POLTAVA STATE MEDICAL UNIVERSITY
THERAPEUTIC STOMATOLOGY PROPAEDEUTICS CHAIR

FILLING OF ROOT CANALS

Lecture for 2-nd year students
of international faculty

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Lecture plan

1. Classification of materials for filling of root canals.
2. Requirements to materials for filling of root canals.
3. Plastic hardenings materials: structure, advantages and lacks of various groups.
4. Plastic unhardenings materials : structure, the action mechanism, indications to application.
5. Primary hard materials. Gutta-percha.
6. Methods of filling root canals.

The historical stages of root canals filling

1879 - Adolf Witzel suggests to abandon pulp in a canal, preliminary saturating it with antiseptics (thymol, sublimate);
1890 - Forberg recommends the charred cotton wool for obturation;
1897 - R Baum for filling of canals offers gold, tin, rubber;
1898 - Bowman propagandizes widely gutta-percha for filling of root canals.

Classification of materials for filling of root canals

1. Plastic
   - unhardenings
   - hardenings
2. Primary hard

International systematization of materials

Sealers ("to seal" - to pressurize) - pressurizing materials, endohermetics;

Fillers ("to fill" – to stopple) – materials and agents, for stopping of root canal.

Unhardenings pastes are materials for the temporal filling of root canals.

Plastic hardenings materials (endohermetics or sealers)

1. Żinc - phosphate cements
2. Materials on the basis of zinc and eugenol
3. Materials on the basis of epoxide [epoxy] resin
4. Polymeric materials, containing calcium hydroxide
5. Glassionomer cements
6. Materials on the basis of resorcin-formalin
7. Materials on the basis of calcium phosphate
8. Materials on the base of the methacrylate resin

Requirements to materials for filling of root canals

Material must:

- not to cause the irritation of periodontal tissues;
- not to possess a toxic, allergen, mutagenic and carcinogenic action;
- to possess antiseptic and anti-inflammatory properties,
- promote regeneration of the pathologically changed periapecal tissues;
- easily be introduced into root canal;

Requirements to materials for filling of root canals

- possess slow hardening;
- be X-ray contrasted;
- not dissolve in root canal but resolve in periapecal tissues;
- after hardening material must form dense, homogeneous mass, not having pores;

Requirements to materials for filling of root canals

- if necessary be easy extracted from a canal;
- not paint (dye) tooth tissues;
- not to violate adhesion, regional adjoining and hardening of permanent filling materials;
- to be moisture-resistant, unporous;

Zinc - phosphate cements

«Фосфат-цемент», «Adhesor», «Argil»

"+"

- Easily be introduced into the canal;
- low solubility in a tissue liquid;
- good adjoining to the walls of canal
- X-ray contrast;
- antimicrobial activity first 2 days.

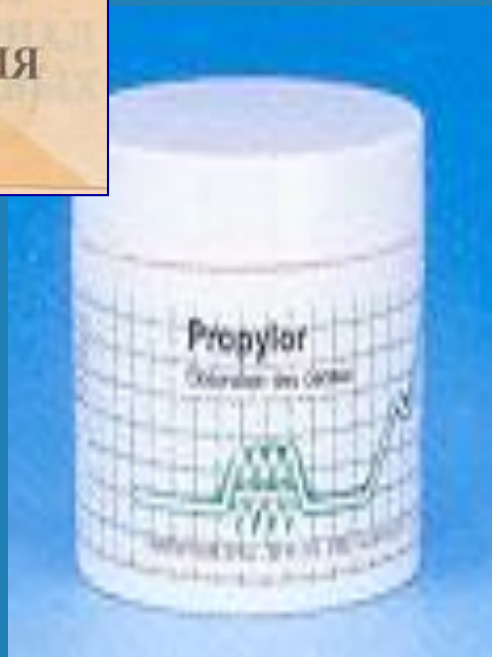
Zinc - phosphate cements

"-"

- rapid hardening (4-6 min) does not give a chance if necessary to introduce into canal more filling material;
- irritating operating on periodont with free phosphoric acid;
- If leaded out from apex does not resolve in periodont;
- complications if the filling be got out.

Therefore now this group of materials is applied seldom, only to bracing of metal pegs.

