

**ENDODONTICS MISHAPS**

- Endodontic mishaps or procedural accidents - unfortunate occurrences that happen during treatment, some due to inattention to detail and others totally unpredictable (Ingle).

**CLASSIFICATION OF MISHAPS (INGLE AND BAKLAND)**

Access related	Instrumentation related	Obturation related	Miscellaneous
<ul style="list-style-type: none"> <li>• Treating the wrong tooth</li> <li>• Missed canals</li> <li>• Damage to existing restoration</li> <li>• Access cavity perforations</li> <li>• Crown fractures</li> </ul>	<ul style="list-style-type: none"> <li>• Ledge formation</li> <li>• Cervical canal perforations</li> <li>• Mid root perforations</li> <li>• Apical perforations</li> <li>• Separated instruments and foreign objects</li> <li>• Canal blockage</li> </ul>	<ul style="list-style-type: none"> <li>• Over-fillings</li> <li>• Under filling</li> <li>• Nerve paresthesia</li> <li>• Vertical root fractures</li> </ul>	<ul style="list-style-type: none"> <li>• Post space perforation</li> <li>• Irrigant related</li> <li>• Tissue emphysema</li> <li>• Instrument aspiration and ingestion</li> </ul>

**ACCESS RELATED MISHAPS**

**Treating A Wrong Tooth**

<i>Etiology</i>	<i>Recognition</i>	<i>Prevention</i>	<i>Correction</i>
<ul style="list-style-type: none"> <li>• Misdiagnosis</li> <li>• Isolating the wrong tooth</li> </ul>	<ul style="list-style-type: none"> <li>• Realizing the mistake after rubber dam removal</li> <li>• Persistence of symptoms</li> </ul>	<p>Mistakes in diagnosis can be avoided by</p> <ul style="list-style-type: none"> <li>• Observing radiograph showing a tooth with an apical lesion</li> <li>• Vitality checking</li> <li>• Draining sinus tract- GP tracing can be done that might lead to the tooth apex</li> <li>• Marking the tooth to be treated with a pen before isolating it with a rubber dam</li> </ul>	<ul style="list-style-type: none"> <li>• Appropriate treatment of both teeth one incorrectly opened and the one with the original pulpal problem</li> </ul>

**Missed Canals**

<i>Frequently missed canals</i>	<i>Etiology</i>	<i>Recognition</i>	<i>Prevention</i>
<ul style="list-style-type: none"> <li>• Additional canals in the mesial roots of maxillary molars &amp; Distal roots of mandibular molars</li> <li>• Second canals in lower incisors</li> <li>• Second canals and bifurcated canals in lower premolars</li> <li>• Third canals in upper premolars</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of knowledge about root canal anatomy &amp; its variations</li> <li>• Improper xray interpretation</li> <li>• Inadequate de-roofing of access cavity preparation</li> </ul>	<ul style="list-style-type: none"> <li>• IOPAS with different horizontal angulations- straight-on, mesio-oblique, &amp; disto-oblique angulations</li> <li>• Loupes and dental operating microscope- better visualization</li> <li>• Ultrasonic tips</li> <li>• Transillumination</li> <li>• Dye test- Methylene blue</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of root canal morphology</li> <li>• Adequate coronal access</li> <li>• Proper assessment of radiograph</li> <li>• Locating canals with surgical operating microscopes</li> <li>• Computerized digital radiography significantly aids in</li> </ul>

