Review Article

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All About First-Generation Periodontal Probes: A Review

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ABSTRACT

Background: One of the paramount indicators of periodontitis is periodontal pocket. Therefore, precise evaluation of periodontal pocket is a key for detection of periodontitis. Most dependable way to calculate and detect periodontal pocket is by means of periodontal probes. Periodontal probes also have various other uses other than detecting periodontal pocket. These days there are lot of advances in periodontal probing systems, however still first-generation probes remain clinicians favorite diagnosing instrument.

Keywords: First generation, probes, periodontology.

INTRODUCTION

Periodontal diseases induced by plaque can be of two types i.e. gingivitis and periodontitis. Gingivitis can be defined as reversible inflammation of gingiva without loss of connective tissue and when the inflammation involves the supporting periodontal tissues with clinical attachment loss it is termed as periodontitis. Cardinal symptom of periodontitis is periodontal pocket. Periodontal pocket is a pathologic fissure between the tooth and pocket epithelium, limited at base by junctional epithelium. Therefore, correct assessment of pocket is important for diagnosis of periodontitis. It is one of the most common signs assessed by clinicians when diagnosing periodontitis. The most reliable way to measure and detect periodontal pocket is by means of periodontal probes. Described by Orban as the "eye of the operator beneath the gingival margin," periodontal probes are an essential part of a complete dental examination.[1]

Periodontal probes can also be used to measure the width of attached gingiva, to measure gingival recession, to locate and measure furcation involvement, to measure size of intraoral lesion and to locate calculus. There are certain limitations of periodontal probing. There may be reading errors due to interferences from calculus on the tooth surface or root surface, overhanging restorations. Another important factor is the operator error, such as incorrect angulation used by operator during probing, the pressure applied to the probe, recording the readings imprecisely, and miscalculating the clinical attachment loss.[2] There are various factors that affect the reproducibility and sensitivity of measurements, such as the size of probe-tip, insertion angle of the probe, probing pressure, probe calibration precision, and amount of inflammation in the periodontal tissues.[3]

HISTORY OF PERIODONTAL PROBE

- ***John M Riggs*** first in ***1882*** described it as a periodontal diagnostic instrument.
- ***GV Black*** published the III edition of Special Dental Pathology in ***1924*** which mentions “the use of very thin flat explorers to determine the depth of pockets”.
- ***F.V. Simonton*** in ***1925*** first described the use of periodontal probe.

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- ***B.L. Philstrom*** in ***1992*** first classified periodontal probes (I-III Generation of probes)
- ***Watts*** in ***2000*** added IV and V Generations.
- ***Simonton*** in ***1925*** proposed flat probes that were 10mm long, 1mm wide and notched every 2mm.
- ***Box*** in ***1928*** used probes with 5 different angulations that were made up of gold and silver
- ***Miller*** in ***1936*** used silver abscess probe with blunt blade to record the pocket probing depth and putting all the information on diagnostic chart
- ***Ramfjord*** in ***1959*** developed probes that are most commonly used nowadays.
- By the end of ***1950s,*** the importance of periodontal probes in prognosis, diagnosis and treatment planning were published by ***Orban et al, Goldman et al*** and ***Glickman.***

CHARACTERISTICS OF PERIODONTAL PROBE

1. **MILIMETER MARKINGS:**

a) The working end of the probe is marked at mm intervals, grooves, colored indentations, or colored bands may be used to indicate the mm markings on the working end.

b) Each mm may be indicated on the probe or only certain mm increments may be marked.

2. **COLOR CODING:**

Color coded probes are marked in black color bands which is several mm in width.

3. **WORKING END:**

a) **CURVED WORKING END:**

- narrow smooth probe with round blunt end
- non calibrated furcation probe

b) **STRAIGHT WORKING END:**

- In shape it may be rod like with rounded end or slender
- In design it may be straight or tapered
- In cross section it may be flat, round (like Williams probe, Michigan probe and Marquis probe) or rectangular (like Goldman Fox probe and Nabers probe)

4. **PROBE DIAMETER:**

- Periodontal probes are available in various tip diameters like 0.4mm, 0.5mm, 0.6mm, 0.8mm and 1.0mm respectively

- In 1981 Jansen and Van Der Velden suggested that the required force to probe the attachment of connective tissue was 0.75N with a periodontal probe diameter of 0.63mm

- The gingival inflammation and healthy gingiva were best discriminated by periodontal probe of diameter 0.6mm as suggested by Keagle and Garnick in 1989.

