TOP TIPS

Top tips for effective use of periodontal instruments in primary care

By Morag Powell,[1] Ruth Potterton[2] and Ewen McColl[3]

Introduction

Stabilisation of primary disease is a key pillar of successful treatment and in addition to managing caries, managing periodontal disease is a crucial component of a successful treatment plan. The recent European Federation of Periodontology (EFP) S3 level clinical practice guidelines (CPG)[1] are evidence-based clinical guidelines providing recommendations to treat periodontitis. Crucial to successful implementation of these recommendations is delivering behavioural change and non-surgical instrumentation. Often this is given passing attention with insufficient time allocated to behaviour change in treatment planning. Similarly, poorly maintained periodontal instruments and equipment not used to their full utility or design can lead to poorer outcomes for patients. In this article we provide tips on how to meet these guidelines with best practice, borne from years of experience in optimising instrument utilisation, including an update on instruments which may facilitate patient care, and operator satisfaction.

Building foundations for optimal treatment outcomes

The treatment for stage I–III of periodontitis is delivered in a stepwise approach, each with different interventions.[1] This approach is broken down into four distinct steps, which clinicians move through sequentially, commencing with the first step of building foundations for optimal treatment outcomes prior to undertaking subgingival professional mechanical plaque removal (PMPR).

In this initial step the focus is on control of the supra biofilm by the patient, with behavioural change interventions and risk factor control. The PMPR element within this step can be completed by various approaches including toothbrushing, hand instrumentation, ultrasonic instrumentation, traditional polishing, and air polishing. The aim of this step is to identify and remove supra biofilm and calculus deposits which in turn will allow patients to carry out their personal homecare plan of toothbrushing and interdental cleaning that has been designed for them by their clinician.

Identification of biofilm

The application of disclosing solution (Fig. 1) at each appointment during step one aids the patient in recognising the mature and cariogenic plaque that remains on the tooth surface after they have performed their homecare routine. Behaviour change interventions are targeted specifically to areas highlighted by the solution, with patients instructed using the Oral Health TIPPS[2] method of Talk, Instruct, Practise and Plan with personalised homecare plans created based on these findings. SMART goals are agreed and set with the patient, with the expectation of them being achievied by the next appointment. Once a reduction of 50% of plaque and bleeding scores is achieved, the patient is then deemed as 'engaging', allowing progression to the next step of treatment. If goals are not achieved, then further behaviour change interventions will be required prior to proceeding onto the next step of treatment.

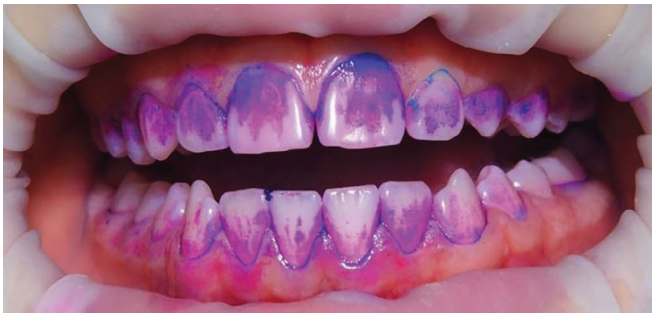

Fig. 1 Disclosing solution applied as part of the behaviour change intervention. Image courtesy of EMS

