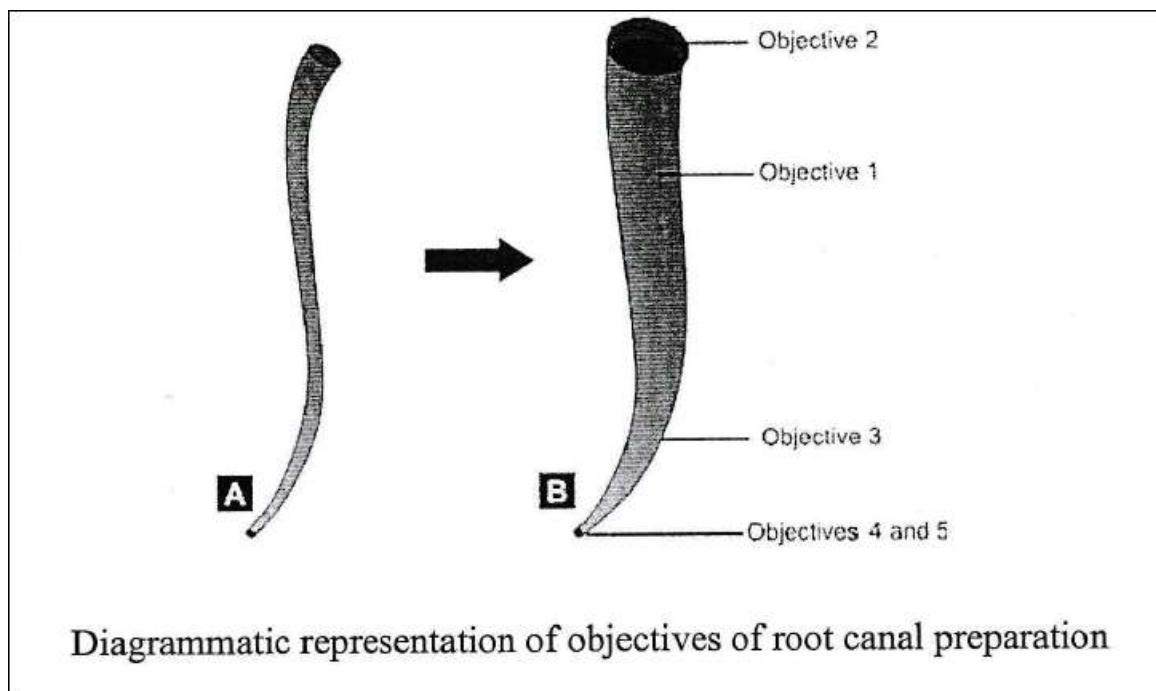


The mechanical objectives for successful root canal preparation given by Dr. Schilder

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.
4. Avoid transportation of the foramen. There should be gentle enlargement of the foramen while maintaining its position.
5. Keep the apical opening as small as possible. The foramen size should be kept as small as possible as overlapping of foramen contributes to number of iatrogenic problems. Doubling the file size apically increases the surface area of foramen four folds (πr^2).



Aids in Preparation of the Root Canals

- 1- Intracanal irrigants: Root canal irrigation Serves many reasons as:
 - a) Flushing out the debris: The solution should be able to flush the debris outside (coronally) the canal. Normal saline is used to flush the debris from the canal
 - b) Tissue dissolution: The solution should be able to dissolve the soft tissues & hard tissues remnants to permit their removal
 - c) Anti bacterial action: The solution should be able to sterilize the canal or at least eradicate most of the bacteria & toxins inside the canal.
 - d) Lubrication: it should aid the instrument to slide down the canal sodium hypochlorite (NaOCl) 2.5-5.25% possesses all the above criteria. The hypodermic syringe can be used and the needle should be placed loosely in the canal.
- 2- Examination of the instruments: 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.
- 3- Precurved instrument: in case of a curved canal, the instrument should be curved to estimate the curvature of the canal. This is true only in case of stainless steel instrument, but nickeltitanium instrument is flexible.
- 4- 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 & so on, but not size 20 then size 30.

