

# Endodontics I.

## Case selection and treatment planning

**Common medical findings  
that may influence  
endodontic treatment  
planning**

- Pregnancy
- Cardiovascular disease
- Cancer
- HIV and acquired immunodeficiency syndrome
- End stage renal disease
- Dialysis
- Diabetes
- Prosthetic implants
- Patients with anticoagulation therapy
- Behavioral and psychiatric disorders

- **Pregnancy**
- Cardiovascular disease
- Cancer
- HIV and acquired immunodeficiency syndrome
- End stage renal disease
- Dialysis Diabetes
- Behavioral and psychiatric disorders
- Psychosocial evaluation
- Recent medical research: Dental implications

- **Pregnancy** is not a contraindication to endodontics but it does modify treatment planning. Consult a physician if you are not sure.

- **Radiography**

If possible **NO!!!**

*Lead apron and thyroid collar*

- **Drugs**

Antibiotics (penicilin, cephalosporin, clarithromycin - all with caution !)

Analgetics (paracetamol – with caution!)

Local anaesthetics (first trimester if possible no in emergency with caution yes, second trimesters YES, third trimester with caution – a risk of contractions).

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- Behavioral and psychiatric disorders
- Psychosocial evaluation
- Recent medical research: Dental implications

## ■ Cardiovascular disease

- Vulnerability to emotional and physical or stress during dental treatment including endodontics.
- Consultation with the patient's physician is mandatory before the initiation of endodontic treatment if within 6 month after the attack.

- Patients who have had heart attack (myocardial infarction) within 6 month should not have elective dental care.

*Medication can potentially interact with vasoconstrictors in LA*

*Increased susceptibility to repeat the heart attack.*



## ■ Risk of vasoconstrictors

### No administration:

- Patients with non stable angina pectoris
- Uncontrolled hypertension
- Refractory arrhythmia
- Recent myocardial infarction (less than 6 month)
- Recent stroke (less than 6 month)
- Recent coronary bypass graft (less than 3 month)
- Uncontrolled congestive heart failure
- Uncontrolled hyperthyroidism

# Risk of bacterial **endocarditis**

Caused by a bacteremia – can be associated with endodontic treatment.

It is **potentially fatal**.

- Patients who have a history
- of murmur or mitral valve prolapse with regurgitation
- Rheumatic fever
- Congenital heart defect
- Arteficial heart valves

# Risk of bacterial **endocarditis**

Must be minimized using

## **ANTIBIOTIC PROPHYLAXIS**

*Short term administration of antibiotic in high dosage – according to recent recommendation.*

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# Cancer

- Risk of metastasis in jaws. Careful examination, OPG.
- Cancer in orofacial region - all potential focuses must be removed, no endodontic treatment during and after radiotherapy. Risk of radionecrosis – radioosteomyelitis.

*Radiotherapy - decreasing number of osteoblasts, osteocytes, endothelial cells and blood flow.*

*Routine dental procedures can be done if granulocytes counts is grater than  $2000/\text{mm}^3$  platelet count grater than  $50.000/\text{mm}^3$ .*

*Consultation with responsible specialist.*

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# HIV and aquired immunodeficiency syndrome

- HIV patients do not have an increased risk of postoperative pain or inflammation.

Precautions of infection of dental team.

Generally – number of CD4 lymphocytys is important (less than  $200/\text{mm}^3$  hihger risk of opportunistic infections).

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# Renal disease and dialysis

- End stage renal disease – best way hospital setting.
- Dialysis – consultation with the specialist
- (some drugs are eliminated by dialysis, the treatment is best scheduled a day after dialysis since on the day of dialysis patients are generally fatigued and have a bleeding tendency)

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- Prosthetic implants
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# Diabetes

- Patients with well medically controlled diabetes and free of serious complications (renal disease, hypertension, coronary atherosclerotic disease) is a candidate for endodontic treatment.
  - *Non insulin patient may require insulin*
  - *Insulin patient may require higher dosis of insulin*
  - *Source of glucosa should be available*
  - *Appointments should be scheduled with consideration given to the patient's normal meal and insulin schedule.*

Especially when surgical endodontics is indicated – consultation with specialist is useful.

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- **Prosthetic implants**
- Patients with anticoagulation therapy
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# Prosthetic implant

- Can require antibiotics prophylaxis depending on time after implantation and other patient's diseases.

**Consultation with patient's physician.**

*Endodontic is an unlikely cause the bacteremia in comparison with extractions, scaling, periodontal surgery.*

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# Patients with anticoagulation therapy

- Risk of bleeding from dental pulp and root canal
- Risk of haematoma when nerve blocking anaesthesia is used.

*Treatment depending on laboratory tests, consultation with specialist.*

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# Behavioral and psychiatric disorders

- Patient's ability of cooperation and drug interaction (local anaesthetics)

*Consultation of physician usefull and sometimes necessary.*

# **Regional factors that influence endodontic case selection**

- Position of the tooth and its importance for function
  - The tooth must be valuable for the function (dystopic teeth, third molars etc..)

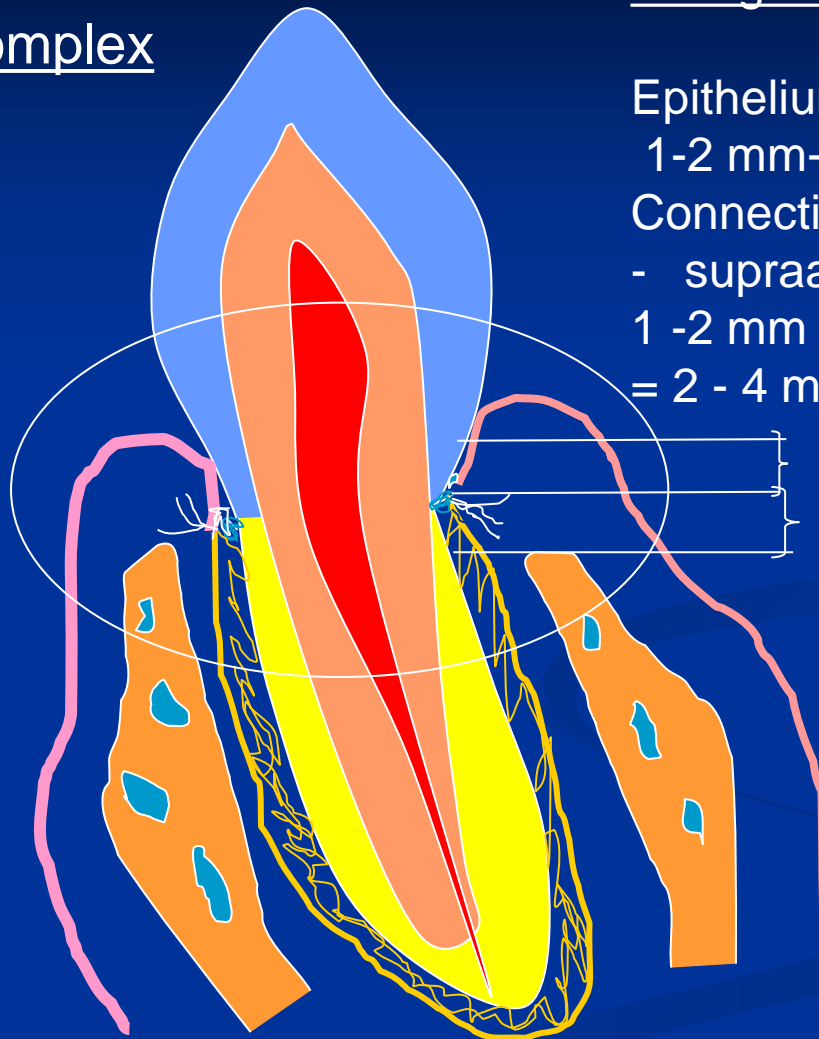
# **Local factors that may influence endodontic case selection**

- Periodontal consideration  
(poor periodontal prognosis – no endodontic treatment)
- Surgical consideration (some lesions are nonodontogenic)
- Restorative consideration (root intraosseus caries, poor crown/root ratio, extensive periodontal defects)
- Others (calcification, obliteration, root resorption, dilaceration etc.)



