

Restorative dentistry 3rd year
Lecture 1 repetition

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Preparation of dental caries (cavity preparation)

- Instrumental treatment that removes dental caries
- The rest of the tooth must be restorable with filling materials
- The rest of the tooth as well as the filling must be resistant against occlusal forces
- The risk of secondary caries must be minimized

Step by step procedure

Access to the cavity

Preparation of cavosurface margin and

Extention for prevention

Retention of the filling

Resistance of the restored tooth

Excavation of carious dentin

Finishing of the walls

Final control (light, mirror, magnification)

Basic rules

Access to the cavity

Preparation through the hard dental tissues

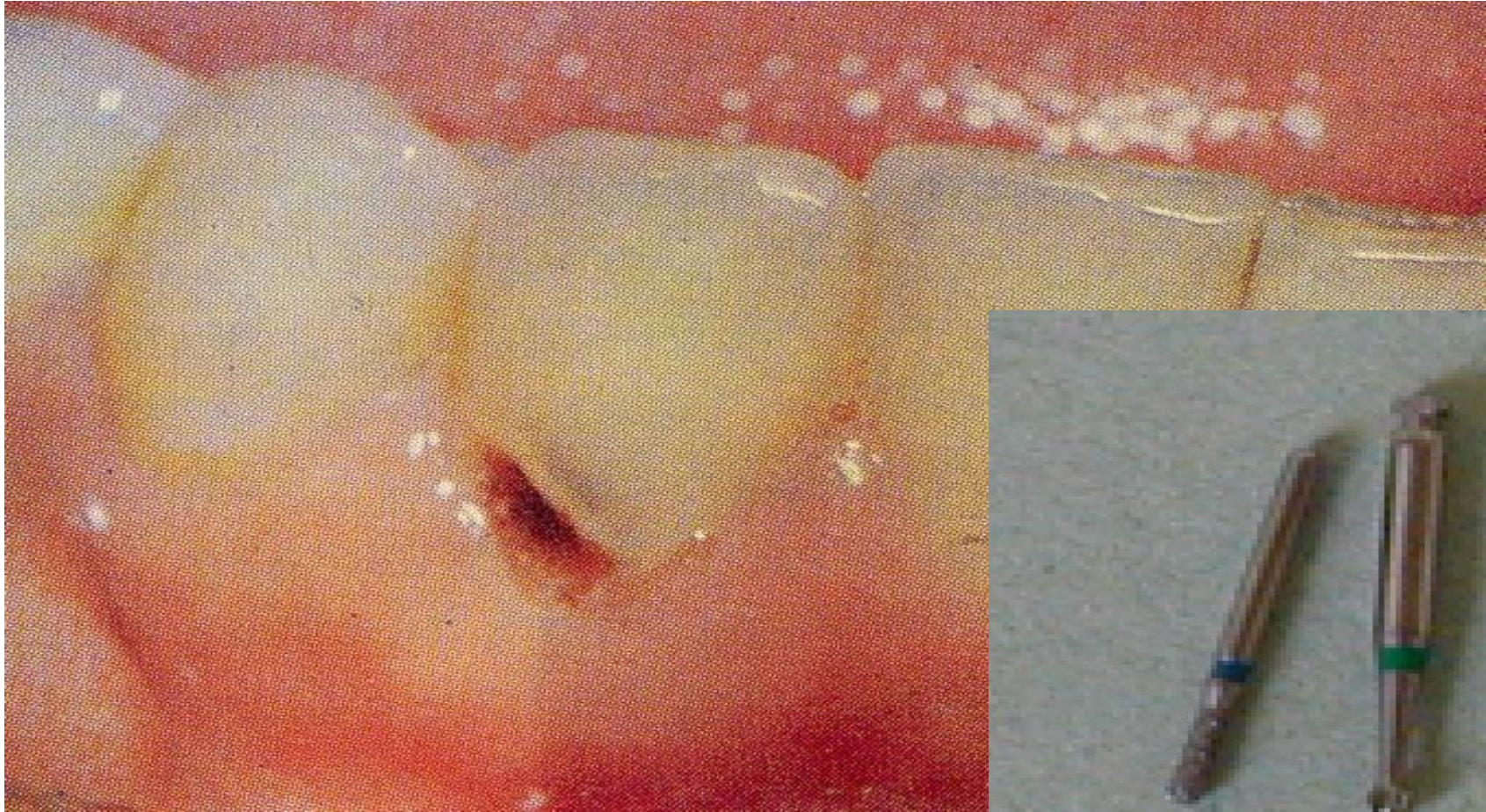
Removal the undermined enamel

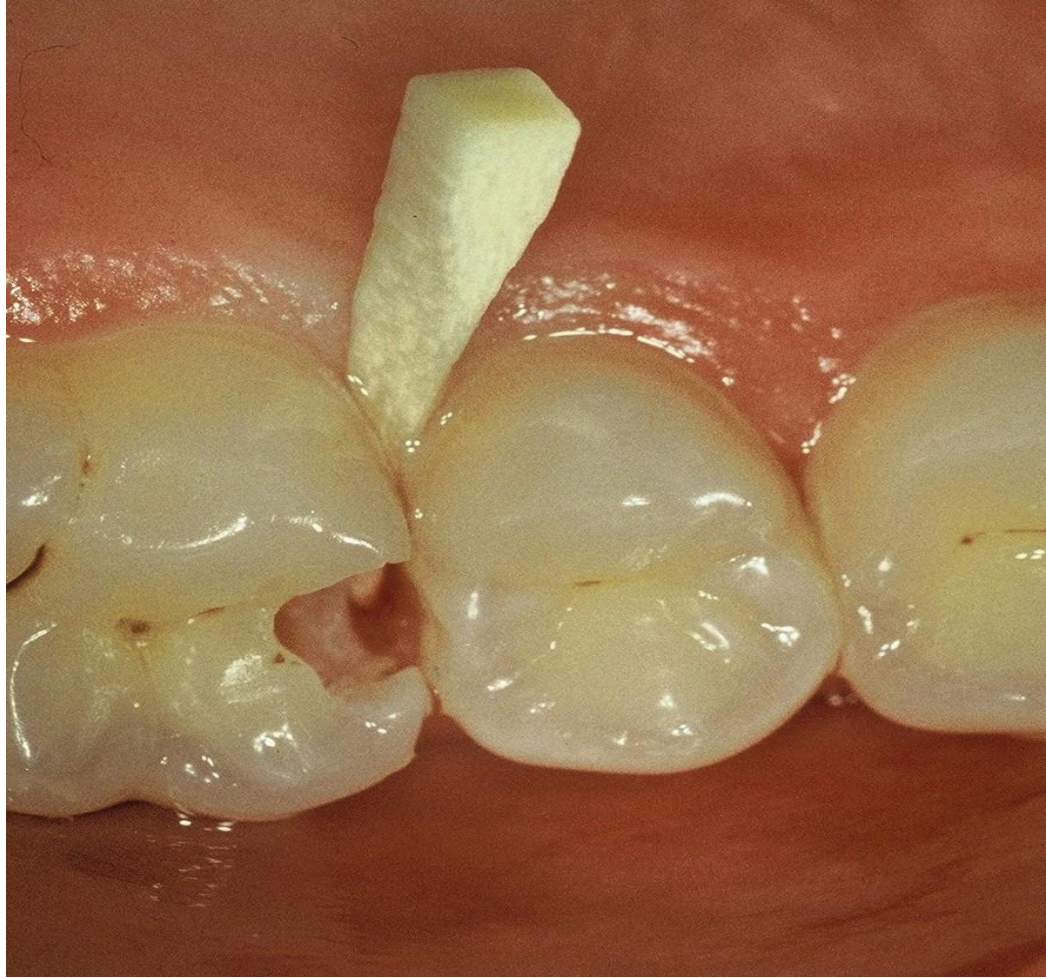