- It is suggested that with the periodontal probe of diameter 0.6mm, force of 20grams is adequate to measure the sulcus depth and to not penetrate the long junctional epithelium.

CLASSIFICATION OF PERIODONTAL PROBES

- 1ST Generation Probes
- 2ND Generation Probes
- 3RD Generation Probes
- 4TH Generation Probes
- 5TH Generation Probes

- The first to third generation classification of periodontal probes was given by ***B.L. Philstrom*** in ***1992***
- In ***2000 Watts*** gave fourth and fifth Generations.

FIRST GENERATION PERIODONTAL PROBES

- They are also called as manual probes or conventional probes
- As the name suggests first generation probes are manual probes hence there is no probing pressure control and they are not acceptable for automatic data collection.

- Manual periodontal probes are commonly used in dental clinics by periodontitis and general dental practitioners.

- **G.V. Black** in 1887 introduced probe tips that had flat blades, 1.5mm wide and 8mm long.

- **HK Box** in 1928 and **WG Cross** in 1966 introduced 6 periodontal probes in a set of 6 for the treatment of periodontal pocket. The probes were of 3 different types and they differed in form and size of blades. They had markings from 1-16mm on one side with 2,4,6mm marking which was emphasized.

- In Europe periodontal probes were first time introduced by **Sachs in** 1929. It was also called as Paradentometer. These probes were thin, 1.3mm wide and consisted of steel blade which was bendable. It had 6 grooves at 2mm distance.

- **Struckmann** in 1934 introduced a set of 6 probes which were made of stainless steel having 3-8mm long probe tips.

WILLIAMS PROBE:

Is the prototype of all first-generation probes and was invented in 1936 by periodontist Charles H.M. Williams and was named the Williams' periodontal probe? It has thin stainless-steel tip of 13 mm in length and blunt tip with a diameter of 1 mm. The markings on this probe are 1mm to 10 mm. (The 4-mm and 6-mm markings are absent to avoid confusion in reading the markings and improve visibility.) The handles and probe tip make an angle of 130^{o} [4]

• EW Fish in 1946 introduced a probe with a tip which was rounded and tapered. The probe was 10mm long.

• Muhlemann in 1960 introduced a probe named ZIS Probe. It was 13mm long and bent at 1150 angle.

UNC-15 COLOR CODED PROBE:

University of North Carolina-15 (UNC-15) periodontal probes are color-coded at every millimeter demarcation. These probes are most commonly used in clinical research if manual probes are required. It is 15mm in length and marked at every 1mm till 15mm and color coded at 5mm, 10mm and 15mm.

MARQUIS COLOR CODED PROBE:

It was introduced in 1965. These probes are calibrated in every 3mm sections with markings at 3mm, 6mm, 9mm and 12mm and color coded at 3mm-6mm and 6mm-9mm.

CPITN PROBE:

The CPITN Probe full form is "Community Periodontal Index of Treatment Need (CPITN) and it was designed in 1978 by Jukka Ainamo and George S Beagrie. CPITN probe is used with CPITN index when monitoring and screening of patients is required. The probe and index were first described in "World Health Organization's (WHO) Epidemiology, etiology, and prevention of periodontal diseases report of a WHO Scientific Group"[5]. The CPITN probe has been divided into two categories that is the epidemiologic probe (CPITN-E) which has markings from 3.5mm and 5.5mm markings and the second probe is (CPITN-C) which is the clinical probe which have 3.5mm, 5.5mm, 8.5mm and 11.5mm markings. The probes have a black band between 3.5 mm and 5.5 mm, and at 8.5 mm and 11.5 mm with ball tip of 0.5mm.

UNIVERSITY OF MICHIGAN O PROBE:

This is a modification of Williams probe with markings of 3mm, 6mm and 8mm. It does not have Williams markings.