## Dentogingival complex

DGC =  
biological width  
2-4mm +  
sulcular depth  
1-3mm  
= 3-7 mm



## Biological width

Epithelium junction

1-2 mm+

Connective tissue junction

- supraalveolar fibers

1 -2 mm

= 2 - 4 mm

1 - 2 mm

1 - 2 mm

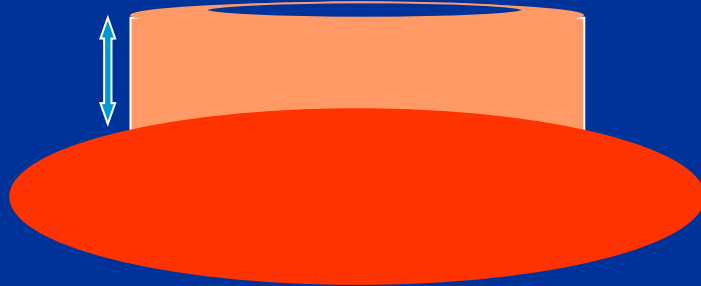
*Gargiulo AW, Wentz  
FM, Orban B  
(J Perio 1961)*

*Vacek JS, Gher ME,  
Assad DA,  
Richardson AC,  
Gambaressi LI  
(Int J Perio & Rest  
Dent 1994)*



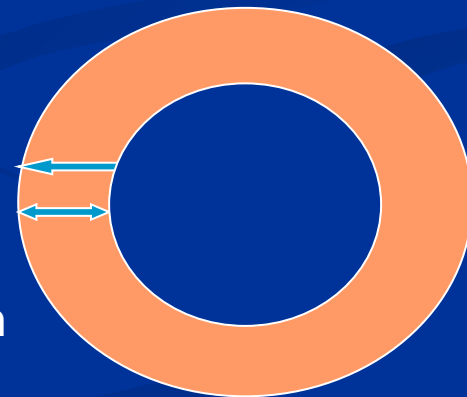
## Ferrule effect

1,5 – 2 mm



1,5 mm

1 mm





# Non restorable teeth

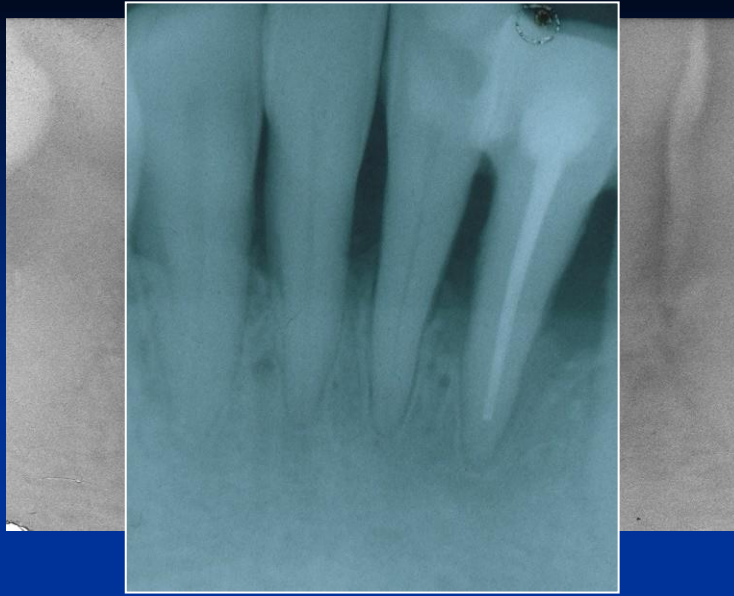


**Elongation of clinical crown surgically**

**Orthodontic extrusion**

**Extraction**





# Diagnosis in endodontics

- Chief complaint
- Medical history
- Dental history
- *History of present dental problem*
- *Dental history interview*

*Questionnaire*

# Examination and testing

- Extraoral examination

(inspection – facial symmetry, loss of definition of the nasolabial fold, palpation of the cervical and submandibular lymph nodes)

- Intraoral examination

- Soft tissue examination
- Intraoral swelling
- Intraoral sinus tract
- Palpation
- Percussion
- Mobility
- Periodontal examination

# Examination and testing

- Pulp test
  - Thermal
  - Electric

Radiographic examination

# Intraoral radiography

Film or sensor placed in oral cavity

Special apparatus

- Teeth
- Alveolar bone
- Periodontal space
- Fillings
- Caries
- Impacted teeth
- Level of endodontic treatment



# Position of the tubus

- In vertical plane
- In horizontal plane

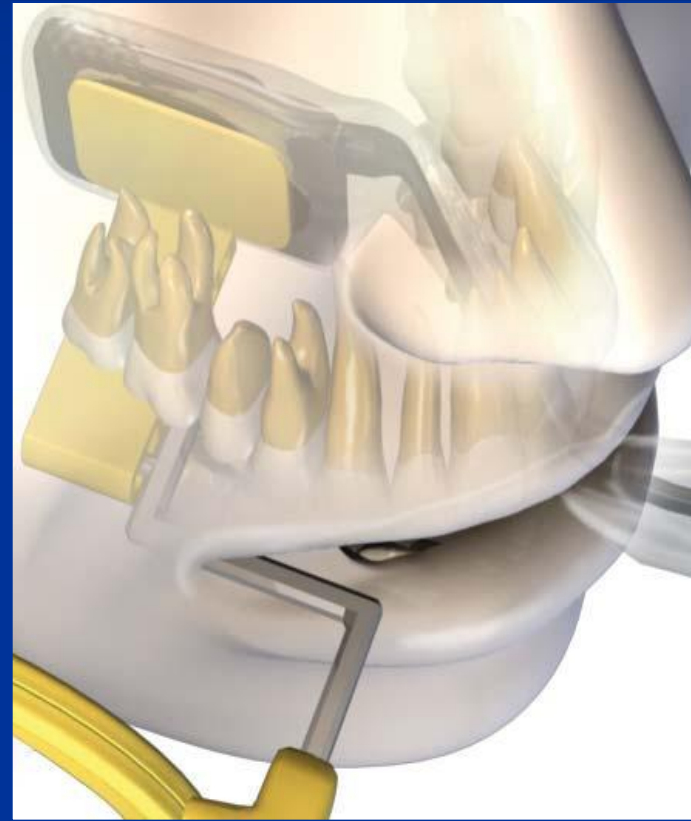
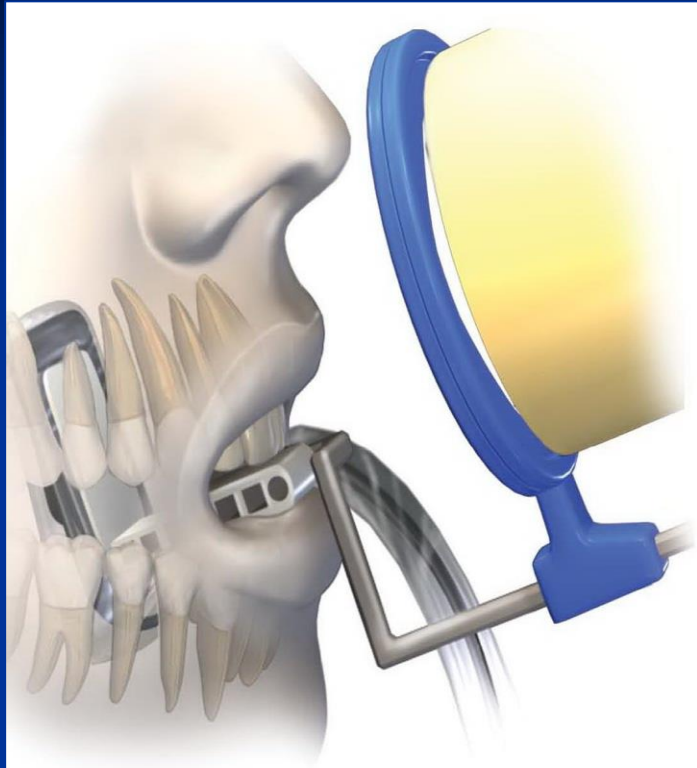


Parallel technique

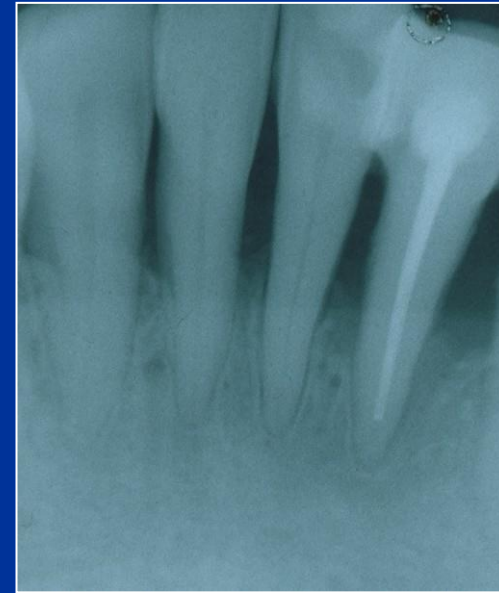
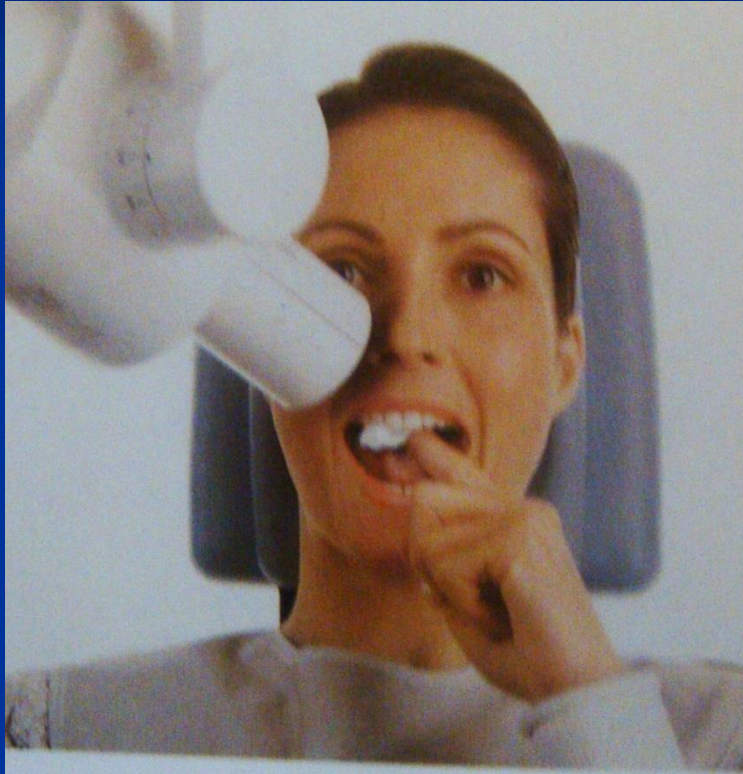
Modified parallel technique