Separation of teeth

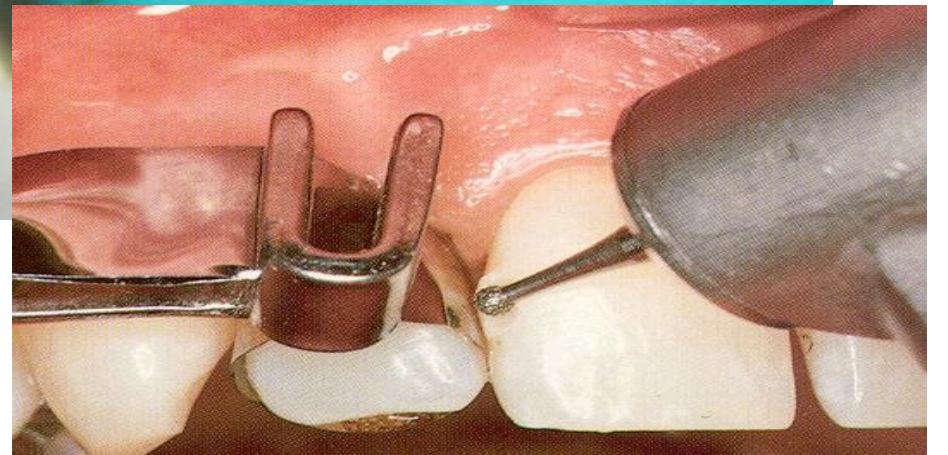
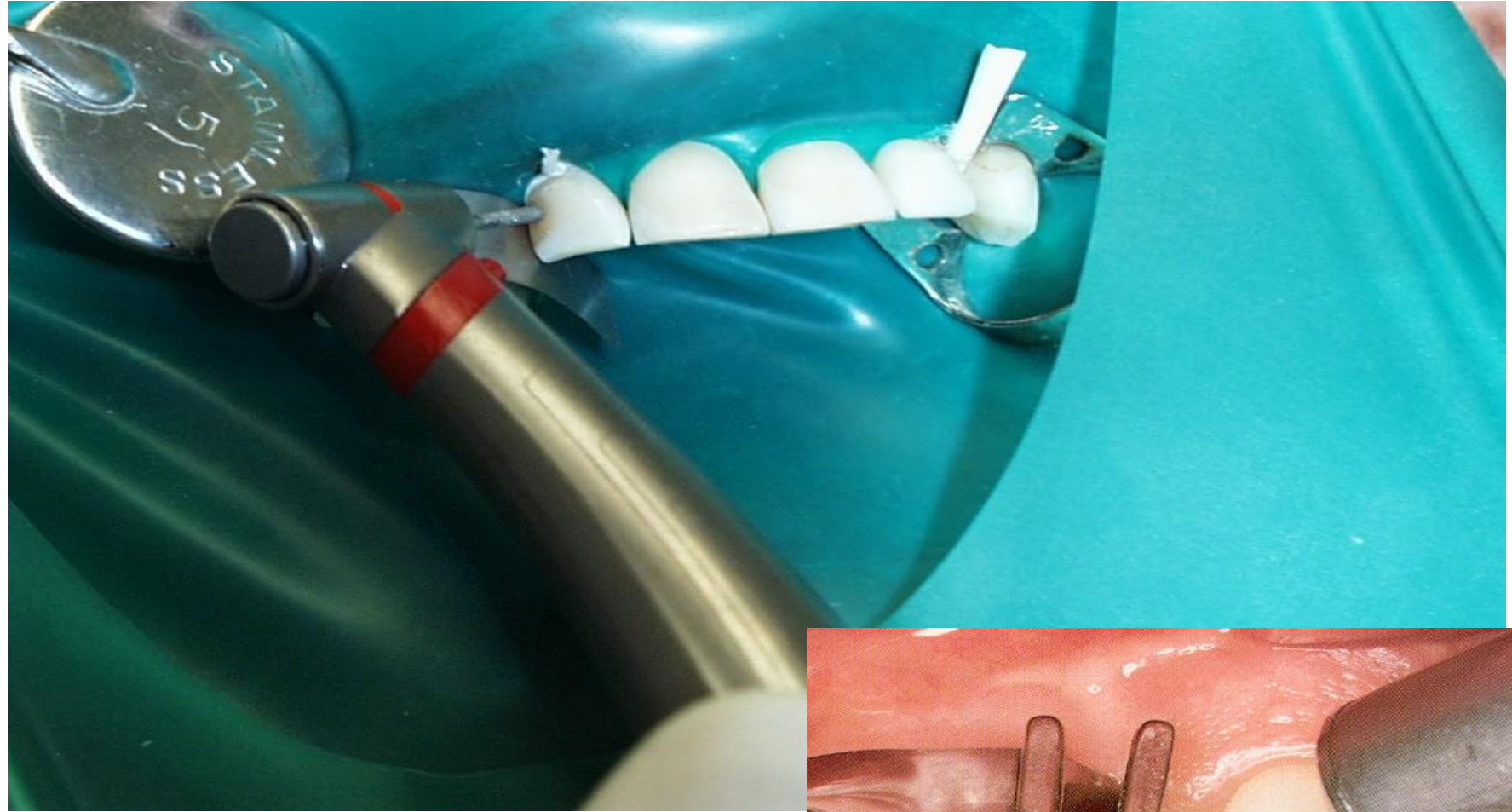
Separation or removal of gingiva



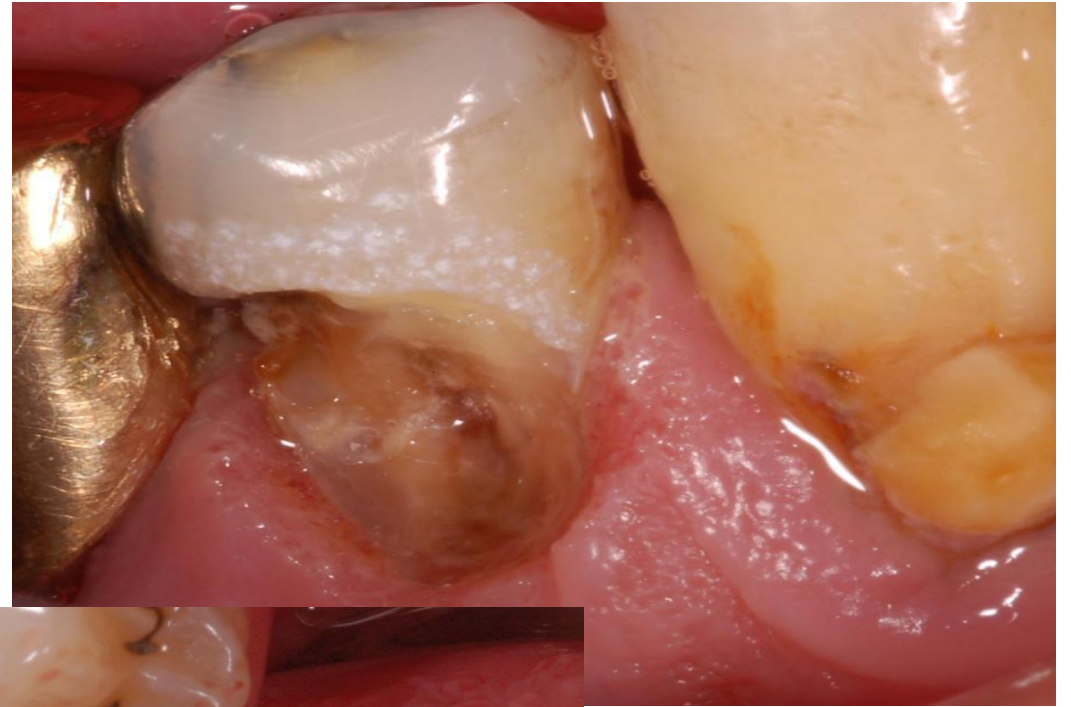








Old filling is being removed



Basic rules

Preparation of cavity borders and **extention**
for prevention (Cavosurface margin)

Depends on

Dental material

Oral hygiene

Precautions of secondary caries

Basic rules

Retention of the filling

Precautions of its lost

Macromechanical retention - amalgam

Micromechanical retention - composites

Chemical retention - glassionomers

Basic rules

Resistance of the restored tooth

Against occlusal and other forces

Depends on

- *Material*
- *Individual occlusal forces*

Basic rules

Excavation of carious dentin

Necessary (risk of recurrent caries)

Ball shaped (spheric) bur - slow speed (3000 rpm)

or

Excavator (hand instrument)

