Research Article

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Clinical Evaluation of Gingival Sulcus Depth In Primary Dentition with Florida Probe and William's Probe: An In-Vivo Study

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ABSTRACT

Background: The periodontal diseases observed in adults often have their beginning in early years of life. The gingival diseases seen in the primary dentition may progress to jeopardize the periodontium of permanent teeth.

Material Method: Thirty children aged 4 to 6 years (range- 3 years 6 moths to 6 years 6 months), were classified into three groups (each with 10 children) on the basis of age. Each group was again sub-grouped (each with 5 subjects) on the basis of gender. The total number of teeth for which gingival sulcus depth was recorded were 600, with six sites on each tooth totaling to 3600 sites in all.

Result: Rating out of 10. The rating < 4 for the Florida Probe was 83.33% at the same time the rating <4 for the William's Probe was 66.67%. For rating > 4 for the Florida Probe was 16.67% at the same time the rating > 4 for the Williams Probe was 33.33 %.

Conclusion: This study strongly suggests that Florida Probe could be a better alternative to conventional probes and especially to the Williams Probe to measure gingival sulcus depth not only in permanent dentition but also in primary dentition.

Keywords: Florida Probe, William's Probe, Sulcus depth, Primary dentition, periodontal disease.

INTRODUCTION

According to Watanabe (1900)[1], if pathogenic bacteria around the deciduous dentition in prepubertal periodontitis patients remain to infect the area or neighbouring area during eruption of the permanent teeth, subsequent infection of newly erupted permanent teeth may occur. The periodontal diseases observed in adults often have their beginning in early years of life. The gingival diseases seen in the primary dentition may progress to jeopardize the periodontium[2] of permanent teeth. Early diagnosis is important for successful treatment. Hence, it is imperative that children receive periodontal examination as part of their routine dental visits. One of the main criteria for determining the onset of periodontal diseases is by measuring the gingival sulcus[3] depth. The knowledge of norms of depth of gingival sulcus is essential not only for the assessment of the extent of periodontal detachment and in the treatment of the affected tissue, but also for restorative procedures. (Fig-1). In the past, gingival sulcus depth in primary dentition[4, 5] have been measured by conventional periodontal probes and indigenously designed probe for more precise measurements. A

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periodontal probing system, the Florida probe system incorporates the advantages of constant probing force, precise electronic measurement and computer storage of data. Various studies have been carried out using the Florida probe system in permanent dentition. To the best of our knowledge, this is the first study to evaluate gingival sulcus depth in primary dentition with Florida probe.

Objective: All the armamentarium were listed (Fig-9: A & B). Different setup (Fig-8) were prepared. For the research to evaluate firstly the gingival sulcus depth in each primary tooth type by Florida Probe[7] and William's Probe. Secondly to evaluate the relationship among age, gender[6] and mean values of gingival sulcus depth.

MATERIALS AND METHOD

Thirty children aged 4 to 6 years (range- 3 years 6 moths to 6 years 6 months), were classified into three groups (each with 10 children) on the basis of age. Each group was again sub-grouped (each with 5 subjects) on the basis of gender. The total number of teeth for which gingival sulcus depth was recorded were 600, with six sites on each tooth totaling to 3600 sites in all.

Inclusion Criteria:

1. Children of age 4 to 6 years. (Fig- 2)
2. Systemically healthy.
3. Full complement of firm primary teeth should not have undergone scaling and oral prophylaxis in last 6 months[8]. (Fig-3: A & B)

Exclusion Criteria:

1. Systemic disease[9]
2. Advanced gingivitis or gingival pathologies
3. Pulpal pathogenesis
4. Evidence of caries on buccal, lingual or proximal surfaces (Fig- 4)
5. Missing, supplementary or mobile teeth
6. Parafunctional habits
7. Uncooperative children

Willing parents and their children were recalled after 7 days of reinforcement of oral hygiene instructions. A thorough medical and dental history was taken and a complete dental examination was done on the recall appointment. Dental caries was recorded according to Modified Moller's Index (1966). Subjects with dental caries grade 0, 1 and 2 on occlusal surfaces but no evidence of caries on buccal, lingual or proximal surfaces were considered for the study.