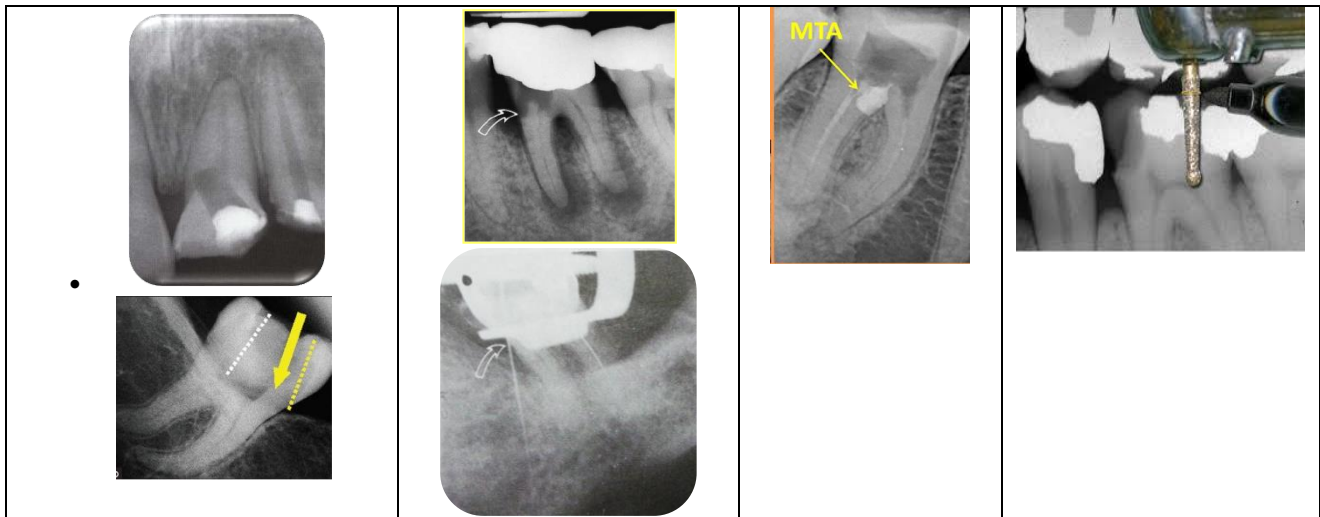
		<ul style="list-style-type: none"> <li>Bubble test /Champaign test- Access cavity is flooded with NaOCl to observe oxygen bubbles emanating from canals</li> <li>Micro-Openers and Microdebrider- Locate &amp; penetrate canals</li> <li>Red Line test- In vital teeth, blood moves into isthmus area and serves as a map for identifying anatomy</li> <li>White line test- In necrotic tooth, ultra sonic procedure without water causes dentinal dust to move into orifices &amp; isthmus</li> </ul>	<p>identifying hidden calcified or untreated canals</p> <ul style="list-style-type: none"> <li><u>Prognosis</u></li> <li>Missed canal decreases the prognosis and will most likely result in treatment failure.</li> </ul>
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#### Damage to Existing Restoration

<i>Etiology</i>	<i>Prevention</i>	<i>Correction</i>
<p>Porcelain crowns are the most susceptible to chipping and fracture while</p> <ul style="list-style-type: none"> <li>Placing a rubber dam clamp on any porcelain or porcelain-faced crown</li> <li>While performing access through the crown</li> </ul>	<ul style="list-style-type: none"> <li>Clamp placement on tooth adjacent to porcelain crown</li> <li>Removing the crown before treatment</li> <li>Use a water-cooled, smooth diamond bur without force while doing access through the crown</li> </ul>	<ul style="list-style-type: none"> <li>Minor porcelain chips can be repaired by bonding composite resin<sup>®</sup> to the crown</li> </ul>

#### Access Cavity Perforations

<i>Etiology</i>	<i>Recognition</i>	<i>Correction</i>	<i>Prevention</i>
<ul style="list-style-type: none"> <li>Misalignment of the bur in relation to axial inclination of a tooth</li> <li>Searching for pulp chamber/orifices</li> </ul>	<p>Above PDL attachment:</p> <ul style="list-style-type: none"> <li>Presence of leakage, either saliva into the cavity or irrigating solution into the mouth</li> </ul> <p>Into the PDL space:</p> <ul style="list-style-type: none"> <li>Presence of bleeding</li> <li>Confirmation by place a small file through the opening and take a radiograph</li> </ul>	<p>Materials for perforation repair</p> <ul style="list-style-type: none"> <li>Glass ionomer cement</li> <li>Tricalcium phosphate</li> <li>MTA</li> <li>Biodentin</li> <li>Cavit</li> <li>Amalgam</li> <li>Calcium hydroxide paste</li> <li>Super EBA</li> </ul>	<ul style="list-style-type: none"> <li>Aligning the long axis of access bur with the long axis of the tooth</li> <li>Presence, location, &amp; degree of pulp calcification noted on the preoperative radiograph and measured using access bur</li> </ul>



