Is a mixed method approach to non surgical periodontal treatment advantageous in comparison to hand instrumentation or ultrasonic debridement alone?

Emma L Pacey

Non surgical therapy remains the gold standard modality in controlling periodontal disease, especially at probing depths of six millimetres and less. Its aim is to create an environment associated with health, more effectively accessed and maintained by both the patient and clinician.

Much research focusing on instrumentation was conducted in the 1980s, comparing hand (HI) with sonic and ultrasonic debridement (USD). Since then there have been many advances in design and engineering. Through analysis and discussion of current literature, it is the aim of this review to reach evidence based conclusions to influence and improve daily clinical practice. The author will pay special attention to studies using site specific curettes and USD with modified inserts (MI) as it is hypothesised that these achieve optimal results, especially when used in conjunction.

Introduction

Removing the microbial biofilm and calcified deposit from the root surface facilitates novel recolonisation, thereby reducing inflammation and decreasing the pocket depth via reattachment and repair - the formation of a long junctional epithelium.

Hughes and Smales found that with microbial product and host response trigger, lipopolysaccharides do not penetrate sub surface cementum and so although removal of extraneous deposit is required, the deliberate removal of cementum is not.

Effective sub gingival debridement is influenced by science and art: the extent of the disease, anatomic factors, operator skill and approach. Firmly adhered pathogenic biofilm, inflammation, root morphology, varying attachment topography and a lack of sight equate to a challenging working environment. Several authors have found residual calculus in almost all sites post treatment and others have found that the majority of residual deposit is at molars and premolars. Within the clinician’s control however, is the approach we choose, largely comprising instrument selection.

Lots of studies have assessed post treatment pocket probing depths (PPDs), clinical attachment loss (CAL), bleeding on probing (BOP) and recession, concluding that a comparable clinical outcome can be achieved using either HI or USD. Beuchat et al found that in probing depths of up to six millimetres, both methods are of equal value. Drisko et al and Tunkel et al concluded that similar results can be achieved in single rooted teeth and Leon and Vogel proved that class I furcation involvement may be accessed effectively with both HI and USD.

Focusing on USD, Khambay and Walmsley identified acoustic microstreaming as advantageous in disruption of the pathogenic biofilm. While Tunkel et al cited benefit in decreased treatment time and Drisko et al concluded that operator fatigue reduced and USD is sometimes preferable to HI. In 2001, Beuchat et al found that clinical attachment levels improved and recession reduced post USD as it is superior in accessing probing depths greater than six millimetres.

The aerosol that is created however, is a negative aspect of USD. The American Academy of Periodontics position paper recommends that ‘additional care is required to achieve and maintain good infection control’ and Barnes et al advocates control with wide bore, high volume aspiration. Combined with Care Quality Commission guidance, Health Technical Memorandum 01-05 decontamination procedures and practice protocols, the aerosol is of little consequence.

Hand instrumentation

Sharp instruments enhance tactile sensation and in situations where deposit is little and tenacious, a dry working environment may be preferable. Christgau et al found that bleeding on probing is reduced furthest in deep sites post treatment with HI.

The need for sharpening, increased treatment time, technique sensitivity and post treatment sensitivity however, pose significant disadvantages to using HI alone.

Certainly modified curettes; site specific with extended shanks and mini working ends are the gold standard HI in providing active treatment.
Their length, small size and unilateral blading allowsatraumatic, superior adaptation to accentuated root contours, as well as areas most difficult to access and therefore most vulnerable to breakdown.

With regards to tooth surface loss on treatment, a significant consideration, Obeid et al. found that there was no more removal with USD than HI. Busslinger et al. and Kawashima et al. observed increased loss with HI, but Flowaczny et al. found root surfaces more grooved post USD. Jepsen et al. and Kocher et al. concluded that MI can be used without risk of tooth surface loss. The American Academy of Periodontology Position Paper (2000) questions whether this is of consequence for healing.

In recent years, MI have been developed; long, slim and probe like to aid access to deeper sites. Proceedings of the 6th European Workshop on Periodontology (2008) reported that current research shows variation in performance of different tip designs, but clinical relevance remains unknown. There is an emerging body of evidence in support of their effectiveness: Dragoo and Drisko recommend MI in preference to other instruments. There is a body of evidence, which also postulates that new approaches are needed to render root surfaces more smooth and improve access. There is a need for further research to define the role of MI in treatment.

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To aid access in this notoriously challenging root morphology, ultrasonic tips curved like a Nabers probe have been developed. Some are ball ended, similar to the end of a Basic Periodontal Examination probe. Oda and Ishikawa and Takacs et al. found that these inserts are more effective than both straight tips and site specific curettes as they improve access, leaving a smooth surface. Wylam et al. postulated that new approaches are needed to render root surfaces compatible with new attachment. Aspilie et al. compared HI, USD and a mixed method approach and found that post treatment with a blended system, smooth root surfaces are achieved with minimal smear layer. As long ago as 1984, Hunter et al. conducted a similar study, concluding that more teeth are rendered calculus free having been exposed to both HI and USD. Employing each instrument modality in sequence and using focused, closely placed, overlapping strokes disrupts the biofilm and removes deposit from the entire root surface.

Conclusion

It is the finding of this literature review that research comparing a single modality with a mixed method approach is limited. Yet in practice, many clinicians choose to use a blended method during initial therapy. It would seem therefore, that it is generally accepted to be effective and perhaps even superior to other methods. Reflecting on, and learning from, practice is important for making positive changes to enhance patient care. Nevertheless, it does not provide an evidence base which is vital for clinical decision making and providing gold standard treatment.

Collating the individual conclusions from the selected studies however, provides evidence which, when amalgamated, can be utilised to influence the delivery of non surgical periodontal therapy. Patients with periodontitis are vulnerable to pathogenic biofilms that are challenging to debride and it is our duty as dental professionals to ensure we provide effective care which incorporates instrument choice. Non surgical treatment is a demanding procedure to perform with either modality, but selecting instruments specifically designed for improved access, such as MI for USD and site specific curettes, results in minimum effort and maximum gain. A mixed method approach exploits the advantages of each, accessing all subgingival areas in an efficient and minimally invasive way, rendering the root surface free of the smear layer and thus enhancing healing.

It is the recommendation of this paper that clinicians expand their hand and ultrasonic instrument armamentariums to that which is modern and evidence based to provide best, patient-centered care.

References


About the author:
Emma qualified as a dental hygienist and therapist at Leeds Dental Institute in 2007. She took dental hygiene and therapy students at King’s College Dental Institute for three years, during which time she also practised in the community dental service. Recently she completed a BSc in Dental Studies at the University of Central Lancashire. Currently she is Clinical Coordinator of the London Tooth Wear Centre and a clinician in specialist practice. Emma is a member of the BSDHT publications team.

Address for correspondence: emmapacey@me.com


Bibliography