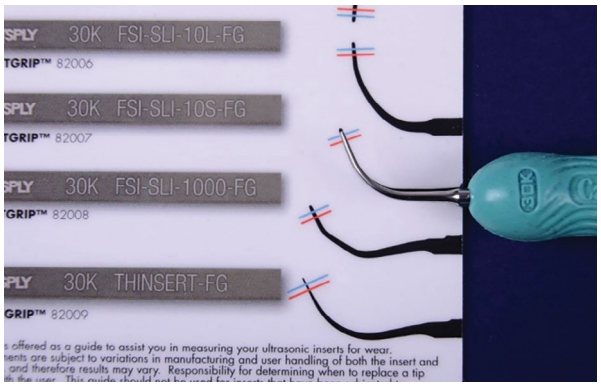

Fig. 2 Cavitron wear guide. Image courtesy of G. Malone, Dentsply Sirona

An efficient method of removing this stained biofilm is with an air polishing device (APD). Current literature suggests that there is no significant difference in treatment outcomes when using APD compared to conventional techniques in the treatment of periodontal disease, however it does identify a difference in patient comfort levels and professional treatment time when compared to hand instrumentation and ultrasonic scalers.[3] Therefore the use of an APD can be an efficient and popular method of removing supra biofilm.

There are various types of powders available for use with APDs including glycine, erythritol and sodium bicarbonate. Glycine and erythritol powders have mostly superseded the use of sodium bicarbonate powders in general practice, with both powders reported in the literature as having improved patient comfort and less abrasiveness on the tooth surface. The use of APDs is technique

[1]Dental Therapist, Lecturer in Dental Therapy & Hygiene, Peninsula Dental School (University of Plymouth), Derriford Dental Education Facility, Plymouth Science Park, Research Way, Plymouth, PL6 8BT, UK; [2]Dental Therapist, Lecturer in Community Based Dentistry Peninsula Dental School (University of Plymouth), Derriford Dental Education Facility, Plymouth Science Park, Research Way, Plymouth, PL6 8BT, UK; [3]GDC Registered Specialist in Periodontology, Peninsula Dental School (University of Plymouth), Derriford Dental Education Facility, Plymouth Science Park, Research Way, Plymouth, PL6 8BT, UK.

Fig. 3 Piezon instrument check tool. Image courtesy of EMS

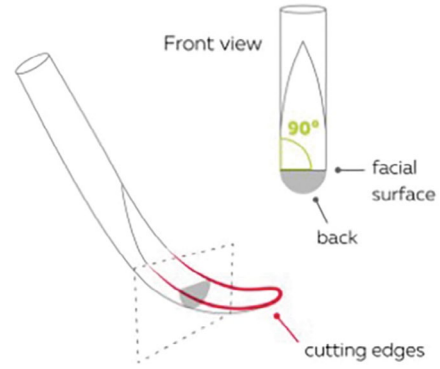

Fig. 4 Universal curette with two cutting edges. Image courtesy of Deppeler

sensitive and it is recommended that clinicians attend formal training prior to using on a patient.

Once the biofilm is successfully removed, the clinician's focus can then turn to the removal of supra gingival calculus deposits and other plaque retentive factors. APDs are unable to remove calculus deposits, and therefore the options available for this include hand or ultrasonic instrumentation.

Supragingival hand instrumentation

There are a wide range of different supragingival scalers that can be used for supragingival PMPR. The fundamental difference between instruments used for supragingival and subgingival PMPR is that supra instruments have a sharp tip and should not be used subgingivally, and subgingival instruments have a rounded toe, designed to reduce trauma to the subgingival tissues. When viewed in cross section the instruments are either triangular (sickle scaler) or semi-circular (curette).

Sickle scalers have an anterior design, with H6/H7 being used as standard in undergraduate training, and a separate posterior design such as S204 or M23 scaler which allows for extended reach to the posterior regions. These instruments have two cutting edges which are set at a 90-degree angle to the lower shank of the instrument. However, the instruments are not used at this 90-degree angle as they require to be tipped slightly towards the tooth to an approximately 80-degree angle to reduce trauma to the gingival tissues. In addition to this angulation, only the anterior first third of the instrument should be engaged and adapted to the tooth surface, again to reduce trauma and increase patient comfort during the procedure.[4]

Correct seating positions, posture and positioning of the patient are fundamental in enabling a clinician to achieve the correct periodontal instrumentation technique whilst maintaining a neutral body posture. Right-handed clinicians are best positioned between 8–1 o'clock with left-handed clinicians best positioned between 11–4 o'clock.[4]

The patient's head should sit between the hands of the operator when their elbows are tucked into their sides and their forearms parallel to the floor. For instrumentation in the lower arch, the patient's chin should be towards the chest allowing for the mandibular occlusal plane to be as parallel to the floor as possible. For the upper arch, the patient's chin should be raised upwards, allowing for the maxillary occlusal plane to be perpendicular to the floor.