**Crown Fractures**

<i>Etiology</i>	<i>Recognition</i>	<i>Correction</i>	<i>Prevention</i>
<ul style="list-style-type: none"> <li>• Tooth may have a preexistent infarction - becomes a true fracture when the patient chews on tooth weakened by an access preparation</li> </ul>	<ul style="list-style-type: none"> <li>• Direct observation</li> <li>• Fracture crown may become mobile</li> </ul>	<ul style="list-style-type: none"> <li>• If the fracture is more extensive- Extraction</li> <li>• Crowns with infractions should be supported with circumferential bands</li> </ul>	<ul style="list-style-type: none"> <li>• Relieving the tooth from occlusion</li> </ul>

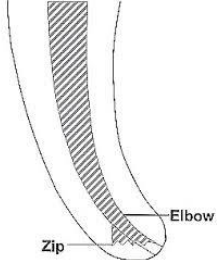

INSTRUMENTATION RELATED MISHAPS  
**Brihaspathi Academy**®

**Ledge Formation**

- Artificially created irregularity on the surface of the root canal wall that prevents the placement of instruments to the apex of an otherwise patent canal
- Deviation from the original canal curvature without communication with the periodontal ligament

<i>Etiology</i>	<i>Recognition</i>	<i>Correction</i>	<i>Prevention</i>
<ul style="list-style-type: none"> <li>• Incorrect assessment of the root canal direction &amp; working length</li> <li>• Using a non-curved stainless steel instrument that is too large for a curved canal</li> <li>• Forcing instrument into the canal</li> <li>• Failing to use the instruments in sequential order</li> <li>• Attempting to prepare calcified root canals or retrieve broken instruments</li> </ul>	<ul style="list-style-type: none"> <li>• When the instrument can no longer be inserted to full working length</li> <li>• Loss of tactile sensation, feeling that instrument is hitting against a solid rock</li> <li>• Radiograph with instrument in place</li> </ul>	<ul style="list-style-type: none"> <li>• Use of a small file, No. 10 or 15, with a distinct curve at the tip with watch-winding motion - used to explore the canal to the apex</li> </ul>	<ul style="list-style-type: none"> <li>• Accurate interpretation of diagnostic radiographs before placement of first instrument in the canal</li> <li>• Pre-curving instruments &amp; not "forcing" them</li> <li>• Using flexible nickel-titanium files &amp; noncutting tips</li> <li>• Work sequentially increasing sizes of instruments without jumping to large numbers</li> </ul>


**Zipping and Elbow Formation**

Definition	Etiology	Correction
<ul style="list-style-type: none"> <li>• Zipping is the transportation of the apical portion of the canal</li> <li>• Elbow is the narrowest portion of the zipped canal</li> <li>• Apical foramen tends to become tear drop or elliptical</li> </ul>	<ul style="list-style-type: none"> <li>• Failure to pre-curve the files</li> <li>• Forcing the instrument in curved canals</li> </ul> 	<ul style="list-style-type: none"> <li>• Use of vertical compaction of warm gutta percha- idea to compact zipped area of canal</li> </ul> 

**Perforations**

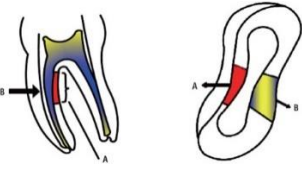
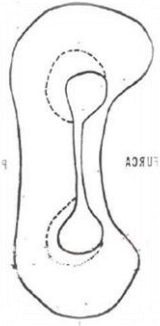
- Undesirable communications between the root canal and the external attachment apparatus.
- As per the location, classified as
  - Cervical perforations
  - Mid root perforations
  - Apical perforations

