

# International Journal of Dental Science and Innovative Research (IJDSIR)

IJDSIR : Dental Publication Service Available Online at:www.ijdsir.com

Volume – 7, Issue – 5, September – 2024, Page No. : 378 - 381

Effect of Mobile Phones Radio Waves and Other Wifi and Bluetooth Gadgets on Apex Locator Readings

<sup>1</sup>Dr. Sourabh Sharma, MDS, OC & GD SPL, Department of Conservative Dentistry & Endodontics, MDC Namkum, India

<sup>2</sup>Dr. Priyanka Malviya, BDS, Dental Officer, Ranchi, India

**Corresponding Author:** Dr. Sourabh Sharma, MDS, OC & GD SPL, Department of Conservative Dentistry & Endodontics, MDC Namkum, India

**Citation of this Article:** Dr. Sourabh Sharma, Dr. Priyanka Malviya, "Effect of Mobile Phones Radio Waves and Other Wifi and Bluetooth Gadgets on Apex Locator Readings", IJDSIR- September – 2024, Volume –7, Issue - 5, P. No. 378 – 381.

**Copyright:** © 2024, Dr. Sourabh Sharma, et al. This is an open access journal and article distributed under the terms of the creative common's attribution non-commercial License. Which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given, and the new creations are licensed under the identical terms.

**Type of Publication:** Original Research Article **Conflicts of Interest:** Nil

# Abstract

**Introduction:** Apex Locator is a commonly used and reliable device for working length determination in root canal treatment. Scientific literature is divided on the effect of mobile phone radio waves on the working of Apex locators.<sup>1</sup> This clinical study evaluates the effects of cellular electromagnetic fields on readings of different apex locators.

**Material and Methods:** Four different types of apex locators were used in single and straight rooted extracted teeth. Six groups were made- Group 1. No Gadgets near Apex locators, Group 2. Mobile phone on flight mode, Group 3. Mobile phone without calling but wifi and Bluetooth enabled Group 4.

Mobile phone on calling mode with wifi and Bluetooth disabled, Group 5. Fit bit Versa Smart watch near Apex locators during calls, and Group 6. WIFI routers near apex locators Five readouts of each group with each apex locator were recorded. The data was compiled and statistically analyzed. It was observed that only group 4mobile phone on calling mode with Wifi enabled and Bluetooth disabled fluctuates the readings of apex locators. The fluctuation was maximum when the Woodpecker apex locator was used and bare minimum with Root ZX.

**Conclusion**: Mobile phones in calling mode do hamper the working of Apex locator readings.

**Clinical Relevance**: During the treatment procedure, no mobile should be permitted in the vicinity or should be in flight mode to prevent any changes in readouts and functioning of apex locators.

**Keywords:** Apex locator, wi fi, Bluetooth, smart watch **Introduction** 

An electronic apex locator is an electronic device used in endodontics to determine the position of the apical foramen and thus determine the length of the root canal

### Dr. Sourabh Sharma, et al. International Journal of Dental Science and Innovative Research (IJDSIR)

space. Electronic apex locators reduce the number of radiographs required and assist where radiographic methods create difficulty in the determination of working length<sup>4</sup>. Cell phones have become an inevitable part of our lives and we always keep them nearby even in clinics also. Cell phones release electromagnetic interference, which might disturb electronic working length measurements. In clinics either Doctor, patient or assistant may have their cellphone nearby during treatment. Scientific literature is divided on the effect of mobile phones radio waves on the working of Apex locators.<sup>2,3</sup>

# Aim

This clinical study is conducted to evaluate the effects of cellular electromagnetic fields on readings of different electronic apex locators (EAL).

# **Material and Methods**

Four different types of apex locators were used in single and straight rooted extracted teeth- Woodpex-I of Woodpecker, Root ZX of DENTSPLY Sirona, iPEX of NSK, and DPEX III of Woodpecker. Six groups were made as Group 1. No Gadgets near Apex locators, Group 2. Mobile phone on flight mode, Group 3. A mobile phone without calling but wifi and Bluetooth enabled, Group 4. Mobile phone on calling mode with wifi and Bluetooth disabled, Group 5. Fit bit Versa Smart watch near Apex locators during calling and Group 6. WIFI routers near apex locators.