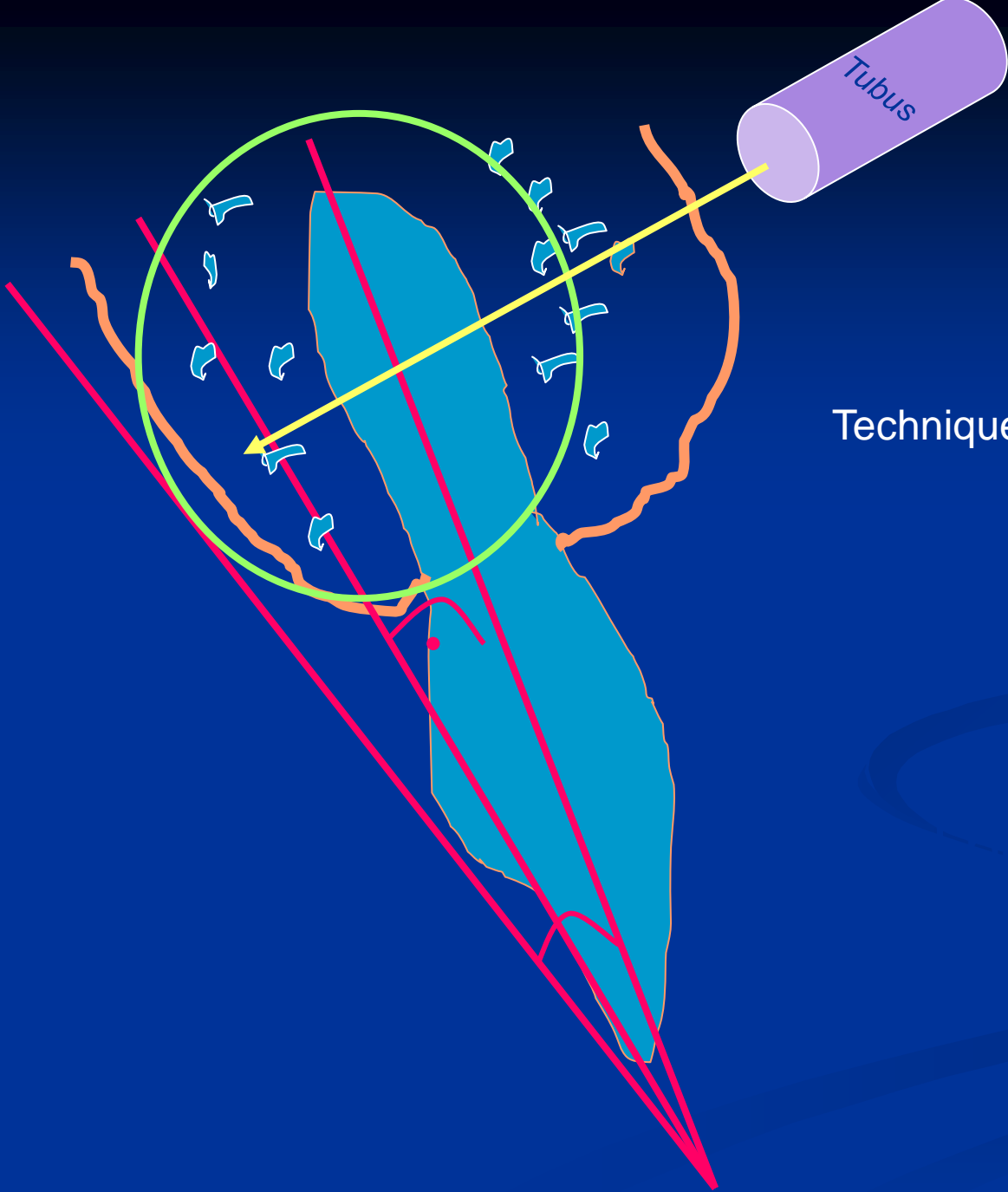
Technique of bisecting angle

**In vertical plane**



# If parallel technique is not possible



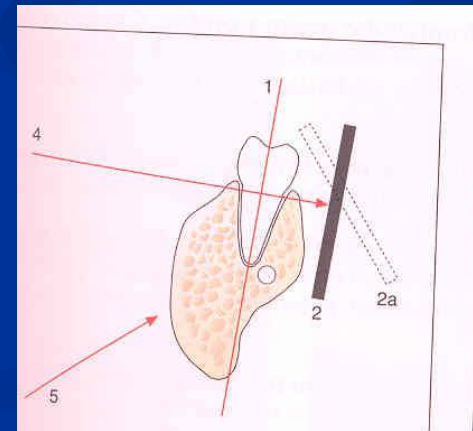
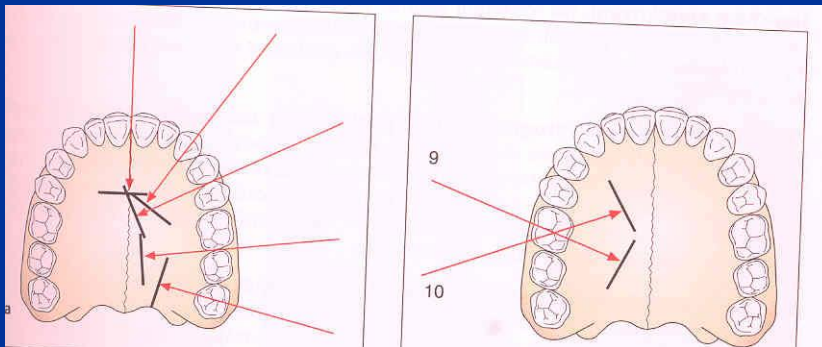


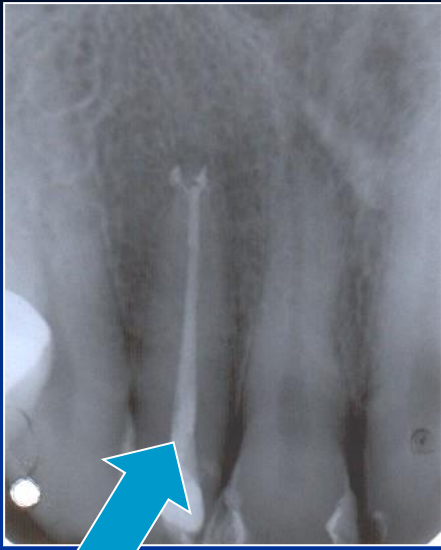
Technique of bisecting angle

**In horizontal plane**

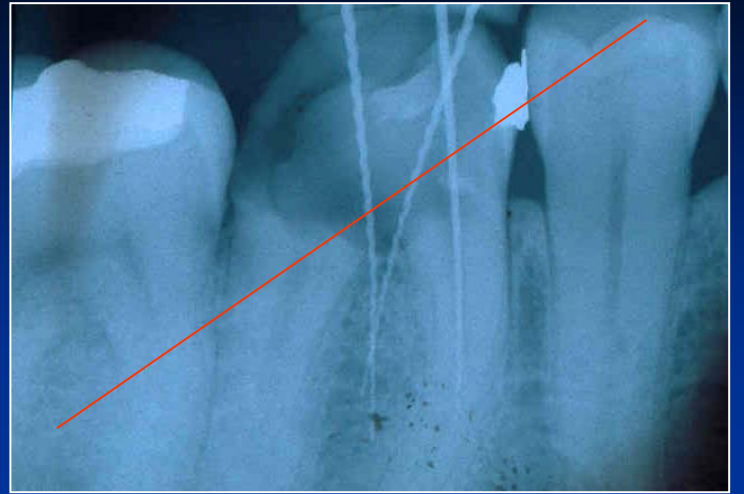
# Orthoradial and excentric projection

- Orthoradial – the central beam goes parallel to interdental septa
- Excentric– the central beam goes from distal or mesial side.