Basic rules

Finishing of the walls

Depends on the kind of material

- *Bevel or without bevel*
- *Fine diamond bur*

Basic rules

Final control

Direct or indirect view

Good illumination

Magnification

Preparation

- Hand

Excavator, cleaver

- Power driven

Burs, diamonds

Chisel – for enamel Cleaver



Chisel for enamel



Excavator



Instruments for cavity preparation

Power driven (powered) instruments for cutting

- Rotary instruments

Comon design characteristics



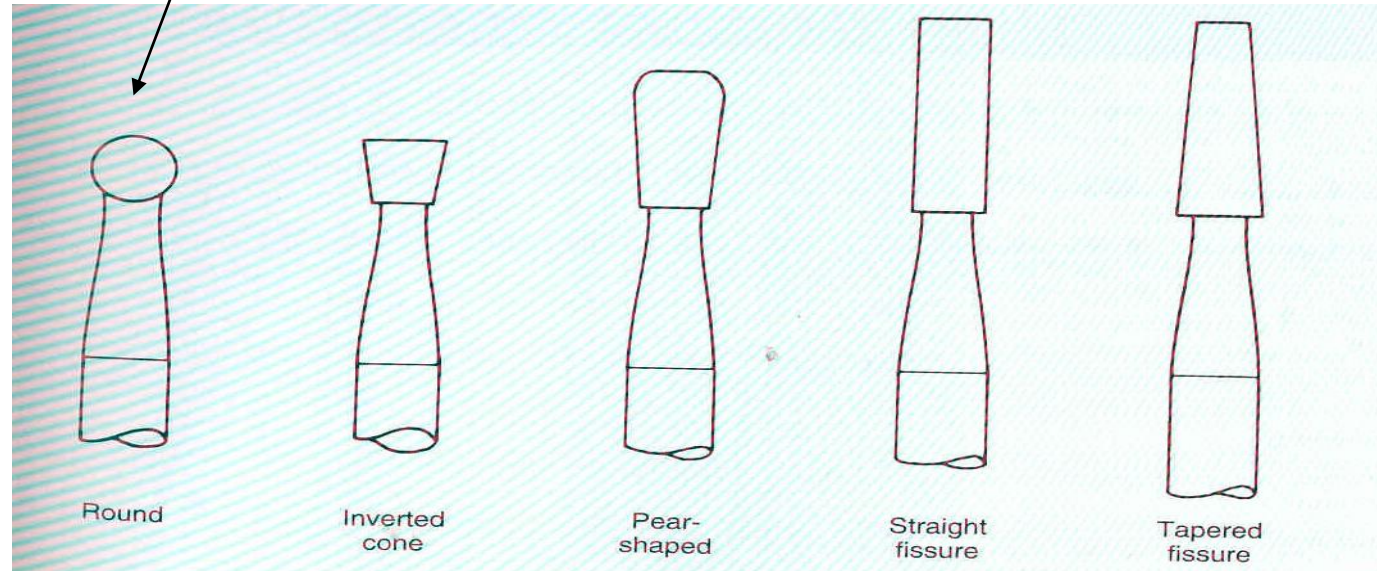
Cutting instruments - burs

Steel

Tungsten carbide

Cutting instruments – burs head shapes

Round (ball shaped)

