

Determining working length

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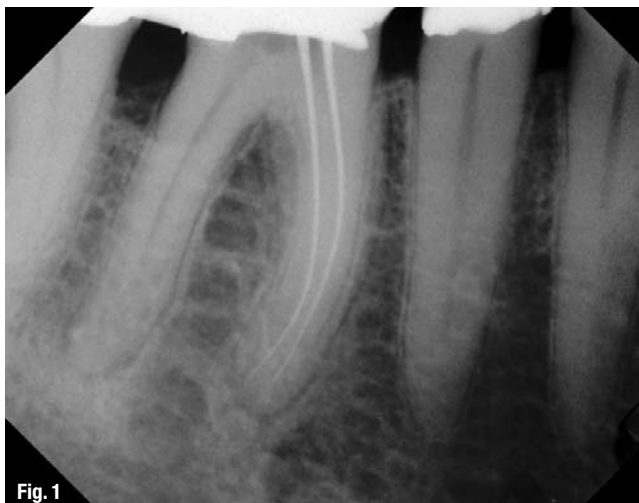


Fig. 1_Radiograph.

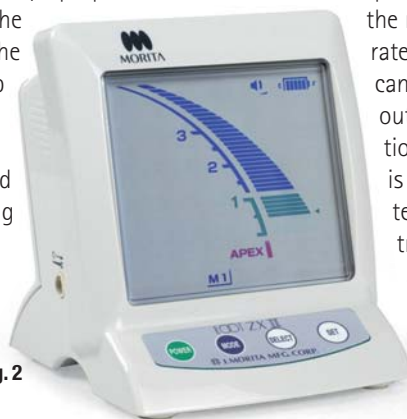
An accurate working length is one of the most important criteria for achieving successful endodontic results and minimising post-operative discomfort. An erroneous working length, either long or short, can compromise the outcome of the case from the beginning. An erroneously short working length leaves uncleaned and unfilled canal space in the apical region. An erroneously long working length will lead to over-instrumentation and overextended obturation, causing significant post-operative discomfort. That being said, in my opinion, it is better to be slightly long than slightly short.

There are different opinions throughout endodontics on where the canal terminus is. There is also debate on how close to the canal terminus you should clean and shape. Do you work short of the canal terminus at the expense of leaving pulp tissue and debris in the canal? Do you achieve patency and clean the entire canal? I am definitely a proponent of achieving patency and cleaning the entire canal. Leaving tissue in the apical region is setting the case up for failure later.

Currently, the three accepted methods for determining working length are

- _radiographs,
- _electronic apex locators, and
- _the paper point method.

Fig. 2



_Radiographic working length

Radiographs are probably the most common method used for determining working length. Although radiographs (Fig. 1) are important in endodontic treatment, primarily for assessing canal curvature and root form, they have limitations regarding length determination. This is because the radiographic apex (the end of the root on the radiograph) and canal terminus (where the canal exits the root) often do not coincide. One absolute that can be proven by a radiograph is when a file is out of the apex. At that point, there is no doubt you are patent. If the file is right at the radiographic apex, you are usually patent. If the file is short of the apex on a radiograph, you still might be patent. This is the reason that radiographs can be used to confirm patency, but are not the most accurate method for determining working length.

_Electronic apex locators

Aside from the surgical microscope, the electronic apex locator (Root ZX, J. Morita; Fig. 2) is the most valuable piece of endodontic equipment in my office. When used correctly, an electronic apex locator is the most accurate and efficient method for determining endodontic working length. When used incorrectly, it can be an unreliable source of frustration. Obtaining a consistent, reliable apex locator reading is necessary for developing confidence in its use.

In order to better understand apex locator use, the attributes and limitations of the device must first be understood. Apex locators should be thought of as "patency locators" because patency is what they detect. Apex locators measure the change in electrical impedance at the canal terminus. This is the reason that they are most accurate at showing when a file is in the canal (not patent) and when a file is out of the canal (patent). The location at which these two points meet is the point of patency, or the canal terminus. This measurement is the true canal length. Apex locators are less accurate at showing how close the file is to the canal terminus. This is the reason that most apex loca-

Fig. 2_Electronic apex locator (Root ZX).

tor manufacturers suggest passing the file tip out of the canal terminus (going patent) then pulling the file tip back into the canal terminus to find the exact point of patency for the best results. If you have not achieved patency then the only information you get from the apex locator is confirmation that you are not patent. Achieving patency is an absolute requirement for using an apex locator to determine working length.