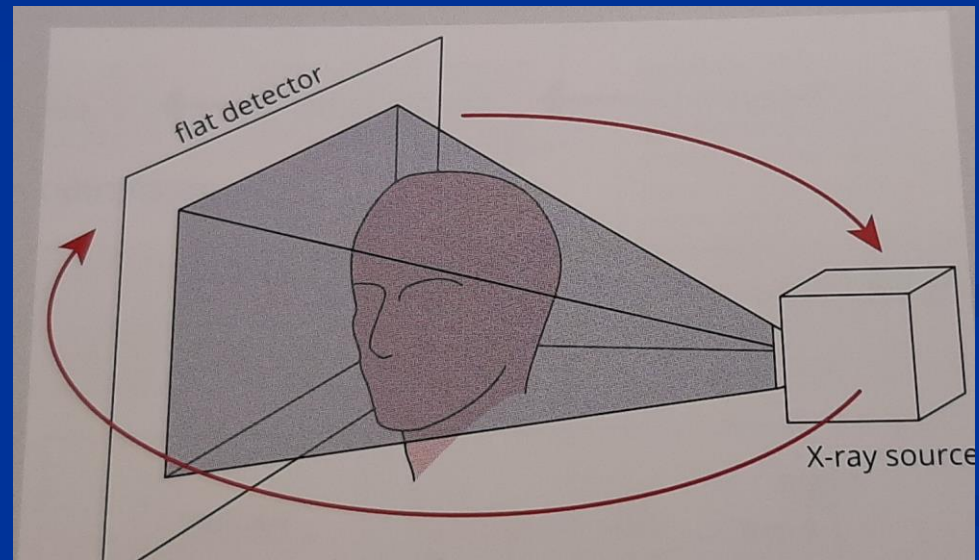






# CBCT – cone beam computer tomography

CBCT  
Source and detector  
are rotating



# CBCT – cone beam computer tomography

- High diagnostic effect for details, possibility of 3D reconstruction
- Endodontics, implantology, surgery, orthodontics other branches. Connections with i.o. scanners
- Irradiation lower in comparison to CT, but not insignificant
- Consider indications with regard to irradiation and price

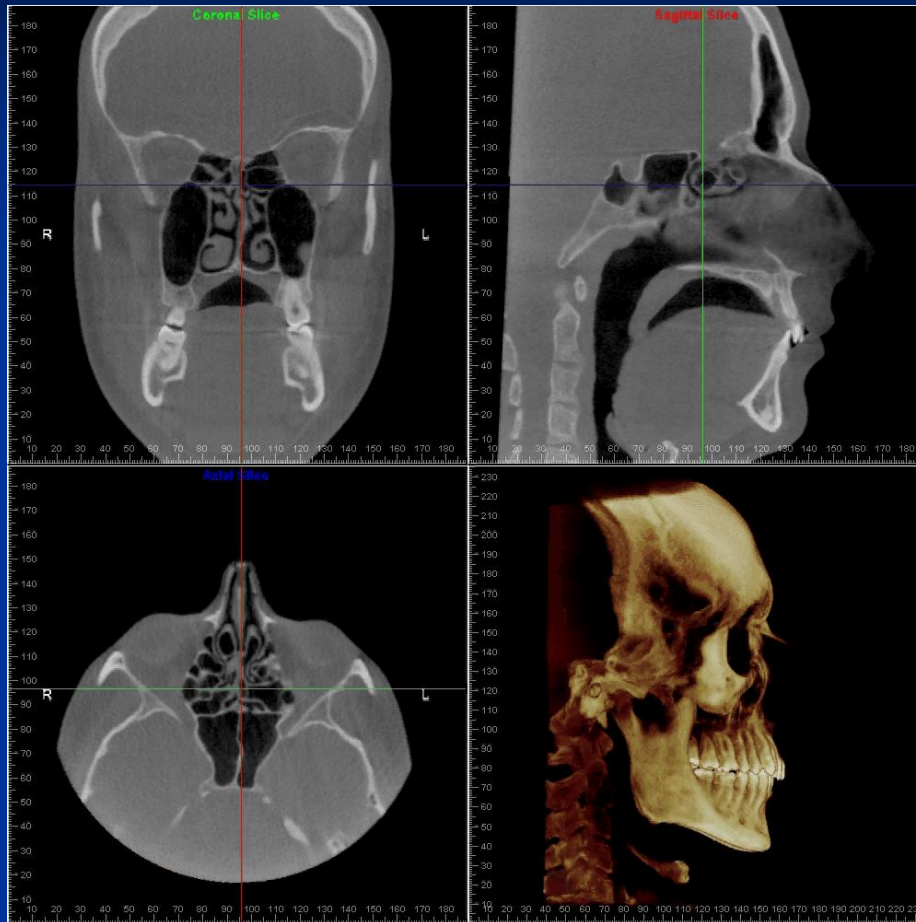
**Table 4-2** Doses of radiographic exams, data, and 'real world' equivalents (DPT = dental panoramic tomography).

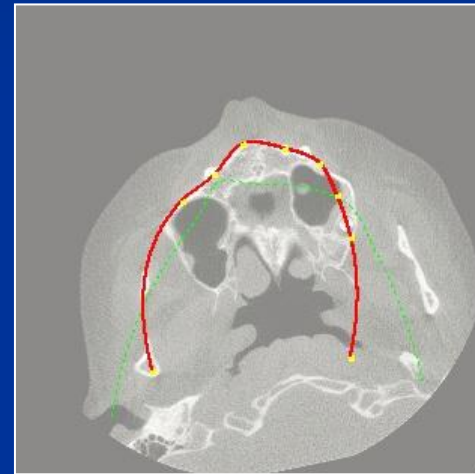
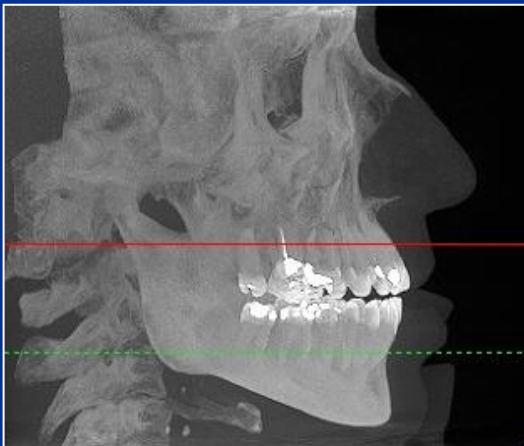
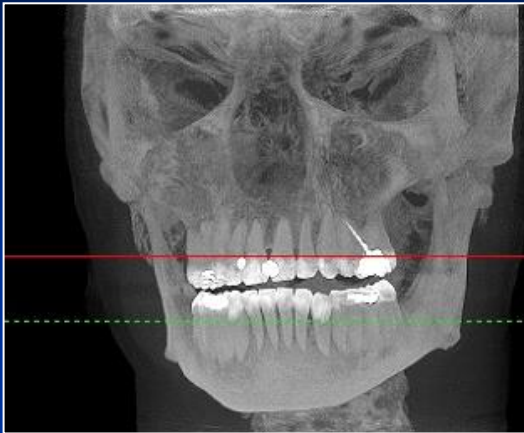
Radiographic exam	Effective dose $\mu\text{Sv}$	Equivalent to a single periapical exam	Equivalent hours of aeroplane travel	Equivalent number of days background radiation	Estimated risk of fatal malignancy to child <16	Estimated risk of fatal malignancy to adult 18-65
Periapical radiograph	1	1	0.25	0.2	2 000 000	4 000 000
Eating a banana	0.1	1/10th	0.025	0.0	n/a	n/a
Dentition-only DPT	10	10	2.5	1.8	<1 000 000	<2 000 000
Full DPT	22	22	5.5	4.0	1 000 000	2 000 000
Average small-volume CBCT	50	50	12.5	9.1	250 000	500 000
CT head	2000	2000	500	365.0	5000	10 000
Yearly UK average background radiation	2700	540	675	365	n/a	n/a

**Notes**

- Periapical radiograph taken with rectangular collimation, 70kV, 200 mm fsd and fast film/detector plate (source: Guidelines on Radiological Standards for Primary Dental Care, 1994).
- Annual natural background estimated at 2700  $\mu\text{Sv}$ .
- Aeroplane travel estimated to give 4  $\mu\text{Sv}$  per hour.
- Risk of malignancy is calculated from National Radiological Protection Board (NRPB) booklet Guidelines on patient dose to promote the optimisation of protection for diagnostic medical exposures, 1999.
- Banana equivalent dose widely regarded as 0.1  $\mu\text{Sv}$ . Radioactivity comes from small amounts of radioactive potassium ( $^{40}\text{K}$ ) in the potassium-rich banana.

CBCT risks

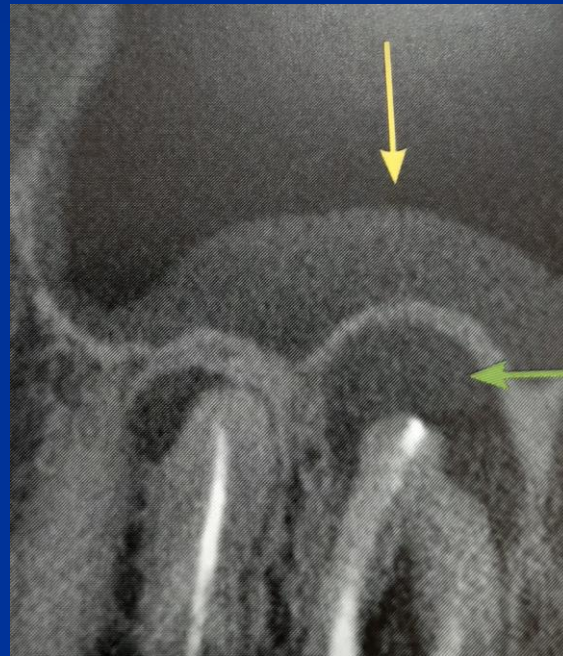






Lze generovat  
různé řezy

# High importance by pathological processes concerning AH

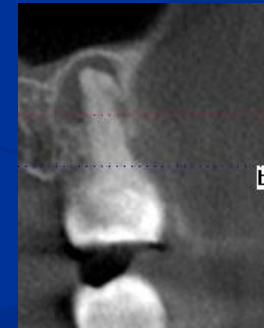
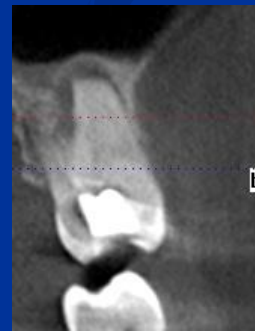




- Endodontics
- Specification of diagnosis
- Resorption, complications
- Cysts, pathological changes in bone



59



# Pulpal disease

- Normal pulp – no spontaneous symptoms, the pulp respond to pulp tests, symptoms are mild, do not cause patient's discomfort.