**Cervical Canal Perforations**



Etiology	Recognition	Correction	Prevention
<ul style="list-style-type: none"> <li>• Occurs during the process of locating and widening the canal orifice</li> <li>• Inappropriate use of Gates Glidden burs</li> </ul> 	<ul style="list-style-type: none"> <li>• Sudden appearance of blood from the PDL</li> <li>• Rinsing and blotting with a cotton pellet for direct visualization</li> <li>• Radiograph with a file in the opening – confirmation</li> <li>• Electronic apex locator - beneficial</li> </ul>	<ul style="list-style-type: none"> <li>• Both internal and external repair</li> <li>• Small area – from inside the tooth</li> <li>• Large area- seal from inside then surgically expose the site to repair the damage</li> </ul>	<ul style="list-style-type: none"> <li>• Reviewing tooth morphology</li> <li>• Radiographic verification of tooth position</li> </ul>

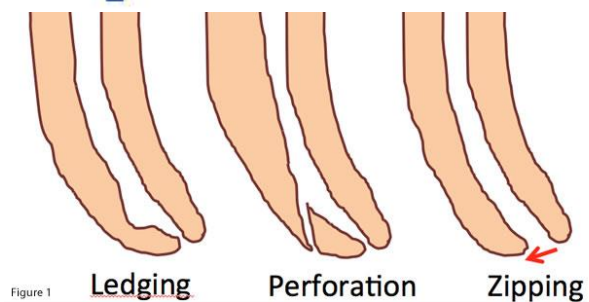
**Mid-Root Perforations**

Etiology	Recognition	Correction	Prevention
<ul style="list-style-type: none"> <li>• Either because of perforating when a ledge has formed during initial instrumentation or canal “stripping”</li> <li>• Most likely to happen on the concave wall of a</li> </ul>	<ul style="list-style-type: none"> <li>• Sudden appearance of blood in otherwise dry canal</li> <li>• Sudden complaint of pain by patient during instrumentation</li> <li>• A paper point can confirm the presence &amp;</li> </ul>	<ul style="list-style-type: none"> <li>• Success of the repair depends on the adequacy of seal established by the repair material</li> <li>• Access to these perforations – Difficult</li> <li>• Repair – Unpredictable</li> </ul>	<ul style="list-style-type: none"> <li>• Anti-curvature filing – maintain mesial pressure on enlarging instruments to avoid delicate danger zone of the distal wall</li> </ul>

<p>curved canal, such as the distal wall of the mesial roots in mandibular first molars</p> 	<p>location of the perforation</p>		
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**Apical Perforations**

Etiology	Recognition	Correction
<ul style="list-style-type: none"> <li>• Not negotiating a curved canal</li> <li>• Not establishing accurate working length &amp; instrumenting beyond the apical confines</li> <li>• Can be result of Ledging and apical zipping</li> </ul>  <p>Perforation</p>	<ul style="list-style-type: none"> <li>• Patient suddenly complains of pain during treatment</li> <li>• Canals flooded with hemorrhage</li> <li>• Tactile resistance of confines of canal space is lost</li> <li>• Apex locators, radiographs and paper points can be used to confirm suspicion</li> </ul> 	<ul style="list-style-type: none"> <li>• Attempts should be made to negotiate the apical canal segment</li> <li>• Re-establish the tooth length and then enlarge the canal</li> <li>• Obturation of both foramens required</li> <li>• Create artificial apical barrier</li> </ul>



*Prognosis*

Good	Poor
Fresh	Old
Small	Large
Apical / Coronal	Crestal

Factors influencing perforation repair

Level of perforation	<ul style="list-style-type: none"> <li>▪ Based on the relation with crestal bone                             <ul style="list-style-type: none"> <li>○ <i>Coronal</i> – coronal to crestal bone and epithelial attachment</li> <li>○ <i>Crestal</i> – at the level of epithelial attachment &amp; crestal bone</li> <li>○ <i>Apical</i> – apical to crestal bone and epithelial attachment</li> </ul> </li> <li>▪ The more apically the perforations, the more favorable the prognosis</li> <li>▪ Lateral perforation has better prognosis than furcal perforation as the furcation is close to crestal bone</li> </ul>
Location	<ul style="list-style-type: none"> <li>• Proximity to the gingival sulcus leads to a bacterial contamination from oral cavity.</li> <li>• Its position is critical in cases of surgical approach</li> </ul>
Size	<ul style="list-style-type: none"> <li>• Prognosis is directly proportional to size of perforation.</li> <li>• Small perforation → better prognosis because                             <ul style="list-style-type: none"> <li>▪ Easier to seal effectively without forcing filling material into surrounding tissues</li> <li>▪ Less tissue breakdown and inflammation</li> </ul> </li> </ul>
Time	<ul style="list-style-type: none"> <li>• A perforation should be repaired as soon as possible</li> <li>• Chronic perforations might lead to loss of sulcular attachment</li> </ul>

