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Cleaning and Shaping the Root Canal System

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According to an old and famous endodontic axiom, what is removed from the root canal is more important than what is placed inside.¹⁵⁶

Without minimizing the importance of the obturation phase, it is nonetheless true that the phase of preparing or emptying the root canal is undoubtedly the most important, the most complex, and the most delicate.

It is difficult to imagine how one can completely obturate a canal that has not been adequately cleaned and disinfected. On the other hand, minor deficiencies in the filling of a root canal that has been totally debrided and disinfected can be biologically tolerated, as well as they can be contributing causes of periapical inflammation in a root canal that remains infected.¹⁵⁶ Therefore, the dentist should direct as much attention and time as possible to thorough preparation of the canal. Good preparation facilitates the subsequent phase of obturation.

Schilder correctly states that even a dentist who is not conversant with his obturation technique can easily obturate a root canal with warm gutta-percha as long as the root canal has been cleaned and shaped *lege artis*.¹⁵⁵

On the other hand, haphazard preparation of a root canal that does not respect the endodontic anatomy will negate any attempts to obtain a perfect obturation of the entire root canal system.

Over the years, canal preparation has been described by a variety of names, including “enlargement”, “mechanical preparation”, and “instrumentation”.

These descriptions are not precise, because the root canals are not simply “enlarged” or “instrumented;” nor is the ultimate goal of “preparation” to reproduce in the canal the shape of the instrument being used. In modern Endodontics, which emphasizes the related biological and anatomical problems, “cleaning” and “shaping” are more correct terms.¹⁵⁰

Schilder introduced these terms to the endodontic vocabulary in 1974. Since then, they have been universally used to indicate the principal goals of canal preparation.

When “preparing” a root canal system, it is in fact cleaned of all inorganic debris, organic substrates and microorganisms, and it is shaped to facilitate the placement of a permanent three-dimensional filling.

The two procedures of cleaning and shaping are intimately related, both conceptually and mechanically-temporally. When one of the two is performed well, the other will also be correctly performed: shaping facilitates cleaning!

In preparing the root canals, one must assure that no trace of organic or inorganic material, which could contribute to the growth of bacteria or generate products of tissue decomposition, is left in the root canal system, and that any microorganisms that might be present are removed or destroyed. At the same time, one must plan and prepare within each root canal the cavity form or shape that is appropriate for the simplest and most effective three-dimensional obturation:¹⁵² shaping facilitates obturation! If the root canal is shaped well, every clinician could compact the gutta-percha in root canals in three dimensions.^{7,148}

It is important to appreciate that *files* produce shape, but it is essential to understand that *irrigants* clean a root canal system.¹⁴⁴

Since shaping facilitates cleaning and cleaning is completed *after* a complete shaping is achieved, (shaping allows a deeper and more apical penetration of the irrigating solutions, and a deeper and more complete dissolution of the existing organic material), today it is preferred to speak in terms of “*shaping*” first and “*cleaning*” later. Furthermore, taking into consideration the results obtained with the new NiTi instruments, which allow to ideally shape relatively easy root canals sometimes in just a few minutes, whi-

le the cleaning of the same system needs much more time, today is considered more appropriate to speak in terms of “shaping and cleaning”, since in chronological order the root canal system is first shaped and then later becomes adequately cleaned, if irrigation protocols are followed. Nevertheless, for practical reasons, in our chapter we will keep the old sequence, describing the cleaning principles first and the shaping objectives later.

A controversial issue in endodontics is: is it possible to thoroughly clean the root canal system? Some dentists think it is impossible and in order to be as close as possible to the ideal result, it is necessary to enlarge the root canal with large size instruments, as a deeper cleaning is only obtainable with bigger enlargement. Many dentists, on the other hand, correctly believe that it is possible to clean into all aspects the root canal anatomy.¹⁹² This obviously not just with files, which can only take care of the negotiable part, but mainly with irrigants, which can take care of the unnegotiable and inaccessible aspects of the root canal system: isthmus, resorptions, lateral canals, bifidities, fins etc. As already stated, one concept must be absolutely clear: files shape and irrigants clean, and this is demonstrated by many accredited studies.^{23-25,48,66,94,108,142,192} Now, the question is the following: how do we know when a root canal is totally cleaned? The answer is: when there is sufficient shape to fit at least an .08 or .10 taper gutta-percha cone (fine-medium or medium of the nonstandardized serie).^{7,114,191} If there is room for such a tapered cone, we also have room for an effective volume of irrigant that, with sufficient time, can penetrate and clean every aspect of the complex anatomy of the root canal system.^{108,139}

CLEANING

The purpose of cleaning is to remove all intracanal material, whether of pulpal origin, vital or necrotic, or microorganisms, from the root canal system.

The removal of vital pulp tissue

In sufficiently wide and straight canals, broaches are recommended to withdraw the pulp tissue all in one piece.

Barbed broaches are produced from a slightly conical, round metallic filament, which is notched in such

a manner as to create a “multiple barb” (Fig. 14.1). It is a very delicate instrument that fractures easily. It is not designed to work on canal walls nor, far less, to engage them, but rather only to hook and twist the pulp filament around itself so that as to extract the pulp from the root canal.

Used properly and safely, therefore, the instrument should never come into contact with the canal walls.

It cannot be used indiscriminately in any situation. First, the correct size must be chosen. Furthermore, it must be wide enough to engage the pulp effectively, but not so wide as to touch the canal walls.

Once it has hooked the pulp filament around itself for two-thirds of its length, the apical third of the pulp will usually become dislodged easily and sectioned without having to thread the instrument to the apex (Fig. 14.2).

One may draw three conclusions from the above statements:

- the broach must never be used in narrow or calcified canals
- it must never be introduced into curved canals or into curved portions of straight canals
- it is useless, as well as dangerous, to introduce it to the apex.

It may be used confidently in the upper central incisors, in canines known to have a single canal, in up-



Fig. 14.1. Barbed broach.