Transient sensation reversing in seconds.

- Reversible pulpitis

Stimulation is uncomfortable, sharp pain, reverses quickly after irritation. (dental caries, recent dental treatment, exposed dentin, defective restoration).

# Pulpal disease

## ■ Irreversible pulpitis

### Symptomatic

- Intermittent spontaneous pain
- Pain on stimuli asp. cold – stimuli can cause an attack of pain.
- Pain is sharp or dull, usually referred
- Patient can hardly recognise which tooth is causative.

# Pulpal disease

## ■ Irreversible pulpitis

### Symptomatic

- pain during the night
- during the time the attacks are longer
- the stimuli are less on cold but more on hot
- during time the patient can recognize the causative tooth
- X ray negative or widened periodontal ligament space. (Thickening of periodontal membrane)

# Pulpal disease

- Irreversible pulpitis

Asymptomatic

Can become symptomatic or necrotic

# Necrosis and gangraena

- Necrotic pulp become very often gangrenous
  - no symptoms
  - no response on vitality tests
  - pain on hot
  - typical smell (gangraena can be open or closed)
  - no radiographic finding or widened of periodontal ligament space.

# Periapical diseases

- Apical periodontitis (periradicular periodontitis)

- Chronic

No symptoms, no response on vitality tests, periapical radiolucency. Can become acute (exacerbation)

- Acute

Symptomatic, pain on percussion, bite, hot, palpation, mobility. No response on vitality tests. X ray – periapical radiolucency, or widened periodontal ligament space.

# Periapical diseases

- Can propagate intraorally or/and extraorally
  - Subperiosteal abscess
  - Submucous abscess
  - Abscess in surrounding tissues
  - Non limited inflammation - cellulitis



# Two main approaches in endodontic therapeutical procedures

- Vital pulp therapy
- Root canal treatment

# Clasification and guidelines for the therapy

## ■ Initial pulpitis

Increased but not prolonged pain on cold, absence of spontaneous pain.

Histologically: hyperaemia

Therapy:

Indirect pulp therapy –IPT.

Mostly Indirect pulp capping

# Clasification and guidelines for the therapy

## ■ Mild pulpitis

- Increased reaction on cold, hor and sweet stimuli, prolonged max 20s, spontaneous regression.
- Histologically: inflammation of the coronal part of dental pulp.

Terapy: IPT – indirect pulp therapy.

Mostly intermittent excavation

# Clasification and guidelines for the therapy

## ■ Moderate pulpitis

Clear symptoms, strong pain, very prolonged reaction on cold, hot (minutes), possible pain on percussion, spontaneous pain, analgetics have only partial effect.

Histologically: Extensive inflammation affecting the coronal pulp completely

Thrapie: Coronal pulpotomy –partial/complete

# New classification and guidelines for the therapy

## ■ Severe pulpitis

Heavy spontaneous pain, very strong pain on stimuli, sharp, throbbing, strong pain after lying down, pain on percussion and

Histologically:

Extensive inflammation in dental pulp, spreading probably into root canal .

Therapie: Deep pulpotomy or pulpectomy

# Therapy - procedures

- Indirect pulp capping

Caries next to dental pulp (caries pulpaе proxima). Carious dentin is possible to remove almost completely. Decay is deep in small region. Appr 1 mm<sup>2</sup> carious dentin can be left.

Kalciumhydroxide cement, permanent filling

Alternativs: MTA, Biodentine

Formation of tertiary dentine.

# Therapy - procedures

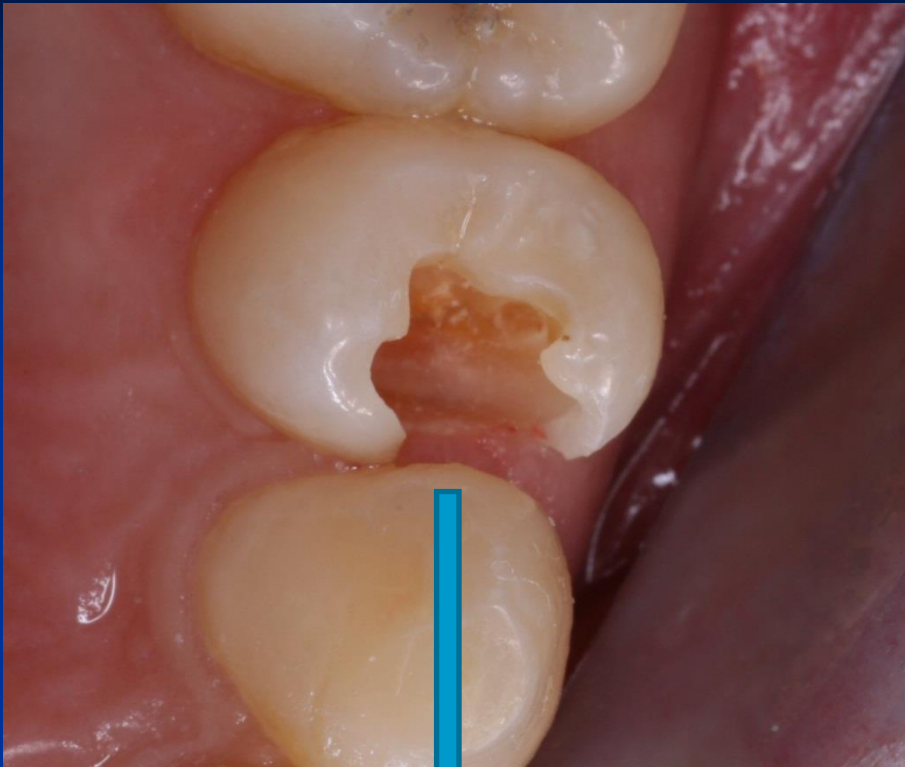
- Intermittent excavation

Large dental caries spreading towards dental pulp. Big amount of carious dentine.

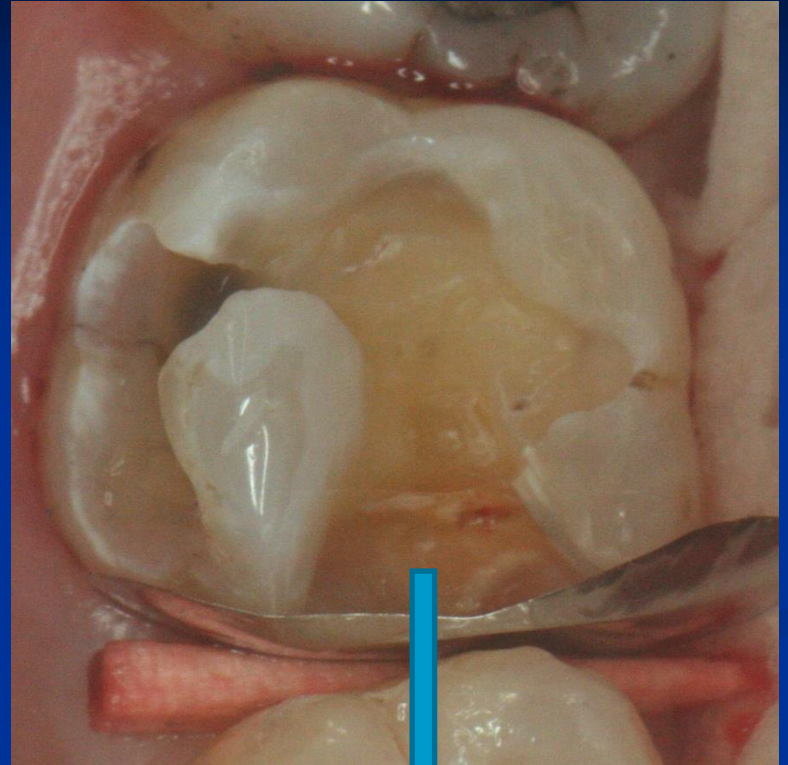
High risk of perforation

Suspension of calcium hydroxide, temporary filling for 6 weeks.

Dessication of soft dentine, formation of tertiary dentine.



Intermittent excavation



Pulpotomy





Nepřímé překrytí materiálem Biodentine

# Therapy - procedures

- Direct pulp capping
- Treatment of small perforation after preparation or traumatic dental injury in non carious dentine.

Immediately ( 2 – 3hours).

