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Sharpening Tips & Tricks of Periodontal Instruments

Dr. Banashree Baishya[1*], Dr akanksha singh[2], Dr piyush pratap singh sikarwar[3], Dr Mallika Sethi Rishi[4], Dr Dilraj Singh[5], Dr.Vinita Dahiya[6]

[1]Associate Professor Department of Periodontics & Oral Implantology Hi-Tech Dental College & Hospital, Bhubaneswar.
[2]Mds Periodontology Senior Lecturer in Maharana Pratap Dental College and Research Centre Gwalior.
[3]Mds Oral and Maxillofacial Surgeon Senior resident, Gajra Raja Medical College Gwalior.
[4]Professor Periodontics Indraprastha Dental College, Sahibabad, Ghaziabad – 201010
[5]Senior lecturer Dept. Of Oral medicine, Diagnosis and Radiology Ideas Dental college Madhya Pradesh 474020
[6]Reader, ITS dental college, Muradnagar Dept of Periodontics.

Corresponding Email: [1*]banashreebaishya24@gmail.com

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ABSTRACT:

The principle objective of periodontal therapy is the eradication of mineralised deposits from the radicular teeth plane as well as planing thoroughly, rendering it smooth & in alignment with periodontal health. In order to obtain this function; usage of properly sharpened instruments are indispensable. It not only enhances the efficacy and quality of operator's work but also minimizes fatigue due to exertion of excessive pressure while working with a dull device along with increasing the shelf-life of the equipment. This review article throws light into the various sharpening techniques, the available equipments for doing so as well as the different points to be kept in mind while sharpening particular periodontal equipments like the equipment design or angulation of abrasive stone application.

Keywords: periodontal therapy, instrument sharpening, mounted & un-mounted stones.

1. Introduction

Principles of Sharpening

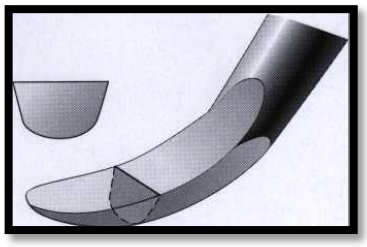
The goals of instrument sharpening are as follows:

1. The production of a workable sharpened tip/point.
2. The preservation of the instrument contour.
3. The maintenance of instrument shelf life.

It is impossible to scale and root plane in a precise & efficient manner with dull instruments. Tactile sensitivity is reduced, because to remove calculus a dull edged instrument need to be grasped rigidly and attached against the tooth in a more firm way in comparison to a sharp instrument. Instead of cleanly, shaving a deposit from the tooth surface takes place making the task even more difficult as a blade must crush and fragment the calculus facilitating thorough cleaning. Bits of calculus are left behind & smoothed over, which is known as **"burnishing"**, & burnished deposits are extremely difficult to detect or remove even with sharp instruments. SRP does require firm lateral pressure, but the pressure should be applied judiciously and effectively with a sharp instrument. Indiscrimination of heavy-handedness is uncomfortable for the patient and can be hazardous because it increases the possibility of inadvertently slipping of the instrument.

Evaluation of Sharpness

The cutting edge margin of a periodontal curette or sickle is established by the angular intersection of face of the blade and the adjacent oblique surface.



In case the periodontal instrument is sharp-edged, this particular intersection/junction is a definite fine line running along the length of the cutting edge. As the instrument is regularly used, working surface gets deteriorated, and the junction becomes curve or dulled. Thus the cutting edge becomes a rounded surface in place of maintaining an acute angulation with the adjacent surface. This is the prime reason for a dull-edged instrument to perform ineffectively and requiring additional constraint in order to perform its function.

