

# VARIABILITY OF THE PROBING DEPTH BETWEEN CONVENTIONAL AND CONTROLLED-FORCE PERIODONTAL PROBES

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## ABSTRACT

*The probing depth (PD) and attachment level measurement is fundamental for the evaluation of the periodontal health. The thickness, positioning, force applied and inflammation of the tissues, influence the results. This study compared the PD gotten through a conventional periodontal probe – Hu-Friedy (SC-Control group) to a manual controlled-force probe – Aesculapio (SPC-Test group). The SPC probe presents one stop that indicates when the pressure reaches 0,25 N, and then the reading of PD was carried through. The same operator, calibrated, that conduced two examinations of PD, with a one-hour interval between them, had examined twenty patients. Six sites for each tooth had been evaluated, using individual guides for the standardization of the position and trajectory of insertion of the probe. For each individual 144 measures had been registered, being impossible to the examiner to remember itself of these. 2880 sites for each group had been examined. The values of each site, gotten in the Test group had been deducted from the values gotten in the Control group. In 66.78% of the sites the result was zero representing agreement between the two probes. The SPC probe produced 1,0mm less deep PD in 12.27% and 1,0 mm deeper PD in 17,44% of the sites. The data did not have a normal distribution and the Wilcoxon test was used. Only three patients had presented a statistical significant difference between the two examinations. We concluded that exist a great variability of the PD comparing the conventional periodontal probe and the controlled-force probe, not verifying additional advantage in the use of SPC probe.*

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## INTRODUCTION

For the diagnosis of periodontal disease there is no uniform established criteria. Unconsistently, it is used a variety of symptoms, clinical signs and exams (PAPAPANOU, 1996).

According to Lindhe (1999) the most accepted form to define a state of periodontal health or disease is the probe exam. By this mean it is possible to obtain clinical parameters that reflect the periodontal condition such as: clinical probe depth (CPD), level of clinical insertion (LCI) and gingival index (GI).

These measurements, obtained by clinical use of the milimetric periodontal probe, are taken as reasonably correct assuming that in the measurement of the CPD the probe identify the most apical cells of the junctional epithelium (LINDHE, 1999)

Besides the degree of gingival inflammation, other factors can influence result of CPD. The diameter of the active point (KEAGLE et al., 1989), angulation (WATTS, 1989; KARIM et al., 1990), position (KARIM et al., 1990), kind of graduation (VAN DER VELDEN, 1978; WINTER, 1979; VAN DER ZEE et al., 1991), applied force (GARNICK et al., 1989; VAN DER VELDEN, 1979; VAN DER VELDEN; JANSEN, 1981; CATON et al., 1982; CHAMBERLAIN et al., 1985;), root anatomy (MORIARTY et al., 1989) and skill of the examiner (CHAMBERLAIN et al., 1985; OSBORN et al., 1990; FLEISS et al., 1991), may also influence these results.

The penetration of the probe into the tissue seems to be related to the pressure applied. This suggests that a standard force may be indicated to the exam (VAN DER VELDEN, 1979; CATON et al., 1982; VAN DER VELDEN; DE VRIES, 1978; MOMBELLI e Graf, 1986). This can be achieved using an electronic device for probing (ABBAS et al., 1982; OSBONR et al., 1990; WALSH; SAXBY, 1989), however, the cost and the operational difficulty linked to such equipments keep them restrict to research (BREEN et al., 1997).

There are models with mechanical control of the applied force at a low cost although some are prone to fatigue, thus studies should be conducted to evaluate its clinical acuity (PERRY et al., 1994).

The present study aims to compare the CPD obtained through a conventional probe and the CPD obtained through a probe with controlled pressure.

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## MATERIAL AND METHODS

It was evaluated 20 volunteer cases of the Dentistry Clinic of the University of the Sacred Heart with age from 25 to 29 years. Patients did not presented any systemic alteration on health and showed complete denture until the first molar (24 dental elements).

