

Review of Clinical procedures

Dr Saaid Al Shehadat

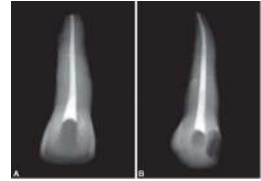


11/9/2019



Root Canal Therapy (RCT)

- ❖ Diagnosis (confirm the indication)
- ❖ Evaluation of pre-operative periapical X-ray
- ❖ Anesthesia (if needed)
- ❖ Rubber dam placement
- ❖ Caries removal (if exists)
- ❖ Access cavity
- ❖ Canal preparation
- ❖ Obturation
- ❖ Restoration
- ❖ Follow up

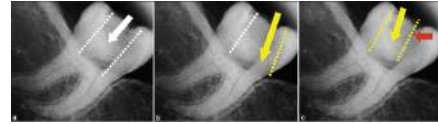


pre-operative film



pre-operative film

- Position of the tooth (crown-root relation)




Prepare the instruments





Anesthesia


- Vital Vs non-vital
- Sever TTP
- First session Vs other session
- Time
- Technique?



Direction of the needle

Anesthesia


- **Maxilla:** No palatal anesthesia
- **Mandible:** No need to anesthetize the lingual nerve
No need to anesthetize the buccal nerve
- **Lingual infiltration:** The superficial cervical plexus
The mylohyoid nerve



Anesthesia

How to check the effectiveness of inferior alveolar block?


The mandibular nerve is the only source of sensory innervation to the labia-attached gingiva between the lateral incisor and canine



Dental secrets, 2015

Anesthesia

- **Intra-pulpal injection**



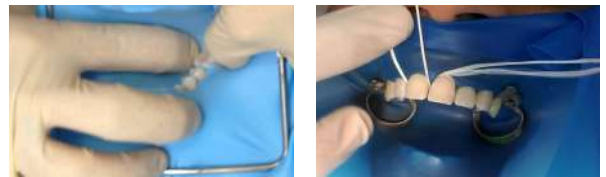
Rubber Dam



Rubber dam



Rubber dam



Rubber dam



Rubber dam

Sealing material



Caries Removal



Caries removal



Caries removal

Build up the tooth

- To place the rubber dam
- To irrigate probably



<https://www.facebook.com/photo.php?fbid=1669414119836374&set=pcb.1873694029373937&type=3&theater>



Access cavity preparation



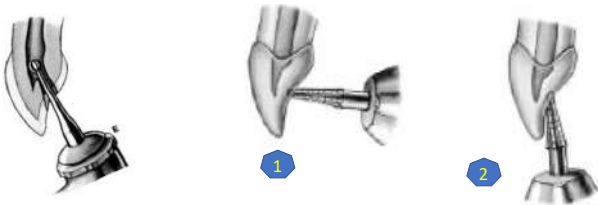
Access cavity

Pulp exposure: start de-roofing



Access cavity

No exposure: follow the rules



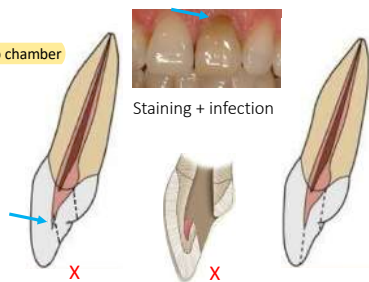
Access cavity



Access cavity

Major objectives

1- Complete removal of tissue in pulp chamber



Access cavity

Major objectives

1- Complete removal of tissue in pulp chamber

2- Straight-Line Access



Access cavity

Major objectives

1- Complete removal of tissue in pulp chamber

2- Straight-Line Access

3- Conservation of Tooth Structure



ERRORS

In access cavity preparation

Errors

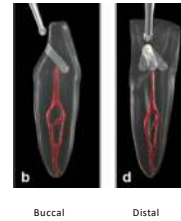
GOUGING

- 1- GOUGING of the labial wall caused by failure to recognize the angulation lingual-axial of the tooth
- 2- GOUGING of the distal wall caused by failure to recognize the inclination mesial-axial of the tooth



Errors

GOUGING



Errors

Perforation

- 3- Perforation at the labiocervical caused by failure to complete convenience extension toward the incisal, prior to the entrance of the shaft of the bur



Errors

Missed canal

- 4- Missed canal due to insufficient convenience extension



Errors

- 5- No straight line access due to insufficient de-roofing



Errors



Errors

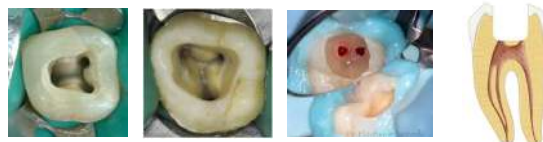
Insufficient de-roofing of pulp chamber

Make sure there are black lines that connect orifices the canals.