Instrument sharpness can be examined as follows:

1. On holding an instrument under direct light, if the cutting edge leads to light reflection back at the operator it indicates that the tip is dull and not sharp for proper functioning. Whereas a sharp-edged tip/blade has no surface area to reflect light, thus no brighter line can be visible.
2. For proper tactile examination, an instrument is gently drawn over a rod-shaped tool known as acrylic or sharpening "test stick." An effortless sliding is noted in case of a dull equipment with no "biting" against the outer aspect of the rod whereas a sharper one will produce slight shavings superficially.

Objective of Sharpening

The prime aim is to restore fine, thin, linear instrument cutting edge obtained via grinding surfaces of the blade until their junction is once again sharply angular rather than rounded. For any given instrument, several sharpening techniques may produce this result.

A technique is recommended if it leads to the production of a definite sharp-edged working end with no associated excessive instrument wear or any change in its actual design or pattern. For proper maintaining of the original design, operator must understand the position and direction of the cutting edges. It is essential for restoration of the working end with no disruption in the actual instrument angles. On alteration of these angles, the instrument can't perform the designated job thus limiting its effectiveness. The desired outcome of a precise sharpening procedure is removal of minimal quantity of alloy from equipment working end in order to reinstate a finer sharper working end without disrupting the actual instrument design.

Advantages of Sharp Instruments

1. Improved tactile sensation.
2. Increased efficiency of the deposit removal.
3. Less pressure required for the removal of deposits.
4. Improved instrument control.
5. Less root gouging.
6. Decreased burnished calculus.
7. Minimized patient discomfort.

Sharpening Needs

1. Considerations as to be the best time for instrument sharpening includes the number of patients scheduled for the day, frequency of use, degree of patient difficulty, and type of procedure to be completed.
2. To lessen the chance of contamination with non-sterile instruments, sharpening should be carried out after sterilization.
3. Mechanical debridement leads to the dulling of instrument making it curved post almost 15 scaling strokes and more highly blunted after every 45 push and pull strokes.
4. Normally sharpening of equipments should be carried out immediately on the initial glance of bluntness.
5. New advanced metals & heat treatments produce a long-lasting tip which can remain honed upto several treatment modalities. Diamond coated technology is another type of instrument that maintains a sharp edge for years & these instruments cannot be resharpened, so must be replaced.

Sharpening technique:

The following are the three different hand-sharpening processes:

1. Reducing the face of the instrument blade.
2. Reducing the lateral surface to create a sharp edge through movement of a sharpening stone against a stationary cutting edge.
3. Moving the instrument against a stationary sharpening stone.

The first method encompassing blade face reduction makes the instrument fragile leading to rapid breakage. Either the stationary stone or the stationary instrument method of sharpening produces a linear border which obstructs with the sharp edge of the instrument.

Instrument wire edges are foundation-less alloy fractions expanding away from the tip either from oblique surface or the instrument blade face. Functional or non-functional types are available. In case this edge is aligned in plane to the mechanical debridement strokes, it is known to be functional & it penetrates into dental calculus without gouging onto the superficial teeth layer. Thus aids accretions removal without any deleterious harm to the teeth or periodontal apparatus. In case this edge is aligned at 90 degrees to the mechanical debridement strokes, it is known to be non-functional in nature. It produces gouging of the superficial

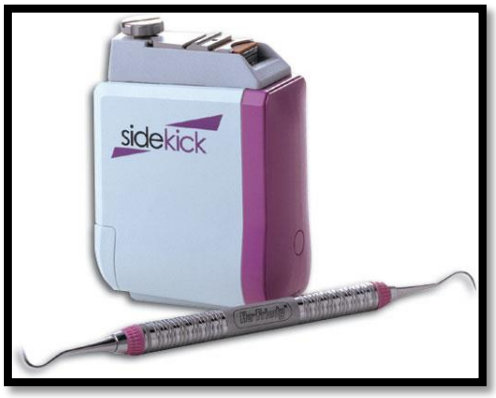
radicular surfaces without assisting in accretions eradication, thus establishing a second reason for sharpening lateral surfaces of an instrument.

