claims about the links between oral and other diseases, including, but not limited to, diabetes, cardiovascular disease, dementia and strokes. In trials conducted by the Northern Manhattan Stroke Study (NOMAS) links between oral infection and the onset of a stroke have been examined. Seventy eight people of mixed ethnicity (Caucasian, Hispanic and Afro-American) who resided in the same community and had never suffered strokes, received detailed oral examinations. These included measurement of probing depth and attachment loss at six sites per tooth as well as an ultrasound measurement of the carotid arteries. It was duly noted that those with the most severe periodontal disease also showed the greatest thickening of the arteries. The results remained consistent, even shortly before suffering a stroke, and this provides a link between periodontal disease and cardiovascular disease. The results suggest that infections such

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as can cause chronic inflammation and activation of T-Lymphocytes, leading to plaque formation and lesions in the carotid arteries. Further thickening of the arterial walls can severely increase the possibility of stroke or heart disease.

**Interproximal Cleaning**

With evidence for the connection between oral health and general health mounting and data suggesting a strong link between periodontal disease and cardiovascular disorders, interproximal cleaning is at the top of many dental researchers’ priority lists. In light of up to date research, recent studies have attempted to assess the oral health benefits of regular interproximal cleaning both alone and with the addition of specially formulated gels. These studies focused on the effects of daily use of a fluoride-based gel with chlorhexidine (0.2 per cent sodium fluoride (900 ppm) and 0.2 per cent chlorhexidine digluconate), applied with an interdental brush.

The University College of Health Sciences, Kristianstad, with the Department of Cardiology, Goteburg University in Sweden, carried out a double-blind crossover design trial, which used an active gel as well as a placebo. In this trial 15 healthy patients with at least four open approximal spaces in the pre-molar/molar region were chosen from the Department of Periodontology in Kristianstad and clinical parameters were registered at eight approximal tooth surfaces: Plaque index after using a disclosing solution, pocket depth, sulcus bleeding index and gingival fluid flow using a periotoron.

Participants were asked to use the gel after brushing, applying it with an interdental brush twice a day, ensuring that each interproximal space was cleaned twice. Results were assessed as mean values at three points within the trial – on days 0, 7, and 21. From the very beginning of the trial a noticeable improvement was shown in all four parameters. The study concluded that three weeks of interdental brushing combined with an interdental gel could significantly improve oral health as well as helping to prevent the build up of plaque.

Those patients predisposed to plaque and cavities are known to benefit from a dual action formula created to strengthen and desensitise tooth surfaces and help maintain oral hygiene. For these patients a product that lists fluoride as an active ingredient and posts the anti-bacterial properties of chlorhexidine (CHX) can help prevent the build up of bacteria.

Using interdental gels and brushes can also be beneficial as these will help the patient access those ‘hard to reach’ areas. Using a product containing bacteria fighting CHX will allow the fluoride to work to better effect, but patients would be well advised to use a non-abrasive formula to protect the tooth enamel from demineralisation.

A dual action gel can be an ideal accompaniment to interdental brushes for oral hygiene issues of varying types and severity. It may be appropriate for practitioners to recommend an interdental cleaning product based on fluoride and supported by the antibacterial properties of CHX. Interdental gels are excellent products for the effective support of your patients’ interdental care regime and specialising formulated, dual-action gels can provide patients with a convenient and effective ‘take-home’ method of cleaning interdental spaces.

That traditional interdental cleaning is no longer a priority for patients is obvious from the statistics cited by the British Dental Health Foundation, but many practitioners have high hopes that the next generation of cleaning products now available will encourage the British public to improve their dental hygiene. If these products can successfully motivate the mass, we may see a dramatic improvement in dental health into the coming decade.

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**About the author**

Helmut Nissen, International Marketing & Sales Manager. Helmut has been working for over 20 years in the health and oral care market and is dedicated to establishing strong brands based on real user benefits. Email: www.tandex.dk for more information.
The use of antiseptic mouthwashes as a secondary line of defence against the onset of periodontal disease has been in existence for approximately 40 years.

In addition to conventional brushing, mouthwashes offer a number of significant advantages for patients, helping to control the oral pathogens that lead to problems like halitosis, dental caries and of course, dental plaque biofilm formation.

However, for patients with manual dexterity issues who may find brushing difficult, as well as those recovering from implant or endodontic surgery, an antiseptic mouthrinse may be vital in maintaining good oral health and/or preventing the onset of infection.

Numerous clinical studies have sought to establish the effectiveness of the active ingredients commonly found in mouthwashes, including chlorhexidine (CHX), cetyl pyridinium chloride and plant extracts such as essential oils and chlorophyll in controlling the spread of supragingival plaque and gingivitis. Overall, it has been shown that mouthwashes containing chlorhexidine are by far the most proficient in controlling sub-gingival plaque, eradicating oral fungi and reducing the bleeding and inflammation associated with gingivitis when compared to other antimicrobial agents, including hydrogen peroxide. 1, 2, 3, 4, 5

Chlorhexidine is a highly effective bactericide, thanks to its capacity to set up chemical links with the anionic groups such as phosphates and sulphates found in the cell wall of bacteria, leading to an increase in cellular permeability and thereby destabilising the bacterial cell, ultimately leading to its destruction or eradication during brushing. 6

Although considered to be the ‘gold standard’ of chemical antiseptic agents, there are a few limitations and drawbacks that go along with using this otherwise highly effective ingredient.