Zinc-oxide-eugenol cements and pastas (Cariosan, Endobtur, Эвгецент В и П Endometasone, Canasone, Esthesone)



Zinc-oxide-eugenol cements and pastas (Cariosan, Endobtur, Эвгецент В и П Endometasone, Canasone, Esthesone)

Composition:

zinc oxide - 4%, stabelitive resin - 27%, subcarbonate of Bismuth - 15%, barium sulfate - 15%, the waterless borate of sodium - 1%, eugenol (Procosol)

Medicines can be added: corticosteroids, antiseptics, diiodium thymol, paraformaldehyde

Zinc-oxide-eugenol cements and pastas

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- easily introduced and extracted from a canal;
- X-ray contrasted;
- optimum time of hardening;
- good adjoining to the walls;
- forms in a canal noncontracting mass;
- resolves in periapecal tissues;
- possesses an antiseptic and anti-inflammatory action;
- after hardening became biologically neutral

Zinc-oxide-eugenol cements and pastas "_"

- possibility toxic and allergen actions;
- probability of resorption of paste in a root canal;
- painting of the tooth crown;
- violation of composite materials hardening;
- group of materials with satisfactory clinical efficiency.

Materials on the basis of epoxide [epoxy] resin

Materials on the basis of epoxide [epoxy] resin

Ан-26, Ан Plus, Therma Seal, Topseal, Интрадонт

Composition : for example: Ан-26
Powder: threeoxide of Bismuth-60%, hexamethylene of threeamyne-25%, dioxide of titan-5%, powder of silver-10%
Liquid: a bisphenol diglycedilic ether

Materials on the basis of epoxide [epoxy] resin

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- good manipulation properties;
- long time of hardening;
- Inert to periodontal tissues;
- stability in a canal, stability to moisture;
- heat-resistance, that enables to work with a hot gutta-percha;
- X-ray contrast;
- plasticity;

Materials on the basis of epoxide [epoxy] resin

"_"

- Shrinkage during polymerization (about 2%);
- Possibility of violation of the regional adjoining is in the badly dried up canal;
- Relatively high cost.

Now it is the most applied materials.

Polymeric materials, containing calcium hydroxide (Endocal, Seal apex, Apexit, Biocalex)

Polymeric materials, containing calcium hydroxide

- Composition: polymeric substanses with addition of hydroxide of calcium.

«+»

- stimulate regenerative processes in tissues of periodont and bone;
- thermostable;
- X-ray contrasted;
- hardening in presence moisture.

Polymeric materials, containing calcium hydroxide "Kerr"

- High solubility of material and probability of resorption in a canal;
- quickly harden in a canal;
- it is necessary to apply only with posts.

Use at treatment of destructive forms of a periodontitis, cysts and cystogranulomas.

Glassionomer cements
Endion, Ketac-Endo, Стиодент

«+»

- Chemical adhesion to the dentine;
- High durability;
- Good manipulation properties;
- Minimum adsorption of moisture;
- Biocompatibility;
- Absence of shrinkage.

Glassionomer cements
Endion, Ketac-Endo, Стиодент

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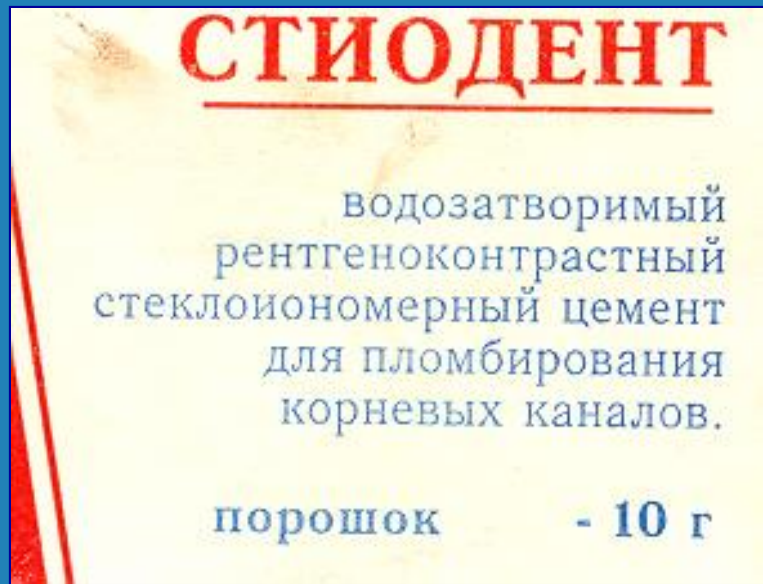
- difficulty of extracted from a canal;
- high water desorption during first hours



Materials on the basis of resorcin-formalin resin

Forfenan, Foredent, Endoform, Крезодент

«+»

- strong antiseptic action;
- disinfection of dentinal and delta-shaped tubules, the pulp rests;
- good manipulation properties.