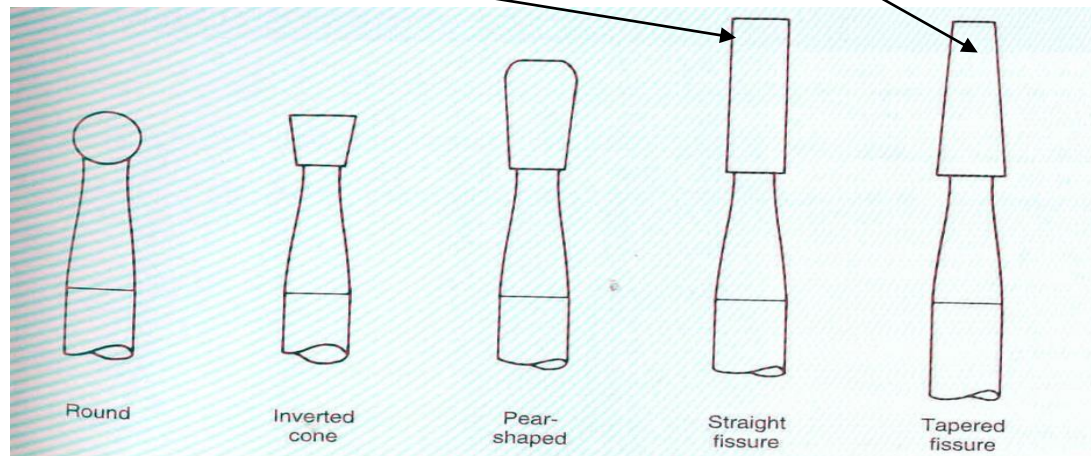


Cutting instruments – burs head shapes

Fissure with flat end

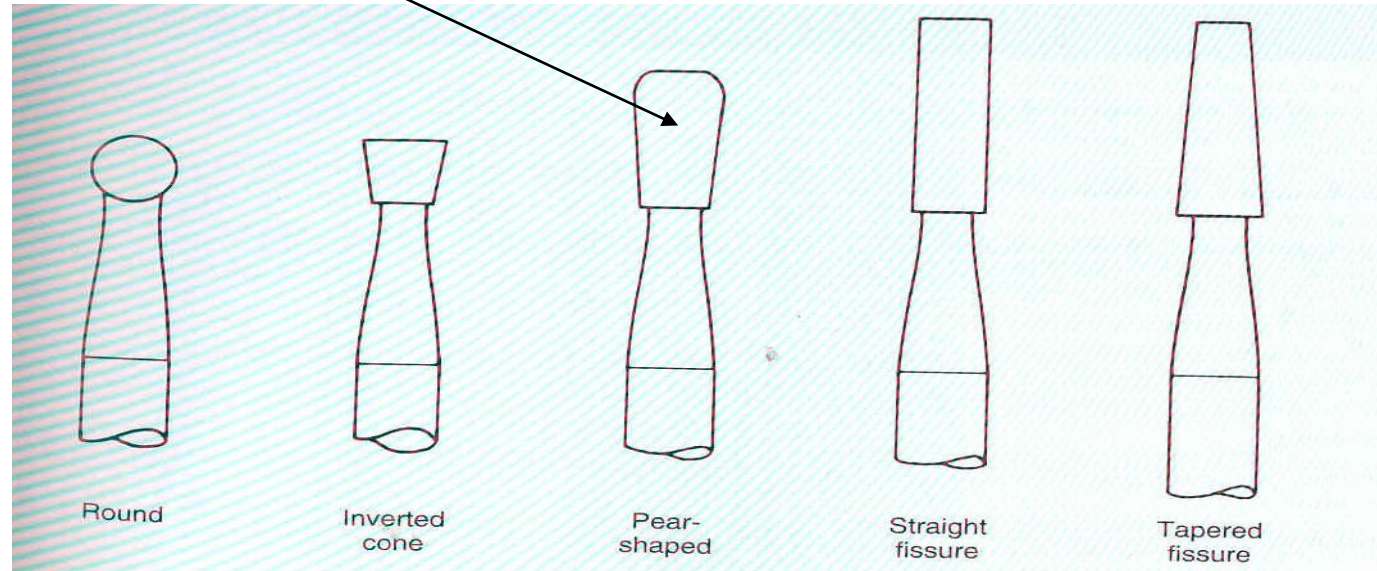
Fissure with pointed end

Straight or tapered form



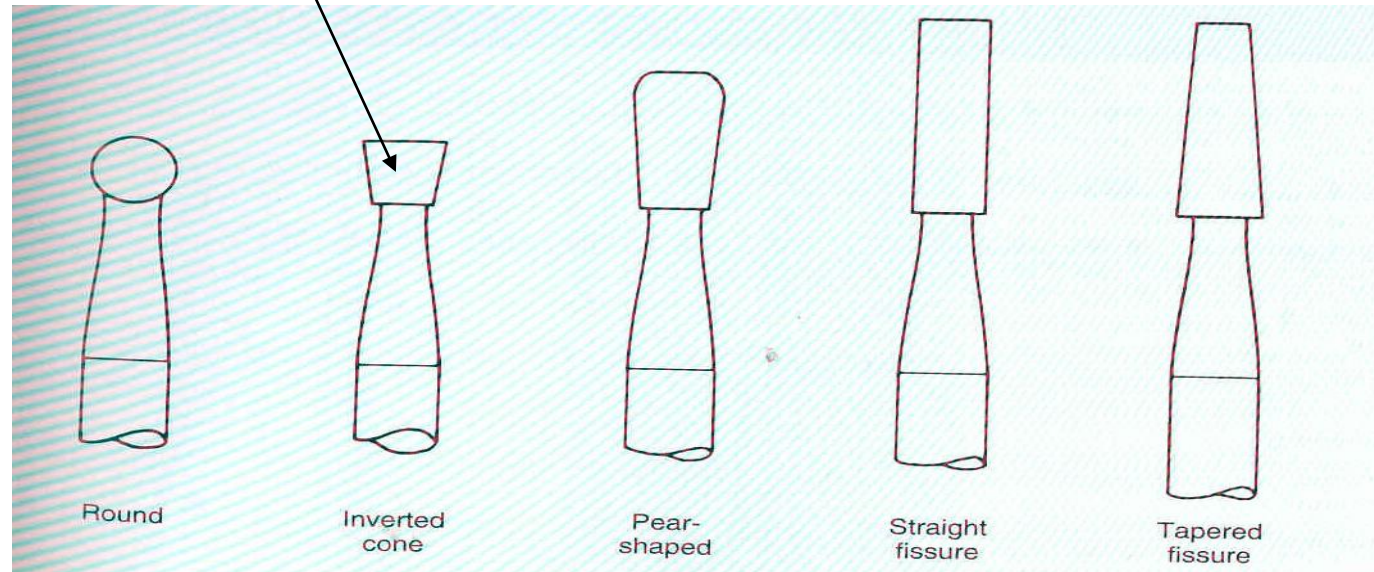
Cutting instruments – burs head shapes

Pear



Cutting instruments – burs head shapes

Inverted conus



Cutting instruments – diamonds

Extra coarse – black

Coarse – green

Standard – blue or without any marker

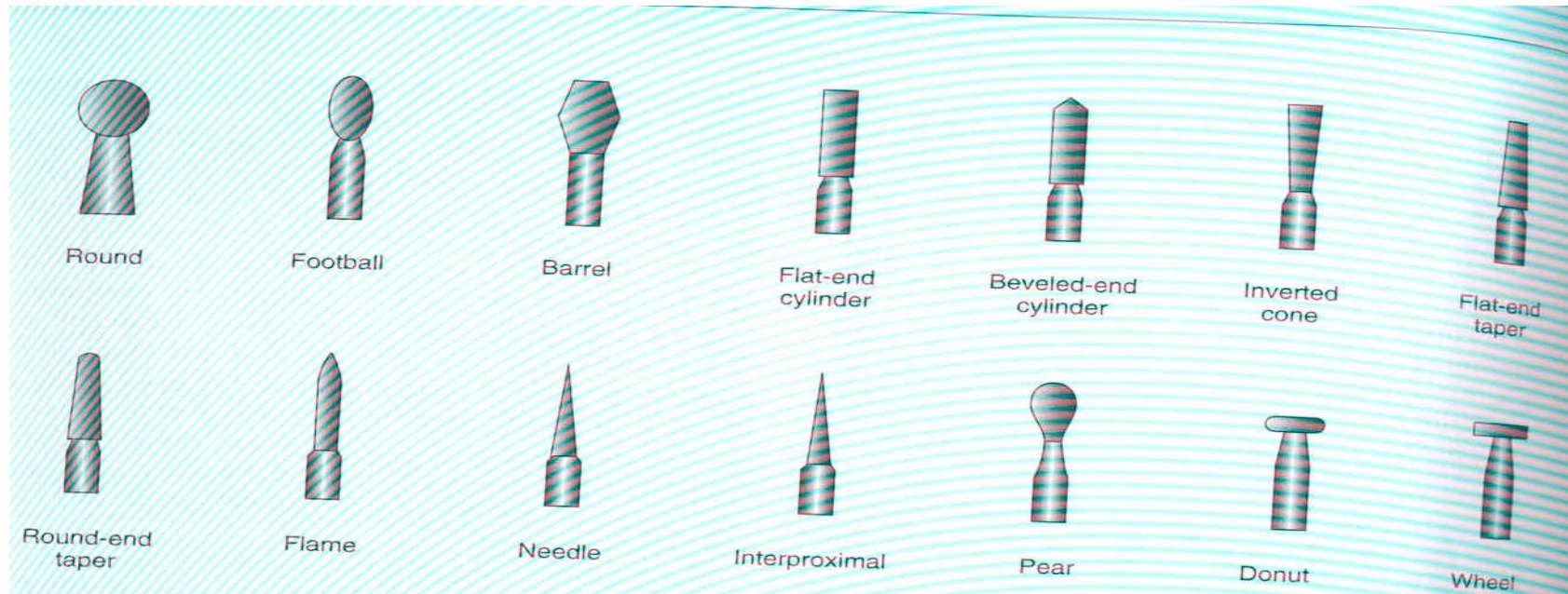
Fine - red

Extra fine - yellow

Ultrafine - white

Cutting instruments – diamonds head shape

- Ball, pear, cylinder,taper,flame, torpedo, lens and others.....



Hazards with cutting instruments

Pulpal precautions

Soft tissue precautions

Eye precautions

Ear precautions

Inhalation precautions

Filling materials

- Temporary
- Definitive, permanent

Temporary filling materials

- Zinkoxidsulphate cement and one component derivatives
- Zinkoxidphosphate cement
- Zinkoxideugenol cement
- Polymer based materials
- Guttapercha

Permanent filling materials

Amalgam

Composites

Glasionomers

M U N I
M E D

Amalgam

Amalgam

Metal-like restorative material composed of silver-tin-copper alloy and mercury.

Types of amalgam restorative materials

Low – Copper Amalgam (5% or less copper)

Composition – wt%

| | |
|--------|-----------|
| Silver | 63 - 70 % |
| Tin | 26 – 28 % |
| Copper | 2 - 5% |
| Zinc | 0 - 2% |

Types of amalgam restorative materials

High – Copper Amalgam (13% - 30%)

copper

Composition – wt%

| | |
|--------|-----------|
| Silver | 40 - 70 % |
| Tin | 26 – 30 % |
| Copper | 2 - 30% |
| Zinc | 0 - 2% |

Particles of the alloy

- ✓ Irregularly shaped (filings - lathe cut)
- ✓ Microspheres
- ✓ Combination of the two.

Particles shape

High – Copper Amalgam

Microspheres of the same composition
(unicompositional)

Mixture of irregular and spherical particles of
different or the same composition (admixed)

Production of irregular particles

Metal ingredients heated, protected from oxidation, melted and poured into a mold to form an ingot.

Phases of the alloy: (intermetallic compounds)



Production of irregular particles

cooled slowly

Ingot heated at 400°C (6 – 8 hours)
(homogeneous distribution of Ag₃Sn)

Ingot cut on the lathe, particles passed through a fine sieve
and ball milled to form the proper particle size.