Plastic transparent glass filled with 0.9 % NaCl solution was used and covered with a wax sheath to hold extracted tooth in place. Root canal opened single-rooted extracted tooth after removing pulp remnants and prepared up to 15 no k-file and irrigated with 2.5% NaOCl was then inserted up to 2/3<sup>rd</sup> root into 0.9% NaCl solution. The file with previously calculated length was inserted into the tooth and a file clip of EAL was attached to it. To complete the circuit, a lip clip was attached to the glass with partially dipped into the 0.9% NaCl solution<sup>5</sup>. File adjusted and stopper fixed at the reference point until 0 reading on EAL was displayed Distance from base of the stopper to file tip measured with the help endo block. Ten readouts of each group with each apex locator were recorded. Figure 1:

## Result

It was observed that only group 4- mobile phone on calling mode with Wifi enabled and Bluetooth disabled nearby EAL fluctuates the readings of apex locators. The fluctuation was maximum when Woodpex-I Woodpecker apex locator. Bare minimum with DPEX III Woodpecker. Readings of rest two apex locators were not affected. The fluctuation was not always reproducible and was not fixed to a certain reading only. Mean Values-

Graph 1:



Dr. Sourabh Sharma, et al. International Journal of Dental Science and Innovative Research (IJDSIR)

Graph 2: Graph 4:



Graph 3:









## Table 1:

Groups	Woodpex-I	DPEX III Woodpecker	iPEX-NSK	Root ZX
1. No Gadgets near Apex	21.5,21.5,21.5,21.0,21.5,	22.5,22.5,22.5,22.5,22.5,	22.5,22.5,22.5,22.5,22.5,	22.5,22.5,22.5,22.5,22.5,
locators	21.5,21.5,21.5,21.5,21.0	22.5,22.5,22.5,22.5,22.5	22.5,22.5,22.5,22.5,22.5	22.5,22.5,22.5,22.5,22.5
2. Mobile phone on flight	21.0,21.5,21.5,21.5,21.5,	22.5,22.5,22.5,22.5,22.5,	22.5,22.5,22.5,22.5,22.5,	22.5,22.5,22.5,22.5,22.5,
mode	21.5,21.5,21.5,21.5,21.5,	22.5,22.5,22.5,22.5,22.5	22.5,22.5,22.5,22.5,22.5	22.5,22.5,22.5,22.5,22.5
3. Mobile phone without	21.5,21.5,22.0,21.5,21.5,	22.5,22.5,22.5,22.5,22.5,	22.5,22.0,22.5,22.5,22.5,	22.5,22.5,22.5,22.5,22.5,
calling but wifi and Bluetooth	21.5,21.5,21.5,21.0,21.5,	22.5,22.5,22.5,22.5,22.5	22.5,22.5,22.5,22.5,22.5	22.5,22.5,22.5,22.5,22.5
enabled				
4. Mobile phone on calling	17.5,20.0,21.5,21.5,23.5,	22.5,23.0,21.5,22.5,22.5,	22.5,23.0,22.5,22.5,22.5,	22.5,22.5,22.5,22.5,22.5,
mode with wifi and Bluetooth	22.0,21.5,24.0,21.5,21.5	23.5,22.5,22.5,22.5,22.5	22.5,22.5,22.5,22.5,22.5	22.5,22.5,22.5,22.5,22.5
disabled				
5. Fit bit Versa Smart watch	21.5,21.5,21.5,21.5,21.5,	22.5,22.5,22.5,22.5,22.5,	22.5,22.5,22.5,22.5,22.5,	22.5,22.5,22.5,22.5,22.5,
near Apex locators during	21.5,21.5,21.5,21.0,21.5	22.5,22.5,22.5,22.5,22.5	22.5,22.5,22.5,22.5,22.5	22.5,22.5,22.5,22.5,22.5
calling				
6. WIFI routers near apex	21.5,21.0,21.5,21.5,21.5,	22.5,22.5,22.5,22.5,22.5,	22.5,22.5,22.5,22.5,22.5,	22.5,22.5,22.5,22.5,22.5,
locators	21.5,21.5,21.5,21.5,21.5	22.5,22.5,22.5,22.5,22.5	22.5,22.5,22.5,22.5,22.5	22.5,22.5,22.5,22.5,22.5

