

## Cleaning and Shaping of Root Canal

**Endodontic treatment mainly consists of three steps:**

1. Cleaning and shaping of the root canal system.
2. Disinfection of the canal system.
3. Obturation and 3D closure and seal of the complete canal space.

Cleaning and shaping is one of the most important step in the root canal therapy for obtaining success in the root canal treatment.

### **Cleaning**

It comprises the removal of all potentially pathogenic contents from the root canal system including the necrotic pulp tissue, dentine debris and microbes.

### **Shaping**

The establishment of a specifically shaped cavity which maintain the original shape and taper of the canal and allow three-dimensional progressive access into the apical part to permit the final obturation instruments and materials to fit easily.

For the success of endodontic treatment the contents of the root canal must be completely removed, to prevent any communication from the root canal system and periodontal space that may act as a portal of exit and can lead to formation of periodontal lesions of endodontic origin.

Apical region contains most of the lateral canals that connect the canal into the surrounding periodontium Communication route between the periodontal pocket and the root canal

**Schilder in early 1960s described mechanical and biological objectives for successful root canal therapy.**

### Mechanical Objectives

1. The root canal preparation should develop a continuously tapering cone. This shape mimics the natural canal shape.
2. Making the preparation in multiple planes which introduces the concept of “flow”. This objective preserves the natural curve of the canal.
3. Making the canal narrower apically and widest coronally. To create a continuous tapers up to apical third which creates the resistance form to hold gutta-percha in the canal. Unprepared canal prepared canal
5. Keep the apical opening as small as possible. Since over-lapping of the foramen contributes to number of iatrogenic problems. Doubling the file size apically increases the surface area of foramen for four folds ( $\pi r^2$ ).
4. Avoid transportation of the foramen. There should be gentle enlargement of the foramen while maintaining its position. Unprepared canal prepared canal.

### The Biological Objectives are:

- 1- Confinement of instrumentation within the root canals only.
- 2- Ensure not to force necrotic or instrumentation debris beyond the apical foramen.
- 3- Optimum debridement of the root canal space.
- 4- Creation of sufficient space for intra-canal medicaments.

Instrumentation: The major biologic aim of endodontic therapy is to eliminate apical periodontitis by disinfection and sealing of root canal systems.

## **Basic principles in root canal instrumentation**

1- Before starting the endodontic treatment, proper diagnosis and evaluation of the tooth has to be performed to ensure that the tooth has favourable treatment prognosis.

2- During preparation of the access cavity, a straight line access from the coronal to the apical regions of the canal must be obtained. This can be performed by removing the overlying dentine to ensure flaring and smooth internal walls of the cavity with straight line access to the root. This dentine shoulder should be removed to straighten the canal access. Straight access of the canal

3- Ensure glide path of the canal and apical patency before starting canal preparation. This can be performed by passing a small size K-file (usually a size #8 or #10) beyond the apex. The glide path file can help to ensure complete opening of the canal and facilitate working length estimation

4- Precurved instrument: In case of a curved canal, the instrument should be precurved to estimate the curvature of the canal. This is true only in case of stainless steel instrument, but nickel titanium instrument is flexible and cannot be curved. Various precurved, stainless steel glide-path file. Compare the curves in the instruments to the ones in a plastic training block

5- The use of intracanal irrigation solutions that serve many advantages:

- Dissolving and flushing out of the debris from the root canal,
- Lubrication for the cutting motion of the files within the canal,
- Antimicrobial activities.

The most popular intra-canal irrigation solution is Sodium hypochlorite (NaOCl) 2.5-5.25%. The irrigation solution can be delivered inside the canal by using hypodermic syringe.

6- Instrument examination: each instrument should be examined each time before insertion inside the root canal to verify the presence of any sign of fatigue, stress or damage, so any instrument showing such a sign should be discarded.

7- After each insertion and removal of the file, its flutes should be cleaned regularly, to ensure efficient cutting action of the file and prevent debris accumulation, canal blockage or extrusion of debris beyond the apical foramen.

9- Use of instruments in sequential order. Root canal preparation is done gradually by using successively larger files (never skip any size of instrument) e.g. size 20 followed by size 25 then 30 and so on, but not size 20 then size 30.

8- Never force the instrument in the canal. Forcing or continuing to rotate an instrument while its bind to the canal wall may break the instrument.

10- Over preparation and too aggressive over enlargement of the curved canals should be avoided.

11- Creation of an apical stop should be maintained during instrumentation procedures by maintaining the apical size as clean and small as possible. Over enlarging of the apical foramen should be avoided because it destroy the apical stop and cause apical extrusion of the irrigation and obturation material and cause failure of endodontic treatment.

### **Manual or Hand instrumentation techniques**

Standardized Technique

Step-Back Technique

Step-down Technique

Balanced Force Technique

Crown Down Technique