Management of Perforations

- Depends upon location, size and accessibility of the perforation

Restoration of defects with materials like <ul style="list-style-type: none"> <li>○ Amalgam- no longer used</li> <li>○ Zinc oxide eugenol</li> <li>○ Glass Ionomers</li> <li>○ Cavit</li> <li>○ Calcium hydroxide</li> <li>○ MTA</li> <li>○ Biodentine</li> </ul>	Barrier materials that can be used are <ul style="list-style-type: none"> <li>○ Indium foil as matrix</li> <li>○ Dentin shavings as barrier under RC sealer</li> <li>○ Hydroxyapatite barrier under amalgam</li> <li>○ Calcium phosphate</li> <li>○ Poly tetra fluoro ethylene membrane</li> <li>○ RMGIC, Ketac molar</li> </ul>	Surgical repair: <ul style="list-style-type: none"> <li>○ Hemisection</li> <li>○ Bicuspidization</li> <li>○ Root amputation</li> </ul>
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SEPARATED INSTRUMENTS AND FOREIGN OBJECTS

Causes	Recognition	Management	Prevention
<ul style="list-style-type: none"> <li>• Skipping of file sizes– larger files binds and breaks</li> <li>• Application of excessive apical pressure</li> <li>• Inadequate lubrication</li> <li>• Repeated use of same instrument or Cyclic fatigue</li> <li>• Torsional fatigue</li> </ul>	<ul style="list-style-type: none"> <li>• Observation of instrument post instrumentation</li> <li>• Resistance to the instrument with a loss of WL</li> <li>• Radiographs</li> </ul>	Depend on <ul style="list-style-type: none"> <li>○ Level of instrument separation – coronal, middle or apical</li> <li>○ Size of the instrument</li> <li>○ Degree of infection beyond the level of separation</li> <li>○ Operator skill</li> <li>○ Patient motivation</li> </ul> 3 possible management options <ol style="list-style-type: none"> <li>1. Retrieval</li> <li>2. Bypass and sealing the fragment within the root canal space</li> </ol>	<ul style="list-style-type: none"> <li>• Careful handling of instruments</li> <li>• Discard stressed instruments</li> <li>• Instruments No. 08 and 10 should be used only once</li> <li>• Sequential instrumentation, using the “quarter-turn” technique</li> </ul>

		3. Wait and observe strategy- in case of true blockage	
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**Retrieval of Separated Instrument**

- GG drill is selected larger than broken segment
- Modified GG- Bud is modified to create a circumferential staging platform
- For Coronal / middle third separations, staging platform facilitates introduction of retrievers

