REVIEW ARTICLE

PERIODONTAL PROBE : A BLESSING IN DENTISTRY

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ABSTRACT

Periodontal probe is accepted as the most important and useful diagnostic tool now a days in dentistry to detect presence and severity of different type of periodontal disease .It is also used to locate measure and mark the degree of progress of periodontal pocket; a definitive sign of periodontal disease. Now a days various types of periodontal probes are available worldwide . In this article an effort has been made to find out generation of periodontal probe in terms of their uses, advantage and limitation .

KEY WORDS

Periodontal Probe, probing, diagnostic tool, Advantage, limitation

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INTRODUCTION

Periodontal probe is most accepted instrument worldwide to determine the gingival and periodontal status of a patient.

'Periodontal Pocket' is defined as pathologically deepened sulcus where the depth is greater than 4mm—It is one of the definitive sign of periodontal disease. A calibrated probe used to measure severity, progression, depth and determine configuration of periodontal pocket.

Goldman et. al. said: 'Clinical Probing with suitable periodontal instrument such as Williams calibrated probe is a prime necessity in delineating the depth, topography and character of the periodontal pocket.'

Irving Gilckman I stated that, "Probe is an Instrument with a tapered rod-like blade which has a blunt and rounded tip."

According to Orban et.al, "Eye of the operator beneath the gingival margin."[1]----- So, Periodontal Probe is very much necessary & essential part for complete clinical examination.

CLASSIFICATION

In 1992, **B.L. Pihlstrom** created classification of periodontal Probe – 1st, 2nd, 3rd. In 2000, Watts extends classification system include 4th, 5th generation of probe.

1)**1st Generation Probe / Conventional Probe/ Manual Hand Held Instruments:**

Composed of either stainless steel or plastic. Design of working ends of manual Probe are either tapered, round, flat, rectangular with round smooth end.[2] (figure 1)

The FDI World Dental Federation/WHO Joint working group[1] has advised the manufacturers of CPITN Probe to identify it as-

- ***CPITN –E – (epidemiological)*** **:** Marking at 3.5 mm & 5.5 mm.
- ***CPITN-C (Clinical)*****:**

1. Marking at 3.5 mm, 5.5 mm, 8.5 mm, 11.5 mm
2. Ball tips →0.5 mm. (figure 2)

•Table 1 : first generation probe :

Name	*Marking*	*Color Coding*	*Advantage*	*Disadvantage*
1. William's Probe (13 mm in length 1 mm in diameter)	At, 1-2-3-5-7-8-9-10 mm (4 & 6 missing)	No	4 & 6 mm marking missing which minimize confusion during reading	Not appropriate for precise pocket depth measurement
2.CPITN Probe / WHO Probe (in 1978, designed by Georges Beagrie & Jukka Ainamo)	At 3.5-5.5-8.5-11.5 (0.5 mm ball end/tip)	Yes, at 3.5-5.5 & 8.5 - 11.5 mm	1. Ball end decreases connective tissue penetration 2. Useful in measurement of Periodontal Pocket depth. 3. Detection of subgingival calculus. 4.Useful in screening Purpose.	Not appropriate precise pocket measurement
3.UNC -15 (University of North Carolina-15) 15 mm long Probe (Marking at each mm) (Preferred Probe in Clinical research if conventional Probes are required)	At , 1-2-3-4-5-6-7-8-9-10- 11-12-13-14-15	Yes, at 5,10,15 mm	1.Use in deep periodontal pocket 2. Thin shank allows access into tight fibrotic sulci.	1. Thin tip may penetrate junctional epithelium.
4. Naber's Probe	At , 3-6-9-12 mm	Present between 3-6 & 9-12 mm	1. Determine extent of furcation in multi-rooted teeth. 2. Curved work end for accessing furcation area. 3. Deep insertion of Probe indicate ? degree of furcation.	May feel bulky
5. Michigan –O-Probe	At, 3,6,8 mm	3-6-8 mm	Thin shank allow access into tight fibrotic sulci .	Not used to measure deep pockets as the markings end at 8 mm.
6. Gold Man fox Probe	1-2-3-5-7-8-9-10 (4,6 missing)	No	4,6 marking missing ? to reduce confusion during reading.	Flat shank does not allow easy access into tight fibrotic pocket.
7.Marquis color coded Probe	At , 3-6-9-12	Yes, 3to 6 & 9-12 mm	1.Easy to read. 2.Thin shank allows access into tight fibrotic sulci	1.Thin tip may Penetrate junctional epithelium. 2. Markings must be estimated between color
8. Merritt Probe	At , 1-2-3-5-7-8-9-10	No	1.4 & 6 mm marking missing that to reduce confusion during reading	Not appropriate to measure pocket depth

f o r d e p t h

•Criteria for Community Periodontal Index of Treatment (CPITN) Needs:

	Periodontal Status	*Treatment needs*
0	Healthy Periodontium.	No treatment needed
1	Bleeding observed, directly or by using mouth mirror after sensing.	Oral hygiene needs improvement.
2	Calculus felt during Probing but the entire black area of Probe is visible.	I + Professional scaling
3	Pocket greater than 6 mm (black area of Probe not visible)	I + II + Complex treatment