Dentin Map

Black lines connect the orifices (darker spots) of the canals



Dentin Map

Black lines connect the orifices (darker spots) of the canals



Errors

Under extended
access cavity



Over extended
access cavity



Access cavity preparation



Surgical operating microscope



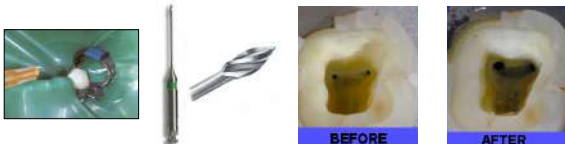
Loupes

Root Canal Preparation

Bio-mechanical preparation/ Cleaning and shaping

After access cavity preparation

- Start irrigation
- Confirm the instrumentation of all canals all root canals
- Open orifices of the canals using Gates Glidden/ large sizes K files
(depends on techniques of preparation and obturation)



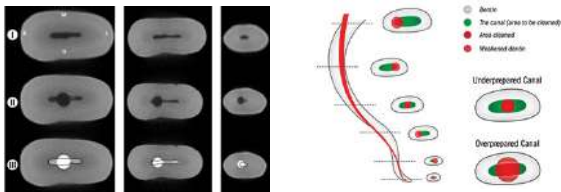
After access cavity preparation



After access cavity preparation

Number of canals/ Oval-shaped canals

(premolar, distal canal in lower molars)



CHEN ET AL., 2018

<http://www.dentistrytoday.com/endodontics/2018-03-01-03-02-03-03-04-05-06-07-08-09-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-38-39-40-41-42-43-44-45-46-47-48-49-50-51-52-53-54-55-56-57-58-59-60-61-62-63-64-65-66-67-68-69-70-71-72-73-74-75-76-77-78-79-80-81-82-83-84-85-86-87-88-89-90-91-92-93-94-95-96-97-98-99-100-101-102-103-104-105-106-107-108-109-110-111-112-113-114-115-116-117-118-119-120-121-122-123-124-125-126-127-128-129-130-131-132-133-134-135-136-137-138-139-140-141-142-143-144-145-146-147-148-149-150-151-152-153-154-155-156-157-158-159-160-161-162-163-164-165-166-167-168-169-170-171-172-173-174-175-176-177-178-179-180-181-182-183-184-185-186-187-188-189-190-191-192-193-194-195-196-197-198-199-200-201-202-203-204-205-206-207-208-209-210-211-212-213-214-215-216-217-218-219-220-221-222-223-224-225-226-227-228-229-230-231-232-233-234-235-236-237-238-239-240-241-242-243-244-245-246-247-248-249-250-251-252-253-254-255-256-257-258-259-260-261-262-263-264-265-266-267-268-269-270-271-272-273-274-275-276-277-278-279-280-281-282-283-284-285-286-287-288-289-290-291-292-293-294-295-296-297-298-299-300-301-302-303-304-305-306-307-308-309-310-311-312-313-314-315-316-317-318-319-320-321-322-323-324-325-326-327-328-329-330-331-332-333-334-335-336-337-338-339-340-341-342-343-344-345-346-347-348-349-350-351-352-353-354-355-356-357-358-359-360-361-362-363-364-365-366-367-368-369-370-371-372-373-374-375-376-377-378-379-380-381-382-383-384-385-386-387-388-389-390-391-392-393-394-395-396-397-398-399-400-401-402-403-404-405-406-407-408-409-410-411-412-413-414-415-416-417-418-419-420-421-422-423-424-425-426-427-428-429-430-431-432-433-434-435-436-437-438-439-440-441-442-443-444-445-446-447-448-449-450-451-452-453-454-455-456-457-458-459-460-461-462-463-464-465-466-467-468-469-470-471-472-473-474-475-476-477-478-479-480-481-482-483-484-485-486-487-488-489-490-491-492-493-494-495-496-497-498-499-500-501-502-503-504-505-506-507-508-509-510-511-512-513-514-515-516-517-518-519-520-521-522-523-524-525-526-527-528-529-530-531-532-533-534-535-536-537-538-539-540-541-542-543-544-545-546-547-548-549-550-551-552-553-554-555-556-557-558-559-560-561-562-563-564-565-566-567-568-569-570-571-572-573-574-575-576-577-578-579-580-581-582-583-584-585-586-587-588-589-590-591-592-593-594-595-596-597-598-599-600-601-602-603-604-605-606-607-608-609-610-611-612-613-614-615-616-617-618-619-620-621-622-623-624-625-626-627-628-629-630-631-632-633-634-635-636-637-638-639-640-641-642-643-644-645-646-647-648-649-650-651-652-653-654-655-656-657-658-659-660-661-662-663-664-665-666-667-668-669-670-671-672-673-674-675-676-677-678-679-680-681-682-683-684-685-686-687-688-689-690-691-692-693-694-695-696-697-698-699-700-701-702-703-704-705-706-707-708-709-710-711-712-713-714-715-716-717-718-719-720-721-722-723-724-725-726-727-728-729-730-731-732-733-734-735-736-737-738-739-740-741-742-743-744-745-746-747-748-749-750-751-752-753-754-755-756-757-758-759-760-761-762-763-764-765-766-767-768-769-770-771-772-773-774-775-776-777-778-779-780-781-782-783-784-785-786-787-788-789-790-791-792-793-794-795-796-797-798-799-800-801-802-803-804-805-806-807-808-809-810-811-812-813-814-815-816-817-818-819-820-821-822-823-824-825-826-827-828-829-830-831-832-833-834-835-836-837-838-839-840-841-842-843-844-845-846-847-848-849-850-851-852-853-854-855-856-857-858-859-860-861-862-863-864-865-866-867-868-869-870-871-872-873-874-875-876-877-878-879-880-881-882-883-884-885-886-887-888-889-890-891-892-893-894-895-896-897-898-899-900-901-902-903-904-905-906-907-908-909-910-911-912-913-914-915-916-917-918-919-920-921-922-923-924-925-926-927-928-929-930-931-932-933-934-935-936-937-938-939-940-941-942-943-944-945-946-947-948-949-950-951-952-953-954-955-956-957-958-959-960-961-962-963-964-965-966-967-968-969-970-971-972-973-974-975-976-977-978-979-980-981-982-983-984-985-986-987-988-989-990-991-992-993-994-995-996-997-998-999-1000>

