

Electric Pulp Testing with Examination Gloves

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Abstract

Aim The objective of this study is to determine differences between EPT results for the same teeth with the operator's hands being gloved and ungloved.

Material and method Electric pulp tests were conducted for the same teeth with the operator's hands being gloved and ungloved. Twenty male and twenty female patients were included in this study.

Results Statistically significant differences between EPT results for the same teeth with the operator's hands being gloved and ungloved were observed.

Conclusion In conclusion, the clinician should not use the EPT while wearing examination gloves.

Keywords Dental pulp tests, Electric pulp testing, Examination gloves, Pulp sensibility, Pulp vitality

Introduction

Dental pulp tests provide beneficial diagnostic aid and contribute to the treatment plan. Pulp testing techniques can be categorized as "pulp sensibility testing" and "pulp vitality testing". Pulp sensibility tests aim to extrapolate pulp health from sensory response while pulp vitality tests examine the pulp blood flow. Test cavities, electric and thermal tests can be categorized as "pulp sensibility tests". In addition, "pulp vitality tests" include Laser Doppler flowmetry and pulse oximetry. The method used for assessing the state of the dental pulp should be accessible, inexpensive, painless, objective and easily performed (1).

Pulp sensibility tests are most favored clinical tests and electric pulp test (EPT) is a commonly preferred method to test pulp sensibility. Magitot mentioned using electricity to localize painful teeth with carious lesions in his book *Treatise on Dental Caries* in 1867. After that, Marshall used electrical current for the differential diagnosis. He defined the terms "vital" and "non-vital" teeth depending on test results in 1891 (2).

Basically, EPT raises the electrical potential through the enamel and dentine into the pulp in order to provoke a measurable response from the pulp. Direct stimulation of the pulp nerve fibres makes the patient feel a sensation. However, this sensation might not indicate that the pulp is healthy and intact. Necrotic and disintegrating pulp often leaves electrolytes which conduct the electric current to the nerves further down the pulp space. Thus, a normal response can occur. Generally, a positive response indicates that there are sensory fibres present within the pulp, which can respond to the electrical stimulus. A lack of response to the EPT suggests the lack of responding nerve fibres, and this usually means that there is likely to be necrosis of the pulp (2).

Wearing gloves while performing electric tests has been controversial, with routine use of gloves for infection control when

treating patients. Latex gloves act as a capacitance, altering the electrical output from the EPT. In 1977, King & King reported that the EPT could be used effectively with the operator wearing latex gloves, but higher readings were obtained. Lado, stated that rubber gloves should never be used during the testing of a pulp with an EPT. Cooley et al said that it is not possible to use EPT unit while wearing surgical gloves. However, Dean et al expressed that the mean differences in EPT results were small and were diagnostically insignificant for clinical situations (3).

This study was conducted to determine differences between EPT results for the same teeth with the operator's hands being gloved and ungloved.

Material and Methods

Twenty male and twenty female patients of Istanbul University, Faculty of Dentistry took part in this study. All participants completed a health questionnaire. None of the subjects wore a cardiac pacemaker. Each patient had two healthy teeth free of caries and restorations. The teeth tested were the right maxillary central incisor [designated as tooth No.11 in Fédération Dentaire International (FDI) system] and the right mandibular second premolar (designated as tooth No.45 in FDI system). Supragingival calculus had been removed before the tests. The teeth were isolated with a cotton roll and dried with an air blast in every test. A gel was applied as the conducting medium on the tip of the pulp tester probe. The teeth were tested with an electric pulp tester (Waldent Electric Pulp Tester, Waldent Co.Ltd., New Delhi, India) both with and without latex examination gloves. The electric pulp tester used in this study was battery-powered. This type of electric pulp testers are easily applicable and do not have any wire or buttons. Moreover, the battery provides constant voltage and displays a green light when it is on.

The subject was advised to raise a hand when he or she first detected a painful sensation in the tooth being tested. When the subject responded, the probe tip was immediately removed from the tooth and the dial number on the pulp tester was recorded.