Aging of particles (60 - 100°C, 6 – 8 hours)

Particle size: 60 – 120 μm in length
10 – 70 μm in width
10 – 35 μm in thickness

Production of irregular particles

Molten alloy is spraying into water under high pressure



Irregularly shaped high-copper particles

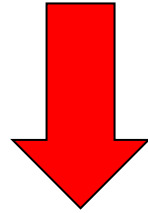
Production of spherical particles

Molten alloy is spraying under high pressure of inert gas through a fine crack in a crucible into a large chamber

Diameter of the spheres: 2 – 43 μm

Amalgamation processes

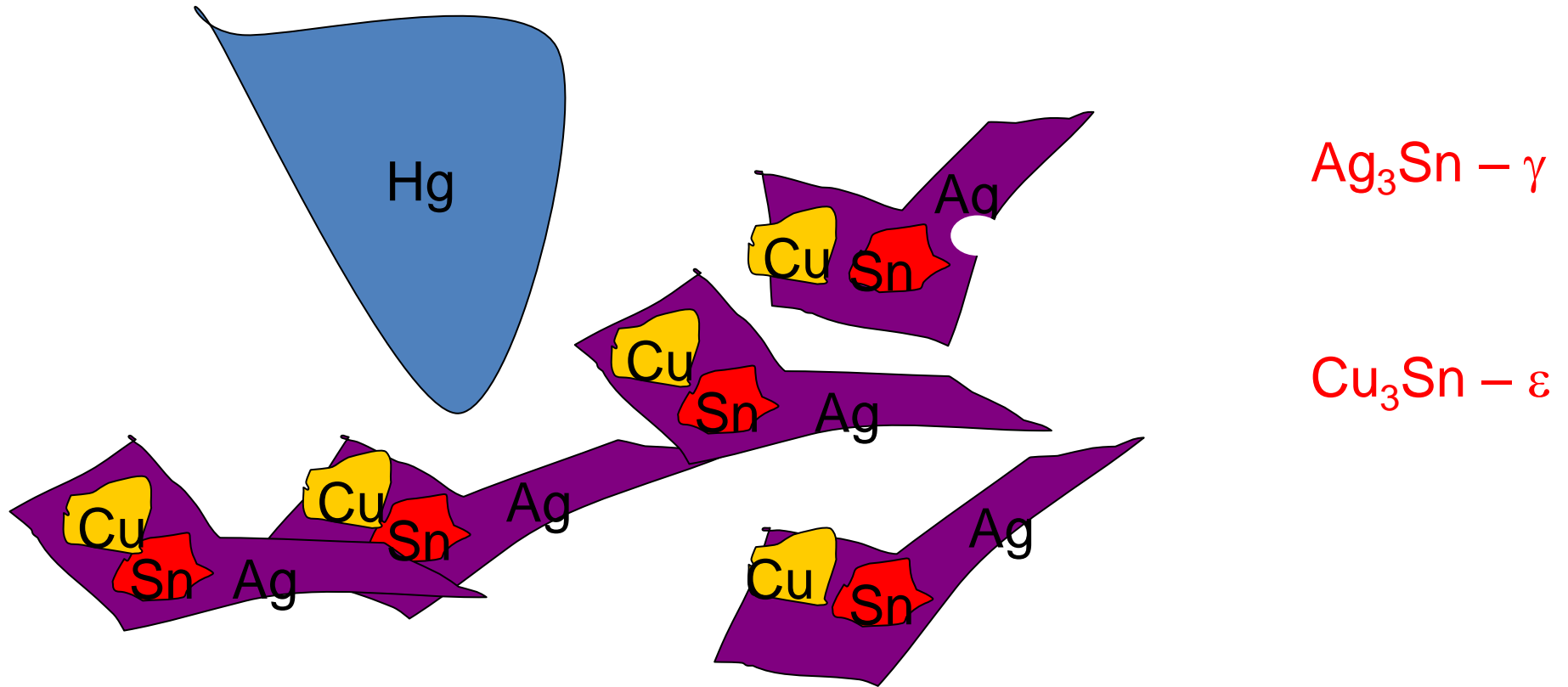
alloy is mixed with pure mercury



Trituration

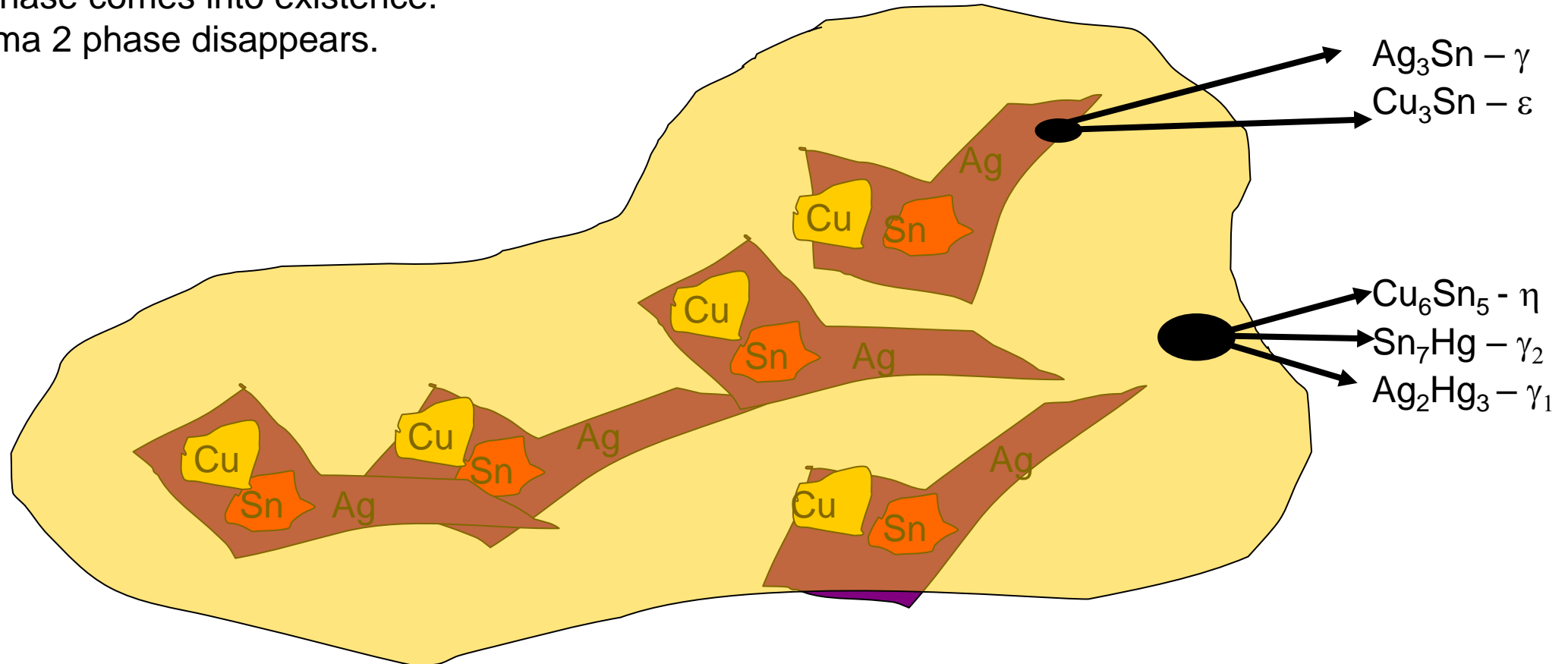
Amalgamation processes

Intermetallic compounds



Amalgamation processes

High copper amalgam – copper dissolved in mercury has high reaction affinity to tin that is also dissolved in mercury. It reacts with tin in gamma2 phase and eta phase comes into existence. The gamma 2 phase disappears.



Setting of low copper amalgam

Principle of setting is crystallization

Structure of the amalgam filling

Ag-Hg: gamma 1

Sn-Hg: gamma 2

} These phases crystallized –
become hard

Gamma phase (Ag-Sn) does not dissolve
completely – remains in the structure

Risks of the gamma 2 phase

- Non stable
- Tin is released due to electrogalvanism in oral cavity and mercury from this phase reacts with remaining gamma phase.
- This is external electrochemical corrosion.

