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Evaluation of patient satisfaction with different periodontal probes

Evaluación de la satisfacción del paciente con diferentes sondas periodontales

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Abstract

Objective: To evaluate patient-reported discomfort during periodontal probing with three different probes (Florida, WHO, and Williams). Methods: A randomized clinical trial was conducted with healthy adults (n=22). Each participant underwent periodontal probing with the three probes on standardized teeth and sites, with five-minute intervals between assessments. Discomfort was measured using the Visual Analog Scale (VAS). The examiner was calibrated to apply a constant force of 20 g. Data were analyzed using the Kruskal--Wallis test, with a 5% significance level.Results: The sample comprised 13 women (59.1%) and 9 men (40.9%), with a mean age of 25.3 (±7.0) years. The Florida probe showed the lowest discomfort scores (2.40 ±1.96), followed by the WHO probe (3.98 ±2.22) and the Williams probe (5.25 ±2.06), with statistically significant differences (p<0.001). Discussion: Although all probes were associated with tolerable discomfort levels, the Florida probe was significantly more comfortable for patients. These findings align with previous studies suggesting that controlled pressure and reduced tip diameter improve patient comfort. Choosing instruments that minimize painful experiences may enhance patient adherence to periodontal treatment and supportive therapy. Study limitations include the restricted number of probes evaluated and the lack of assessment of periodontal phenotypes, indicating the need for future research with larger samples and broader probe comparisons.Conclusion: The Florida probe provided the greatest comfort during periodontal probing, compared with the WHO and Williams probes.

Keywords: *Periodontal Probing, Pain Measurement, Patient Satisfaction, Clinical Trial*

Resumen

Objetivo: Evaluar la incomodidad reportada por los pacientes durante el sondaje periodontal con tres sondas diferentes (Florida, OMS y Williams). Métodos: Se realizó un ensayo clínico aleatorizado con adultos sanos (n=22). Cada participante se sometió a un sondaje periodontal con las tres sondas en dientes y zonas estandarizadas, con intervalos de cinco minutos entre evaluaciones. La incomodidad se midió mediante la Escala Visual Analógica (EVA). El examinador fue calibrado para aplicar una fuerza constante de 20 g. Los datos se analizaron mediante la prueba de Kruskal-Wallis, con un nivel de significancia del 5%. Resultados: La muestra estuvo compuesta por 13 mujeres (59,1%) y 9 hombres (40,9%), con una edad media de 25,3 (±7,0) años. La sonda Florida mostró las puntuaciones de incomodidad más bajas (2,40 ± 1,96), seguida de la sonda WHO (3,98 ± 2,22) y la sonda Williams (5,25 ± 2,06), con diferencias estadísticamente significativas (p < 0,001). Discusión: Aunque todas las sondas se asociaron con niveles de incomodidad tolerables, la sonda Florida fue significativamente más cómoda para los pacientes. Estos hallazgos coinciden con estudios previos que sugieren que la presión controlada y el diámetro reducido de la punta mejoran la comodidad del paciente. La elección de instrumentos que minimicen las experiencias dolorosas puede mejorar la adherencia del paciente al tratamiento periodontal y a la terapia de soporte. Las limitaciones del estudio incluyen el número limitado de sondas evaluadas y la falta de evaluación de los fenotipos periodontales, lo que indica la necesidad de futuras investigaciones con muestras más grandes y comparaciones más amplias de sondas. Conclusión: La sonda Florida proporcionó la mayor comodidad durante el sondaje periodontal, en comparación con las sondas WHO y Williams.

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Palabras clave: *Sondaje periodontal, Medición del dolor, Satisfacción del paciente, Ensayo clínico*

Introduction

Periodontology relies on a variety of periodontal instruments designed to meet specific needs. Among the instruments used in periodontal procedures, the periodontal probe is used to assess the presence of periodontal pockets, measure the depth of the gingival sulcus, and locate any other possible subgingival changes (Al Shayeb, Turner & Gillam, 2014; Neto et al., 2001).

