Endodontic materials are used to obturate the root canal system of teeth when the pulp tissue has been destroyed either as a consequence of trauma or subsequent to tooth decay involving the pulp and infection of the pulp tissue.

**THE OBJECTIVES OF ENDODONTICS ARE TO:**

1- Clean and shape the root canal system to within 0.5 mm of the point of maximum constriction of the root canal close to the periapex.

2- Obtain the canal with a combination of materials that will allow a full three-dimensional obturation of the canal system with a material that is inert and biocompatible.

3- Provide an adequate seal at the coronal extent of the root canal to prevent the ingress of bacteria from the oral cavity re-infecting the root canal system.

*Figure (10-1):* Cold lateral condensation is one of the classic techniques for obturation of root canals. A gutta percha ‘master cone’ is selected which matches the instrument size used to prepare the apical portion of the canal. The cone is inserted coated in sealant to length (A) and then a finger spreader is used to squash the gutta percha apically and laterally within the canal (B). An accessory cone is then inserted into the space created by spreader (C) and the spreader re-inserted. This process is repeated until the canal is completely filled in three dimensions with the combination of gutta percha and sealant.
The purpose of endodontic irrigants is to flush the debris from preparation of the root canal out of the prepared area, to help to both disturb debris in the canal and finally to disinfect the canal.

1- The most effective of the currently available materials is sodium hypochlorite which is usually used at a concentration of (2 to 10 %). One of the disadvantages of sodium hypochlorite is that it is a tissue irritant resulting in ulceration of the oral and esophageal mucosa if it is allowed into the mouth and painful inflammatory response if it is expressed out of the tooth into the bone around the tooth.

2- The most appropriate alternative is chlorhexidine gluconate in a 0.2 %.

3- All of the solutions that are used as irrigants will to an extent lubricate the passage of instruments into the root canal. In addition, gel preparations containing ethylene diamine tetra acetic acid (EDTA) have been described as custom lubricants. In addition to their lubricating role the EDTA will also soften the walls that is very important where there has been internal mineralization of the canal.

Figure (10-2): Facial swelling caused by a ‘hypochlorite accident’. Hypochlorite is highly irritant to bone and soft tissue resulting in rapid development of pain and swelling. This responds to analgesia and takes 10–14 days to recover. Removal of the tooth is of no benefit.
This disinfectant is used to reduce the risk of recurrent infection of the root canal system between visits. Unfortunately its effectiveness is very short-lived within root canals as it is denatured in the presence of calcium and there is currently no clinical indication for use of this medicament.

2- **Non-setting calcium hydroxide paste**
Non-setting calcium hydroxide has a very high pH (of the order of 11) and has a potent antimicrobial action as a consequence.

3- **Poly-antimicrobial paste**
This is a proprietary poly-antibiotic paste that contains a mixture of corticosteroid, sulphonamide and tetracycline.

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**ENDODONTIC OBTURATION MATERIALS**

1- **Silver (historical material)**
Silver points that had a matching taper to the files or reamers used to prepare the canal were used at one time to obturate the canal space. The points were sealed into place with an appropriate sealant (see later).

2- **Dental amalgam**
Conventional dental amalgam has also been used as a retrograde root filling material with specialized amalgam carriers and pluggers designed to allow the mixed material to be carried to the apex of the root and then condensed into place.

3- **Contemporary materials**
The contemporary approach to obturating the root canal space is to use a malleable bulk fill material in association with a thin sealant that is used to fill the spaces around the bulk fill material and to refine adaptation of the materials particularly to the walls of the prepared root canal.
The most widely used bulk fill material is gutta percha.

**Composition**
Trans-polyisoprene (19-22 %), zinc oxide 60-75 %, and a variety of other components including coloring agents, resins, waxes, antioxidants, and metal salts (to give radiopacity).

**Supplied as**
Tapered cones which may be matched to the size of the instrument used to prepare the canal mechanically or as pellets of material to be loaded into a gun-type delivery system.

**Disadvantages**
A- Lack ability to seal the cavity, this lead to microleakage.
B- Heat, lead to pain to the patient.
C- Lower strength.
It is a commercially available material which is based on thermoplastic synthetic polyester, barium sulfate, bismuth chlorate and a bioactive glass. It is claimed that the bioactive glass releases calcium and phosphate ions from its surface on exposure to bodily fluids stimulating bone growth. This material is also available in both tapered and pelleted forms for use with either cold or thermoplastic filling techniques.

4- **Sealants**

The purpose of a sealant is to fill the spaces between increments of the bulk fill material and to improve the quality of adaptation of the composite of sealant and bulk fill to the walls of the root canal to help to maintain the seal around the root filling.

There have been a number of dental cements adapted for this purpose including **glass ionomer**, **zinc oxide eugenol**, and **calcium hydroxide based products**. **Resins and dentine bonding agents** are also used as sealants with the polyester bulk fill materials.