•To overcome limitation of Conventional Probe NIDCR gives 8 criterias. They are—

•Table : 2

National Institute for Dental and Craniofacial Research (NIDCR) Criteria: [3]

Limitation	*Conventional*	*Conservative*
Precision	1.0 mm	0.1 mm
Range	12.0 mm	10.0 mm
Probing force	Non-standardized	Constant
Applicability	Non-invasive	Non-invasive
Reach	Easy to access	Easy to access
Angulations'	Subjective	Guidance System
Read out	Voice dictation and Recording	Direct electronic Reading
Security	Easily sterilized	Complete sterilization

- **Second Generation/ Constant Pressure Probe:**

i. Second generation probe are pressure sensitive

ii. To improve standardization of controlled probing pressure. Weinberg et. al. Stated that, Controlled force of 20-25 gms during probing, reduce examiner error & made depth changes of less than 2 mm which was clinically meaningful [3]

iii. Pressure should not exceed 0.2 N/mm^2

(Figure -3)

Table 3: Second generation probe :

Probe	*Introduced by*	*Description*
True Pressure Sensitive (TPS)	Hunter, 1994	This Probe have - • disposable probing head • Hemispheric probe tip (diameter 0.5 mm) • Controlled probing Pressure 20 gm • Visual guide & sliding scale where two
		indicator lines meet at a specific pressure.
Pressure - Sensitive Probe	• Van der velden • De vies	1.Cylinder & Piston connected to an air pressure system.
Electronic Pressure Sensitive Probe	Polson, 1980	This Probe has- • Hand piece • Control base to Control Probing Pressure • Pressure is increased until an audio signal indicates Preset Pressure has been reached .
Yeaple Probe	Modification of Polson et. al's original design	Use to measure dentinal hypersensitivity

Table 4 : Third generation probe :

Probe	*Description*
1.Foster-Miller Probe(1986)	Prototype of third generation Probe
2.Florida Probe	a. Devised by Gibbs et.al. in 1988. b. Generated detail computerized Periodontal chart. c. has constant Pressure of 15 gms (Provided by colspring inside hand Piece & Precision of 0.2 mm)
3.Toronto Automated Probe	a. devised by – McCulloch & Birek in 1991. b. use the occluso incisal surface to measure relative clinical attachment level.
4.Inter Probe/ Perio Probe	a. has flexible probe tip b. has probe's optical encoder hand pieces (uses constant probing pressure) that provides repeatable measurement of pocket depth & attachment loss.

3rd Generation Probe (Automated):

In this generation, computer aided direct data is collected that helps to reduce examiner bias and detection of more accurate measurement of periodontal pocket depth with probe .[3]

4th Generation Probe:

(i) Refers three-dimensional technology

(ii) Precise & Continuous reading of base of sulcus or Pocket.

5th Generation Probe :

3D technique + Ultrasound technology Available.

Ex:

(a) The only 5th generation Probe available → **Ultrasonographic Probe** (US Probe)

(b) Devised by → Hinders & Companion at the NASA Langley Research Centre.

© Uses ultrasonic wave to detect image and map of the upper boundary of periodontal ligament & indicator of periodontal disease.

Periodontal Disease Evaluation System:

1. Diamond Probe: detects Periodontal disease during routine dental examination. It measures relative sulphide concentration as an indicator of gram (–ve) bacterial activity.[3]

2 Perio-temp Probe:

- Temperature Sensitive Probe.
- Detects Pocket temperature difference of 0.1^0C from referenced sub gingival temperature. [3]

Probing healthy non-inflammed periodontium :

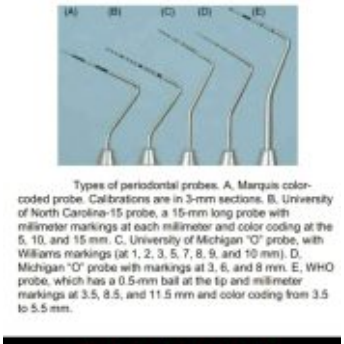
For healthy non-inflammed gingiva clinically determined probing depth is approximately 1-3mm. With respect to design of sulcus depth of gingiva ,proximal sulcus depth is slightly greater than lingual sulcus. Buccal sulcus shows least depth .There is no bleeding upon probing in healthy gingiva as blood vessels in connective tissue are not injured by probe . According to Taylor and Campbell, 1972, healing of epithelial cleft following probing is achieved within 5 to 7 days.[4] (figure -4)

Probing the inflamed periodontium :

