

Introducing Schilder's Five Mechanical Objectives

Dr Raphael Bellamy describes the historical concept of cleaning and shaping in endodontics, the modern concept of cleaning and shaping, its rationale and introduces Schilder's Five Mechanical Objectives



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Last issue I discussed the principle of patency and how, in my opinion, it was critical to maintain when preparing and filling the root canal system in three dimensions.

In this article it seems logical to discuss how we get to that point. The subject of cleaning and shaping the root canal systems, next to diagnosis, is the single most important facet of root canal therapy. Obturation of the cleaned and shaped root canal system is merely incidental as long as it is sealed.

Nevertheless, it does merit discussion, perhaps in a future article. Dr Schilder once told me of a journeyman in New England, at the turn of the last century, that was a great success in the treatment of the dental abscess. His method was to pack the tooth with bird lime (calcium hydroxide to you and I!). When asked how and when he knew that the tooth was filled, he replied, 'When it comes out of the sinus'. Well I'm pleased to say that we have moved on since then. But my point is that, relative to cleaning and shaping, obturation is a far less accurate science.

Cleaning and shaping

Cleaning and shaping the root canal system was a bit hit and miss before Dr Schilder entered the stage in the early 1960s.

Initially, root canals were manipulated primarily to allow the placement of intra canal medicaments. With the

advent and development of radiography (no pun intended!), clinicians could now see the lesion in the bone above the tooth for the first time. They went with a vengeance to vent the evil spirits and purge the area with various noxious substances, including arsenic itself! Very little regard was ever paid to removing the organic substrate from the root canal system because the belief was that the disease process was outside the tooth. Radiography confirmed this for the clinicians.

Many endodontic methods, current and past, still fail to cleanse the root canal system effectively. Also, they pay little regard to the anatomy of the individual tooth or to the material that will be used to obturate the root canal system.

As root canal therapy has developed, preparation has been described as instrumentation, chemo-mechanical instrumentation, biomechanical instrumentation and more... each described a particular mode of root canal therapy. But in a holistic sense only, Schilder has stated, with sufficient directness, the goal of cleaning and shaping. The secret lies within The Five Mechanical Objectives set out in his seminal article of 1974.

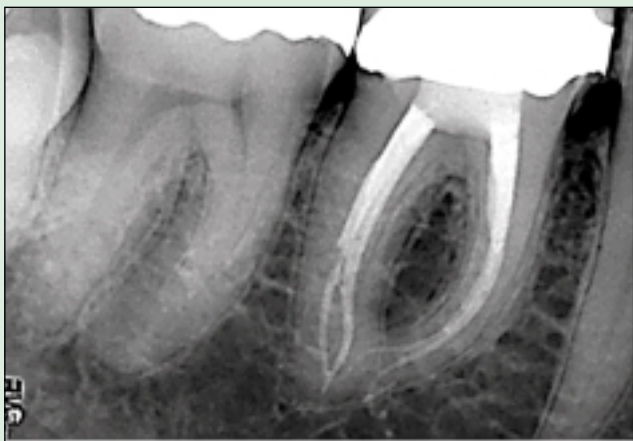
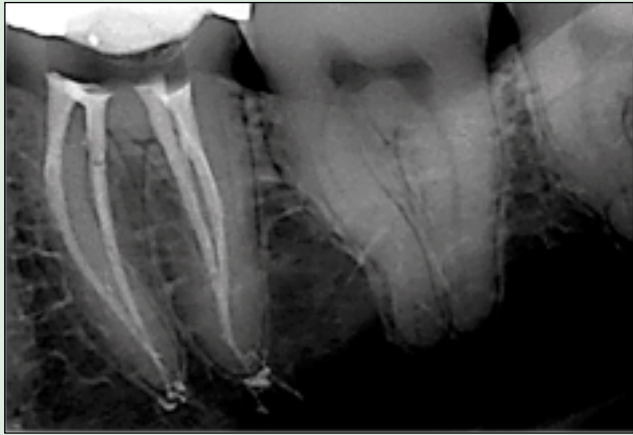
Cleaning and shaping refers to the removal of all organic substrate from the root canal system and the development of a purposeful form within each canal for the reception of a dense and

permanent filling. So, shaping implies the development of a unique shape for each root canal directly related to the length, position and curvature of the root.