Suspension of calcium hydroxide hydroxidu vápenatého, calcium hydroxide cement, permanent filling.

Alternatives: MTA, Biodentine aj.

Dentin bridge formation

# Therapy - procedures

## Pulpotomy

- Coronal
  - ✓ Partial (removal cca 2 mm of dental pulp)
  - ✓ Total (removal dental pulp from the pulp chamber completely)
  - ✓ Deep (removal of dental pulp to the root canal cca 4 mm of dental pulp apically can be left)

# Pulpotomy

- Aseptic approach
- Excavation of soft dentine
- Opening of the pulp chamber with sterile bur or diamond)

Stopping bleeding (2,5% sodium hypochlorite)

Capping using calcium hydroxide or bioactive cement, permanent filling.

Dentine bridge

# Pulpotomy - indication

- Traumatic dental injury – opening of the pulp chamber - bigger perforation or longer time after the injury (more than 2 -3 hours)
- Perforation in carious dentine
- Reversible pulpitis

It is necessary to consider

- Age of the patient
- Aseptic approach

# Dentin bridge

- Formation of dentin bridge
- Calcium hydroxide on dental pulp causes— necrosis — this necrosis is limited - it does not go deep into dental pulp ( $\text{CO}_2$  from dental pulp reacts with calcium hydroxide — a barrier of calcium carbonate occurs — so necrosis can not go deeper). This necrosis is resorbed during the reactive inflammation - connective tissue — (fibrotic tissue) is formed, calcium salts can be deposited here, due to high alkalinity new odontoblasts are differentiated and they form new dentin — predentin and mineralized dentin. This is dentin bridge is formed when the direct pulp capping or pulpotomy is performed.

# Root canal treatment

- Irreversible pulpitis
- Necrosis, gangreana
- Apical periodontitis

*Conservative, conservative/surgical approach, surgical approach.*

# Acces

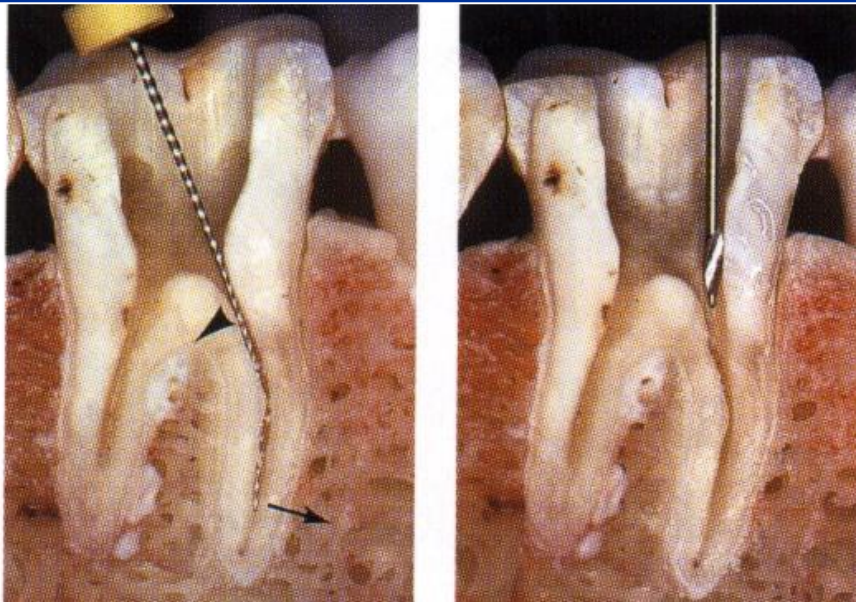
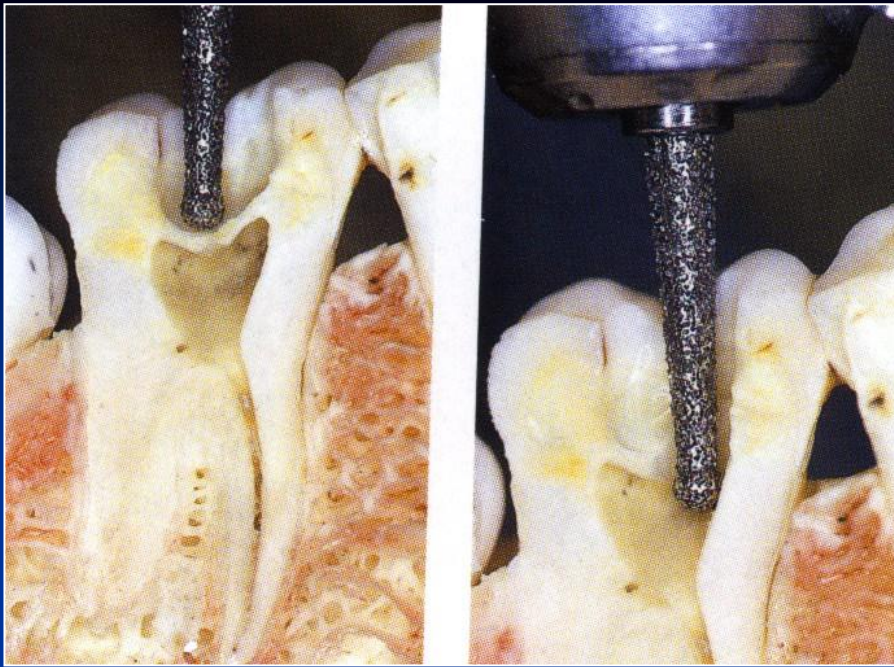
## ■ Access to the pulp chamber

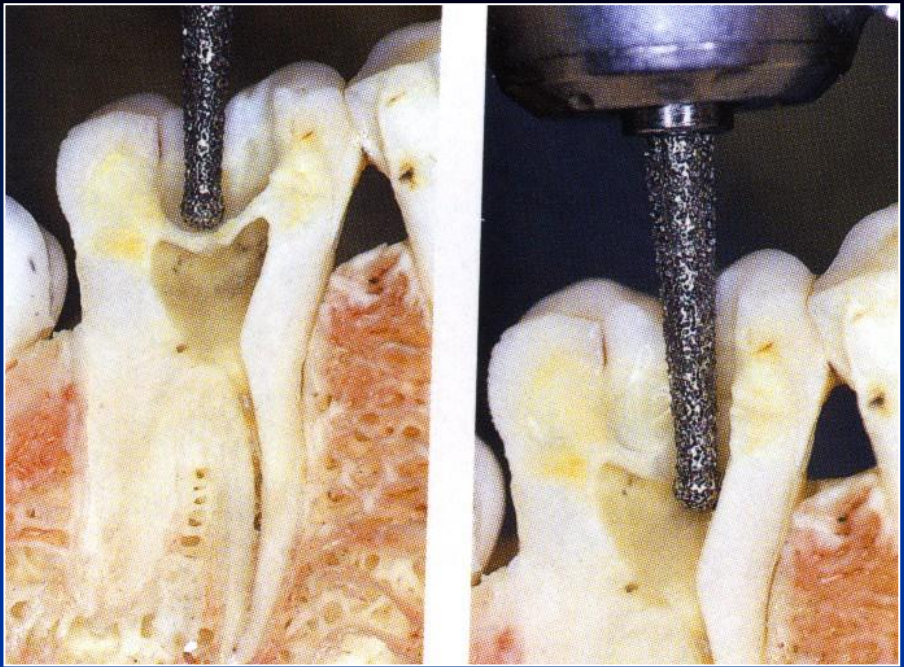
Penetration to the pulp chamber and removal of its roof

- *Orifices of root canals must be seen clearly*
- *The instrument goes through to the root canal without bending*
- *Walls of the endodontic cavity are divergent*



