The discussions about apical gauging are a much-welcomed indication that the endodontic community believes this topic deserves another look. Not long ago the preinstrumentation apical size of a root canal was pretty much a non-issue—most likely because the rigidity of stainless steel instruments gave us little choice. We had to keep apical preparations sizes (molars) pretty much in the #25 or #30 range or risk the mishaps caused by rigid instruments--ledges, zips, blocked canals, etc. Others have done well in their explanations on this topic and I appreciate their efforts. Allow me to add a few of my thoughts.

Apical gauging is important because it gives us a fairly good approximation of canal diameter in the critical apical 3 to 5 mm. Apical gauging is a guide. If it reveals that the natural apical canal diameter is a #40, it would not be appropriate to instrument this part of the canal to less than a size 40 and expect to do the best job possible in thoroughly cleaning the canal.

There are many controversies in endodontics but I believe we all agree (or should agree) that the main goal of root canal treatment is to disinfect and rid the canal of as much debris as humanly possible. If we agree, then determining the final apical preparation size is critical thus apical gauging must assume the importance it deserves. Continuing the trend towards small apical preparation sizes (“keep the size as small as practical” or “keep the size as small as possible”) is not right as is ignores the research of apical dimensions. Instead, we should be saying; closely match the apical preparation sizes to original canal size. This avoids over preparation and under preparation.

The most predictable way to clean the apical canal is by mechanically removing all canal contents-- unattached or attached to canal walls.
Attached material (tissue/debris) is removed by the scraping/cutting action of the instrument blade against canal walls. Therefore, the final instrument size must be large enough to touch all walls. Because most canals are oval in their cross-sectional shape, our goal should be to make the final apical instrument size correspond to the largest diameter of the oval, whenever possible.

Keep in mind that apical gauging only determines the NARROWEST dimension of an oval canal. Therefore, the gauged size is the MINIMUM size for canal instrumentation. With LightSpeed, this size is called the First LightSpeed Size to Bind (FLSB). The FLSB represents the starting point for canal instrumentation. In the vast majority of cases, larger size instruments must be used to clean all recesses of an oval canal. With LightSpeed (LS), the final apical preparation size (MAR) is determined with the “12 pecks rule”.

An article about apical gauging was mentioned and discussed on “Roots” (Int Endod J 2002). The aim of the study was “to determine whether the first file (LS) that binds at working length corresponds to the canal diameter”. I would like to make some comments about this article and they relate only to LS. Let’s start first with a brief review of the LS gauging (sizing) technique.

A clear path to WL is established by at least a size 15 K-file. Then, beginning with the smaller size LS instruments, they are pushed apically by hand, with moderate force, and without rotation. All LS sizes that easily reach the working

length (WL) confirm that the canal diameter, from orifice to working length, is larger than the instrument sizes.
Sequentially larger LS sizes are tried until reaching a size that does not go to WL because the blade binds on opposing canal walls and can advance no further (using moderate force, but without rotation). We call this instrument the First LS Size to Bind (FLSB). For example: LS sizes 25,
27.5 and 30 go to WL by hand but the size 32.5 does not because it binds (on at least 2 walls) prior to reaching WL. When this happens it should be clear that the canal (from orifice to WL) is larger than a size 30 (it didn't bind) but smaller than a size 32.5 (starting at the location where it first binds). This instrument, the FLSB, is placed in the handpiece to begin mechanical instrumentation. All instrument sizes smaller than the FLSB would simply rotate freely in the canal if used in the handpiece.
Note: LS, like all rotary instruments is a reaming instrument. A reamer enlarges a canals and it starts cutting when it contacts at least 2 walls.
K-files, when used in a filing motion, can cut when engaging just one wall.

My comments about the study are:

1) The LS technique requires instrumenting to WL with at least a #15 K-file. In the study a #10 was used but no specific mention was made that the LS canals were instrumented to at least a #15 file. This is not the recommended LS technique.

2) In the study the LS handles were modified. This is not the recommended LS technique.

3) In the study "the apical half of the cutting head of LS instruments was removed". This is not the recommended LS technique. One must question why the LS instruments were modified so drastically. By doing so the study used instruments that were no longer LS but instruments with a radically different configuration (no pilot tip and perhaps a sharp edge).
They did not perform like LS instruments because they were not LS instruments.

4) The LS technique requires advancing LS with moderate apical force. This is the recommended LS technique. No mention was made of doing so.

5) The study states that "in 90% of the LS canals the diameter of LS was smaller than the short diameter of the canal". How can LS bind when its diameter is smaller than the smallest canal diameter? Remember that the short LS blade is the largest part of the instrument. The shaft is always smaller in diameter than the blade and is non-cutting (smooth) and has no taper. Therefore, LS can bind only at the tip. If the tip size is smaller than the entire canal size how can it bind? Our guess is that when the tip of the instrument was removed, the remaining sharp edges dug into the sides of the canal.

6) The study states that in four (of 10) of the LS canals the instrument did not touch any wall at the WL. How is it possible for LS to bind when it isn't even touching one wall? They go on further and state that in the other canals the instrument was found binding at one part of the wall.
Again, how can LS bind when it touches only one wall?

I have been hoping for years that researches conduct their studies using methods and materials exactly according to the manufacturer's instructions. If they choose not to do so they must clearly understand that they, and they alone, are responsible for the results and not the manufacturer or the product they are testing. This view is supported by the Journal of Endodontics as described in their Information to Contributors (3c)). Item (3c) clearly states that the above must be done if the purpose of a paper is to evaluate a commercial product. It further states that if this was not the case, a precise description of any variant use must be prominently stated. There it is—a directive that makes scientific sense but unfortunately often ignored.

For the good of our specialty we should start with a clean sheet of paper, rethink our methodology, stop doing research the "same old way" and follow the manufacturer's instructions exactly. Only by doing so will we have meaningful research.

Thanks "ROOTS" for listening.
Steve Senia, DDS, BS, MS

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