Techniques in Root Canal Preparation

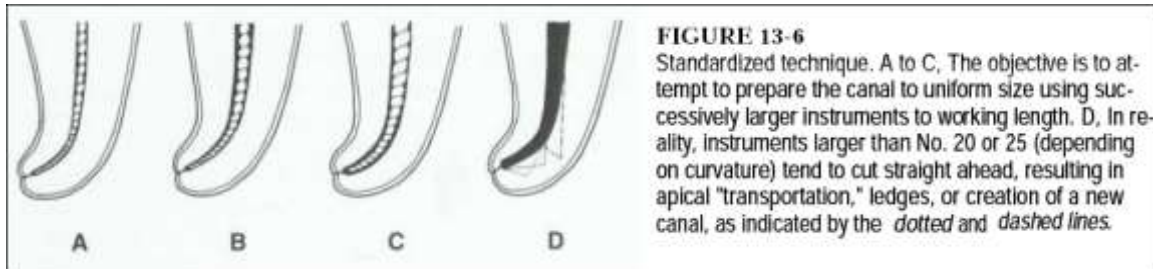
There are many techniques used in root canal preparation like:

- 1- Standardized preparation. 2- Flare (step-back) preparation.

1 - Standardized Preparation:

- Objective of this preparation is to prepare the canal to a uniform size using successively larger instrument to the working length.
- This technique uses reaming action and produces a canal shape or taper that resembles the tapering of the instrument. The instrument should engage on the apical, middle & coronal parts at the same time, but we rare see such a canal because it's elongated bucco-lingually.

- Creation of a true standardized tapered preparation is difficult in ideal situations & impossible in curved canal.
- This preparation is indicated for silver cone obturation but may be also employed for gutta-percha.



Procedure

Reaming action is used in straight canal. The procedure is as follows:

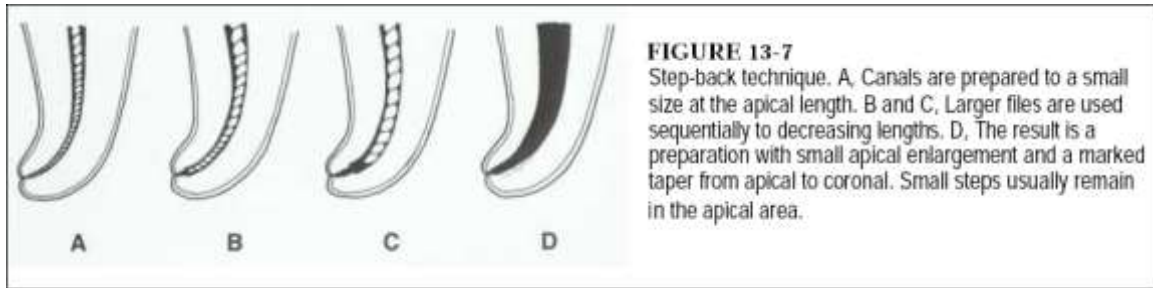
- 1- The canal should be flushed with irrigant solution.
- 2- We start for example with size 10 by reaming action until the instrument is very loose.
- 3- The canal should be flushed with irrigant solution.
- 4- We use size 15 instrument until the instrument is loosened, then irrigation.
- 5- Then we switch to size 20 & do reaming until the instrument is loosened, then irrigation.
- 6- We switch to size 25 & do reaming until the instrument is loosened.

We do this procedure until white clean dentin shavings are removed from the root canal and now the canal is ready for obturation.

2- Flaring Technique or Step-Back Preparation

Objective: is to keep the preparation as small as practical apically with an increasing taper coronally throughout the canal.

The final result is a preparation with small apical enlargement & marked taper from apical to coronal. The wide, less flexible instruments are avoided in the preparation of the apical portion of the canal to preserve the original shape of the canal. Filling with gutta-percha is made easier because more room space will be available for spreader & plugger to penetrate more apically to get maximum condensation.