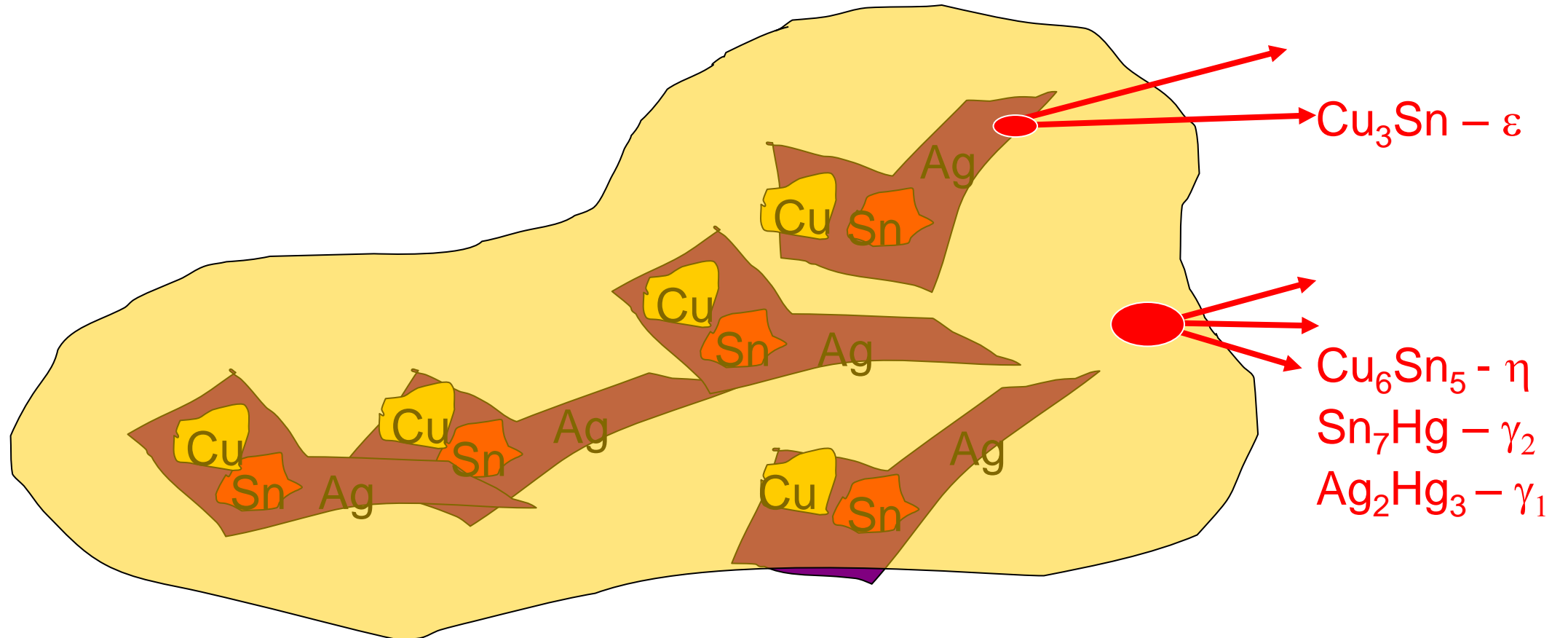
Low copper amalgam has worse mechanical and corrosion resistance than high copper amalgam

High copper amalgam

- Content of copper increased: 12 – 13%
(Less tin)
- Or up to 25% (Less tin and silver)

Better mechanical and corrosion resistance

Amalgamation processes



Gamma two disappears or it does not occur when content of copper is high

Amalgam - properties

Amalgam

- **Wear and pressure resistance (2mm thickness at least)- brittleness**
- **Easy handling**
- **Low price**
- **Thermal and electrical conductivity**
- **Corrosion**
- **Bad aesthetics**
- **Flow (deformation of not completely set amalgam if the filling is loaded)**
- **Creep – completely set amalgam can be deformed due to bite forces. The filling is principally hammered.**

Biocompatibility

- More than 160 years, more than 200 millions Ag fillings every year in USA.
- Allergy rare
- Precautions in children and in pregnancy.

AMALGAM IS STILL A MATERIAL OF CHOICE

Toxicity

■ Organic compounds

Vapours, aerosol

Precautions

- Ventilation
- Rests of amalgam in water
- Amalgam separators
- Dangerous waste (180 110)

Amalgam indications

- Posterior area
- I. a II. class : moderate or large cavities,
- V. class

Other factors for consideration

When oral hygiene is not excellent

When patient wants low cost filling.

Contraindications of amalgam

Indications

- Moderate and large cavities in posterior area (class I., II. V)

Contraindications

Fillings in frontal area

Pregnancy, children till the age of 15

Allergy

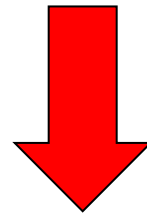
Other factors for consideration

When oral hygiene is not excellent

When patient wants low cost filling.

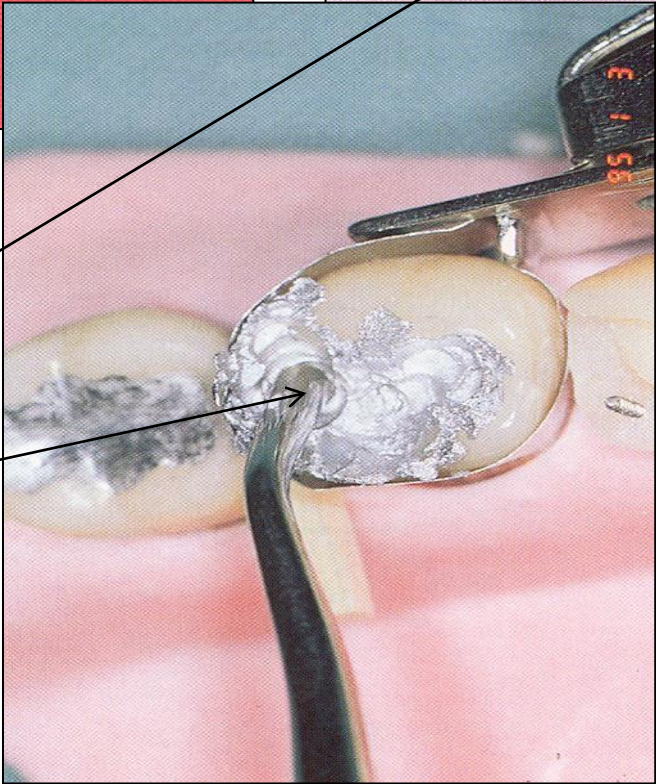
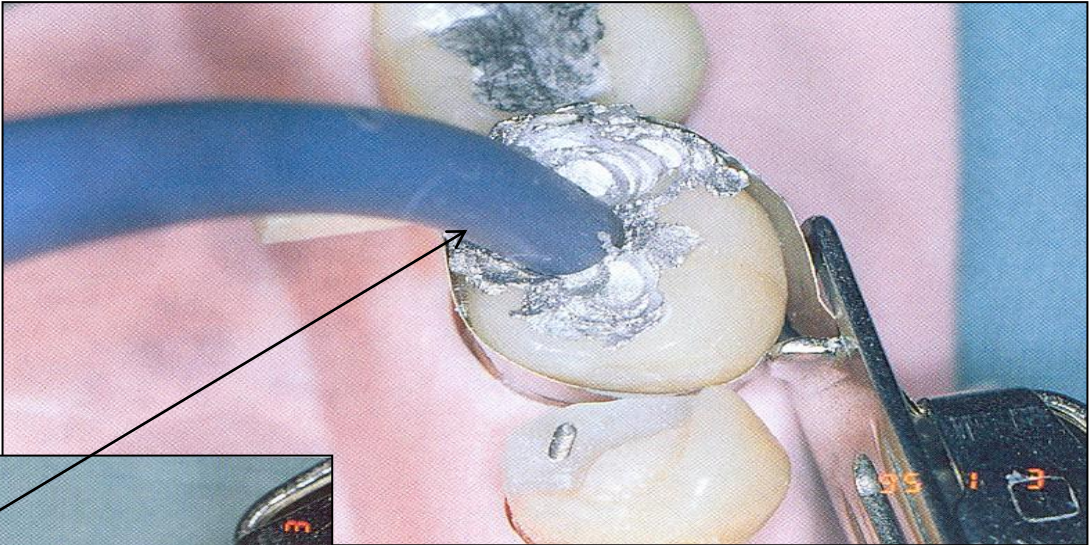
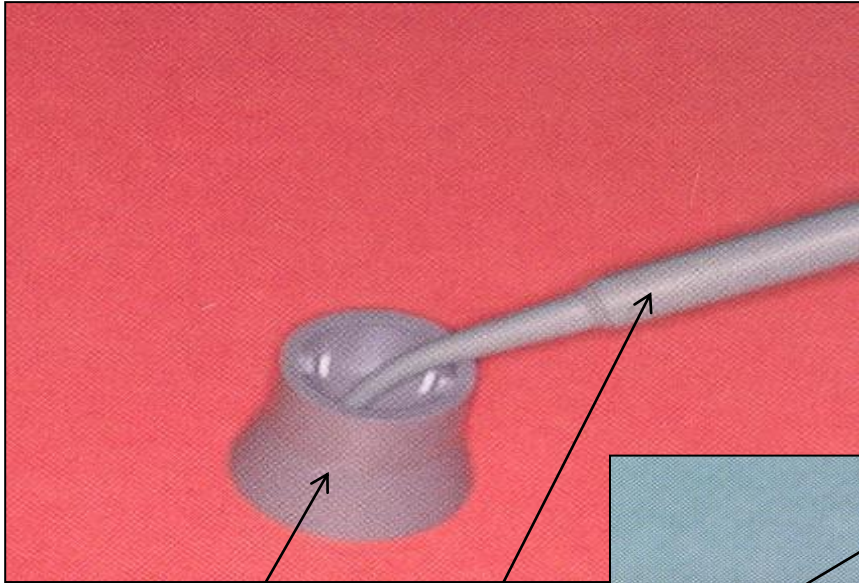
Mixing of amalgam