The correct instrument grasp is the modified pen grasp which allows for precise control of the instrument and good tactile sensory feedback.[5] This grasp will not look the same for every clinician as it requires to be adapted based on hand size and finger length, however adopting this grasp will lessen musculoskeletal stress to the clinician's fingers during instrumentation.[4] The handle selection of the instrument is also significant, with ergonomic handle designs recommended to reduce muscle load and pinch force. Two of the main risk factors for carpal tunnel syndrome in clinicians are the consistent use of a non-neutral wrist position and repetitive excessive pressure applied during pinch forces that occur during instrumentation. It is recommended that clinicians relax the fingers of the grasp between each instrument stroke to help prevent repetitive injuries.[4,6]

Ultrasonic instrumentation

The two main options of ultrasonic technology available to use for both supra and subgingival PMPR are magnetostrictive and piezoelectric. The literature advises that there is no significant difference in clinical outcomes when compared, and therefore the choice of equipment used is generally the clinician's preference.

Ultrasonics convert electrical energy to mechanical energy in the form of vibrations. Taking Dentsply Sirona Cavitron Ultrasonic Scaling System as an example, their 25K and 30K inserts vibrate at 25,000 cycles and 30,000 cycles per second respectively.

Whether the clinician opts to use a magnetostrictive, piezoelectric or a sonic scaler is often down to personal preference or availability within the primary care setting. There are many differing interchangeable tips/inserts to choose from varying in diameter, shape, length (depending upon unit manufacturer) to complete the required periodontal treatment and as such it is important to have a wide ranging and suitable selection. Whichever ultrasonic equipment is used, it is of vital importance to facilitate effective treatment, the operator is aware of the selected tip movement (eg elliptical, linear, orbital/elliptical) and which surface(s) of the tip is 'active' when in use. Clinicians will be practised in their dexterity and know only a light pen grasp, using gentle 'featherlike' pressure and small overlapping strokes is required.

In Cavitron tip selection a common misunderstanding is that the thicker, heavier diameter inserts or Cavitron Powerline Ultrasonic Inserts cannot be used subgingivally.