Microorganisms in dental plaque are the most potent etiological factor for causing gingivitis and periodontitis. Plaque bacteria colonize on tooth surface and initiate mild inflammatory reaction along adjacent gingival tissue. In such condition, if pocket depth is measured it will be as similar as the pocket depth of normal healthy gingival tissue. Probe tip is inserted gently under the gingival margin, now slowly directed the tip towards apical portion of junctional epithelium with firm enough pressure until resistance is felt. While probing, it should be ensured not to damage epithelium and connective tissue. Now place the probe parallel to tooth surface and move it carefully along the surface of tooth ('Walking of Probe'). As tissue is slightly inflamed minor bleeding may be observed due to injury in blood vessels. If inflammation continues, exuded containing proteolytic enzymes and transmigrating neutrophills moves in the gingival sulcus, may cause loosening of epithelial attachment and allows plaque bacteria to go in apical direction. Subgingivally established plaque separates junctional epithelium from tooth surface and spontaneous re- attachment will not occur. The junctional epithelium is now transform into pocket epithelium which is typically characterised by irregular epithelial ridges, thin inter-ridge coverings,

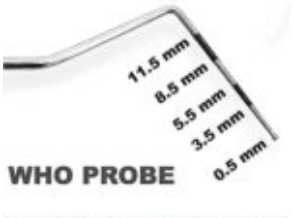
Table : 5
Advantages & Disadvantages of Periodontal Probe according to Generation:

	• ***First generation probe***
Advantages	• Easily Available • Inexpensive • Tactile sensitivity is Preserved.
Disadvantages	• Heavy • Probing force is not controlled, so tip of Probe may pass beyond the base of Pocket. • Errors during visualizing the readings may possible.
	• **Second generation probe**
Advantages	1. Standardization of Probing force 2. Constant pressure
Disadvantages	1. Probe tip may pass beyond junctional epithelium in inflamed sites. 2. No computerized storage of data.
	• **Third generation probe**
Advantage	• Standardization of Probing forces • Elimination of "Errors in reading Probe".
Disadvantages	• Tactile sensitivity decreases. • Probe may pass beyond junctional epithelium in inflammed sites, overestimating pocket depth.
	• **Fourth generation probe**
Advantage	• Three dimensional Probe. • Sequential Probe positions are measured.
Disadvantages	• Invasive • It is under development.
	• **Fifth generation probe**
Advantages	• Non- invasive • Probe provides painless probing to patient. • Guidance Path is predetermined • Ultrasound wave to detect, image & map the upper boundary of Periodontal ligament, so there is no chance to pass probe beyond the junctional epithelium.
Disadvantages	• Expensive • Operator needs to understand images provided by computer.



Types of periodontal probes. A, Marquis color-coded probe. Calibrations are in 3-mm sections. B, University of North Carolina-15 probe, a 15-mm long probe with millimeter markings at each millimeter and color coding at the 5, 10, and 15 mm. C, University of Michigan "O" probe, with Williams markings (at 1, 2, 3, 5, 7, 8, 9, and 10 mm). D, Michigan "O" probe with markings at 3, 6, and 8 mm. E, WHO probe, which has a 0.5-mm ball at the tip and millimeter markings at 3.5, 8.5, and 11.5 mm and color coding from 3.5 to 5.5 mm.

Periodontal probing: A Blessing in dentistry; figure 1



Periodontal probe: a blessing in dentistry ; figure 2

Periodontal probe: a blessing in dentistry; figure 3

Curved #2 Nabers probe for detection of furcation areas, with color-coded markings at 3, 6, 9, and 12 mm.

Periodontal Probe: a blessing in dentistry ; figure 4

Periodontal probe of healthy gums.

Periodontal probe showing a pocket forming between the tooth root and the gums.

Periodontal probe: a blessing in dentistry; figure 5

micro-ulceration, and strong infiltration of the epithelial ridges by lymphocytes, blast cells, and plasma cell.

Now, the area between tooth surface and epithelium is called as gingival pocket. In severe inflammation, there is increased vascularity and vascular proliferation. In this condition, if probing is done, it shows bleeding on probing, as probe penetrates inflammed connective tissue. Clinical sign of bleeding on probing is a great parameter for periodontal examination. If plaque induced inflammation continues more, infiltration attacks principle group of fibers of gingiva, destroys it and results in apical shifting of residual junctional epithelium – clinically called ' attachment loss'. Now periodontal pocket (depth is approximately greater than 4 mm) develops-clinical sign for periodontitis.[4]. (Figure -5)

CLINICAL USE:

1. To check the status of periodontal health.
2. Detect & Measure Periodontal Pocket depth.
3. To check clinical attachment loss.

A. For Calculus assessment [by Detect Tar Probe][4]

B. Gingival sulcus depth measurement, component of **Periodontal disease Index** (by Ramfjord Technique[5])

C. Marginal gingival palpated with periodontal probe to assess its consistency & adaptation to tooth. When gingival Inflamed, it is edematous, spongy loosely adapted to tooth surface due to degeneration of collagen[6] and influx cells, fluid into lamina propria .

For general dental practice mainly 1st & 2nd generation probes are mainly used .

Most recent advancement in Probe:

- COLORVUE probe
- GO probe
- ULTRASONOGRAPHIC perio probe [7]

CONCLUSION

Newer Research & development on periodontal probe will give us a painless, error-less pocket-depth determination procedure in early future. We believe that improvement in periodontal probe will also helps in early detection of periodontal disease.

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