Each tooth was tested three times with the operator waiting approximately 30-40 seconds from the end of one pulp test to

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the commencement of the next test. The mean of three values is calculated as vitalometric value. Attempts were made to avoid raising the pain threshold of the patients. Half of the subjects (in both groups) had the two different teeth tested three times each with gloves being used first, and the remaining half had testing done first without gloves. EPT values were recorded for tooth 11 with and without gloves and for tooth 45 without and with gloves being worn by the operator. Symmetrical teeth of 11 and 45 were tested as a control group and the values had been matched. Patient groups were control groups at the same time. To perform the statistical analyses for this study, SPSS v.20.0 software (IBM Corp, Somers, NY) and T test were used.

Results

There were 40 subjects consisting of 20 male and 20 female, with an age range of 20 to 30 years. Each tooth was tested three times with the operator waiting approximately 30-40 seconds from the end of one pulp test to the commencement of the next test. As a result, for each tooth, three EPT values were obtained. The values were close but not equal. Thus, the mean of three EPT values were calculated.

The EPT values of male patients are listed in Table 1-2. There were statistically significant differences between gloved and ungloved tests of maxillary right incisor (No.11). Patient number 16 and patient number 19 had a negative value difference. In other 18 patients, high values like 1.9 were measured. The results of No.45 teeth of male patients were found statistically significant. Similar results were obtained from female patients.

Table 1: EPT Values of No.11 Teeth In Males

	Gloved	Ungloved	Difference
1	2.40	1.73	0.67
2	3.16	1.26	1.9
3	3.70	3.60	0.1
4	2.06	0.96	1.1
5	1.96	1.83	0.13
6	2.53	2.03	0.5
7	1.70	0.96	0.74
8	2.83	1.30	1.53
9	2.76	1.50	1.26
10	3.33	2.36	0.97
11	3.10	1.30	1.8
12	2.46	1.76	0.7
13	2.80	1.66	1.14
14	1.53	1.36	0.17
15	2.00	2.00	0
16	2.70	2.76	-0.06
17	3.23	3.13	0.10
18	2.36	1.33	1.03
19	1.66	1.90	-0.24
20	2.36	1.86	0.5

Table 2: EPT Values of No.45 Teeth In Males

	Gloved	Ungloved	Difference
1	3.46	2.03	1.43
2	3.33	2.06	1.27
3	3.70	3.60	0.1
4	2.66	2.36	0.3
5	3.83	1.90	1.93
6	3.66	2.46	0.2
7	3.60	3.36	0.24
8	3.26	1.66	1.6
9	2.96	1.53	1.43
10	3.76	2.63	1.13
11	3.83	2.93	0.9
12	3.86	2.63	1.23
13	3.9	2.4	1.5
14	3.33	1.53	1.8
15	3.23	2.13	1.1
16	3.66	3.53	0.13
17	3.53	2.83	0.7
18	3.53	2.83	0.7
19	2.93	1.63	1.3
20	3.26	2.0	1.26

Discussion

Dental pulp tests are investigations that provide valuable diagnostic and treatment planning information to the dental clinician. If pathosis is present, pulp testing combined with information taken from the history, examination, and other investigations such as radiographs helps the diagnosis of the underlying disease which can usually be reached relatively easily.

Our study shows the disadvantage of gloves for diagnosis. Results of our study correlate with other studies in the literature (1-5). However, in some studies, it was stated that the difference between tests has no relevance with clinical practice (1-3). We emphasize that the value deviations of sound teeth; which has no tissue loss and trauma, retrograde pulpitis or of the teeth that are affected by apical lesions of adjacent teeth, are important for diagnosis.

Conclusion

In conclusion, we do not recommend wearing latex examination gloves throughout electric pulp tests.

Declarations

Author Contributions: Conception/Design of Study- U.Z., M.T.Y., M.M.; Data Acquisition- U.Z., M.T.Y., M.M.; Data Analysis/Interpretation- U.Z., M.T.Y., M.M.; Drafting Manuscript- U.Z., M.T.Y., M.M.; Critical Revision of Manuscript- U.Z., M.T.Y., M.M.; Final Approval and Accountability- U.Z., M.T.Y., M.M.; Material and Technical Support- U.Z., M.T.Y., M.M.; Supervision- U.Z., M.T.Y.,

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