One of the main disadvantages of using chlorhexidine is its tendency to cause staining on the teeth, especially in the inter-proximal areas and the mucous membranes on the back of the tongue, as well as the lead to discoloration of dental restorations and prostheses. This is caused by the chemical interaction of tooth-bound chlorhexidine and leftover chromogens from food or beverages and is known as the Maillard reaction.

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Results from stain removal study conducted at Bristol University on Beverly Hills Formula toothpaste over a 5 minute treatment period
This issue of chlorhexidine and dental discoloration is more difficult to resolve, making most CHX mouthwashes inappropriate for long-term use.

However, this major issue looks to have been resolved thanks to the inclusion of an anti-discoloration system, known for short as ADS, which is thought to significantly reduce the likelihood of discolouration and taste interference without in any way diminishing the plaque-fighting effects of CHX.

Recent studies undertaken in 2004, 2005 and 2008 to assess this claim have shown that not only did a chlorhexidine ADS formulation perform better in terms of the stain index, but that CHX ADS was just as effective at controlling plaque formation and reducing gingival inflammation in post-operative patients as more traditional forms of 0.2 per cent CHX mouthwashes.

The efficacy of chlorhexidine is also significantly diminished in an interaction with several anionic compounds found in detergents such as sodium lauryl sulfate (SLS) that are commonly added to toothpaste.1 This means that in general, patients need to wait for a full 30 minutes after brushing before rinsing in order to get the full benefits out of their chlorhexidine mouthwash. However, the use of SLS-free toothpaste can help patients get around this issue, even getting a double dose of CHX when using an SLS-free paste containing Chlorhexidine.

Many chlorhexidine-based mouthrinses also contain alcohol, which has been known to cause irritation of the oral mucosa, leading to a stinging or burning sensation in the mouth. Currently, over-the-counter brands of mouthwash can contain anything between 18- and 26 per cent alcohol. Whilst there have been suggestions of a link between the alcohol content and oral cancer, a critical analysis of literature has failed to find evidence of a direct causal link and so far, the studies have been inconclusive.

However, the same study also concluded that there is no evidence that alcohol improved the effectiveness of anti-plaque agents.12 As demand for non-alcoholic mouthwashes has increased, the need to develop effective chlorhexidine mouthwash products with reduced negative side effects has become ever greater. Addressing this demand, several manufacturers have risen to the challenge to develop an alcohol-free chlorhexidine mouthwash.

In an effort to rectify the problems associated with chlorhexidine, several studies have looked at alternatives such as combining agents (ie sodium fluoride and cetyl pyridinium chloride) with CHX.

There is evidence to suggest that, when used together in low concentrations, the combination of CHX and fluoride provide added benefits to patients, including the prevention of caries and the remineralisation of teeth, and whilst also acting as an effective prophylactic against oral diseases.13 However, there is also evidence to suggest that this combination is not effective in tackling oral pathogens such as streptococci.14 Another long-term study31 sought to establish the anti-bacterial capacity and side effects of an ethanol-free lower concentration of chlorhexidine (0.05 per cent) combined with 0.05 per cent cetyl pyridinium chloride, and found that it had an anti-plaque effect comparable to a 0.2 per cent chlorhexidine + alcohol solution, but with reduced subjective side effects: slightly less staining and better taste. However, such combinations, whilst effective, do not completely remove the problem of alcohol and the user’s acceptance of its inclusion in mouth rinses for a number of reasons, including stinging and burning.

Another chemical plaque-control agent that has been studied is essential oils. In a six-month randomised controlled clinical trial,15 a commercially available mouth rinse containing essential oils was compared with an experimental mouth rinse containing 0.07 per cent cetylpyridinium chloride and found both to be effective in reducing gingivitis and the proportions of periodontal pathogens. Furthermore, a meta-analysis of six-month studies16 found six studies that showed essential oils to be effective as both an anti-plaque and anti-gingivitis agent, compared with the results achieved using 0.12 per cent chlorhexidine. However, essential oils have the disadvantage of poor substantivity and, in some cases, an unpleasant bitter taste and burning sensation.

Conclusion:

Although chlorhexidine is the gold standard of anti-plaque agents, in general it is not considered suitable for long-term use due to a number of factors, including altered taste sensations, which are likely to make patient compliance problematic.

About the author

‘Following his degree in biochemical engineering, Howard went on to work in the pharmaceutical industry, where he became responsible for a number of the products and development multimarkets before becoming CEO of Meck for 11 years. After leaving Meck, Howard set up Molecure Pharmaceuticals, America’s first focusing Pennsive Oleum product (the nicotine gels that helped smokers quit) and thereby established a world-class standard for the manufacture of pharmaceuticals. He later diversified the business in the Cambridge area and sold the company for significantly over $1 billion. Howard is currently focusing on developing a range of natural products for the dental market. The dental market in terms of product development has been neglected by companies, yet over 90% of the population has some degree of oral disease and suffer form minor to severe discomfort.’

Reference