1. Cavitron Ultrasonic Inserts:
   a. Powerline:
      i. Moderate to heavy deposits sub and supra PMPR

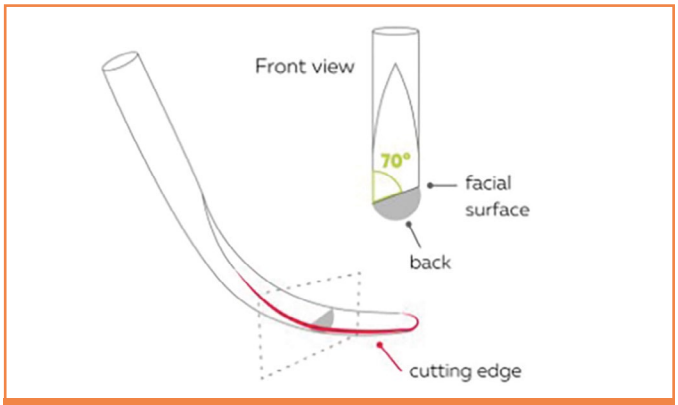

Fig. 5 Area specific curette with one cutting edge. Image courtesy of Deppeler

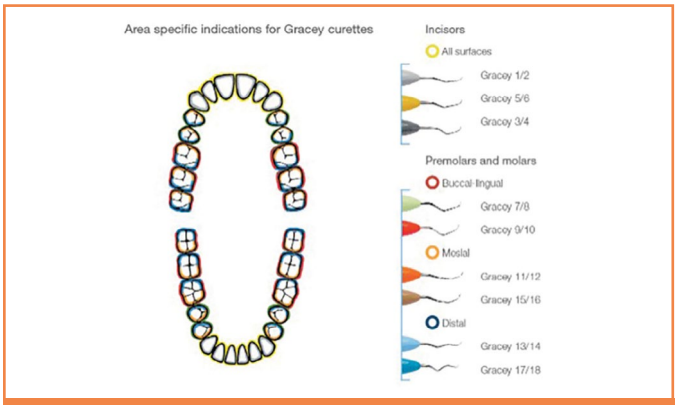

Fig. 6 Full Gracey Series. Image courtesy of LM Dental

b. Slimline:
   i. Light to moderate deposits sub and supra PMPR
   ii. 30% thinner than Powerline inserts allowing for improved subgingival access
c. Thinsert:
   i. Biofilm removal and light calculus deposits sub and supra PMPR
   ii. 47% thinner than Slimline inserts.

2. EMS Piezon inserts:
a. Perio Slim (PS):
   i. Can be used both sub & supra in 95% of areas
b. Perio Slim L&R:
   i. Used up to 8 mm in depth providing complete accessibility to all tooth surfaces

Ultrasonic set up:

- Flush handpiece for minimum of two minutes (at the beginning and end of the day or after any significant period when it has not been used) and for at least 20–30 seconds between patients[7]
- Select appropriate tip or insert (if using insert [magnetostrictive] ensure handpiece chamber is filled with water first)
- Adjust water flow and appropriate power setting before commencing treatment
- Adapt the working part of the tip to the tooth surface and during activation keep the ultrasonic tip in motion at all times. Power levels and water flow may need adjusting throughout the operative procedure especially if interchangeable tips/inserts are used to obtain the required outcome.

Ultrasonic tips will wear from use over time but cannot be sharpened back to optimum condition. 1 mm loss of the tip will result in a 25% loss of efficiency, 2 mm loss resulting in 50% loss of efficiency, which often leads the clinician to apply more pressure or increase the unit's power during the procedure. This has the potential to cause inefficient PMPR and can lead to patient discomfort. To ensure continued efficiency of ultrasonic insets/tips use a 'wear guide' frequently (Fig. 2), which are available from the manufacturer of the mechanical scaling unit being used (Fig. 3).

Subgingival PMPR

Sanz *et al.*[1] advise within the S3 guidance on Step 2, that the current available evidence demonstrates that outcomes of periodontal treatment were not dependent on the type of instrument employed. This evidence was considered strong and consistent, advising that there were no clinically or statistically significant differences observed between the different types of instruments. However, they did highlight that there may be an ethical dilemma in that a patient's preference may conflict with a clinician's preference and due consideration should be given to this.

In addition to this, Suvan *et al.*[8] advise that subgingival instrumentation is an efficacious treatment in reducing inflammation, probing pocket depth and number of diseased sites in patients affected by periodontitis and that this effect was consistent, irrespective of the choice of instrument (sonic/ultrasonic vs. hand) or mode of delivery. Therefore, subgingival PMPR can either take the form of hand instrumentation, ultrasonic instrumentation or a blended method of both techniques with consideration given to the patient's preference and delivered with quadrant or full mouth treatment options.

Subgingival hand instruments

Subgingival hand instruments can either be universal or area-specific in design. These instruments use slightly different techniques due to the differing angles of their cutting edges. The shank of both instruments can vary in length, with a shorter shank designed for use in shallow pockets and longer shanks designed for use in deep pockets. In addition to this, shank design can be rigid for removal of heavy deposits, or flexible for removal of small to medium deposits of calculus.