The following tips will help you achieve a consistent and smooth apex locator reading and improve your apex locator experience:

1. For teeth with multiple canals, the chamber and preferably the canals should be dry. Manufacturers claim that their units work in moist environments (wet canals) but this is primarily true for teeth with one canal. In teeth with multiple canals, fluid will bridge from one canal to another, allowing electrical current to flow down multiple canals. The apex locator will not know which canal is being measured and produce an inaccurate reading.
2. Remember the file must maintain good electrical contact with the canal wall and not contact metallic restorations.
3. Use a thin layer of viscous lubricant such as RC-Prep (Premier Dental) to coat the file and improve electrical contact between the file and the canal wall.
4. Placing a curve in the file will also increase the electrical contact between the file and the canal wall.
5. The most stable reading is achieved when the file size approaches the natural size of the canal. The file must fit snugly within the canal and have good electrical contact with the canal wall. When an erratic reading occurs, change to a larger file size until the reading becomes stable and reproducible.
6. Always advance the file until the file tip is patent (the apex locator reads "apex"), then slowly pull the file back into the constriction of the foramen to find the exact point of patency; this is the true canal length. Achieving patency is an absolute requirement for accurately using an apex locator.
7. Apex locators are accurate at showing when the file is in the canal (not patent) and when the file is out of the canal (patent). The location at which these two points meet is the point of patency, or the end of the canal. This is the true canal length. Apex locators are less accurate at showing how close you are to the canal terminus.

When you are completely confident in your apex locator reading, working length determination takes only a few seconds and is the most reliable method for length determination.

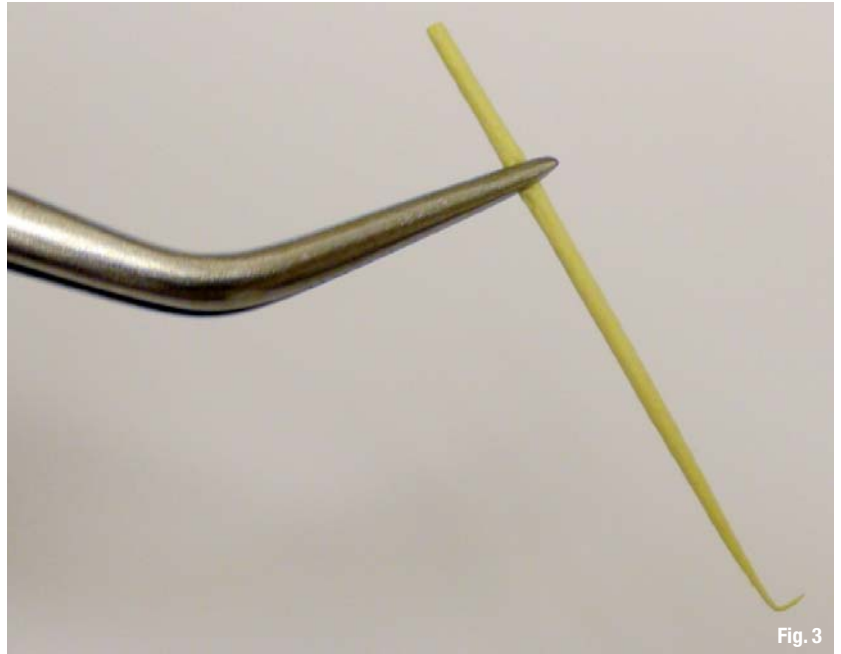


Fig. 3

_Paper point method

The paper point method is most accurate for determining the final canal length prior to obturation. This technique requires a shaped canal; therefore, it is used following instrumentation. In this method, a feather-tipped paper point (Fig. 3) is placed through the terminus of a dry patent canal. The tip of the paper point becomes moist where it exits the canal and the moisture spot is the true working length for obturation. The moist tip of the paper point bends easily, as shown in Figure 3. This method is very good for post-shaping measurement, but it is also technique sensitive and requires much practice to master. The paper point method requires a patent canal terminus and great care must be taken to prevent over-instrumentation and apical bleeding.

Often use this method to compare the pre-shaping working length from an electronic apex locator to the post-shaping working length. In curved canals, the degree of curvature is usually less following instrumentation. This reduction in curvature means there is a straighter and shorter distance to the canal terminus, resulting in a shortening of the true working length.

_Conclusion

I rely on and trust the electronic apex locator over all other length-determining methods. Once you develop confidence in your electronic apex locator, it will shorten your treatment time and increase your accuracy. Ultimately, it will produce better end-results with less post-operative discomfort for your patients.

Fig. 3 _Paper point.

_author

roots



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