## Discussion

An electronic apex locator is an electronic device used in endodontics to determine the position of the apical foramen and thus determine the length of the root canal

space. The apex of the root has a specific resistance to electrical current, and this is measured using a pair of electrodes typically hooked into the lip and attached to an endodontic file. The electronic principle is relatively

### Dr. Sourabh Sharma, et al. International Journal of Dental Science and Innovative Research (IJDSIR)

simple and is based on electrical resistance; when a circuit is complete (tissue is contacted by the tip of the file), resistance decreases markedly and current suddenly begins to flow. According to the device, this event is signaled by a beep, a buzz, a flashing light, digital readouts, or a pointer on a dial. Cell phones have become an inevitable part of our life globally. T. Buczkowski et al, proved that GSM mobile phone electromagnetic radiation influences the ECG recordings and that the distance between two electronic devices is a parameter that can influence EMI<sup>6</sup>. Cell phones radiation interferes with the working length determination of electronic apex locators when placed next to it.<sup>7</sup> Mobile phones communicate by transmitting radiofrequency waves. Radiofrequency waves are electromagnetic fields. These radiofrequency waves can generate an Electromagnetic interference (EMI), also called radiofrequency interference (RFI), affecting the conduction circuit established by the electronic apex locator. This disturbance may degrade the performance of the circuit or even stop it from functioning. Wave emission is intense during the calling mode that can generate electromagnetic interference. In a study Nishanthine, C., et al. found that electromagnetic radiation from smartphones, especially during active communication, can interfere with EAL readings, suggesting that devices should be kept at a distance during procedures.<sup>8</sup>

## Conclusion

Mobile phones in calling mode do hamper the working of Apex locator readings. During the treatment procedure, no mobile should be permitted in the vicinity or should be in flight mode to prevent any changes in readouts and functioning of apex locators.

### References

 Dr. Madhureema De Sarkar, Dr. Kundabala M., Dr. Neeta Shetty, 2018. "Effect of cell phone radiation on electronic apex locator" International Journal of Development Research, 8, (02), 19056-19058.

- Justine Hurstel, Herve Tassery-Do. 2015. Cell Phones Affect Establishing Electronic Working Length? J Endod, Jun; 41(6):943-6.
- Kti-Tang, K.H., Chan, L.C., Fung, S.W. and Leung. 2011. Electromagnetic Interference of IEEE 802.11 Wireless LAN Systems in Medical Equipment. May; IEICE Transactions on Communications, 94-B(5):1463-1466.
- Pascon, E.A., Marrelli, M., Congi, O., Ciancio, R., Miceli, F. and Versiani, M.A. 2009. An ex vivo comparison of working length determination by 3 electronic apex locators. Oral Surg Oral Med Oral Pathol Oral Radiol Endod., 108:e147–e151.
- Hurstel J, Guivarc'h M, Pommel L, et al. Do cell phones affect establishing electronic working length? J Endod 2015;41:943–6.
- Buczkowski, T., et al. (2013). Influence of Mobile Phones on the Quality of ECG Signal Acquired by Medical Devices. Measurement Science Review, 13(5), 231-236
- Alrahabi, M., et al. (2017). Effect of electromagnetic interference from smartphones on the accuracy of electronic apex locators. Journal of Clinical and Diagnostic Research, 11(9), ZC01-ZC05. DOI: 10.7860/JCDR/2017/28642.10618.
- Nishanthine, C., et al. (2020). Assessment of Smartphone Interference with Electronic Apex Locator in Working Length Determination: A Clinical Study. Journal of Operative Dentistry & Endodontics