Materials on the basis of resorcin-formalin resin «-»

- high toxicness of components;
- irritating action on peridontal tissues
- painting of tooth tissues in pink color.

It is applied only to a lateral teeth in a case:

- strongly infected, badly passable, bent root canals;
- impassable canals because of breakage of instruments;
- at devital amputating and combined metho

Materials on the basis of calcium phosphate

«Biocalex» «Spad», Франция

«Биопульп» «Chema», Польша

- ✓ They are in the stage of clinical tests;
- ✓ Represent phosphatic connections of calcium acid and alkaline nature;
- ✓ At mixing during time chemical reaction it is formed hydroxiapatite.

The experts of ADA acknowledged these materials most perspective

Materials on the basis of calcium phosphate

«+»

- good adhesion to the walls of canal;
- low solubility;
- solubility in acids (if to get off the filling);
- high biological compatibility;
- X-ray contrast equal to the bone and dentine.

Materials on the basis of the adhesive systems

New generation of materials which are in the stage of studing now.

Cyanoacrylates and isocyanates showed oneself well with dentinal adhesives and without them.

Plastic unhardenings materials

Unhardening pastas dissolve in the canal, do not provide a long reliable abjuration of apical aperture. They are effective enough as agents for temporary sealing of canals.

The plastic not hardening materials are divided on some groups:

1. Pasta on the basis of antibiotics and corticosteroid preparations
2. Pasta on the basis of Metronidazolum
3. Pasta on the basis of an admixture of antiseptics of long action
4. Pasta on a basis of hydroxide calcium

Pastas on the basis of antibiotics and corticosteroid

(Zedermix, Septomixine Forte, Pulpomixine, Fokalmin, Boots)

Usually in structure of these preparations include 2-3 antibiotics with a wide range of antibacterial and antifungal action. Other component of Pasta - corticosteroid, is more often Dexamethazonum, - is applied in such dosage, that reducing the inflammatory and allergic phenomena, does not influence thus protective reactions of a periodontium and organism as a whole. The third component - radiopaque excipient - allows to estimate quality of filling of the canal. These Pastas have strong, but short action, are brought into the canal for 3-7 days.

Pastas on the basis of Metronidazolum (Grinasol)

They are intended for temporary sealing strongly infective canals of roots of teeth, is especial when it is possible to expect prevalence in them of an unaerobic microflora (at a gangrenous pulpitis, acute and chronic periodontitis). They allow even acute periodontitis to treat at the tightly closed pulp cavity.

- Pasta on the basis of Metronidazolum is entered in the canal with the help of root filler, on an ostium of the canal the sterile wadded globule is imposed, and the tooth is tightly closed by a bandage. It is necessary to mean, that Pastas are intended for active treatment, therefore it change in the canal daily, before complete disappearance of all signs of disease.

Pastas on the basis of antiseptics of long action (Октенисепт, Цидипол, Мирамистин)

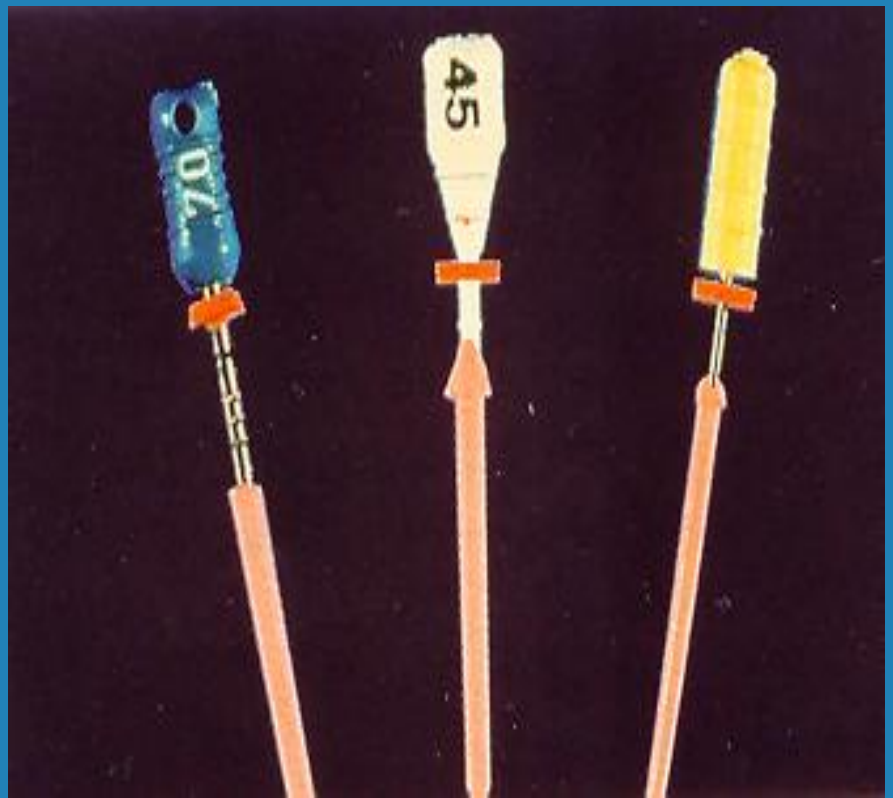
- In structure of preparations of this group, as a rule, include strong antiseptics: Thymolum, creosote, Iodoformium, Camphora, Mentholum etc. – “Tempofor” (Septodont).
- These Pastas radiopaque, do not harden, are slowly dissolved in canals. They are applied to temporary sealing of canals at the adult at treatment of pulpitis and periodontitis, at the endodontic treatment of deciduous teeth, including with resorbtive roots.