'The Look'

I am always wary of a root treated tooth that appears to have the root treatment imposed upon it; a straight rod superimposed upon a curved canal rather than 'the look' as described by Dr Schilder. It is an assault on my senses, a violation of the natural harmony of form. 'The look' not only portrays what was originally there, as it has evolved from what was there, but is probably closer to a replica of what was there 20 years previously before the ravages of time, decay, iatrogenic intervention and other trauma took their toll.

When I commence root canal therapy, I feel that my goal is akin to a burglar breaking into a house, stealing the jewels and leaving without setting the alarm off. Nobody will know that I've been there. So that is why, each day, I subject myself to critique when I call the patients I have treated and words like 'not a bother' or 'I wouldn't know it had been done' fill me with pride. It comes in the knowledge that I have done my job well. I have not violated any sacred ground. I have not violated the principles laid down by Schilder in The Five Mechanical Objectives. Perhaps I would have made a good burglar!



The radiographs show compliance with the 5 Mechanical Objectives of Schilder and clearly demonstrate the concept of 'flow'. These cases possess the 'look'

Cleaning and shaping

So, by the definition of cleaning and shaping, many teeth in the past, regrettably, were instrumented while being neither cleaned nor shaped. I hate the word instrumented. It implies the use of force. Rather

cleaning and shaping; it is passive, empathetic, implies smoothness, art and skill.

Shaping facilitates cleaning. It facilitates and encourages the actions and efficiency of medicaments, allowing them to pass within

the root canal system. It allows access to the more virulent anaerobic organisms deep within the recesses of the necrotic root canal system. Irrigation compounds pass deeper, allow the evacuation of substrate and oxygenation of the deeper parts of the system. Tissue debris in root canals encourages and supports microbial growth, greatly complicating the disinfection of the root canal system.

It ought to be remembered that even uninfected tissue, on degradation, can create lesions of endodontic origin by production of lytic enzymes and bi-products leaching out of the portals of exit. Within days of efficient cleaning and shaping, the healing and even the laying down of bone has already begun outside the root canal system, even in the absence of obturation.

The mechanics of cleaning and shaping may be viewed as an extension of the principles of coronal cavity preparation to the full length of the root canal system. A cavity prepared to receive amalgam, for example, will be as clean as one to receive a gold inlay but the shape of the preparation will differ. Likewise, the root canal prepared to receive gutta percha should differ from that to receive silver points.

The Five Mechanical Objectives


Dr Schilder's Five Mechanical Objectives are those design objectives for the use of gutta percha.

Gutta percha possesses and displays unique characteristics when heated that are well suited to root canal obturation. Incidentally, I would refer you to the articles written by Alvin Goodman, a Boston University graduate, on the rheology of gutta percha entitled *The thermomechanical properties of gutta percha* (ref details need).

Put simply:

1. The root canal preparation should develop a continuously tapering cone
2. Decreasing cross sectional diameters at every point apically and increasing at each point as the access cavity is approached
3. In multiple planes which introduces the concept of 'flow'
4. Do not transport the foramen
5. The apical opening should be kept as small as practical in all cases.

It is beyond the scope of this month's article to discuss the objectives. These I hope to discuss at a later date in great detail. On this page are some examples of endodontically treated teeth that conform to the Five Mechanical Objectives and, as a consequence of this, do exhibit the 'flow' alluded to in this article.

It is this 'flow' that generates that other elusive aesthetic value described by Schilder as the 'look' and is typical of Boston University endodontics. 

References

- Schilder H (1974) Cleaning and shaping the root canal. *Dental Clinics of North America* **18**(2)
- Schilder H(1967) Filling root canals in three dimensions. *Dental Clinics of North America* **11**(7)
- Schilder H, Goodman A, Aldrich W (1974) The thermomechanical properties of gutta percha. *Oral Surg. Oral Med. Oral Path.* **37**(6): 946-53

Acknowledgements

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