Patients were informed on the procedures related to the study an a informed concent was signed. The study was approved by the Ethical Committee of the University of the Sacred Heart.

Study models of the cases were obtained and PVC guides were made with a vacuum plastifier (FIGURE 1). Deep and rectinily sulcus were made in the guides to orientated the position and insertion route of the probe.



Figure 1 - The sulcus in the PVC guide are used to orientated the position and the insertion route of the probe.

Two millimeter priodontal probes (with sphere of 0.5 mm in the extremity) were used for the comparison of CPD measures: a conventional one – Hu-Friedy (CP) and pressure controlled probe – Aescupalio (PCP). The latter has a “stop” that indicated the attainment of a pressure of 0.25N allowing the reading of the CPD (FIGURE 2).



Figure 2 - A sample of the pressure controlled probe with a stop at 0.25N.

The same examiner, calibrated, conducted the two probing examination in each patient with an interval of one hour (CLARK, 1992).

In the “tested” group the examiner introduced the CPP in the gingival sulcum. When the “stop” indicated a pressure of 0.25N the examiner proceeded to the reading and the result was recorded.

In the “control” group the conventional probe was introduced in the gingival sulcus and when the examiner felt satisfaction with the applied pressure the reading was done and the result recorded.

The CPD of six sites for each dental element (vestibular, lingual, mesial vestibular, distal vestibular, mesial lingual and distal lingual) were recorded. For each exam 144 measures were recorded and, thus, it was impossible to the examiner to remember a specific measure. Overall 2880 sites were examined in each group.

After the periodontal exam a crown and root polishing of the dental elements were made and instructions of oral hygiene and physical therapy were provided. Those presenting periodontal disease were referred to treatment in the Periodontal Clinics of the Dentistry Clinic.

## RESULTS

The value for CPD of each site in the control group was subtracted from the value of the same site in the tested group (CP-PCP). The percentual was calculated taking into consideration the frequency of the obtained differences (FIGURE 3).

The result of the subtraction was zero in 66.78% of the examined sites.

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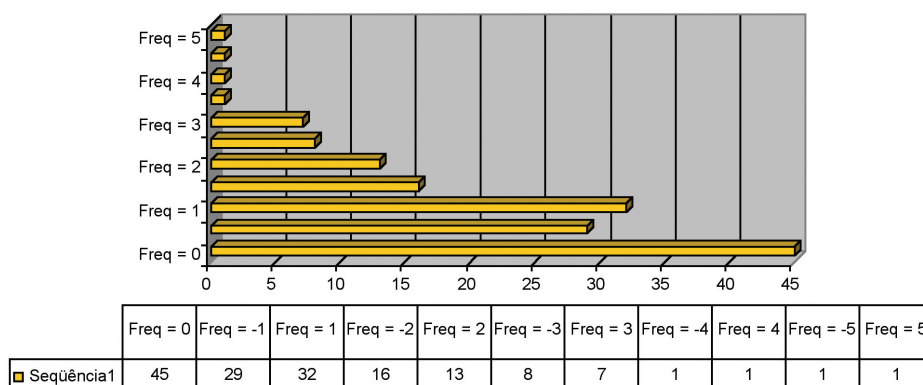


Figure 3 – Frequency of the medians (in mm) of the differences between CP and PCP

The use of the described formula showed a numeric result equivalent to (+)1 in 12.27% of the sites. Therefore, in these sites the controlled pressure probe produced measures 1 mm less deeper in the conventional probe.

On the other hand, in 17.44% of the sites the result of the subtraction was (-)1 revealing measures 1 mm deeper than in conventional probe (CP).

The difference in the CPD varied from 2 to 5 mm and was detected in 3.51% of the tested sites.

TABLE 1 – Statistical details showing the sample size (N), median and values for P for the studied variables.