Plaque Index (PI) of Silness and Loe[10]: Subjects with plaque scores 0 and 0.1-0.9 were only considered for the study.

Gingival Index (GI) of Loe and Silness[10]: Subjects with scores 0.1 -1.0 were only considered for the study. (Fig-3)

All the subjects were checked and cleared for Dental Caries Index, Gingival Index[11] and Plaque Index for all age groups and gender. (Fig-4)

Measurement of gingival sulcus depth with Florida Probe[7].

FP32 version[12] 6.6.2 with PD/CEJ standard probe tip was used in the study (Fig-5). The Model Chart (Fig- 10) were saved from the footswitch after all the primary teeth were probed for sulcus depth. There were no changes required to be made to the angulation or probing pressure of the Florida probe for primary dentition. Tip length of probe - 10.8mm. Each tip is made from implant grade titanium and also marked with a 3mm, 6mm and 9mm blue band for visual reference. The diameter of the tip was 0.45 mm. A straight wire design with a flat bottom and rounded corners. The Florida Probe System comes standard with a 15 gram probing force set in the encoder. It was expected that the higher precision numbers that come from the Florida Probe data will help with increased accuracy and precision over manual probing. A single examiner recorded the sulcus depth of all the 30 subjects first with Florida probe and then with Williams probe. A behavior pain assessment was done for all the subjects using FLACC scale (Table-2).

RESULT

Rating out of 10 according to FLACC Scale (Table-2). The rating < 4 for the Florida Probe was 83.33% at the same time the rating <4 for the Williams Probe was66.67%. For rating > 4 for the Florida Probe[13] was 16.67% at the same time the rating > 4 for the Williams Probe was 33.33 %. Age wise variation was not significant. In a study, by Gomes-Filho I S. et al., there was an increase in the gingival sulcus depth based on age from 4 to 6 years. Gender

Table 1: FLACC Scale.

FACE	0 No particular expression or smile	1 Occasional grimace or frown, withdrawn, disinterested	2 Frequent to constant frown, clenched jaw, quivering chin
LEGS	0 Normal position or relaxed	1 Uneasy, Restless, Tense	2 Kicking or legs drawn up
ACTIVITY	0 Lying quietly normal position or moves easily	1 Squirming, Shifting back/forth Tense	2 Arched, rigid or jerking
CRY	0 No cry (awake or asleep)	1 Moans or whimpers Occasional complaint	2 Crying steadily Screams or Sobs Frequent complaints
CONSOLABILITY	0 Content relaxed	1 Reassured by occasional touching, hugging or talking	2 Difficult to console or comfort

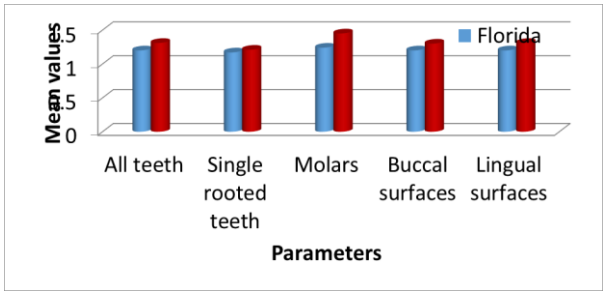
Table 2: Results

Rating out of 10	**Florida Probe (No. of subjects in %)**	**Williams Probe (No. of subjects in %)**
Rating less than 4	83.33 %	66.67 %
Rating more than 4	16.67 %	33.33 %

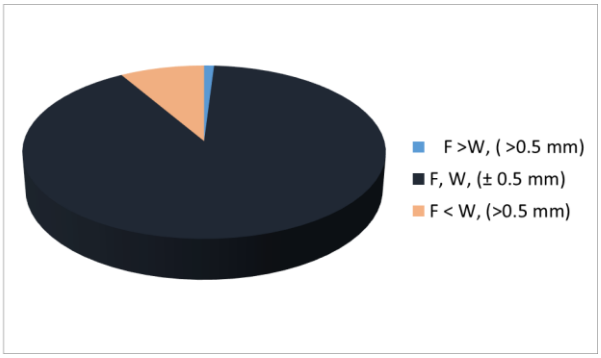
Table 3: Distribution of subjects according to age and gender.