Devices Used to Sharpen Instruments

Mechanical

A honing device is a mechanical bench-type piece of instrument which follows the basic principles of equipment maintenance & conservation. Specifically manufactured honing disks are attached on the uppermost part of the device, and a sharpening guide positions the instrument in accordance with classification of instrument**.** The instrument blade is held in opposition to the stone as it revolves in a routine machine-like fashion and the disk moves at a speed of 7000 rpm**.** The operator controls the pressure when the machine eliminates alloy from the face of working end/blade. The machine sharpens quickly so maintaining a steady hand is essential for proper maintenance of the angulations and designs of the instruments.

A battery-operated device (Sidekick) using ceramic stones is another example and it contains a guide channel & perpendicular backstop to control the machine working end angulation. Proper guidebook is available for sharpening sickles & universal curettes and a different pathfinder is available for sharpening periodontal Gracey curettes. This also consists of a toe guide in order to maintain roundness of curette toes. Although it eradicates alloy sideways of instrument tip, the operator should be cautious for thorough maintenance of the rounded outline of the working ends.



Sharpening Stones

These might be extracted from naturally-occurring deposits within the earth's crust or manufactured unnaturally. In both the scenario, stone's superficial portion consists of coarse-grained crystalline particles which are stiffer in comparison to instrument's metal to be sharpened.

Coarse stones have bigger-sized fragments with rapid cutting action which is effective for sharpening of dull-edged instruments. Fine sharpeners consist of small-sized crystalline particles which relatively cut in a slower pace, thus are reserved to provide final sharpening in order to obtain a fine linear working edge & are used for equipments which have slightly lost its razor-sharp edge. India or Arkansas oilstones are examples of natural abrasives. Carborundum, ruby or ceramic stones were synthetically produced. Synthetic abrasives causes increased irregular working ends in comparison to Arkansas stones [1]. There is a positive correlation between sharpness and the type of abrasive stone used for the purpose whether its coarse or fine grit stone as well as with degree of smoothness of planed root surfaces [2]. Aluminium oxide stone produces finer sharper working edges in comparison to Arkansas stone [3]. Fine ceramic stones are hugely recommended for maintenance of instrument sharpness [4]

& the sharpening action of India stones is found to be supreme under SEM view with a standard sharpening technique [5].
These are also classified as follows:

Mounted Rotary Stones
These are attached onto a metallic mandrel & mostly function with the help of a motorized hand-held piece. These are available in various shapes like disc, cone-shaped or cylindrically inclined. Most common mounted stones are **Arkansas stone & Ruby stone**. Their use is normally contraindicated for regular use in clinical practice as they are arduous while pinpoint controlling, thus contributing to damage of equipment shape or metal loss from the working end rapidly. This renders the device ineffective and produces exceptionally greater abrasive warmth which has a deleterious effect on the equipment nature. Application of rotary stones lead to formation of maximal asymmetrical non-uniform cutting margins [6]. Technique using sharpening horse was proved to be of supreme efficiency [7]. Insignificant difference was noted in strength from sharpening of face in comparison to lateral surface of a periodontal scaling device [8].

Un-mounted Stones
These are available in various forms like rectangular-shaped with levelled or chiselled superficial layer, or pyramidal and tubular-shaped. Flat stone is ideal for moving instrument technique and conical versions are effective for eradication of lateral wire surfaces/edges. Curetted new modifications are available like the channel-shaped stone system which is devised with a trench where the equipment is supposed to be kept & passed through the channel. These have been shown to produce a levelled working end with very few remaining alloy fractions extending from the lateral surface or blade. If instruments are excessively dull, then a coarse-type or abrasive version (India stone) should be used and a smooth or less abrasive stone (Arkansas) is highly recommended in case of regular equipment final finishing. Degree of sharpness following mechanical debridement and SEM evaluation of the working end to determine the times of strokes required for device dullness was examined but no significant differences were observed [9]. India & Arkansas grinding stones are hugely indicated for regular instrument sharpening [10].