Working length

Estimated working length: Apex locator → How to avoid false reading?

Actual working length: Periapical X-ray & Apex locator



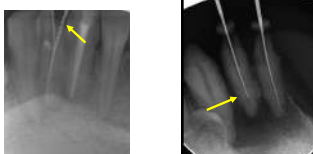
Determine the size of the initial file

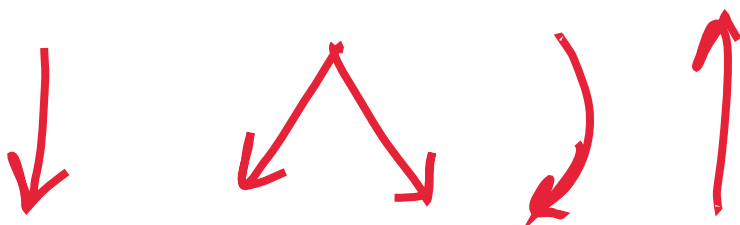
To Avoid False Readings:

- 1) Make sure canals are dry
- 2) Use largest endodontic file possible
- 3) Pull file away from metal fillings or crowns
- 4) Charge Apex Locator

Working length

- Use different types of files for x-ray overlapped canals
(i.e. K-file & H-file)
- Repeat the x-ray if the file is far more than 2 mm from apex





Root canal preparation

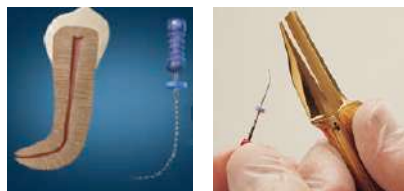
Standardized Technique

- Start preparation using the initial file up to the master file (all should be used to the full actual WL)
- THREE motions:
 - Filing motion: up and down against the canal walls
 - Watch winding with apical pressure: to reach to the full WL
 - Quarter turn and pull



Root canal preparation

Pre-bend the file to follow canal curvature



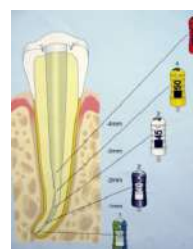
Root canal preparation

Step-back technique

- Achieved using 3 sizes bigger than the master file (Non of them should reach to the full actual WL)
- | | | | |
|--------------|---------------------------------|---|-----------------------------|
| First file: | 1 size bigger than master file | → | 1 mm shorter than actual WL |
| Second file: | 2 sizes bigger than master file | → | 2 mm shorter than actual WL |
| Third file: | 3 sizes bigger than master file | → | 3 mm shorter than actual WL |

Root canal preparation

Step-back technique



What is the benefit?
Why do we do it?
What is the substitute?