The periodontal probe is an instrument composed of three parts: handle, shank, and working end. The working end is used for measurements, and therefore has millimeter markings (Wang et al., 1995). However, various models with different types of millimeter calibrations can be found (Penteado et al., 2010).

The WHO periodontal probe has characteristics considered ideal as recommended by the Organization (Tonus et al., 2021). To avoid alteration of probing values during periodontal probing due to the instrument's conformation, its manufacturing must follow certain requirements. Specifically, the WHO probe must weigh up to 4.5g, have correct millimeter markings, possess a handle with a diameter of 3.5mm, and a ball at the end of its working end that must have a diameter of 0.5mm (Tonus et al., 2021). At the point where the working end joins the ball, the probe has a diameter of 0.25mm.

Additionally, it is recommended to apply a pressure of 15 to 25g during its use (Penteado et al., 2010).

The Florida probe is a constant-pressure probe that exerts a force of 15g. Its precision is 0.2mm, and its probing depth is a maximum of 11mm. The instrument's tip is made of titanium and has a scaling of 3, 6, and 9mm, which are marked in blue for clinical orientation (Bareja, Bansal & Naveen Kumar, 2021). Furthermore, the tip has a diameter of 0.45mm and a rounded shape, to make the patient feel more comfortable and to ensure accurate probing. It is also worth noting that the Florida probe is somewhat flexible, which allows deeper areas of the pockets to be accessed (Bareja, Bansal & Naveen Kumar, 2021).

The Williams probe has markings at millimeters 1, 2, 3, 5, 7, 8, 9, and 10 (Tonus et al., 2021). There are no markings at millimeters 4 and 6 on the probe, to provide better visibility and facilitate reading the markings (Ramachandra et al., 2009). This instrument has a stainless steel tip measuring 13mm and a blunt tip with a diameter of 1mm. As this type of probe is manually operated, it is possible to preserve tactile sensitivity, in addition to having a lower cost (Ramachandra et al., 2009). However, the force and pressure exerted cannot be controlled, varying from operator to operator, which can lead to the probe passing beyond the bottom of the gingival sulcus or pocket. Thus, the interpretation of the probing depth length can also be impaired (Ramachandra et al., 2009).

Once the periodontal probe is introduced into the gingival sulcus to measure probing depth, the patient may experience discomfort (Renatus et al., 2016). Furthermore, the ability to perceive and evaluate the patient's pain perception during probing may be related to their adherence or non-adherence to subsequent treatment (Renatus et al., 2016). Currently, procedures performed in the health field, in addition to seeking to ensure the improvement of the patient's health conditions, also seek ways to ensure the patient's well-being and satisfaction during their execution (Douglas-de-Oliveira & Chen, 2023; Flores-Rodrigo et al., 2022; Taqi et al., 2023).

Most studies found in the current literature compare the anatomical shape of different types of periodontal probes, as well as their accuracy during probing (Al Shayeb, Turner & Gillam, 2014; Penteado et al., 2010; Tonus et al., 2021; Ramachandra et al., 2009; Renatus et al., 2016; Garnick & Silverstein, 2000). Therefore, few studies address the patient's experience during the procedure. Thus, given the variety of periodontal probes available on the market and the lack of comparative analyses regarding patient satisfaction during probing, it is important to analyze which instrument is more comfortable for patients in general. Therefore, the objective of the present study was to evaluate which periodontal probe, among the three tested options, provides less discomfort to the patient during periodontal probing.

Methods

Study design and ethical considerations

This was a randomized clinical trial conducted at the Dental Clinic of the Department of Dentistry of the Federal University of Jequitinhonha and Mucuri Valleys (UFVJM). The project was approved by the Research Ethics Committee of the UFVJM (protocol # 6,768,033). The study was conducted in accordance with the Declaration of Helsinki of 1975, and subsequent revisions. All volunteers signed the Free and Informed Consent Form prior to data collection. It was registered at the Brazilian Registry of Clinical Trials platform (https://ensaiosclinicos.gov.br/rg/RBR-1094zfg5).

