Are we deluding ourselves?
Michael Sultan discusses the point of perfection in treating root canals

Over the years dentists have been preparing root canals with the intention of removing infected and inflamed material and ultimately making them easy to seal. The result of all their efforts would reveal itself in a post-treatment X-ray as a pretty, neatly shaped root filling fully sealing the mythical region known as the “apical third”. When we saw those satisfyingly smooth, regular shapes we deluded ourselves into thinking that we had done the perfect job.

However, if we were to clear that tooth, we would uncover an irregularly shaped canal system with an intricate network of interconnections. Years back the only reason the radiographic result looked so wonderful was because the material we used to create these root fillings - the silver point - was so radio-opaque. The reality, as we all know, is that the tool we rely on most - the radiographic film had little hearing on the canal’s original anatomy but just enlarged in the direction the file wanted to go in. We then moved onto the next instrument that, again, gives us a false sense of security: NiTi. These are actually wonderfully efficient cutting instruments that prepare a canal much faster than was previously possible. In reality, all these instruments do is create pretty shapes that bear no relation to the canal’s natural anatomy. This nicely shaped canal, narrow at the tip and gently flaring out to the orifice, hopefully encompassing the whole canal system somewhere in between, is really being shaped to receive our filling materials.

Basic Flaw
The problem is that the instruments are so conducive to efficiently cutting the canals, yet again, gives us a false sense of reality, all these instruments are so conducive to efficient cutting the canals, but what they did not show us was actually how clean the canal was, whether a rubber dam had been used during treatment, whether our irrigant had been saliva (no dam) or the industry-gold standard of bleach.

In the old days clinicians would use stiff, rigid, stainless steel files to try and shape these canals, the results often

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* England only.
replenished regularly. Simply syringing it in and leaving it to sit passively in the canal simply does not work.

**Complex Biofilms**
Bacteria do not just float about in the tooth’s canal. They are made of highly complex biofilms that are firmly attached to the walls of the canals and unless we physically remove them, the canals will never become clean. To this end we need to aggressively move the irrigant in and out of the canal walls to remove the bacteria within them.

As an inter-appointment dressing we generally use calcium hydroxide, which is often regarded as the most important dressing we can put in a tooth. It is given an almost mystical status with the ability to cap pulps, cause roots to grow, apexes to close and to kill all bacteria in sight. It may well be highly alkaline (if it hasn’t degraded to calcium carbonate in the jar) and kills bacteria well, but if bacteria are trapped in a muddy pool of debris the calcium hydroxide will be unable to reach it. One of the prime causative agents of endodontic failure is E. faecalis, which is resistant to alkaline solutions anyway. To compound problems further, the purpose of a root canal filling is to entomb any residual bacteria so that they are no longer viable.

**This fluid tight root filling will deprive the bacteria of their food supply and cause them to wither and die.**

that all root filling materials leak (it is just a question of extent) and the bacteria themselves lay dormant, waiting patiently for leakage and their next supply of food.

Despite all our best efforts, even when we think we have a technically beautiful root filling and an excellent 3D seal of the canals, we still heavily rely on the final coronal seal of the tooth. Many studies have shown that a great root filling coupled with a poor coronal seal will unfortunately lead to failure.

With all these weak spots in our procedures it is perhaps surprising that we have any success rate at all and yet despite all we do, success rates remain high (95 per cent in uninfected teeth and about 80 per cent in re-treatment). So I will not be abandoning endodontics just yet to be seduced by larger pieces of titanium but I acknowledge the gaps in our knowledge and procedures, and am thankful that our patients have innate abilities to heal.

In order to progress and move forward, we will have to rethink how we overcome the aforementioned problems. In this respect I think the most exciting product on the market at the moment is the Self Adjusting File (pictured). This ingenious device expands to touch all canal walls and their irregularities whilst continuously vibrating and pumping irrigant through its hollow central lattice. In the future we will be using systems that actively kill bacteria rather than one that just relies on the constant flow of irrigants. In this field, photosensitisation and activated disinfection systems may show great promise for the future.

**Insane**
Those who repeat the same task over and over again, expecting a different outcome each time, are accused of being insane. I think that we are all guilty of trying to refine an already flawed approach and what we really need is a complete paradigm shift in our methodology and to stop really deluding ourselves about what is going on when we treat root canals.