



EVALUATION OF DIFFERENT INTERFACE MEDIA USED WITH THE ELECTRIC PULP TESTER-AN IN VIVO STUDY

Endodontics

Dr. Pradeep Chigadani*

Senior Lecturer *Corresponding Author

ABSTRACT

The ability of a clinician to correctly treat diseases of endodontic origin is based on accurate diagnosis. The electric pulp tester (EPT) has been used as a diagnostic tool to differentiate periapical lesions of endodontic origin from other pathological entities of similar radiographic appearance. A conducting media is necessary when using an electric pulp tester (EPT). The objective of this study was to evaluate the efficacy of different interface media while using electric pulp tester. The digitest electric pulp tester was selected for use, the interface media investigated are RA Thermo seal, EKG paste, and water; a dry contact was used as a control. Ten patients were selected, each with six intact healthy maxillary anterior teeth. This yielded 30 pairs of contralateral teeth. A medium to be tested was spread on the electrode tip and applied at a level of the incisal 3rd on the facial surface of the tooth. After all six teeth were tested. Each patient was recalled, and another medium was tested. The readings of each test were recorded on each patient's chart and averaged. All readings for contralateral teeth were correlated. In results the ekg gel showed better results when compared to wet surface and RA Thermo seal. Post-hoc bonferroni test should no significant difference between ekg gel an RA Thermo seal, whereas significant difference was seen when compared with wet surface. Ekg gel showed better results but not significant when compared with RA Thermo seal. Can be concluded that interface media is a must during electric pulp testing procedure.

KEYWORDS

EKG gel, RA Thermo seal, electric pulp tester.

INTRODUCTION:

The electric pulp tester has been a useful diagnostic device in determining the vitality of teeth.

Van Hassel and Harrington determined that the overall stimulus-localization accuracy of pain to the electric pulp tester was 82%. They also determined that there was no stimulation of the periodontal ligament until readings far exceeded those used in the testing (3).

The principle of the pulp tester, whether it is the type that measures current or voltage, is to raise the electrical potential through the enamel and dentin into the pulp. This, in turn, will provoke a measurable response.

Mumford concluded that the current density is greatest where the current path is the narrowest.

He determined that the current density was the important factor in producing a threshold response in pulp tissue (4).

The stimulation of the nerve endings within the pulp tissue by an electric current depends on the duration, rate of increase of current, its density, and its strength.

The stimulation is best produced when an interface material is used to maximize contact between electrode and tooth to ensure that the stimulus reaches the pulp tissue.

Various interface materials have been used to increase the reliability of the pulp tester to evoke a response by coupling the electrode to the tooth surface

This invivo study was designed to compare EKG (Electrocardiogram) Gel with other accepted electric pulp testing interface media and to determine whether differences exist in the amount of current needed to elicit a response with the tested materials.

MATERIALS AND METHODS:

The digitest electric pulp tester was selected for use, the interface media investigated are RA Thermo seal, EKG GEL, and wet surface; a dry contact was used as a control.

Ten patients were selected, aged between 22 to 25years each with six intact healthy maxillary anterior teeth from the department of conservative Dentistry and Endodontics Ame's dental college and hospital Raichur.

This yielded 30 pairs of contralateral teeth. The teeth were isolated with cotton rolls and saliva ejector was used and dried with a cotton pellet. A medium to be tested was spread on the electrode tip and

applied at a level of the incisal 3rd on the facial surface of the tooth. Then the pulp test was performed on all maxillary anterior teeth.

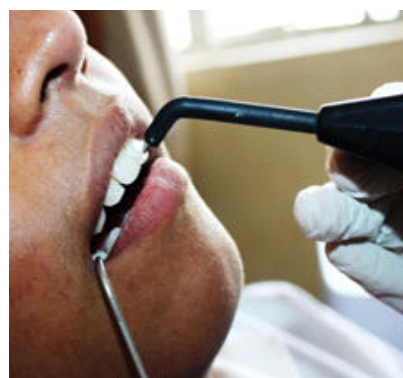
After all six teeth were tested on the facial aspects the tooth was cleaned after each test.

