Introduction

The long-term success of endodontic treatment is basically based on adequate 3-D cleaning of the endodontic space after root canal shaping, followed by complete 3-D obturation of the complex root canal system. The endodontic space is composed of areas that are easily accessible to hand and rotary instruments (the main canals) and, as confirmed by many clinical and histological studies, some spaces that are difficult to access or even inaccessible (isthmuses, loops, lateral canals, ramifications, deltas and dentinal tubules; Fig. 1). For that reason, mechanical shaping is not able to reach all areas of the complex root canal system, regardless of the technique used, leaving parts of the root canals untreated. Therefore, it is necessary to carry out endodontic biochemical cleaning (for the accessible and inaccessible areas). Once these areas have been cleaned, they can be filled and obturated with gutta-percha and sealer during the obturation phase.

When it comes to obturation, there are different techniques, mainly warm and cold techniques. In the literature, there are no significant differences regarding whether warm obturation techniques are better than cold techniques, but it is logical and well-demonstrated that the warm filling techniques can fill the endodontic space in a 3-D way.

As already mentioned, it is not only the main canal that is present in the endodontic space, but there are different anatomical configurations. Therefore, if we use cold filling techniques, most of these spaces will not be filled. In brief, in the pursuit of excellence, we must try to clean almost all of the endodontic space and then fill it nearly completely.
Together with gutta-percha, the most commonly used sealers are those based on zinc oxide, as well as eugenol and resin. In recent years, a new generation of sealers, the bioactive sealers, less toxic and with greater healing capacity, have been released on the market. However, these biosealers have two major disadvantages:

- The first is that they must be used with the cold single-cone technique because they cannot be heated; therefore, they are not able to obturate the endodontic space in 3-D.
- The second disadvantage is their consistency after hardening. They harden a great deal, and in the case of retreatments, the problem becomes more complicated.

Recently, a new biosealer was introduced, ROEKO GuttaFlow bioseal (COLTENE). This is not a pure biosealer because it is composed partly of gutta-percha fluid and partly of calcium silicate particles. It is less toxic than other sealers and biosealers, guarantees micro-expansion within the endodontic space after hardening, and therefore more hermetic filling, and has excellent regenerative capacity.

Furthermore, its composition offers two great advantages:

- The first is that it can be used with warm vertical compaction, so it can obturate in a 3-D way.
- The second is its consistency after hardening. It does not become extremely hard like other biosealers do, so it can be easily removed in the case of retreatments.

Using GuttaFlow bioseal

This article demonstrates and discusses a modified warm filling technique using GuttaFlow bioseal. Several clinical cases are shown with follow-ups using this technique (Figs. 2–4).

Obturating all of the endodontic space is very important for the final treatment outcome. This new biosealer combines fluid gutta-percha with a suitable sealer at room temperature and bioceramics in an automix syringe (Fig. 5). Setting time ranges between 10 and 15 minutes.

What we call the 3-D obturation technique is, in fact, an efficient and reliable way to fill even a complex anatomy. For the current warm modified technique, we used the System B heat source (Kerr), but any similar device could also be used.

After choosing the correct gutta-percha master cone, we prepared the biosealer and inserted it into the root canal with the proper tip. We then inserted the gutta-percha cone to the working length and began the 3-D obturation technique. In order to reach our aim, we decreased the heat carrier temperature to 130–150 °C instead of the average 200–250 °C, as this is sufficient.

Figs. 4 & 5: In vitro test showing better sealer penetration into a lateral canal.
Penetration depth was reduced to three seconds, rather than the usual five seconds, and the heat carrier was inserted to 4 mm short of working length. Conventionally, to dissolve the gutta-percha in the apical third, the heat carrier has to reach 3 mm from working length. However, with this modified technique, the heat carrier can be stopped also at 6–10 mm from working length. The clinician does not have to reach the desired working length in one stroke, but can use another stroke until the desired length is reached.

With this modified technique, the gutta-percha itself does not have to enter the accessory canals, as the bioceramic sealer will flow into any hidden canals. In in vitro tests, it was shown that the modified obturation technique allowed the sealer to advance deeper inside lateral canals in comparison with the conventional single-cone technique (Figs. 6–8).

By increasing the penetration speed of the heat carrier, we increase the pressure and this is needed to ensure the biosealer penetrates throughout the endodontic space. With the new warm modified technique, the biosealer sets only around two minutes earlier than with the normal technique. This happens owing to using the reduced heat settings and fast penetration.

With aid of 3-D obturation, the sealer is allowed to do its job in areas that are difficult to reach, while it is pushed further down into the canal by the slightly melted gutta-percha on top.

Conclusion

Shaping, 3-D cleaning and 3-D obturation are the three key parameters for achieving short- and long-term success in endodontics. Nowadays, many sealers are available, including biosealers, but the latter have some disadvantages, such as being limited to use with cold techniques and hardening a great deal. In order to guarantee a secure obturation, we must try to fill the endodontic space as much as possible, and achieving this with cold techniques is not possible.

Instead, with the benefit of a new biosealer, GuttaFlow bioseal, we can achieve 3-D obturation using a modified obturation technique. This new biosealer has less toxicity than other sealers and biosealers do, and the bioactive components of the obturation material enhance the healing process, as they stimulate the rebuilding of bone and dentinal tissue, which is favourable for the actual sealing of the canal.

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