# Access





# Access



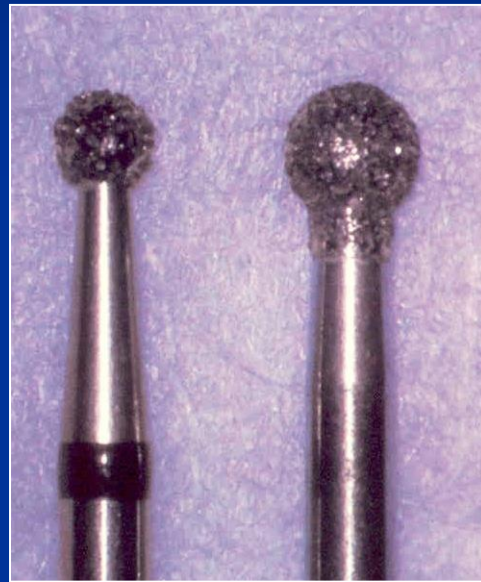


The wall is weakend

# Opening of the pulp chamber



Dia trepan



Dia round burs – balls



Steel round burs



# Removal of the roof of the pulp chamber



Dia trepan

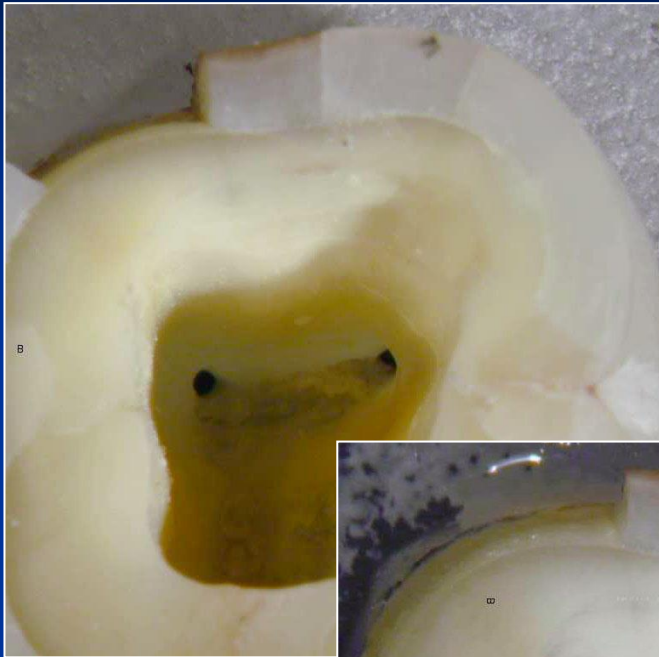


Safe ended tips  
Batt's instruments

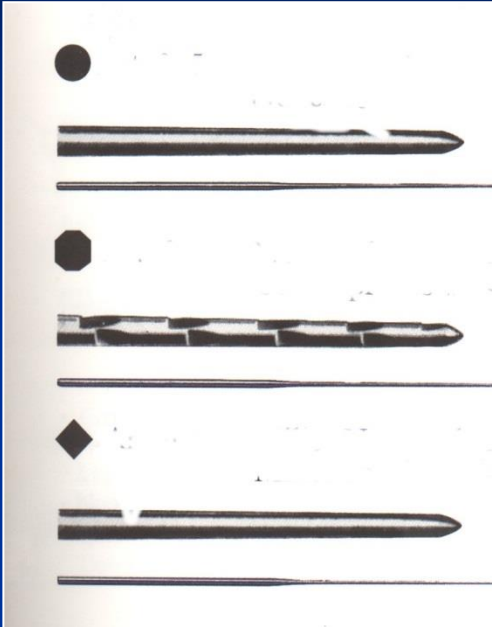


Fissur bur

# Finding of the root canal orifice



# Finding and opening of rot canal orifices



Endodontic probes  
Microopeners



Ultrasound tips

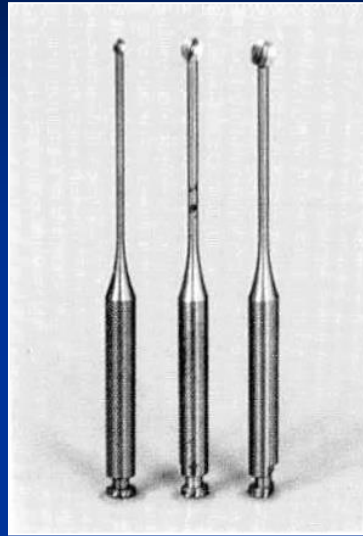


Dye

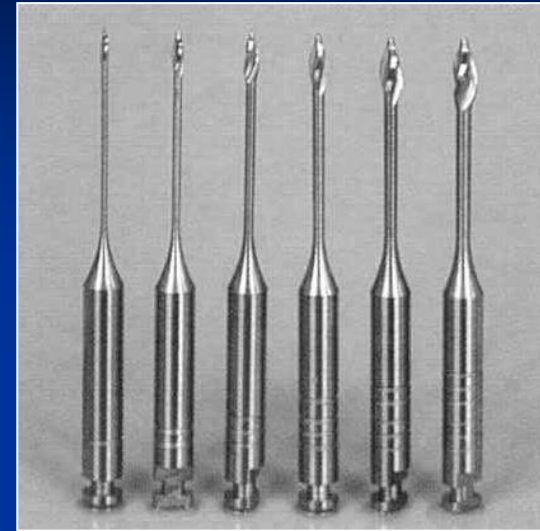
# Finding and opening of root canal orifices