Age Groups	No. of subjects	Gender		No. of teeth N	No. of sites n
		Male	Female		
4	10	5	5	200	1200
5	10	5	5	200	1200
6	10	5	5	200	1200
Total	30	15	15	600	3600

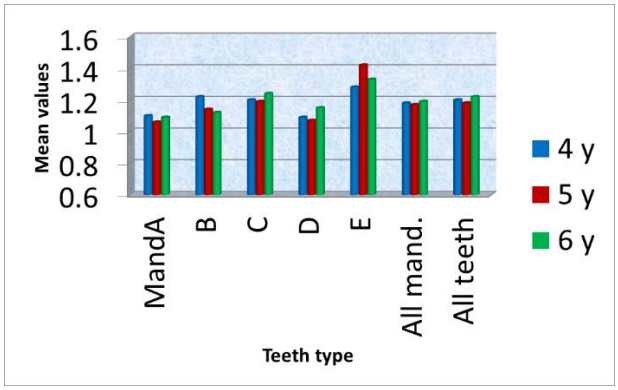
Graph 1: Comparison of gingival sulcus depth measured by computerized pressure-sensitive Florida Probe & Williams Probe.



Graph 2: Frequency of agreement (% of match) between Florida probe & William's Probe.



Graph 3: Age-wise variation of gingival sulcus depth in mandibular teeth was plotted.



related results showed the mean depth in females was 1.24 ± 0.22 mm and males was 1.16 ± 0.28 mm. (Chart-6).

DISCUSSION

After the standard setup distribution of subjects were done according to age and gender as shown in the Table -3. Comparison of gingival sulcus depth measured by computerized pressure-sensitive Florida Probe & William's Probe. The mean gingival sulcus depth for primary dentition was 1.20 ± 0.25

Graph 4: Gender –wise sulcus depth variation

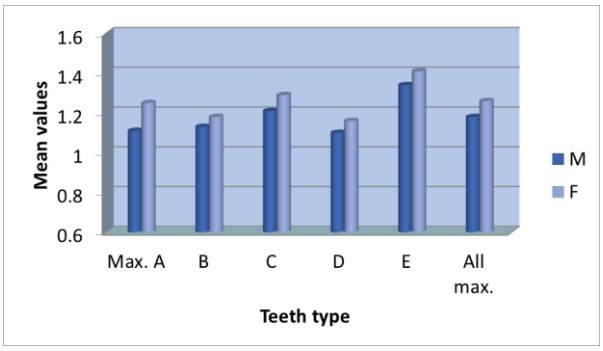


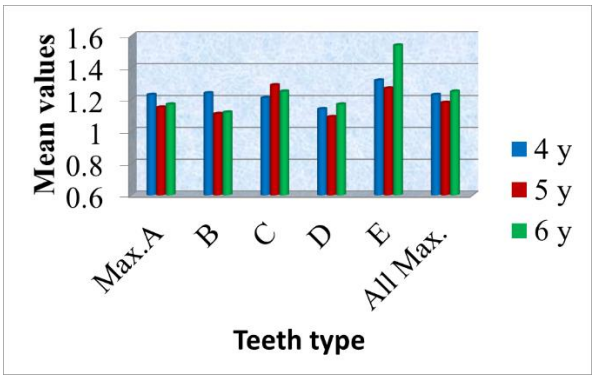
Table 4: Mean gingival sulcus depth in males.

Tooth type	Maxillary	Mandibular
Central incisor	1.11	1.04
Lateral incisor	1.13	1.11
Canine	1.21	1.18
First molar	1.10	1.08
Second molar	1.34	1.27

Table 5: Mean gingival sulcus depth in females.

Tooth type	Maxillary	Mandibular
Central incisor	1.25	1.12
Lateral incisor	1.18	1.20
Canine	1.29	1.24
First molar	1.16	1.12
Second molar	1.41	1.41

Graph 5: Age-wise variation of gingival sulcus depth in maxillary teeth.



mm. Ainamo and Loe found an average of 1 mm in twenty children, age three to ten years. Rosenblum examined twenty-nine children, age 3 to 6 years and found that the mean depth for entire primary dentition was 2.1 mm with a range of 0.5 to 4.6 mm.