Universal curettes

These come in a variety of designs including Langer, Columbia, Barnhart, and McCalls. Universal curettes have two cutting edges, inner and outer, which both sit at 90 degrees to the lower shank (Fig. 4). Similarly to the sickle scaler, the universal curette requires the lower shank to be tilted towards the tooth during instrumentation, to allow the instrument to be used at 70–80 degree angle. It should be noted that for use in the anterior regions, only the outer cutting edge of the instrument is used. For correct technique in this area, clinicians should ensure that the lower shank is titled across the tooth, which in turn only allows for the outer cutting edge to be engaged on the root surface.

Area-specific curettes

Area-specific curettes are, as their name suggests, used in specific

Fig. 7 Gleason guide. Image courtesy of PDT dental

areas on each tooth. Much like the universal curettes, they also come in a variety of designs including Gracey curettes, Kramer-Nevis and Turgeon Series. The most common area specific curette used during undergraduate training in the UK is the Gracey curette series.

Area specific curettes are designed with a cutting edge set at a 70-degree angle to the lower shank, on the working end of the instrument (Fig. 5). This angulation tilts the face of the instrument, giving it a lower and upper cutting edge. It is only the lower cutting edge of the working end of the instrument that is used for periodontal instrumentation.

Within the Gracey series there are a total of nine different designs, ranging from a Gracey 1/2 through to a Gracey 17/18, providing the best adaption to complex root anatomy (Fig. 6).[9] As the numbers of the series increase, so does the bend in the shank which allows for more reach in the posterior regions of the mouth. The Gracey 17/18 has the deepest bend in the shank allowing for use in the distal aspects of posterior molars. It should be noted that not all instrument brands follow the same colour coding system, and clinicians are advised to gain an understanding of the number of the instrument used in each area and not the colour of the instrument.

Technique for using universal and area-specific curettes – 3As

Whilst both instruments have differing degrees of their cutting edges, they are both used with the same technique of adaptation, angulation and activation in an instrument stroke.

Adaptation is the first step of an instrument stroke, where the clinician adapts the anterior first third of the cutting edge of the instrument to the root surface and feels engagement of this area of the instrument with the root surface of the tooth. Angulation is when the clinician angles the lower shank of the instrument to allow for correct instrument stroke. For a universal instrument the lower shank requires to be titled towards the tooth to allow for an approx. 80-degree angle, and for an area specific instrument the lower shank requires to be parallel to the long axis of the tooth as the required angle of 70 degrees is already present in the cutting edge. When each of these steps are correctly in place, this then allows for the clinician to take an activation stroke to remove the calculus. As with all periodontal instrumentation a fulcrum should be used for stability and control, and these can be either intra or extra oral.[4]

Calculus detection – periodontal explorer probes

Periodontal explorer probes are an excellent tool to identify calculus deposits on the root surface, surface irregularities, deficient restorative margins, excess cement and carious areas.[9] There are a variety of designs of these probes available from most periodontal instrument manufacturers. A popular periodontal explorer is the EXD 11/12, which has a similar shank design in terms of shape to that of the 11/12 Gracey curette. The shank on this instrument is very thin and flexible in design in comparison to a standard Gracey shank, allowing for excellent tactile feedback when assessing root surfaces of deep pockets for residual calculus deposits.

Sharpening and monitoring instrument wear

Hand instruments need to be sharp to remove deposits effectively and efficiently, This prevents trauma to soft tissues, improves quality of results and treatment outcomes, provides the patient with a more comfortable experience and is less demanding for the clinician. Periodontal instruments will dull through the rounding of the cutting edge after 15–45 instrument strokes,[10] therefore they require sharpening on a very frequent basis. Dull cutting edges will result in burnished calculus (a calculus deposit where only the top part of the calculus has been removed, leaving a 'burnished' deposit behind), increased lateral pressure and pinch force on use leading to musculoskeletal issues and increased operator time to perform good quality PMPR.[4]

Cutting edges of the instruments can be assessed both visually and manually by using a plastic sharpening testing stick. Visually a dull cutting edge of an instrument will reflect the light due to the rounding of the cutting edge, whereas a sharp cutting edge will not reflect the light when it is placed on it. When assessing the sharpness of the cutting edge manually by using a test stick, the cutting edge of a sharp instrument will 'bite' the surface when it is sharp, and therefore if this does not occur and the instrument does not engage with the testing stick, the instrument is identified as needing sharpening. Some of the more modern instrument ranges have been designed with a coating that requires less sharpening than standard stainless-steel instruments, in addition to ranges of instruments that do not require to be sharpened at all. It is important to note that once a non-sharpen instrument becomes dull, it must be replaced as it is not able to be sharpened.