Using technique
a) The working end of the equipment has to be securely upheld in an immobilized fashion & the stone is moved over against it; or
b) The sharpening device has to be balanced & grasped motionlessly in place followed by the moving of the equipment over it.

Principles of sharpening:

1. The prime aspect is the selection of an acceptable and worthy stone for periodontal equipment sharpening which has the desired abrasiveness & suitable design or configuration.
2. In case the periodontal equipment has to be put to function without being re-sterilized; usage of a previously disinfected stone is highly recommended. Ceramic grinding stones can be disinfected by usual office protocols [11].
3. Establishing the conventional angulation of the superficial layer of the periodontal equipment and the abrasive stone is mandatory keeping in mind the equipment configuration.

4. Another important point is the maintenance of steady, secure grasping of the abrasive stone as well as the periodontal equipment. This ensures that the proper angulation is maintained throughout the controlled sharpening stroke. In this manner, the entire surface of the instrument can be reduced evenly, and the cutting edge is not improperly beveled.
5. Over-exaggerated force has to be avoided which leads to grinding of the superficial layer of instrument more quickly and may shorten the instrument's life unnecessarily.
6. "Wire edge" production has to be eliminated. When working on root surfaces with the periodontal instrument, these projections form depressions on the superficial layer in place of a desired fine, shiny and evenly levelled layer. These unsupported alloy fractions are formed at the time of grinding when sharpening strokes are placed in outward direction to the working end of the instrument, rather than inward direction. On using vertical motions, "wire edge" production can be eliminated by finishing with a down stroke in the direction of instrument "cutting edge."
7. Stone's lubrication during the process is equally essential. It decreases obstructing of the stone's superficial layer with metallic remnants eradicated from the periodontal equipment during sharpening process. It also decreases frictional heat production. In case of natural stones, oil has to be applied and water for synthetic stones.
8. Sharpening periodontal equipment at the initial or earliest sight of dullness is important. Instrument that has lost its sharpness requires exertion of elevated levels of force while working with it, which in turn hinders controlled functioning. Furthermore, sharpening of dull equipments need more amount of alloy to be removed in order to create a fine pointed working end. This process in turn decreases the efficiency and shelf life of the periodontal equipment.

Universal curettes sharpening:

The angulation formed by the face of the working end and the lateral aspect of a curette is approx. 70-80 degrees. This has to be remembered at all times while using any sharpening technique. This angulation is of utmost efficiency for thorough scaling & root planing, while any deviation from this designated angulation disrupts the periodontal equipment configuration rendering it ineffective. The cutting blade margin of lesser angulation (70-degrees or lower) makes it sharper but at the same time slender which wears down quickly and becomes dull. A perpendicular cutting margin (90-degrees) needs application of exaggerated sideways force to remove deposits. Calculus removal with such cutting margins cannot be thoroughly finished, as well as efficient planing of tooth roots cannot be done.

Sharpening the lateral surface:

When a flat, hand-held sharpening stone is precisely adapted to the lateral aspect of periodontal curette in order to conserve a 70 to 80-degree angulation, the cutting margin of blade and the superficial layer of the stone forms a 100-110 degree angulation. It can accurately be seen when the curette is held in such a fashion so that the blade cutting margin becomes aligned side by side to the floor. The palm grasping technique can be utilized with the upper limb stabilized besides the body for support.

1. The sharpening stone has to be applied onto the curette's lateral plane, thus maintaining an angulation of 100 to 110-degrees between the superficial layer of stone & blade's cutting margin.
2. Starting from the shank side of the blade cutting margin and working toward instrument toe, activate the stone with short up-and-down strokes. Use consistent, light pressure and keep the stone continuously in contact with the blade. Make sure that the 100- to 110-degree angle is constantly maintained.