Sample size calculation

To determine the sample size, the calculation for comparing means was used. Calculations with a significance level of 5%, power of 90%, standard deviation of 1.2, (Flores-Rodrigo et al., 2022) and a minimum difference to be detected of 0.5 points on the VAS, determined a minimum of 22 participants per group.

Inclusion and exclusion criteria

For inclusion in the study, patients had to be between 18 and 60 years old, have good general and oral health conditions, and consent to participate in the study. In addition, smoking volunteers, pregnant women, those with dentin hypersensitivity and using NSAIDs and/or analgesics were excluded, these being the exclusion criteria.

Periodontal probing procedure and Operator calibration

Periodontal probing was performed on 6 teeth (16, 21, 24, 36, 41, and 44), (Flores-Rodrigo et al., 2022) 6 points per tooth, these points being: mesio-buccal, mid-buccal, disto-buccal, mesio-lingual/palatal, mid-lingual/ palatal, and disto-lingual/palatal (Flores-Rodrigo et al., 2022). Each patient received 3 periodontal probings, one probing being performed with the WHO probe, another with the Williams probe, and another with the Florida probe (Figure 1). Between each probing, there was a 5-minute interval, to reduce gingival sensitivity from the previous probing (Figure 2).

Figura 1

Williams Probe (A), WHO Probe (B), and Florida Probe (C).

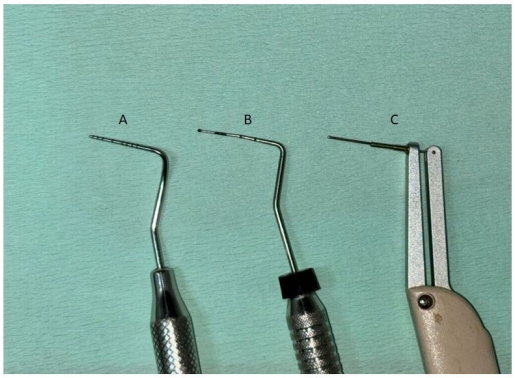
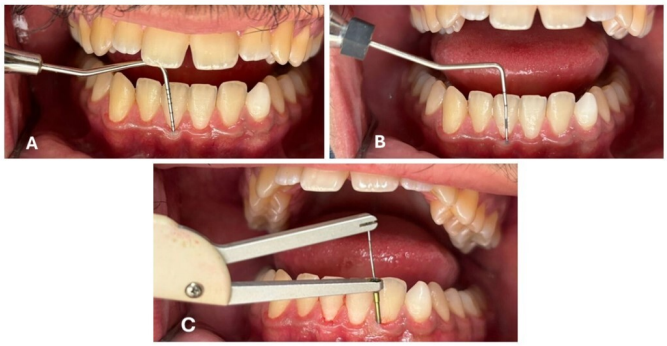


Figura 2

Periodontal probing with the Williams probe (A), WHO probe (B), and Florida probe (C).



The researcher responsible for the intervention (E.K.J.S) was trained to exert a force of 20g on the probes. For training, the researcher had to apply force with a probe on the surface of a scale until reaching 20g. After training for 15 days, the researcher began to exert this force with the scale display covered, to ensure calibration. As soon as the exerted force began to be equivalent to 20g, the researcher was able to start the probings (ICC = 0.850).

Randomization and blinding

Randomization was performed by an independent researcher (D.W.D.O) who was unaware of the patients. The study had three groups: Group A: WHO Probe; Group B: Florida Probe; and Group C: Williams Probe. At each periodontal probing session, a prior draw was held to determine the type of instrument (group A, B, or C) and order of application to be used during the probing of the participant's teeth on that day. The result of the draw was kept in an opaque envelope and was only revealed to the applicator at the time of execution, ensuring allocation concealment. Such measures were nec-

essary to avoid external interference. The patient did not know which instrument would be used in each session, and the probing result did not allow distinction between the WHO, Williams, and Florida probes.