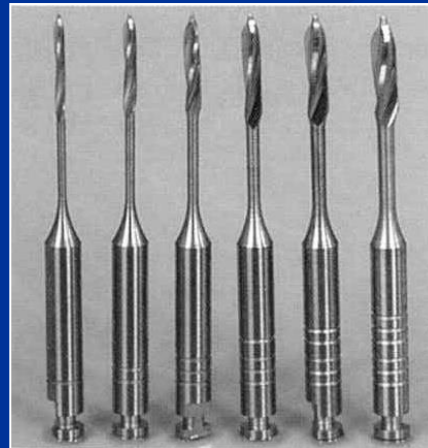
Rounded burs - balls



Miller's burs



Gates Glidden's burs



Peeso - Largo

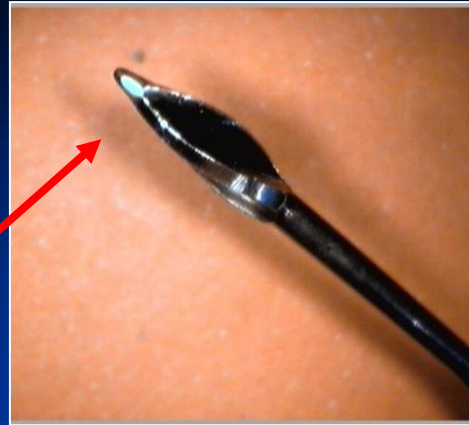




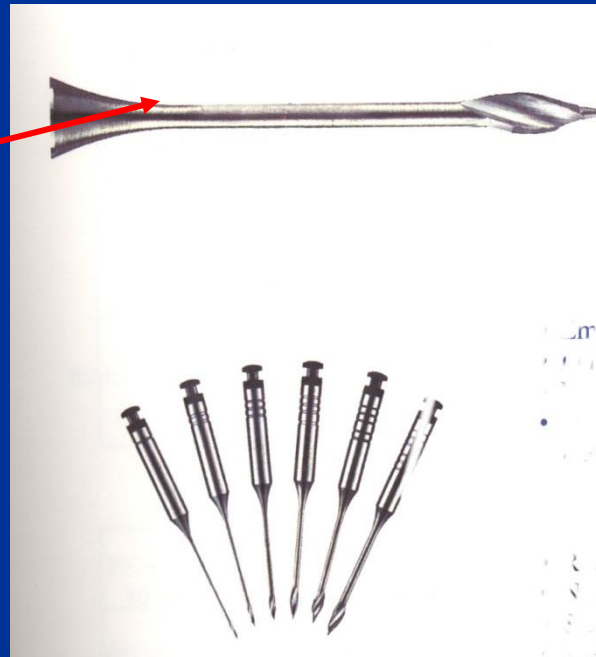
Gates - Glidden



Peeso-Largo

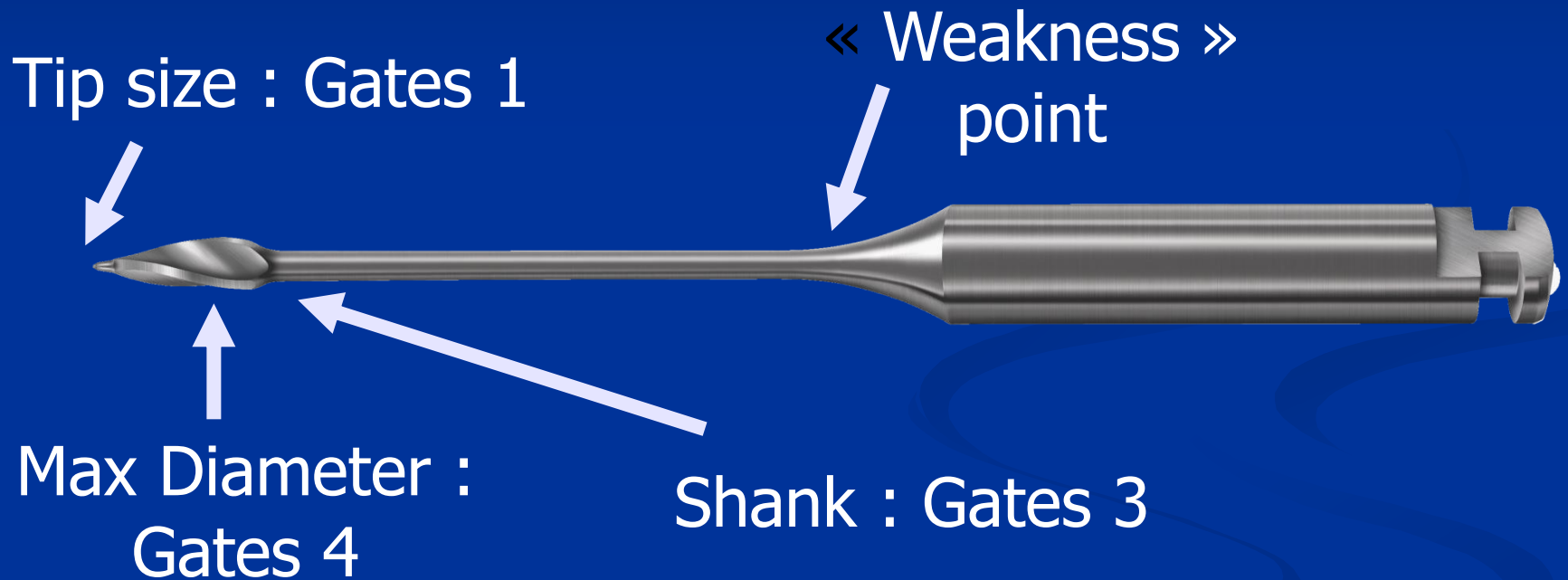


Gates – Glidden:  
Blunt, non active tip



Programm point of breakage

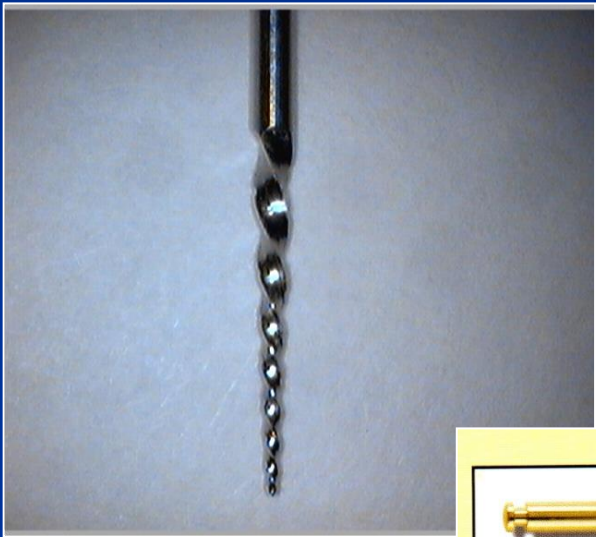
# X-GATES

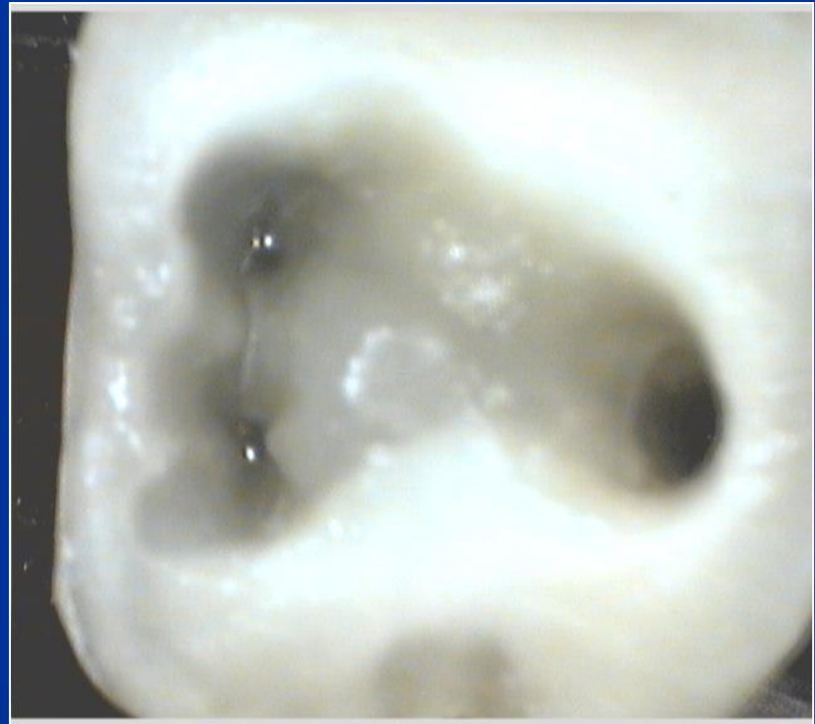
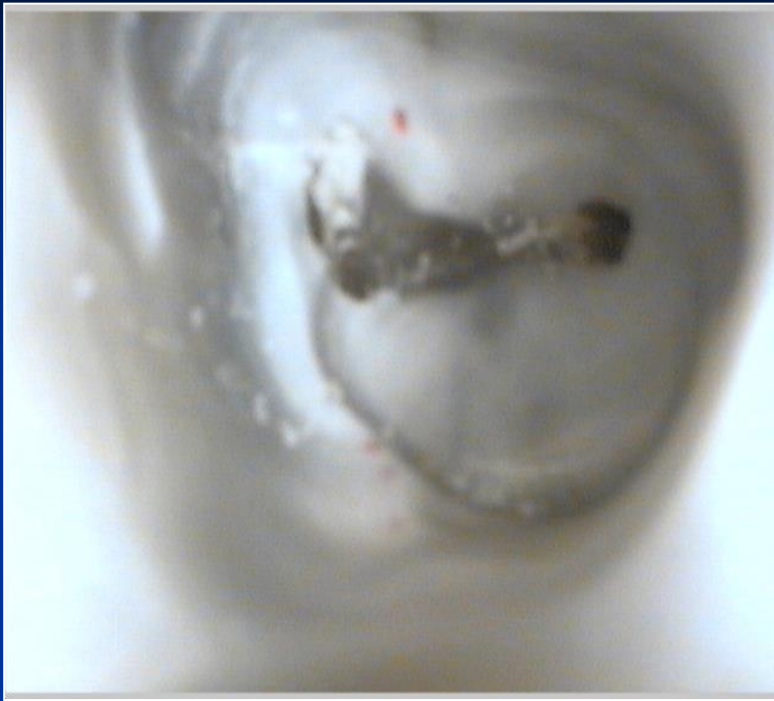


# Opening of the root canal orifice

Ni-Ti instruments

E.g: Profile O.S., ProTaper SX, IntroFile etc.







# ACCESS Kit



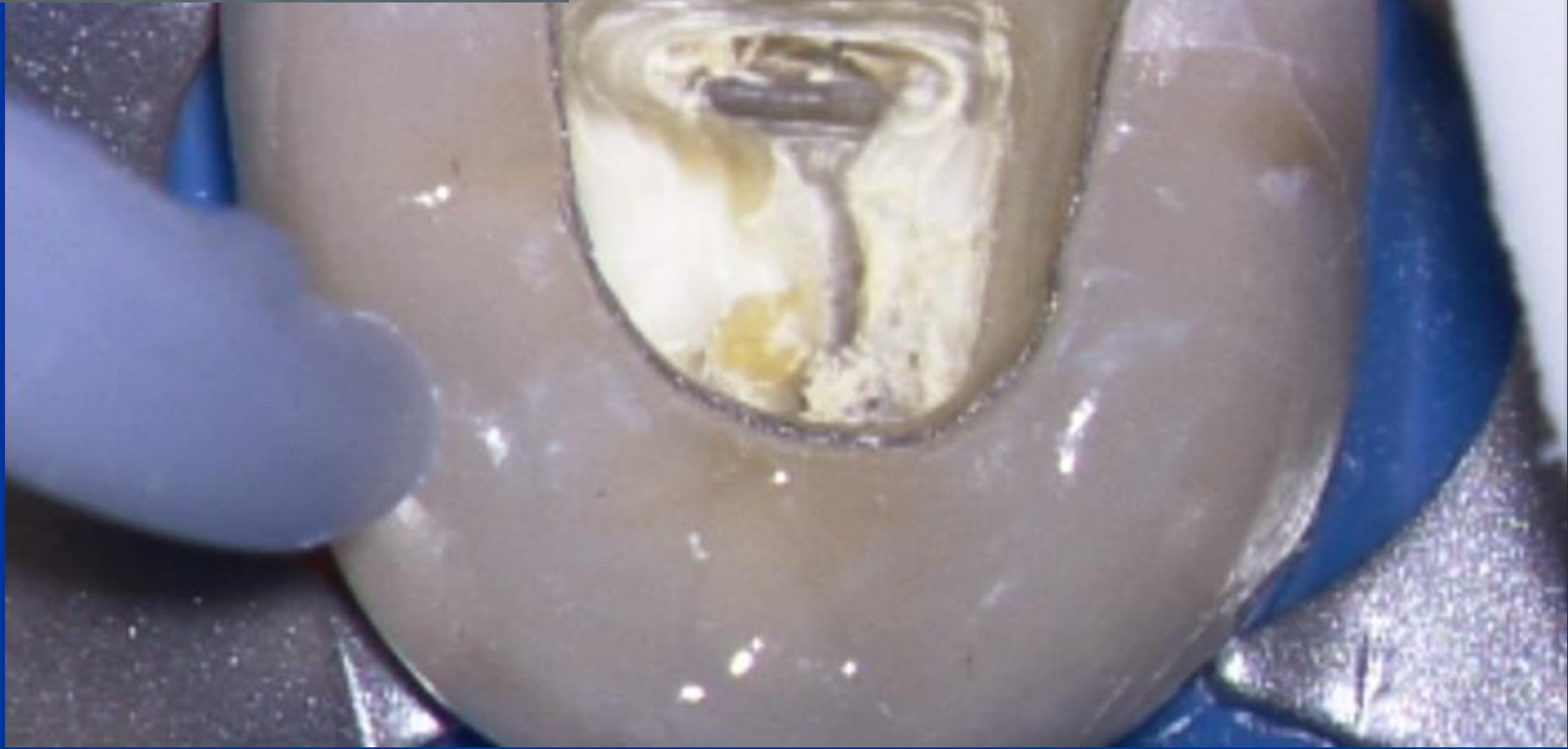
















# Tungsten Carbide Burs

***LN BUR (Long Neck)  
Improves visibility***