Pastas on a basis of Calcium hydroxidum (Calasept, Endocal)

- Thanking of alkaline reaction (pH about 12) Calcium hydroxide at filling by it of the root canal renders bactericidal action, blasts of a necrotic tissue, stimulates of osteo-, dentino-, and cementogenesis. The application of these Pastas is shown at treatment of the destructive forms of periodontitis and radicular cysts.
- Pasta in the canal is replaced with a new portion in 6 weeks after the first introduction, and then once per 2 months up to achievement of desirable result.

Primary hard materials

Posts (fillers) - silver, titanic, fiberglass, plastic, gutta-percha.



Gutta-percha (alpha and beta)

- It is the coagulated and specially processed latex received from juice of tree Manilkara bidentata.

Alpha - sticky, fluid mass, softened at low temperature;

Beta - the elastic form, it is used for manufacturing of pegs.

Gutta-percha

Structure of mass for manufacturing of pins:

- ß- gutta-percha - *20%*
- zinc oxide - 60 -70%
- beeswax or resin -1- 4%
- sulfates of metals -1,5-17,3%
- biological dyes
- antioxidants

Gutta-percha

- Advantages of gutta-percha posts:

- plasticity
- non-toxicity
- chemical inactivity
- absence of shrinkage
- reliability of obturation
- X-ray contrasted

Methods of filling root canals

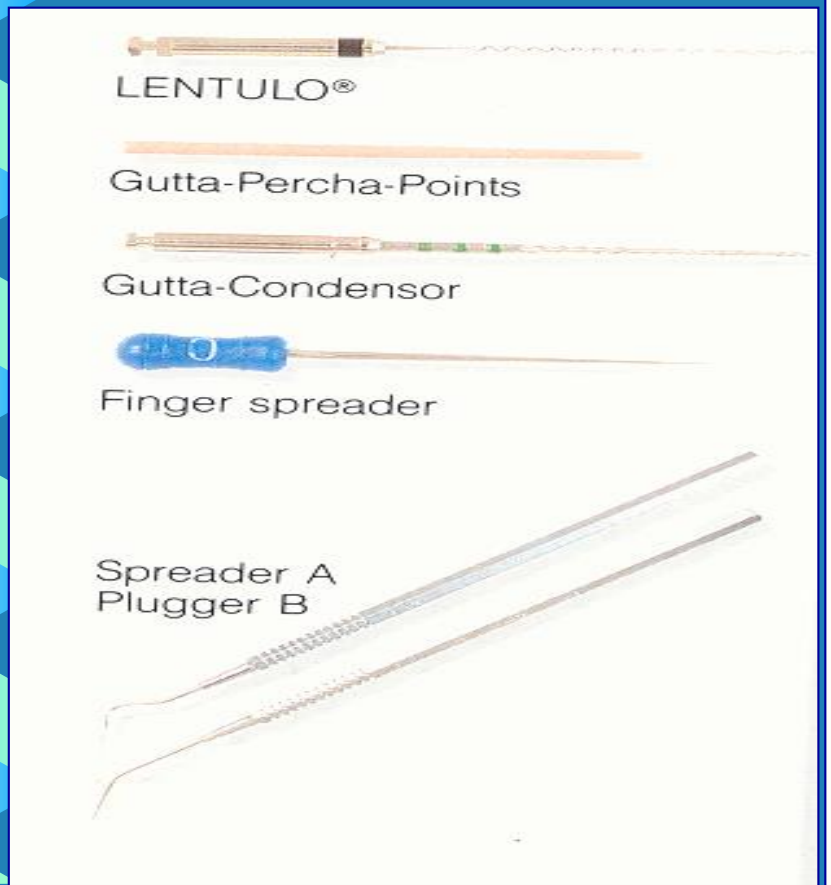
1. Obturation of canal with only sealer
2. Obturation with cold gutta-percha posts:
    a) method of one post;
    b) lateral condensation and its variations
3. Obturation with chemically plastificated gutta-percha