Chawla H S, Vacher B R, Taneja J R[3] reported the mean depth as 1.44 with a range of 0.73 to 2.93. The probing depth in primary dentition from 1.03 ±0.91 mm to 2.08 ± 0.07 mm was observed by Gomes-Filho I S. et al. Age-wise variation of gingival sulcus depth in maxillary teeth (Chart-4). Age-wise variation of gingival sulcus depth in mandibular teeth was plotted (Chart-5). Gender wise variation in gingival sulcus depth. In a study, by Gomes-Filho I S. et al., gender did not demonstrate statistical significance in majority of teeth. The mean gingival sulcus depth was greater in males than females in a study by Chawla H S[3], Vacher B R, Taneja J R. In male children, the mean depth was 1.48 mm, whereas in female children it was 1.41 mm, but the difference was statistically non-significant. The mean depth of gingival sulcus in both males and females increased gradually from primary central incisor to primary second molar (in both maxillary and mandibular arch) except in primary first molar in which the depth was lesser than that of primary canine. These results were in accordance with study done by Chawla H S, Vacher B R, Taneja J R.Rosenblum and Bimstein E[4], Eidelman E.have also repoterted similar pattern in his study. The shallowest sulcus of the first primary molar may be due to the special configuration of buccal bulge in this tooth. The mean gingival sulcus depth of maxillary teeth (1.22 ± 0.27) was more than mandibular teeth (1.18 ± 0.24). This result was in accordance with a study by Bimstein E, Eidelman E.[4], where the average sulcus depth around maxillary teeth was 1.5 mm and around mandibular teeth was 1.3 mm. The fact that the maxillary teeth had a greater depth of sulcus than the mandibular teeth may be explained by the differences in the ages of tooth eruption and in the eruption process itself. The mean gingival sulcus depth on facial surface (1.20 ± 0.29) was almost equal to lingual surface (1.20 ± 0.34) in the present study. In females, buccal sulcus depth was significantly shallower for maxillary and mandibular first molars. Buccal sulcus depth[13] was significantly deeper than lingual for mandibular central and lateral incisors. In males, buccal sulcus depth was significantly shallower for maxillary central incisors and mandibular first molars. Buccal sulcus depth was significantly deeper than lingual for maxillary canine (Table-4 & 5). The mean depth of gingival sulcus of permanent dentition has been reported by Glickman[1] to be 1.8 mm. In the present study, the mean depth of gingival sulcus for primary teeth was found to be 1.20 mm. Chawla H S, Vacher B R, Taneja J R have reported it to be 1.44 mm. It was found that depth of gingival sulcus in primary teeth was lesser than permanent teeth. Rosenblum[15] reported that gingival sulcus depth[14] of primary teeth (2.1 mm) was more than permanent teeth. The presence of shallow gingival sulcus in primary dentition may be due to the small size of the teeth, jaws and less powerful musculature in children. Buccal sites of maxillary and mandibular first molar in females were MB – 1.23 mm and 1.05 mm, B – 0.90 mm and 0.81 mm; and DB – 1.09 mm and 1.09 mm respectively. In males were MB – 1.29 mm and 0.94 mm, B – 0.89 mm and 0.78 mm; and DB – 1.01 mm and 1.03 mm respectively[16]. The B (mid-buccal) site presents the shallowest sulcus of the buccal margin, the crown margins should be trimmed according to the mid-buccal measurement of gingival sulcus depth to prevent damage to the gingival attachment.

CONCLUSION

The present study strongly suggests that Florida probe could be a better alternative to conventional probes to measure gingival sulcus depth not only in permanent dentition but also in primary dentition. The advantages of constant force probing, smaller tip diameter, accurate precision and better acceptance by children makes it apt for evaluation of gingival sulcus depth in primary dentition. The present study gives a cross-sectional data, longitudinal studies for evaluating age variations in gingival sulcus depth in primary dentition is required. These norms may not be applicable for an individual case, but should be taken into consideration for diagnosis and treatment of periodontal diseases as well as restorative procedures. A larger epidemiological survey is required to represent the population for establishing the norms of gingival sulcus depth in primary dentition.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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