Outcome measurement

Patient discomfort (pain) during probing was evaluated using the visual analog scale (VAS). The VAS was linearly arranged, having 10cm in total, without any markings along its axis. At the left end, it had the marking minimum discomfort and the opposite end corresponded to maximum discomfort. After probing, the patient marked which point on the scale corresponded to their discomfort (pain), and then the evaluator measured this mark. Data collection was carried out between June and September 2024.

Statistical analysis

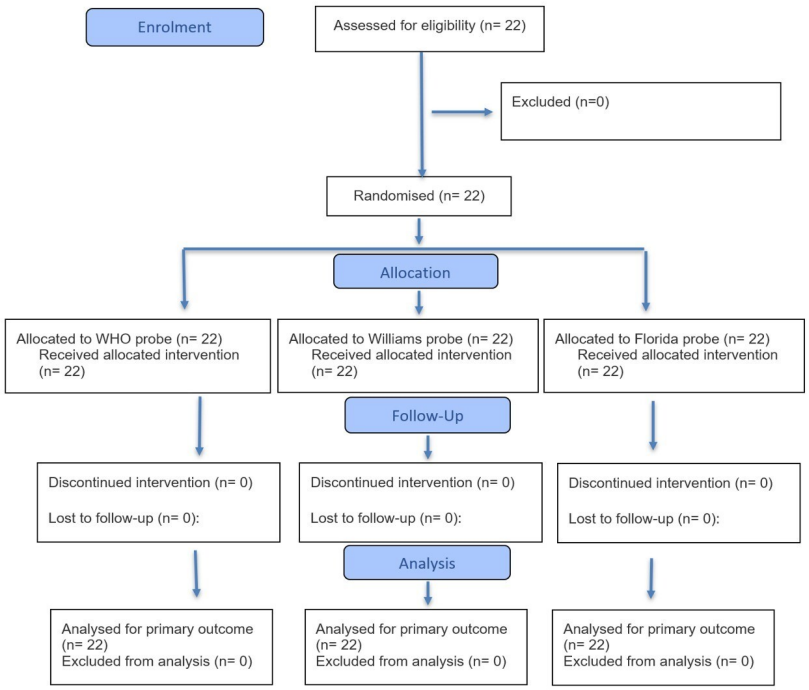
Statistical analyses were performed using the SPSS® (Statistical Package for the Social Sciences Inc.) version 26. Descriptive analyses provided means and standard deviations. Normality was verified by the Shapiro-Wilk test. The Kruskal-Wallis test and post-hoc analysis were performed. The adopted significance level was 5% ($p<0.05$).

Results

The study sample consisted of 22 participants (Figure 3), with a mean age of 25.3 years (±7.0), with 40.9% men (9) and 59.1% women (13).

Figura 3

Flowchart of the included participants.



The WHO probe showed a mean discomfort of 3.98 (±2.22), while the Williams probe recorded 5.25 (±2.06) and the Florida probe 2.40 (±1.96) ($p<0.001$) (Table 1).

Table 1

Evaluation of patient discomfort level during periodontal probing.

	Discomfort			
	Mean	SD	p*	p**
WHO	3.98	2.22	<0.001	WHO x Williams: 0.076
WILLIAMS	5.25	2.06	<0.001	WHO x Florida: 0.027
FLORIDA	2.40	1.96	<0.001	Williams x Florida: <0.001

Notes: *Kruskal-Wallis test. **Post-Hoc

Discussion

Periodontal probing is a routine and essential procedure for the clinical practice of the dental surgeon, allowing the assessment of health conditions and the detection of possible diseases of the periodontal tissues (Garnick & Silverstein, 2000). This evaluation is crucial for developing an effective treatment plan. However, it is fundamental that the patient feels comfortable during the clinical approach to ensure acceptance and treatment success. During this research, it was possible to note that the Florida probe presented a lower level of discomfort for patients.