Each patient was recalled next day, and another medium was tested. The procedure was repeated with each patient four times until all media were tested.

The readings of each test were recorded on each patient's chart and averaged. All readings for contralateral teeth were correlated.

ETHICS:

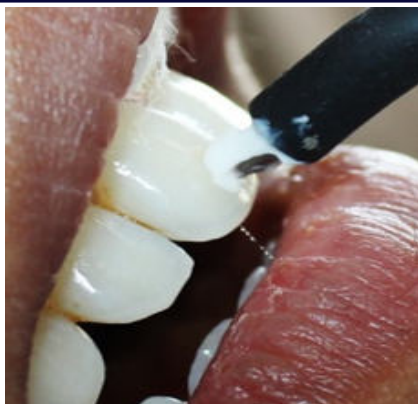
Patient was informed about the procedure and the intervention was a diagnostics procedure. The consent form was obtained from the patients.



Dry surface



EKG Gel



RA Thernoseal



Wet surface

RESULTS:

The results were correlated, readings indicated that the type of medium used made no appreciable difference on the amount of current required to evoke a response.

The dry electrode tip did not evoke a response. There was a general pattern of close similarity in the comparative readings from one patient to another when specific teeth were related to each other.

Canines required more current to evoke a response than did the incisors.

The contralateral teeth of each patient generally exhibited similar readings.

EKG Gel showed no significant difference with readings when compared with the RA Thermoseal interphase media, whereas significant difference was seen with wet surface

Table 1: Mean Distribution Of The Scores Of Ecg Gel

	Minimum	Maximum	Mean	Std. Deviation
Tooth 11	.4	3.0	1.110	.7894
Tooth 12	.6	2.6	1.310	.5934
Tooth 13	1.0	3.8	2.250	1.009
Tooth 21	.6	2.4	1.250	.6078
Tooth 22	.7	1.9	1.200	.4137
Tooth 23	.8	3.6	1.980	.8284

Table 2: Mean Distribution Of The Scores Of Ra Thermoseal

	Minimum	Maximum	Mean	Std. Deviation
Tooth 11	.4	2.7	.960	.7427
Tooth 12	.8	2.1	1.160	.4222
Tooth 13	.9	3.5	2.030	.7469
Tooth 21	.5	2.0	.980	.5940
Tooth 22	.5	1.7	1.050	.3408
Tooth 23	1.3	3.7	1.960	.8289

Table 3: Mean Distribution Of The Scores Of Wet Surface

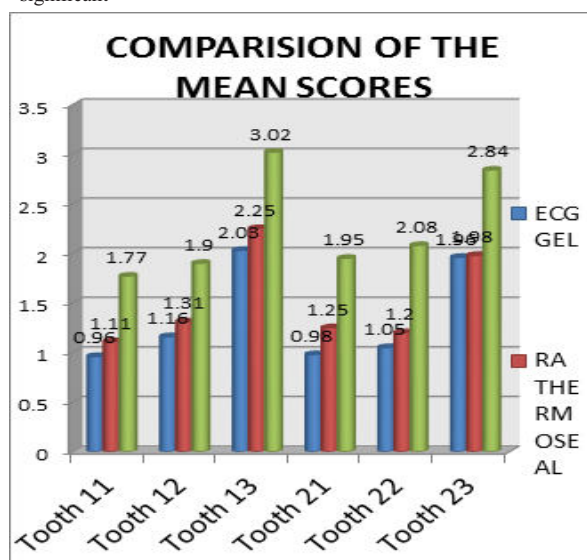
	Minimum	Maximum	Mean	Std. Deviation
Tooth 11	1.2	3.2	1.770	.6255
Tooth 12	1.3	2.7	1.900	.4055

Tooth 13	1.1	3.9	3.020	.8337
Tooth 21	1.0	2.9	1.950	.6060
Tooth 22	1.0	2.7	2.080	.4590
Tooth 23	1.1	3.7	2.840	.7834

Table 4a: Post-hoc Bonferroni

	ECG * RA Thermoseal	ECG * wet surface	RA thermoseal * Wet surface
Tooth 11	1.00	0.056	0.153
Tooth 12	1.00	0.006*	0.032*
Tooth 13	1.00	0.05*	0.174
Tooth 21	0.976	0.004*	0.045*
Tooth 22	1.00	0.00*	0.000*
Tooth 23	1.000	0.068	0.077

*significant

**DISCUSSION**

Martin and co-workers proposed that a high dielectric medium could improve the effectiveness of the electric pulp tester. They found that a tight capacitive coupling between the electrode tip and the tooth was necessary. Media with high dielectric constants allowed the best contact (11).