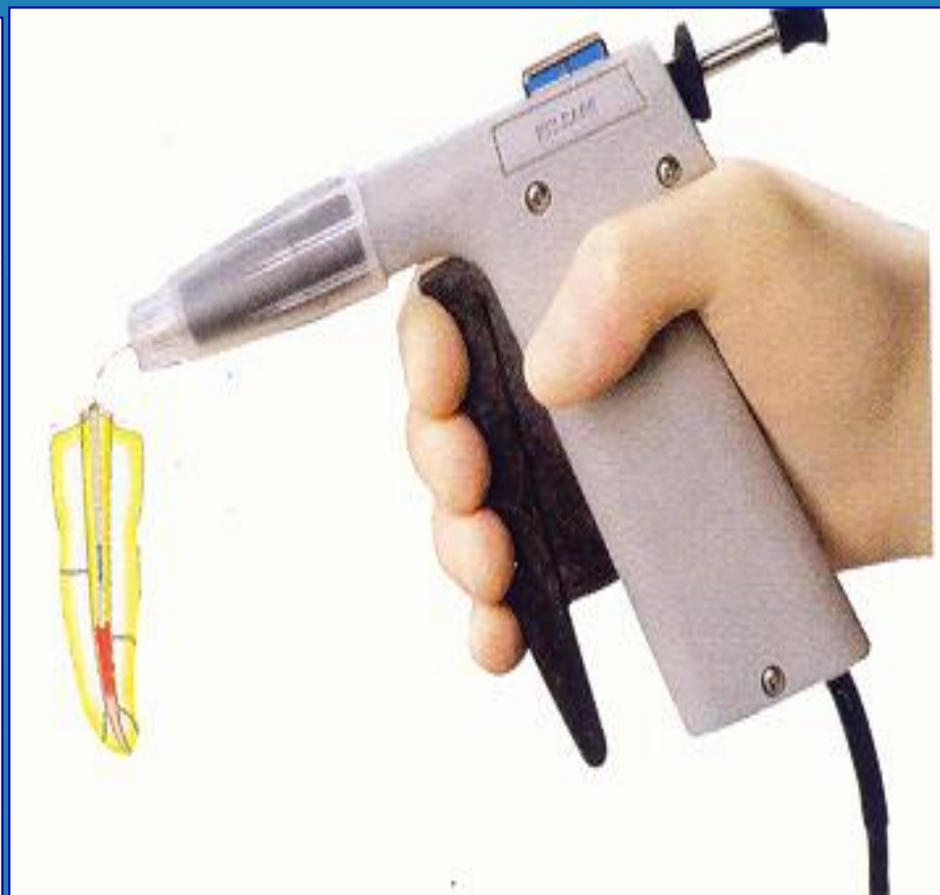
Methods of filling root canals

4. Obturation with a warmed-up gutta-percha:
    a) vertical condensation
    b) by the fragmented gutta-percha
    c) lateral-vertical condensation
    d) thermomechanical condensation
5. Obturation with the thermoplastificated gutta-percha:
    a) syringe injection or system of Ul'trafil
    b) bringing on hard core - (Termafil)

Methods of filling root canals

- Instruments for filling





Methods of filling root canals

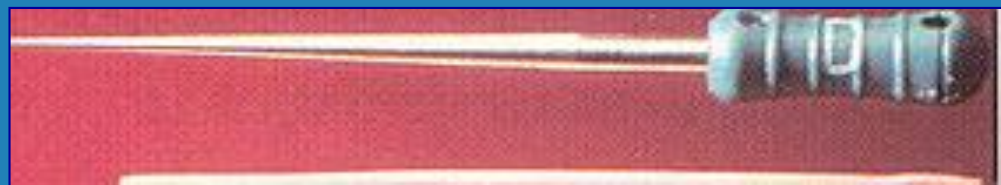
Method of one post - after bringing in of sealer, gutta-percha, silver or titanic posts is entered in a canal

Failings: insufficient obturation of canal; Resorption of sealler.