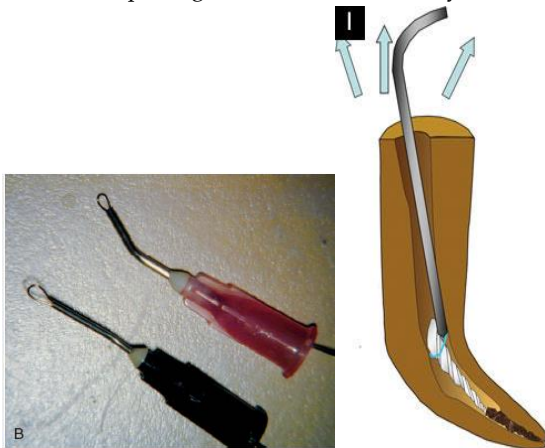
**Methods of Retrieval**

<p>Steiglitz forceps</p>	<p>Retrieve fractured instrument fragments above the orifice</p>
<p>File braiding technique</p>	<ul style="list-style-type: none"> <li>• Trepine around broken instrument</li> <li>• 3 H- files inserted and twisted clockwise – entangling the instrument &amp; then pulled out</li> </ul>
<p>Ultrasonics</p>	<ul style="list-style-type: none"> <li>• Using special tips – tunnel created around the separated instrument</li> <li>• This can be then vibrated &amp; dislodged.</li> <li>• Used in a counter clockwise direction, lowest power setting and dry field.</li> <li>• Zirconium nitride coated tips CPR-3,4,5 or Titanium coated CPR-6,7,8 can be used– ProUltra Endo Tips.</li> </ul>



Microtube removal systems

- Masseran kit
- Endoextractor system
- Instrument removal system
- Endo rescue kit
- Post removal system-Tap and thread method
- Meitrac Endo Safety System
- Wire loop and tube-
  - Microtube is selected & a wire passed through the tube, then looped at one end and passed back through the tube
  - Loop is engaged around fractured instrument and pulling the wire ends coronally



- Tube and glue method- microtube is bonded onto the obstruction with an adhesive, such as cyanoacrylate adhesive



- Tube and H- file- A tube is placed over the fractured fragment & two are locked together by gently screwing a H-file down the center of the tube

Masserann Kit

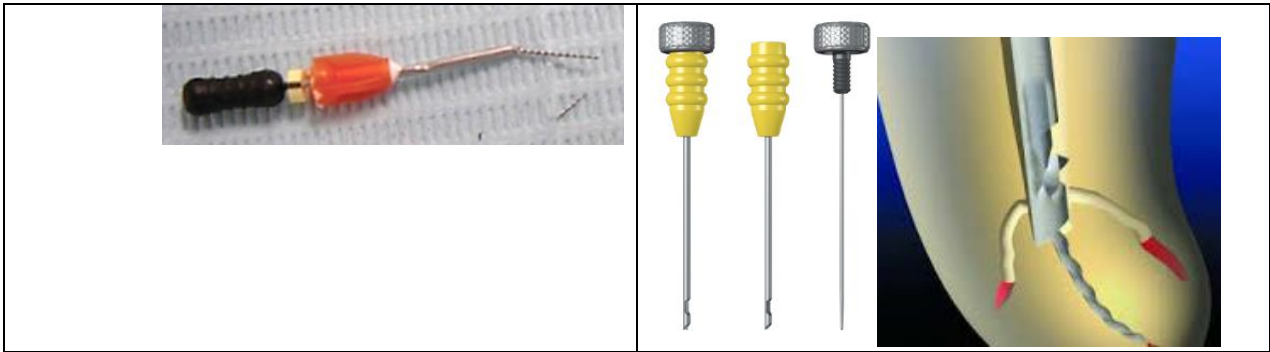
- It has series of trephining drills & tubular extractors
- Trephine burs- Create a space in the root canal around the coronal 2mm of the metallic object
- Extractor tube passes over it
- Extractor plunger is screwed down locking the object against a knurled ring in the tube wall



Instrument removal system

- 2 component device-Different sizes of hollow microtubes and screw wedges
- Microtube tips have 45°bevel and a lateral/sidecut out window.
- The beveled end of microtube "scoops-up" the broken instrument into its lumen.
- Then, screw wedge is rotated counter clockwise into microtube
- This to to engage and displace the head of the file out of the side window
- Removal of fragment by rotating the microtube and screw wedge assembly out of the canal






**CANAL BLOCKAGE**

Cause	Recognition	Management	Prevention
<ul style="list-style-type: none"> <li>Accumulation of dentinal debris in the apical third of the canal during enlargement</li> <li>Secondary to the other procedural errors like ledges, canal transportation and fractured instruments</li> <li>Rapid increase in the file size</li> </ul>	<ul style="list-style-type: none"> <li>When the confirmed working length is no longer attained</li> </ul>	<ul style="list-style-type: none"> <li>Recapitulation starting with the smallest file in the quarter-turn technique using a chelating agent</li> <li>If block out occurs at the curve, precurve the instrument and redirect it</li> </ul>	<ul style="list-style-type: none"> <li>Frequent irrigation during canal preparation</li> <li>Use of lubricant during instrumentation</li> </ul>