3. Roundedness of the toe has to be maintained so sharpening on all sides is essential when it is approximated. In order to stop the curette toe from appearing pin-pointed, whole of the blade has to be properly sharpened starting from the shank side to the toe-end.
4. While moving the stone onto the working end of the instrument, all the sides has to be completed with the help of a downward stroke in the direction of the cutting margin. This helps reduce the "wire-edge" production. The working end has to be evaluated underneath illumination.
5. Flattening of the lateral aspect of the equipment is rectified by gently abrading that surface along with the backside of the equipment, towards the outward direction from the working end while sharpening it.
6. While sharpening a working end margin of periodontal equipment, the contrasting cutting margin has to be sharply manipulated in similar fashion.

Sharpening the blade working end:

It is sharpened by moving a hand-held conical stone in to-and-fro motion over the working end of the periodontal equipment. In the same manner, an abrasive stone attached in a hand-piece can be utilized by application to the working end; moving the stone in the direction of the periodontal equipment toe end.

These methods are often contraindicated for regular clinical practice as:

1. It is difficult to maintain the angle formed by the superficial layer of the stone & the instrument while sharpening; therefore the blade may be improperly beveled.
2. Using the abrasive stones in the direction of cutting margin to back-side tapers the working end of the equipment. It leads to the weakening of the blade thus causing bending or breakage during usage.
3. Using a mechanical stone for producing a razor-sharp margin in a to-and-fro direction leads to "wire-edge" production which obstructs in the proper functioning.

Area specific (Gracey) curettes:

The area specific curettes (Gracey) form an offset angulation (70-80 degrees), not perpendicular, by the blade face with the lateral margin of the instrument working end. Thus similar ways can be utilized for sharpening area specific curettes like the universal ones. But the proper understanding of the distinctive configuration differentiating these curettes from universal instruments is important for preventing distortion of periodontal equipment design while sharpening. A Gracey curette is further distinguished by a distinctive curved design of the working end. On observing straight overhead, the working end of a universal instrument is in linear fashion from equipment shank to toe end; both cutting margins can be utilized for mechanical debridement. The cutting edges of a Gracey curette, on the other hand, curve gently, thus the outwardly placed working end is exclusively utilized for mechanical debridement.

A Gracey curette is sharpened in the following manner:

1. The curette has to be held in such a manner that the instrument face is aligned in the same plane with that of floor. Since the working end has an offset angulation, the periodontal tool shank does not maintain a 90-degrees angulation with floor surface, as in case of universal curettes.
2. Proper identification of the working margin prior to sharpening is essential. Apply the stone to the lateral surface maintaining a 100-110 degrees angulation of the superficial surface of the abrasive stone with the blade working end. Stone activation for longer duration should be avoided to prevent flattening the blade.
3. It has to be activated with shorter vertical strokes in the direction from the shank side to the curve-ended toe of the blade. It has to be finished by a down stroke.

4. It has to be kept in mind that the working margin or end is slightly bend and not straight. Preservation of this curvature can be done by slightly turning the abrasive stone during sharpening procedure to prevent distortion of the desired curvature and configuration. After activation if the abrasive stone is placed at a point for several times, this will cause flattening of the blade surface rendering it ineffective.
5. Evaluate sharpness as described previously. Continue sharpening as necessary.

Extended shank and mini-bladed curettes

The extended shank curettes like After Fives can be sharpened exactly in same manner as that of the previously mentioned periodontal Gracey curettes. Although the terminal shank is 3 mm elongated, the design and curvature of the working end is alike & thus a similar sharpening method is utilized. Mini-bladed curettes like Mini Fives or Gracey Curvettes are also sharpened in similar fashion. The working end is shorter by half of the total extent of original periodontal curettes and angulation formed by the blade face and back is offset (70-80 degrees). However, excessive sharpening repeatedly with exaggerated force can lead to shortening of blade which has to be prevented for maintaining its efficiency.