Benefits:

- Eliminates Coronal Interferences
- Easy Access
- Improved distribution of irrigant
- Facilitates removal of caries
- Reduces change in WL during apical preparation

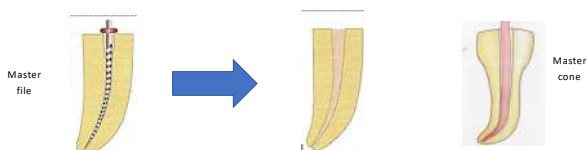
Why we do it?

- Shape the apical 1/3 with small flexible files while larger stiffer files are used away from apex (no break)
- Maintain proper resistance form
- Create spaces for multiple cones

Root canal preparation

When root canal preparation is complete?

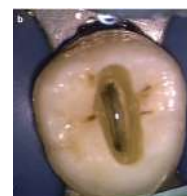
- Clean canals
- Smooth walls
- Master file is inserted **PASSIVELY** to the full working length



Root canal irrigation

Irrigation

- Irrigation between each 2 files
 - Mechanical effect
 - Chemical effect



Root canal irrigation

Irrigation



Root canal vs root canal system

Root canal irrigation

Irrigation



Root canal irrigation

Irrigants

I. Chemically non active solutions

- Sterile Water
- Physiologic Saline
- Anesthesia Solution

II. Chemically active solutions

- Alkalis: sodium hypochlorite
- Antibacterial agents: chlorhexidin
- Oxidizing agents: hydrogen peroxide
- Chelating agents: EDTA

Sodium Hypochlorite is antimicrobial
Hydrogen peroxide is anti-viral, anti-bacterial, anti-yeast
EDTA is chelating agent which removes smear layer in canal.

Root canal irrigation



NaOCl + chlorhexidine (CHX) (dark brown precipitate);

EDTA + CHX (cloudy blue)

NaOCl + EDTA (no discoloration)

NaOCl + Citric acid (white precipitate and the solution turns cloudy after shaking)

Ahmed, H.M.A. and Abbott, P.V., 2012. Discolouration potential of endodontic procedures and materials: a review. International endodontic journal, 45(10), pp.863-867.

DONT USE SODIUM HYPOCHLORITE WITH CHLORHEXIDINE

Root canal irrigation



Root canal irrigation

Sodium hypochlorite (NaOCl)

- ✓ Anti microbial properties
- ✓ Tissue solvent (dissolve vital and non vital tissue)
- ✓ Flush debris
- ✓ Lubricant
- ✗ Eliminate the smear layer.
- ✗ Low toxicity level



Root canal irrigation

Sodium hypochlorite (NaOCl)

- Heating to 60°C
- Activate it with Ultrasonic tips (passive ultrasonic irrigation PUI)



Protocol of final irrigation

smear layer

amorphous and irregular particles that resulted from root canal instrumentation and covered all instrumented surfaces of the prepared root canals

- can harbor bacteria and their products
- decrease the dentin permeability to irrigants and medical dressing
- compromise the fluid-tight seal of canals after root filling

Protocol of final irrigation

- * 5.25% NaOCl + PUI (1 min)
- * 17% EDTA (pH 7.5) + PUI (1 min)
- * 5.25% NaOCl + PUI (1 min)

Lui et al., 2007

when NaOCl was used as final irrigants after demineralized agent, a remarkable erosion of dentin occurred with a view of irregular eroded dentinal tubules