PACIENT	N	Median	P
1 SC	144	2.0	P=0.03*
1 SPC	144	2.0	
2 SC	144	2.0	P=0.284
2 SPC	144	2.0	
3 SC	144	2.0	P=<0.001*
3 SPC	144	2.0	
4 SC	144	2.0	P=0.653
4 SPC	144	2.0	
5 SC	144	2.0	P=0.055
5 SPC	144	2.0	
6 SC	144	2.0	P=<0.001*
6 SPC	144	2.0	
7 SC	144	2.0	P=0.704
7 SPC	144	2.0	
8 SC	144	2.0	P=0.248
8 SPC	144	2.0	
9 SC	144	2.0	P=0.808
9 SPC	144	2.0	

Pacient	N	Median	P
10 SC	144	3.0	P=0.252
10 SPC	144	3.0	
11 SC	144	2.0	P=0.436
11 SPC	144	2.0	
12 SC	144	2.0	P=0.496
12 SPC	144	2.0	
13 SC	144	2.0	P=0.200
13 SPC	144	2.0	
14 SC	144	2.0	P=0.370
14 SPC	144	2.0	
15 SC	144	2.0	P=0.417
15 SPC	144	2.0	
16 SC	144	2.0	P=0.499
16 SPC	144	2.0	
17 SC	144	2.0	P=0.576
17 SPC	144	2.0	
18 SC	144	2.0	P=0.198
18 SPC	144	2.0	
19 SC	144	1.0	P=0.059
19 SPC	144	1.0	
20 SC	144	6.0	P=0.470
20 SPC	144	5.5	

\*with statistical significance

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## STATISTICAL ANALYZES

To verify significant differences among the studied variables it was used the Wilcoxon Test since the obtained data did not follow a normal distribution.

The measurement of the CPD obtained with a conventional probe was compared with the one obtained with a pressure controlled probe in the same site. Only three out of the 20 cases showed a significant difference between the two probing (TABLE I).

## DISCUSSION

The importance of probing periodontal examination to evaluate the health status of the periodont is universally accepted. Some parameters reflects the periodontal condition allowing a measurement of the health status or the evolution of the periodontal disease.

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Such parameters are the clinical probing depth (CPD), level of clinical insertion (LCI) and the gingival index (GI) (LINDHE, 1999).

The CPD represents the depth of the gingival sulcus once the probe identify the more apical cells in the epithelial junction (LINDHE, 1999). However, the degree of gingival inflammation, which determines more or less penetrating of the probe, is not the only factor to affect the CPD. Application of an adequate force seems to be very important in obtaining reliable measurements (GARNICK et al., 1989; VAN DER VELDEN; JANSEN, 1981; CATON et al., 1982; CHAMBERLAIN et al., 1985).

Aiming to obtain a better reproducibility in the measurements of CPD mechanical probes with control of the pressure were developed (PERRY et al., 1994).

Results of CPD for both studied probes were, in most cases, concordants (66.78%) or showing a variation of 1.0 mm (29.71%), which is within an acceptable range of tolerance. These results agree with those of Perry et al., (1994) and Walsh and Saxby (1989).

Breen et al. (1997) have also found a similar reproducibility among probes (variation of  $\pm 1.0$ mm) including the electronic controlled pressure probe that makes these measures acceptable for the diagnosis and the clinical plan of treatment for a patients, although these authors recommend the use odd electronic probe to the follow up of clinical studies.

Taking into consideration the cost, the difficulties to operationalize computerized probes, the reproductibility and acuity of manual probes, being pressure controlled or not, the manual probing can be considered as a gold stand to clinical procedures.

This is even true if additional care is taken in the reproducibility, standardization of sites of insertion, applied force and, mainly, the calibration of the examiner.

## CONCLUSION

The obtained results allows the following conclusions:

1. There is no great variability of PCS between the conventional and the controlled pressure probe.
2. No advantage was noticed in the use of controlled pressure probe.
3. Concordance among probing was 66.78%
4. Reproducibility of measurements from 0 to  $\pm 1.0$  mm was 96.49%.

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