Methods of filling root canals

Method of lateral condensation -
a root-canal is densely filled by posts in combination with hardening paste.

A method is effective, gives little complications, but difficult in application, lateral condenser is needed (spreader).



Methods of filling root canals

- Obturation with chemically plastificated gutta-percha

Dissolution of gutta-percha post tag by a chloroform or eucalyptus butter, coverage with sealer, and then entering of it into a canal. The softened gutta-percha fills the branches of canal.

Methods of filling root canals

Vertical condensation of gutta-percha - in opinion of author of method Shil'dera there must be a maximal amount of gutta-percha and minimum sealer in a canal . After entering of post the special instruments (plugers) warm up a gutta-percha in a canal and make more compact it. It densely obturates canal.

Methods of filling root canals

Obturation with warmed-up fragmented gutta-percha.

- A method is offered by Vebster in 1911y. and named «Chicago-technique». Essence of method in bringing and condensation of small pieces warmed-up or cut-in in a chloroform gutta-perchas.

Methods of filling root canals

Thermomechanical condensation

- Me Spadden is offered in 1979y.

A method is based on softening influence of gutta-percha under act of heat. Special instrument (gutta-condensor) at a rotation at speed about 8-10 thous. rev/min warms up a gutta-percha and it fills canals.

A gutta-percha can be warmed up by an ultrasound, affecting file, placed in a canal, but without cooling.

Methods of filling root canals

Thermoplastic syringe injection

A method is offered in 1977г. Warmed-up in the special syringe gutta-percha to 160 degrees through a needle are entered in a canal.

A needle is not entered to apex on 3-5 мм.

After injection of the first portion a gutta-percha would be made more compact with plugger. Then enter next portions.

Alike the system of Ultrafil is, where gutta-percha is in canulas and heated by a heater