It is not recommended to use NaOCl as a final irrigant after EDTA

Qian et al., 2011

Mishaps (Accidents) in Root canal Preparation

Endodontic Mishaps

1- Loss of working length

blockage, Ledge formation, broken instrument

2- Deviation from the normal canal anatomy

elbow, zipping, apical transportation, perforation

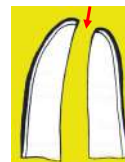
3- Inconvenient canal preparation

Over-instrumentation, Over-preparation, Under-preparation

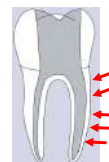
Endodontic Mishaps



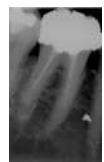
Over-instrumentation



Over-preparation

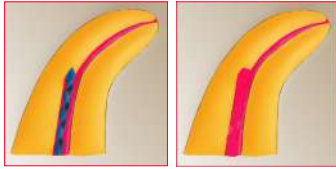


Over-preparation



Under-preparation

Endodontic Mishaps



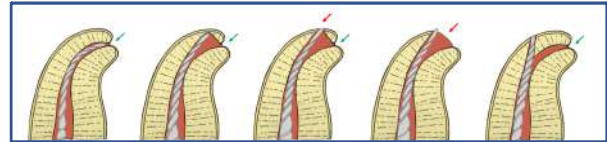
Ledge formation



Separated file

Endodontic Mishaps

- Size of foramen
- Number of foramens
- Presence of elbow



Elbow (Ledge)

Apical transportation

Zipping

perforation

Endodontic mishaps

Impedes full cleaning and sealing of the root canal (apical part)



Increase possibility of failure



Easy to avoid...

difficult to manage



Causes

- 1- lack of knowledge Motion of files, sequences of instruments or techniques, management curved canals...
- 2- lack of experience Fail to select the suitable size of files, fail to recognize cases that need specialist, when to discard the files?
- 3- lack of suitable instruments
- 4- anatomy of the root canal system c-shaped canal, S shaped canal, sever curved canals, Poor access, ...
- 5- Manufactural defects in instruments

How to avoid Endodontic mishaps

- Follow the protocols and company instructions
- Select a clear reference points
- Always Irrigate and recapitulate



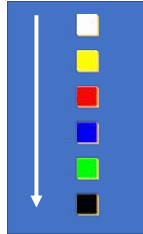
How to avoid Endodontic mishaps

- Select a clear reference points
- Always observe the rubber stopper and the length
- Pre-bend the files to follow the curvature of the canal



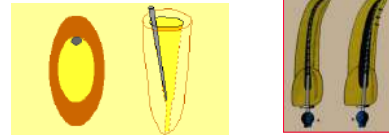
How to avoid Endodontic mishaps

- Do not rush to bigger sizes



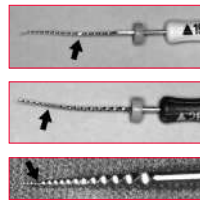
How to avoid Endodontic mishaps

- Work on all walls



How to avoid Endodontic mishaps

- Discard the files if any deformation or shining areas are observed



How to avoid Endodontic mishaps

- Remove weak and unsupported restoration parts of the old restoration
- Remove the remaining of the temporary filling



How to avoid Endodontic mishaps

- Clean the instruments before using them in the canal
- Use lubricants when necessary



Root Canal Obturation

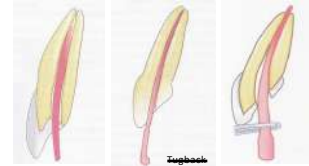
Technique: Lateral compacting

Check for the Master cone

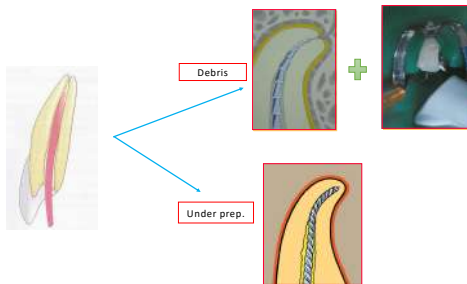
- Clinically: tug-back
- Radiographically: confirm the length



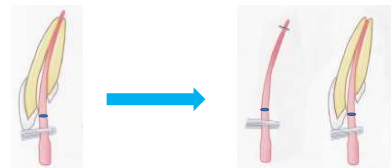
Problems with the master cone



Lateral Compaction



Lateral Compaction



Lateral Compaction

No Tugback?



Lateral Compaction

Technique

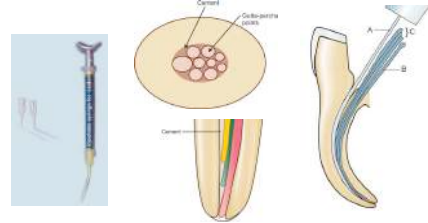


Lateral Compaction

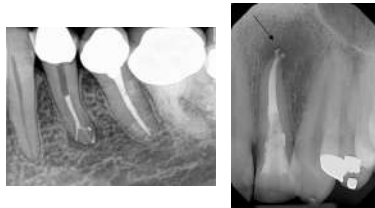


Lateral Compaction

Gradual filling



Lateral Compaction



Problems with the root filling



Under filling



Poor condensation



Over extension



Over filling