The image of the dental surgeon can be associated with fear and pain perceived by patients during dental procedures, especially regarding the use of instruments, such as periodontal probes (Andersson, Hedström & Bergh, 2021). Despite the existing gap in the literature on the subject, (Flores-Rodrigo et al., 2022) point out that some studies show painful experiences of patients during the periodontal probing procedure, which may vary according to the location and the individual. In this sense, this research performed periodontal probing with three different types of probes, to evaluate which one provides a lower level of discomfort to the patient and, thus, reduce the painful experience during the procedure. However, it is important to emphasize that all three types of probes showed a low level of discomfort, which indicates that periodontal probing is a tolerable procedure for patients.

The pressure exerted by the periodontal probe depends on the force applied and the diameter of the working end (Garnick & Silverstein, 2000). Probes with finer tips, such as the Florida probe, tend to generate greater pressure on the tissues, which can influence the probing depth, but can also provide greater patient comfort, as observed in our study (Garnick & Silverstein, 2000). Thus, if the force exerted on the probe is multiplied by 2, the pressure will also be increased by 2x. However, by doubling the diameter of the instrument, the pressure will be reduced by 4x. In this sense, it is important to evaluate the force exerted and the diameter of the instrument tip when comparing periodontal probes (Garnick & Silverstein, 2000). In this work, the researcher responsible for probing was trained, through calibration, to ensure that the pressure exerted on each of the three probes was constant, thus reducing research bias.

A study by (Flores-Rodrigo et al., 2022) compared patient comfort with three types of probes: the WHO periodontal probe, North Carolina, and Colorvue UNC 12. The results of this study showed that the Colorvue UNC probe was more comfortable for patients (0.61 ± 0.96), followed by the WHO probe (1.23 ± 1.01) and North Carolina (2.3 ± 0.75). These data are similar to the findings of this research, since the WHO

probe was also the second most comfortable type of probe, followed by the Williams probe, which has a similar shape to the North Carolina probe.

Renatus *et al*.(2016) conducted a study comparing the use of an electronic controlled pressure probe and a manual periodontal probe. After analyzing the study results, the authors pointed out a series of benefits related to the use of controlled-pressure periodontal probes, among which was the reduction of pain perception by the patient. This data corroborates the result of the present research, since the Florida probe provided greater comfort to the patients in this study. Furthermore, it is possible to assume that the operator exerts greater pressure during periodontal probing with manual probes, which could imply a slightly more painful experience for the patient.[8] However, even if it is not possible to control the force applied by the operator, this study had a single operator, who was calibrated to exert a pressure similar to the computerized probe, seeking to reduce this possibility.

Another point worth highlighting is that probes with smaller diameter working ends tend to cause changes in probing depth measurement, since the pressure will be greater and they may advance more deeply into the tissues (Garnick & Silverstein, 2000). However, when the probe is introduced into the gingival sulcus, aiming for patient comfort, it is desirable that it has a smaller diameter, to promote the gentle displacement of the gingival tissue. Thus, patient discomfort will be less. As this study sought to identify patient discomfort during probing, and not variations in probing depth measurements, the Florida probe, which has a smaller working end diameter, proved to be more efficient.

This study provides important information that can contribute to dental surgeons' choice of periodontal probes, so that they choose instruments that cause less discomfort.

Although this study was well conducted, an important limitation was the examination being performed only on some teeth, the use of only three periodontal probes, and the absence of periodontal phenotype evaluation, which may limit the generalization of the results. Future studies with larger samples and involving different types of probes could provide a more comprehensive understanding of the impact of tip diameter and exerted pressure on patient discomfort measurements. After all, providing comfortable experiences for the patient leads to greater adherence to treatment, especially to supportive periodontal therapy, which is the basis for the success of numerous procedures.

Conclusion

It was concluded that the Florida probe provided a higher level of comfort to patients during periodontal probing, followed by the WHO probe. The Williams probe provided a higher level of discomfort to patients.

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