Methods of filling root canals

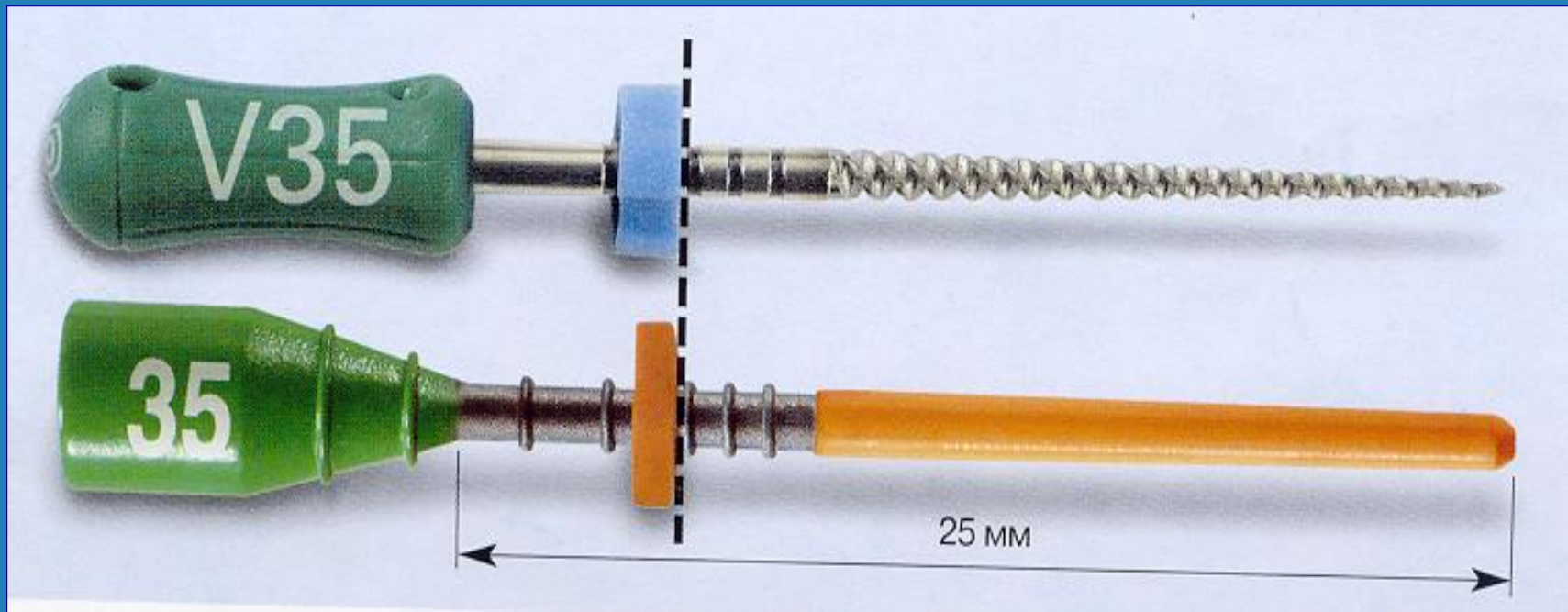
- Filling of canals with Thermafil

Stages of root canals filling with Thermafil

Calibration of canal with the use of verifier

Stages of root canals filling with Thermafil

Choice of obturator, proper to verifier and setting of working length

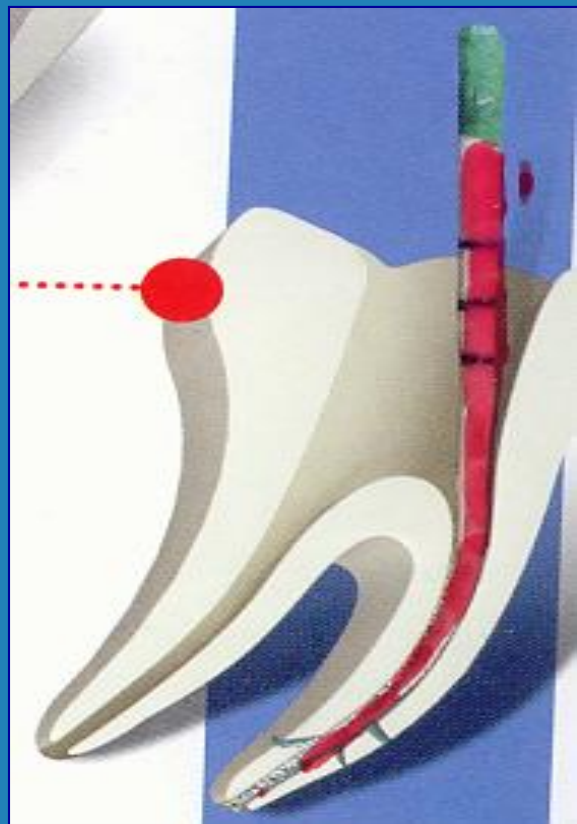


Stages of root canals filling with Thermafil

- Heating of obturator in stove ThermaPrep Plus

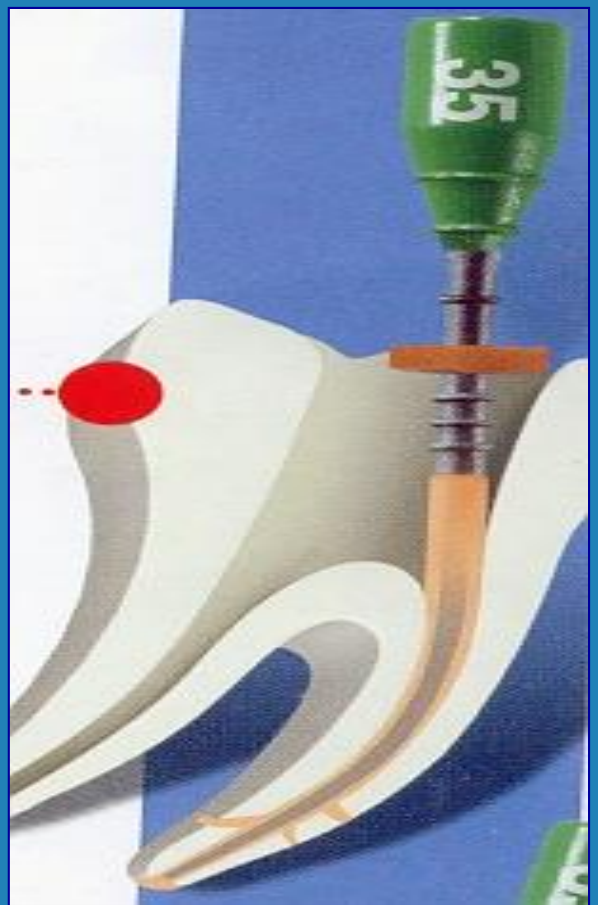
Stages of root canals filling with Thermafil