- **Hand mixing (obsolete)**
- **Power driven trituration**



Amalgamators

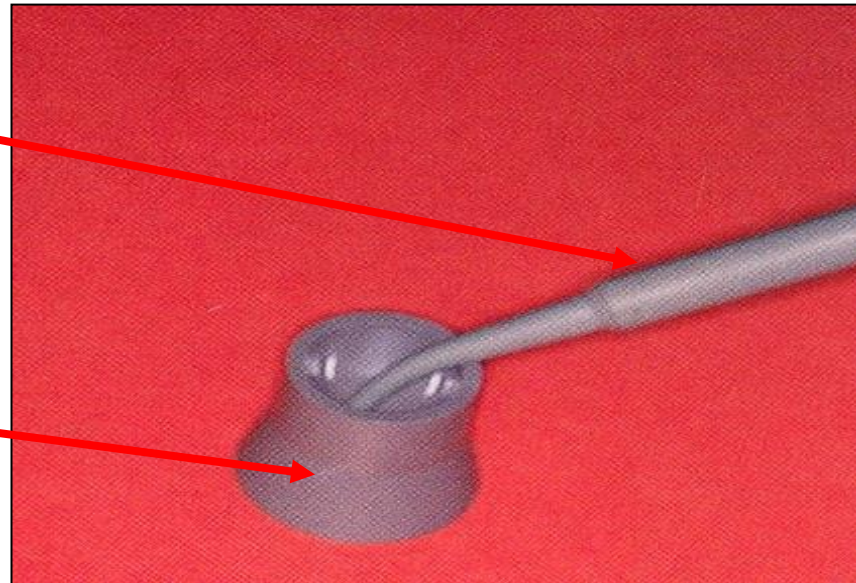


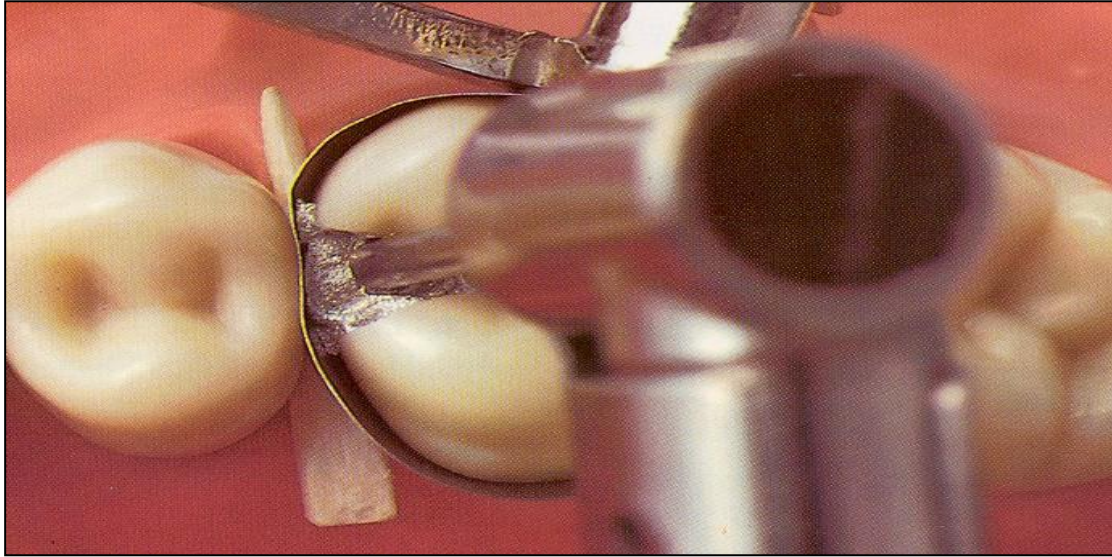


Cup
Amalgam gun
Condensor

Amalgam gun

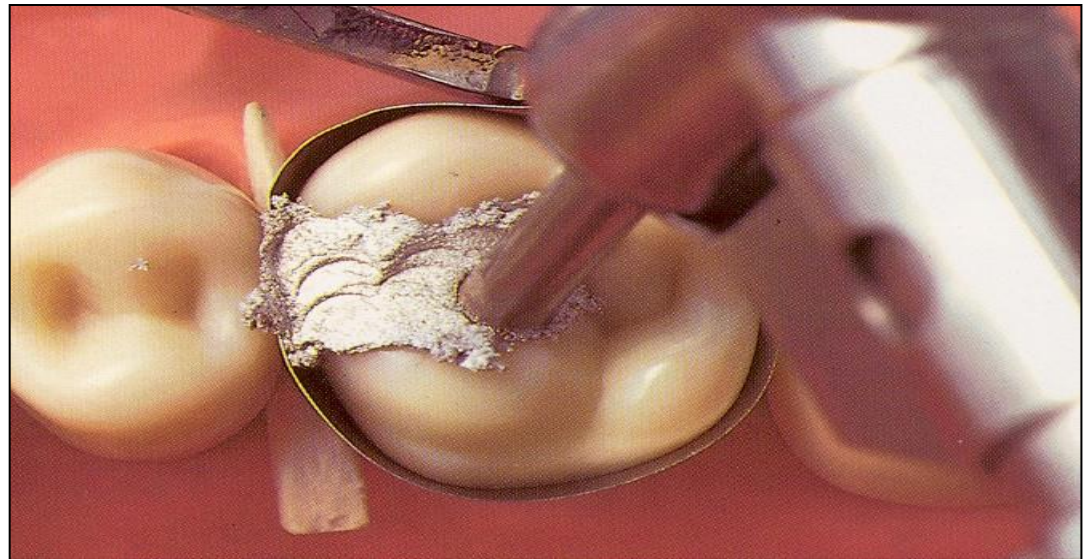
Crucible (cup)