Sickle scalers

This scaling instrument is available in 2 types, namely straight and curved. The working end of the straight sickle is aligned flat in the direction from shank side to the toe end. On the contrary, working end of the curved sickle is slightly bent forming a soft curvature. However, both of these have a same cross-section configuration. The angulation formed by the blade face with the back is approx. 70-80 degrees which is similar to curettes. Proper adaptation of the abrasive stone to the lateral aspect of blade is important for preservation of the offset angulation. During sharpening, instrument face & superficial stone surface makes an angulation of 100-110 degrees. It has to be sharpened in similar pattern like the curette, remembering that it has a sharper toe end which should not be rounded while sharpening to maintain its effectiveness.

It can also be sharpened using a flat abrasive stone steadily held on table-top with one hand & the instrument being held by the other hand in modified pen grasping method. The angulation of 100-110 degrees between the instrument face and superficial surface of stone has to be maintained at all times. “Wire-edge” formation can be prevented by finishing with a proper pull-stroke without disrupting the angulation.

Chisels & hoes

These possess one cutting margin which is perpendicular to instrument shank. The blade face is in line with shank of the periodontal device and its end is beveled at 45 degrees to form the cutting edge. While sharpening it, the abrasive stone has to be held steadily on flat area & chisel properly grasped establishing finger rest with pads of the third and fourth fingers facing the linear margin of the abrasive stone. The sloped aspect of the instrument has to be applied to superficial surface of abrasive stone. Sharpening should always be proceeded by proper maintenance of the desired instrument angulation without altering its configuration. On placing the total sloped margin in direct proximity with the abrasive stone, angulation formed by the stone’s superficial surface with that of the periodontal equipment is 45degrees. Maintaining this angulation helps adequate sharpening of the working margin when the instrument is pushed across the stone.

With stabilized mild force & finger-rest on stone margin acting as guide, the periodontal equipment has to be pushed over the superficial surface of abrasive stone. Here the operator’s hand & arm acts as a single unit during the process. The force has to be freed lightly followed by retracting the instrument to its original onset mark. Continuous strokes are to be applied till

a precisely sharp-edged margin is acquired. It has to be ended with a push-motion always in order to prevent "wire-edge" formation. Instrument configuration should not be irreversibly modified post sharpening. Back-action chisels and hoe has to be sharpened with exactly same technique described for chisels with only difference being that a pull-type stroke has to be applied in place of a push-motion.

Periodontal knives

There are disposable scalpel blades that come pre-packaged. They are pre-sharpened and sterilized by the manufacturer. These are not re-sharpened when they become dull but are discarded and replaced. Other category knives are reusable stainless steel variety which has to be filed and polished up after repeated usage rendering it round-edged in place of pointed & sharp-edged. Commonly used are the flat-bladed gingivectomy knives (e.g., the Kirkland knives) and pointed interproximal knives.

Gingivectomy knives

It is characterized by the presence of wide, flat-shaped working end of blade which is perpendicularly placed to the periodontal equipment shank. Its curved cutting edge extends around the whole outwardly placed margin of the instrument blade. It is produced by bevels on front and back surfaces of blade. Only the slope at the back of the equipment blade has to be sharpened. A sharp-edge can be achieved either by moving the instrument working margin over a stagnant abrasive stone or by keeping the instrument immobile while moving the abrasive stone over the area of the blade to be sharpened.

Interproximal knives

The blades of interproximal knives consist of 2 cutting margins coinciding at the sharp-edged working end point. These margins are produced by the slopes on the face & lateral surface of the instrument blade. The equipment working end makes approximately 90-degrees to instrument shank. Only bevels on lateral aspect of interproximal knives needs sharpening. Again, it can be accomplished by moving instrument over an immobile abrasive stone or by immobilizing the periodontal equipment followed by moving the stone across it.

Stationary stone technique

This method is used by fixing an abrasive stone onto a table-top & the instrument being held with modified pen grasp. The beveled surface of the instrument working end is applied onto the superficial surface of stagnant stone. Applying mild force, the equipment should be dragged towards the operator followed by releasing the applied pressure slightly & returning it to the starting point.