- Drying of canal, bringing in of sealler



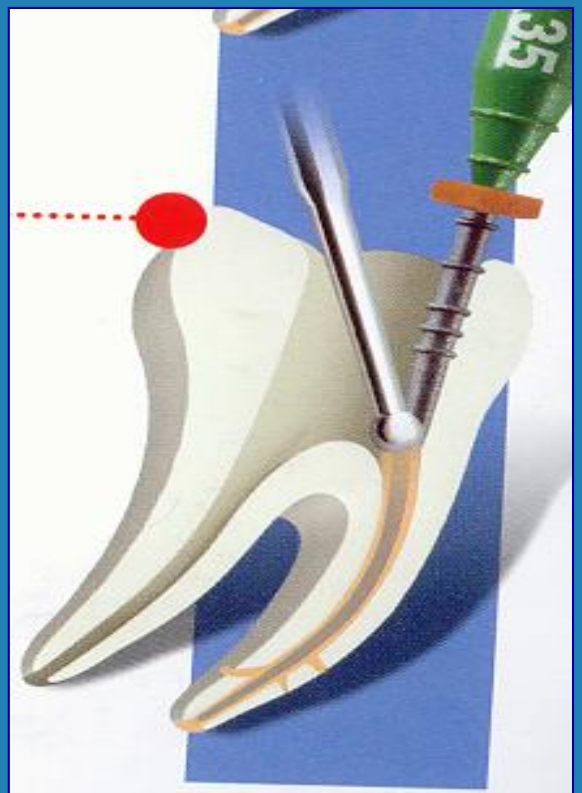
Stages of root canals filling with Thermafil

- Obturation of root canal

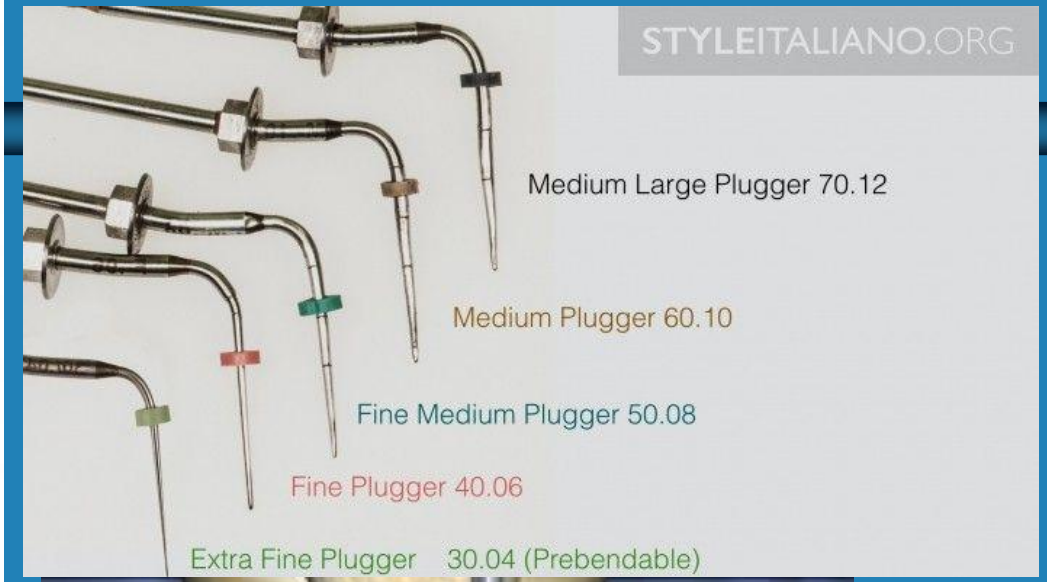


Stages of root canals filling with Thermafil

- Cutting away of bar and handle, delete of surplus of gutta-percha



Continuous wave thechnique



Continuous wave thechnique

a)

Fig. 1. Up-to-dated electronic devices for root canal obturation with warm gutta-percha using the continuous wave technique:

a – cordless electric devices for filling root canals with warm gutta-percha, equipped with functions of LED working area highlighting, plugger vibration and intraradicular irrigation solution activation GuttaEst-V (L) and extruder for filling root canal with warm gutta-percha GuttaFill (GeoSoft Dent);

b)

b – electric device for hybrid technique of root canal obturation with methods of vertical condensation and injection of warm gutta-percha (Dentsply);


Thanks for attention!

Recommended literature