Power driven condensation

handpiece
condensor





Instruments

➤ **Preparation instruments**

➤ **Filling instruments**

➤ **Carvers**

➤ **Burnishers**

Instruments

Preparation instruments - power driven

Burs

Diamonds

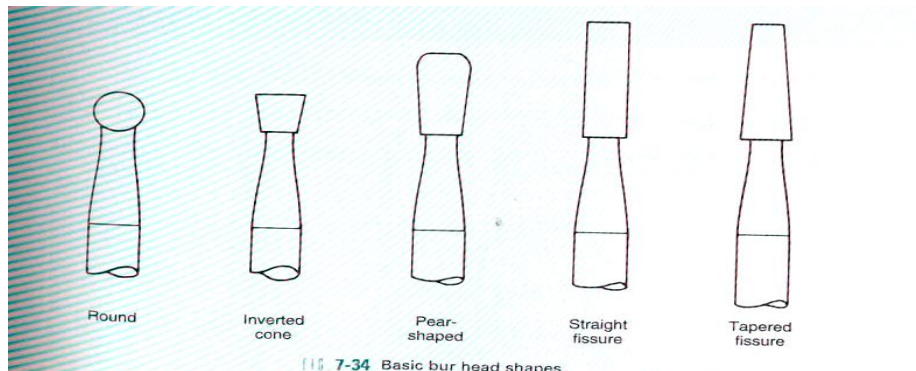


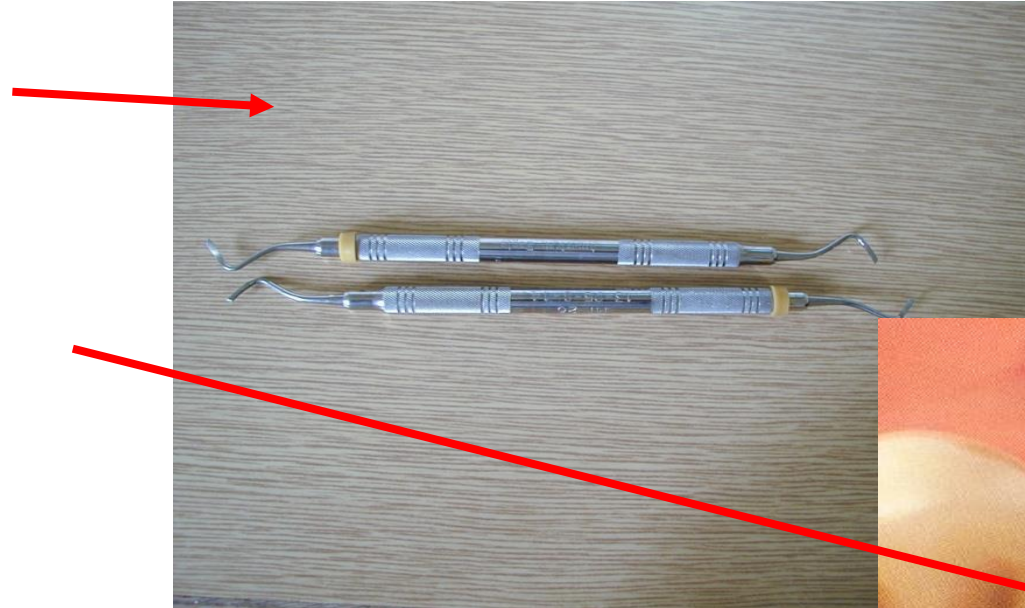
FIG. 7-34 Basic bur head shapes.



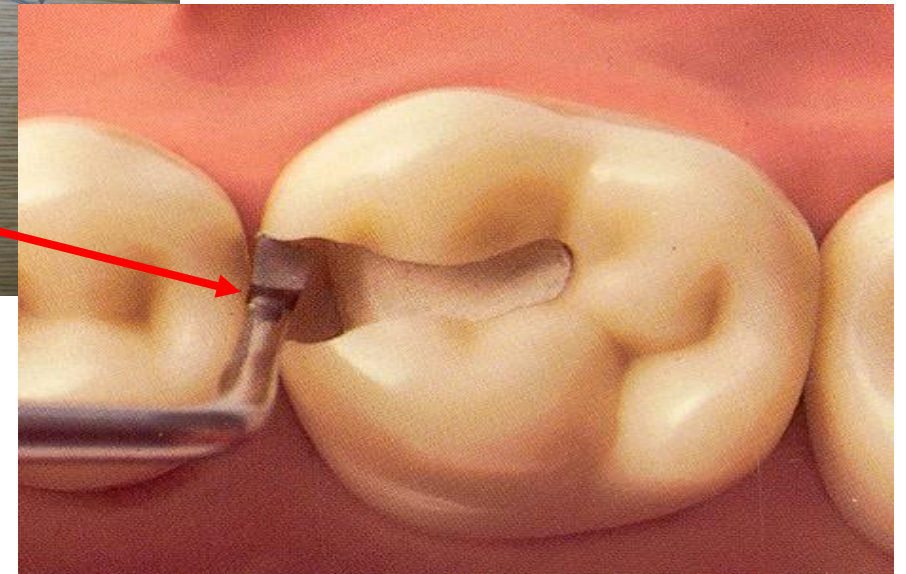
Instruments

➤ Preparation instruments - hand

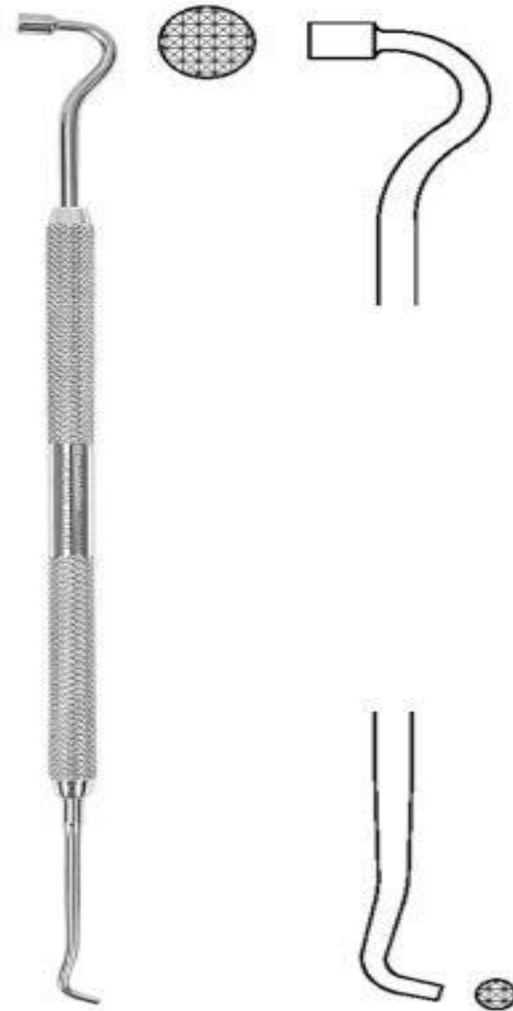
Chisel



Excavator



Amalgam carrier



Amalgam carrier



Instruments

➤ **Filling instruments condensers and spatulas**

Condensor with flat
front



Condensor with flat front

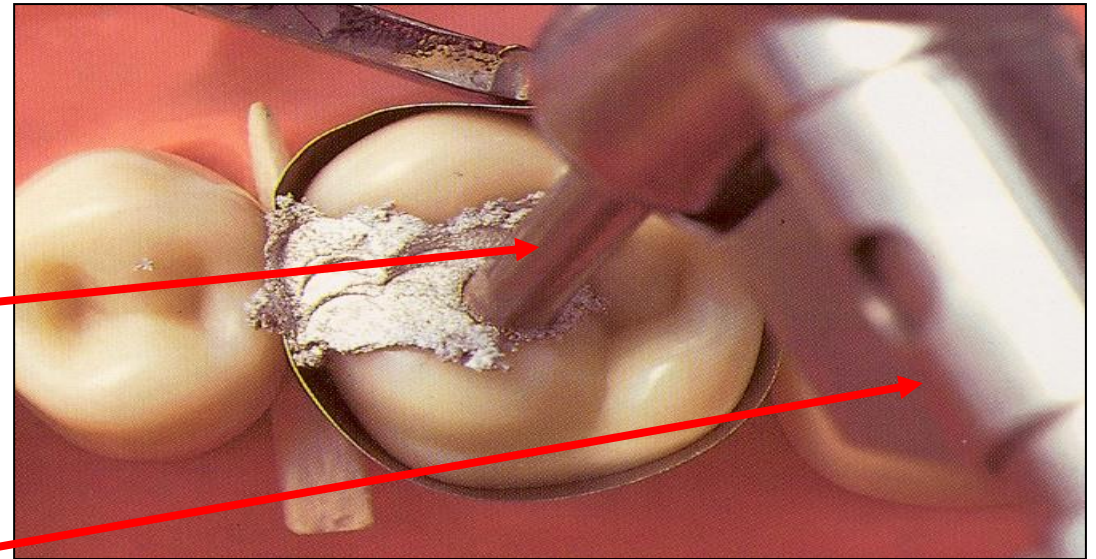


Condensor and burnisher - spatula combined



**Power driven
condensor**

Special handpiece



Burnisher - spatula

Angular- trough edge trough face



Burnisher – spatula, angular three face



Instruments

➤ **Burnishers**

Ball condensor – used as a burnisher at most



Why still amalgam?

- Teaching – practical training
- Still material of the choice