When sharpening instruments, it is important to ensure that the angle of the cutting edges of the instrument is preserved, therefore it is recommended to use a sharpening device that has both universal and area specific angles pre-determined such as the Gleason guide (Fig. 7).

Implant instrumentation

The EFP have recently published guidance on the multidisciplinary treatment of peri-implant diseases. This S3 level clinical practice guideline focuses on best practice interventions required to prevent the development or recurrence of peri-implant disease and to treat patients with dental implants following the development of peri-implant diseases.[11] At the time of writing, this guidance advises that it is unknown which specific PMPR regime is the most effective in reducing the risk of recurrent per-implantitis. However, it does advise the following based upon the periodontal literature and indirect evidence:

Dental implant biofilm removal

For this specific intervention guidance advises the use of titanium

or stainless-steel curettes; Ultrasonic/sonic instruments; rubber cups or brushes and APDs with glycine powder or erythritol alone or in combination.

Peri-implant mucositis treatment

For the treatment of mucositis, the recommendation from current guidance is that ultrasonics with plastic tips or APDs with glycine powder or titanium curettes or chitosan brushes *may be considered* as a single mode of PMPR. Clinicians should be aware that this guidance advises against the use of APDs in combination with conventional PMPR – curettes, ultrasonics or both, and that they should only be used as a single mode of treatment for peri-implant mucositis.

Non-surgical management of peri-implantitis

A step wise approach is also advocated for the treatment of peri-implantitis, with the aim of controlling peri-implant biofilms and inflammation along with sub marginal instrumentation. In patients with peri-implantitis it is recommended to perform non-surgical supra and sub marginal instrumentation with titanium or stainless-steel curettes and/or ultrasonic/sonic devices. It is important to note that it does not recommend the use of APDs for non-surgical submarginal peri-implant instrumentation. Literature advises that cases of subcutaneous emphysema have been reported after the use of APDs during submarginal instrumentation and therefore these clinical practice guidelines only consider the use of APDs for biofilm control or as a standalone treatment for peri-implant mucositis.[11]

Titanium instrument hand instruments

Titanium instruments are made from the same titanium alloy as implants and abutments and are available in various designs including sickle scalers and curettes. These titanium instruments have the benefit that they can also be sharpened which is advantageous for both calculus and excess cement removal. The literature acknowledges that titanium, graphite, and plastic implant scalers were all within safe limits in regard to damage to the implant surfaces however, this surface can become contaminated with trace elements that plastic, graphite, or stainless-steel scalers leave behind,[12] therefore titanium curettes are the instruments of choice for hand instrumentation.

Ultrasonic implant tips

The three recommended materials used with ultrasonic implant tips are polyether-ether-ether-ketone (PEEK) used with piezoelectric; Ultem, polyetherimide (PEI) used with magnetostrictive and titanium alloy used with piezoelectric.[12] All three of these materials are deemed safe to use, in terms of damage to the surface of implants, for PMPR in both titanium and ceramic implants.[10]

Conclusion

As with any instrument used in clinical dentistry, following instructions for use and understanding its full utility will not only optimise outcomes for patients but improve comfort and safety for the operator. In this short article we have highlighted key considerations for optimising instrument use in the management of periodontitis, which we hope will be of benefit to busy clinicians. ■

Top tips are intended as a series of experiential tips, rather than a compendium of the evidence.

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