Technique:

1. Set the rubber stopper on file (size 10 through 80) at the correct working length.
2. Flood the pulp chamber with irrigant solution.
3. Place the largest file that penetrates to the established working length & snug in the canal.
4. Using filing motion, work the instrument against the canal wall until it becomes loose, then irrigate the canal.
5. Place a larger file into the canal to the established working length and file.
6. Next use a larger file and file until we get white dentin. This instrument is called the master apical file (MAF) which is the final instrument that goes to the full working length.
7. Next use a larger file, i.e. one size larger than MAF into the canal but 1 mm short of the working length and file.
Sometimes, the dentinal shavings are pushed in the apical 1 mm so we use the MAF to retain the patency of the full working. This is called recapitulation
8. Next use a larger file penetrating 2mm. shorter than the working length, and then do filing, and recapitulation.
9. Next use a larger file penetrating 3 mm. shorter than the working length, and then do filing, and recapitulation.
10. Flaring procedure is continued by the use of Gates Glidden drills until the canal is totally cleaned and flared

Differences between flaring & standardized techniques:

1. We can use flaring technique in curved canal & can't use the standardized technique in that canal.

2. Standardized technique is indicated for silver cone obturation & may be employed for gutta-percha, while in the flaring technique, the filling material is gutta-percha.
3. Objective of the standardized technique is to prepare the canal to a uniform size using successively larger instrument to the working length, while the objective of the flaring technique is keeping the apical preparation as small as practical with an increasing taper throughout the canal.
4. We need recapitulation in flaring technique to check the patency of the canal, while in standardized tech. we don't need recapitulation.
5. The final preparation will have the same shape of the tapering instrument we use in standardized technique, while the final shape of the canal will be flared, narrower at the apical part & wider in the coronal part in flaring technique.
6. In flaring technique, in each switching from size to the next, we subtract 1mm. while this is absent in standardized technique.

Errors in Root Canal Preparation

1. Over instrumentation
Passage of the file through the apical foramen, i.e. the apical constriction here has been violated & injury to the periapical area will occur.
2. Under instrumentation
Files don't reach the correct working length (so you leave 2-3 mm). Part of the canal remains unprepared & full of bacteria & debris which leads to infection & inflammation.
3. Ledge Formation & Perforation
Ledge defined as artificially created irregularities in the lateral wall of the canal as a result of using uncurved instrument in curved canal with excessive pressure. (Gouging)
4. Failure to debride all Canals
Sometimes a canal may not be located & therefore; not debrided.
5. Separated instrument
If the file or reamer is fractured and locked in a canal, we try to remove it or by-pass it.

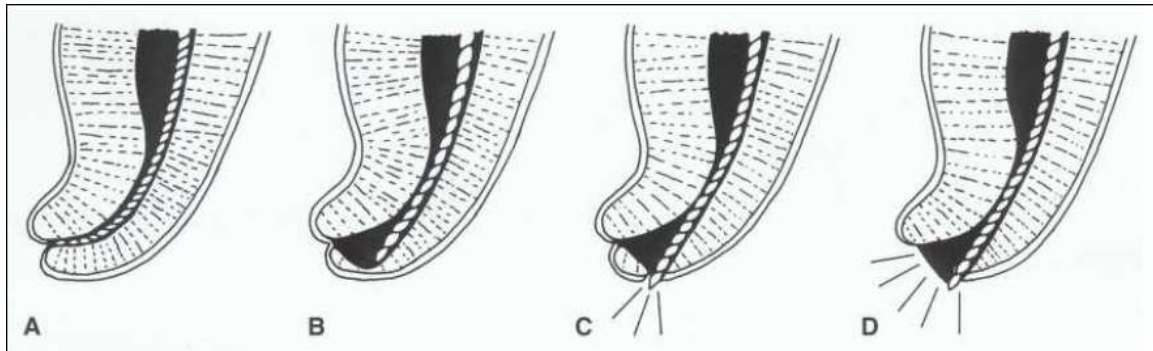


FIGURE 13-18

Hazards of overenlarging the apical curvature. A, Correct preparation is maintained when small flexible instruments, less than No. 25, are used to negotiate the curvature. B, Larger instruments increase stiffness and cutting efficiency and transport the apical preparation. C, Continued enlargement results in perforation. D, Apical region is zipped when large instruments are continually forced apically.

The causes of fracture of the instruments are:

- ❖ Small access opening.
- ❖ Using non-flexible instrument with extreme pressure.
- ❖ Skipping instrument sizes.
- ❖ Fatigued instruments.