Their findings explain the negative response to the dry tip tests. When one compares the EKG GEL and RA Thermoseal interface media, they allowed more current through to the cathode into the pulp. This difference may not be clinically detectable and further research will be necessary to determine this.

When wet surface was compared with EKG GEL and RA Thermoseal there was a significant difference. This showed the use of interphase media is a useful material during electric pulp test.

The contralateral teeth exhibited similar readings in our testing. This reemphasizes the necessity for testing contralateral teeth as a means of comparison when the electric pulp tester is being used.

It also showed the higher readings of the canines compared with those of the incisors. The thicker the enamel and dentin surface, the more resistance there is for the stimulus to overcome.

Lilja found that the highest concentration of neural elements is in the pulp horn region. A progressive decrease in the number of nerve fibers in the cervical and radicular areas of the pulp was observed. Similar findings have been reported by Byers and Byers (12).

Presumably the direction of the dentinal tubules is important in establishing the pulp tester response threshold in various regions of the tooth crown. The dentinal tubules run an almost straight course from the incisal edge of the tooth to the pulp horn, whereas elsewhere in the tooth the course of the tubules is somewhat curved and resembles an S in shape. Because it is principally the fluid in the tubules that conducts electrical impulses from the pulp tester electrode to the pulp, the shorter the distance between the electrode and the pulp, the lower the

resistance to the flow of electrons.

CONCLUSION

A weak conducting media may serve to increase the likelihood of a false negative response in a tooth that is still vital. It would follow that a medium that provides for maximal conduction of current would allow for the most reliable EPT test.

This study does show that there is a difference in conduction through interface media, till date, this has not been established. Further research is needed to evaluate the clinical relevance of these findings.

REFERENCES

1. Reynolds, R.L. The determination of pulp vitality by means of thermal and electrical stimuli. *Oral Surg* 22:231 Aug 1966.
2. Degerling, C.I. Physiologic evaluation of dental-pulp testing methods. *J Dent Res* 41:695 May-June 1962.
3. Van Hassel, H.J., and Harrington, G.W. Localization of pulpal sensation. *Oral Surg* 28:753 Nov 1969.
4. Mumford, J.M. Path of direct current in electric pulp-testing using one coronal electrode. *Br Dent J* 106:23 Jan 6, 1959.
5. Sommer, R.; Ostrander, F.; and Crowley, M. *Clinical endodontics*, ed 3. Philadelphia, W. B. Saunders Co., 1966, p 80.
6. Ingle, J.I. *Endodontics*. Philadelphia, Lea & Febiger, 1965, p 416.
7. Grossman, L. *Endodontic practice*, ed 6. Philadelphia, Lea & Febiger, 1965, p 25.
8. Coolidge, E., and Kessel, R. *A textbook of endodontology*, ed 2. Philadelphia, Lea & Febiger, 1956, p 64.
9. Curzon, I. *Dental surgery*. London, Butterworth & Co., Ltd. 1963, p 112.
10. Ziskin, D., and Wald, A. Observations on electrical pulp testing. *J Dent Res* 17:79, 1938.
11. Martin, H.; Ferris, C.; and Mazzella, W. An evaluation of media used in electric pulp testing. *Oral Surg* 27:374 March 1969.
12. Bender IB, Landau MA, Fonseca S, Trowbridge HO. The optimum placement-site of the electrode in electric pulp testing of the 12 anterior teeth. *The Journal of the American Dental Association*. 1989 Mar 1;118(3):305-10.