The gingivectomy knife may be sharpened on a stationary abrasive stone. The ring finger leads the sharpening motion while the periodontal equipment is being rotated in between fingers in order to sharpen all the surfaces of the working end precisely. This process should be started at one point of the working margin & continued around the entire area by rotating the periodontal equipment slowly between fingers. "Wire-edge" formation can be obliterated by ending sharpening each blade surface with a pull-motion.

Stationary instrument technique

The instrument should be grasped steadily and the superficial aspect of the hand-held abrasive stone be applied to the slope on the lateral surface of working end. The process should start at one end-point of the working margin with slight force & the abrasive stone drawn to-and-fro over the periodontal device. "Wire-edge" formation can be avoided by ending every stroke with a pull-motion towards the cutting margin. Gradual revolving of the instrument & the

abrasive stone is also essential for efficient sharpening without distortion in configuration or angulation.

2. Conclusion

The proper understanding of the instrument configuration, its angulation along with its function is essential for precise sharpening technique to be applied; without disrupting the original design or shape. Constant maintenance of the angle is also essential while sharpening for effective razor-sharp working end achievement; without rendering it ineffective. Time to time meticulous sharpening increases the shelf-life of the periodontal instrument along with enhanced operator efficacy with reduced fatigue. Care must always be taken not to overzealously sharpen an instrument which will hamper its accurate and pin-point functioning.

3. References

1. Silva MV, Gomes DA, Leite FR, Sampaio JE, de Toledo BE, Mendes AJ. Sharpening of periodontal instruments with different sharpening stones and its influence upon root debridement--scanning electronic microscopy assessment. J Int Acad Periodontol. 2006 Jan; 8(1):17-22.
2. Rossi R, Smukler H. A scanning electron microscope study comparing the effectiveness of different types of sharpening stones and curets. J Periodontol. 1995 Nov; 66(11):956-61.
3. Moses O, Tal H, Artzi Z, Sperling A, Zohar R, Nemcovsky CE. Scanning electron microscope evaluation of two methods of resharpening periodontal curets: a comparative study. J Periodontol. 2003 Jul; 74(7):1032-7.
4. Andrade Acevedo RA, Cardozo AK, Sampaio JE Scanning electron microscopic and profilometric study of different sharpening stones. .Braz Dent J. 2006; 17(3):237-42.
5. Huang CC, Tseng CC. Effect of different sharpening stones on periodontal curettes evaluated by scanning electron microscopy. J Formos Med Assoc. 1991 Aug; 90(8):782-7.
6. Andrade Acevedo RA, Sampaio JEC, Shibli JA. Scanning Electron Microscope Assessment of Several Resharpening Techniques on the Cutting Edges of Gracey Curettes. J Contemp Dent Pract 2007 November; (8)7:070-077.
7. Fiore A Di, Mazzoleni S, Fantin F, Favero L, Francesco M De, Stellini E. Evaluation of three different manual techniques of sharpening curettes through a scanning electron microscope: a randomized controlled experimental study. Int J Dent Hyg 2015; 13(2): 145-150.
8. Murray GH, Lubow RM, Mayhew RB, Summitt JB, Usseglio RJ. The effects of two sharpening methods on the strength of a periodontal scaling instrument. J Periodontol 1984; 55(7): 410-413.
9. Hoffman LA, Gross KB, Cobb CM, Pippin DJ, Tira DE, Overman PR. Assessment of curette sharpness. JDH 1989; 63(8):382-387.
10. Nahass HEL, Madkour GG. Evaluation of Different Resharpening Techniques on the Working Edges of Periodontal Scalers: A Scanning Electron Microscopic Study. Life Sci J 2013; 10(1): 989-993.
11. Wiebe CB, Hoath BJ, Owen G, Bi J, Giannelis G, Larjava HS. Sterilization of Ceramic Sharpening Stones. J Can Dent Assoc 2017; 83: h11.