PCP 12 PROBE

The PCP12 probe with Marquis markings has alternating shades every 3 mm.

PCP12 probe with shades alternating every 3 mm. The probe is on a modified Novatech shank, intended to make it easier to align the probe with the vertical axis of the teeth.

LL 20 (Hu-Friedy USA) PROBE

LL 20 probe is a conventional manual probe with a rounded end marked in increments up to 20 mm, and a tip diameter 0.5 mm. There are thick black markings at 4 mm, 9 mm, 14 mm and 19 mm to

facilitate the reading. Measurements were rounded up to the nearest mm.

MODIFICATIONS OF WILLIAMS PROBE:

- **GOLDMAN FOX PROBE:**

The markings are similar to Williams probe i.e. 1mm, 2mm, 3mm, 5mm, 7mm, 8mm, 9mm and 10mm with 4mm and 6mm markings which are missing. The only difference is the working end of Goldman Fox probe is flattened and not round.

- **GLICKMANS PERIODONTAL PROBE:**

It has a longer shank with rounded tip. It is calibrated at 1mm, 2mm, 3mm, 5mm, 7mm, 8mm, 9mm and 10mm with 4mm and 6mm markings which are absent.

- **NABERS PROBE:**

The Nabers probe is used to detect and measure the involvement of furcal areas by the periodontal disease process in multirooted teeth. Nabers probe also is used in the assessment of more complex clinical cases, including those with a restorative treatment. These probes can be color-coded or without demarcation.

It is calibrated at 3mm, 6mm, 9mm and 12mm with 3mm-6mm and 9mm-12mm which is color coded. It has a blunt tip.

TYPES OF FURCATION PROBES

A) Nabers 1N: with smooth non-calibrated surface and sharper more defined curves/angles used for measuring mesial and distal furcation on maxillary molars

B) Nabers 2N: with smooth non-calibrated surface, has a shallower curve at the working end and accesses all buccal and lingual furcation

C) Nabers Q2N: color coded variant of 2N with color coding at 3, 6, 9 and 12mm

D) ZA2 Probe: with a diameter of 0.5mm and graduations at 2, 4, 6 and 8mm

E) ZA3 Probe: with a diameter of 0.5mm and graduations at 3, 6, 9 and 12mm

F) HO2 Probe: is a non-graduated and has a diameter of 0.4mm

G) NS2 Probe: is a non-graduated and has a diameter of 0.5mm

H) NP2C Probe: has a diameter of 0.5mm and graduations at 3-5mm

Refer figure 1

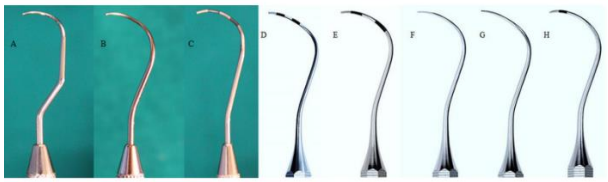

FIGURE 1

ADVANTAGES OF FIRST GENERATON PROBES

The main advantage of first-generation probe is operator's tactile sensitivity is preserved. The first-generation probes are inexpensive compared to other generation probes and also, they are easily available. It has a rounded tip which does not cause tissue trauma. Even in presence of subgingival calculus, probe can be inserted by little navigation by the operator. First generation probes are color coded for faster and easier identification of readings.

DISADVANTAGES OF FIRST-GENERATION PROBES

The main limitation of first-generation probe is that the probing force cannot be controlled and the tip of the probe may pass beyond the base of pocket. The probe is heavy and there can be errors in visualizing the readings also an assistant is required to transfer the readings.

CONCLUSION

The diagnosis of periodontal disease is lagging behind in the technology curve. The field of periodontics need to move forward from manual probes to a better digital probing system. For error free determination of periodontal pocket depth and clinical attachment loss newer development in periodontal probing proves to be beneficial.

New technologies are now at the forefront with the potential for accurate, reproducible and volumetric

digital measurements of periodontal pockets.[6] These technologies are needed for comprehensive treatment planning and to assess outcomes of therapy.[6]

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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