**OBTURATION RELATED MISHAPS**


**UNDERFILLING**

- Obturation of canal short of its prepared length

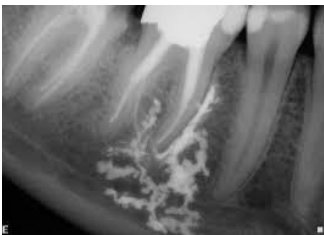

Etiology	Correction	Prevention
<ul style="list-style-type: none"> <li>Ledges, zipping and perforations</li> <li>Insufficient taper</li> <li>Insufficient flow of GP</li> <li>Large condensing instruments – spreaders &amp; pluggers</li> <li>Excessive packing of dentin chips in apical portion</li> <li>Failure to fit master cone accurately</li> <li>Use of a bigger size of master cone</li> </ul>	<p>Retreatment by removal of old filling &amp; proper preparation and obturation</p> 	<ul style="list-style-type: none"> <li>Proper canal preparation</li> <li>Adequate irrigation</li> <li>Proper fit of condensing instruments</li> </ul>

**OVERFILLING**



Cause	Recognition	Correction	Prevention
<ul style="list-style-type: none"> <li>Instrumentation beyond the apical constriction</li> <li>Zips, strips and perforations</li> <li>Excessive condensation force</li> <li>Excessive sealer</li> <li>Use of too small master cone</li> </ul>	<ul style="list-style-type: none"> <li>Post obturation pain</li> <li>Post obturation radiographs</li> </ul>	<ul style="list-style-type: none"> <li>Re-treatment</li> <li>Removal of over -extended filling is difficult                             <ul style="list-style-type: none"> <li>At times, entire point can be removed with one tug</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Accurate WL determination &amp; restricting instrumentation within canal space</li> <li>Apical barrier placement required- cases of root</li> </ul>



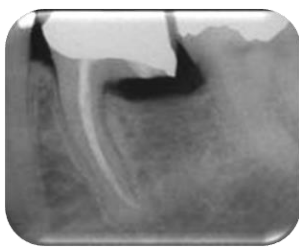
		<ul style="list-style-type: none"> <li>• Risk of leaving a fragment loose in the periradicular tissues</li> <li>• If it cannot be removed through the canal – surgical intervention required if symptoms or periradicular lesions develop</li> </ul>	<p>resorptions or open apex cases</p> <ul style="list-style-type: none"> <li>• Avoiding excessive condensation forces and amount of sealer</li> </ul>
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**NERVE PARESTHESIA**

Cause	Correction
<p>Overextensions of root canal filling materials, medicaments or over instrumentations via mechanical or chemical mechanisms</p>  <p>Zinc oxide and eugenol-based sealers – neurotoxic effect</p>	<ul style="list-style-type: none"> <li>• Nerve damage may be transient or permanent</li> <li>• Through nonintervention and observation for paresthesia to resolve- after removing the cause</li> <li>• Surgical intervention in severe cases</li> </ul> 



**VERTICAL ROOT FRACTURES (AIPG-01)**

Causes	Recognition	Management	Prevention
<ul style="list-style-type: none"> <li>• Too much force during compaction of GP</li> <li>• Over enlargement and thinning of dentinal walls</li> <li>• Excessive force application during post placement</li> </ul>  <p>26-10-2015</p> <p>Screw Post</p>	<ul style="list-style-type: none"> <li>• Sudden crunching sound (crepitus) during obturation</li> <li>• Bleeding during condensation</li> <li>• Swelling of soft tissue – Broad based at mid-root region</li> <li>• Deep periodontal pocket</li> <li>• Multiple sinus tracts</li> <li>• Direct observation of fracture line</li> <li>• Transillumination test</li> <li>• Dye test</li> <li>• Bite test – Tooth sloothe</li> </ul> <p><u>RADIOGRAPHIC FEATURES</u></p> <ul style="list-style-type: none"> <li>• TEAR DROP / J shaped Radiolucency</li> <li>• Separation of fractured fragments</li> </ul>	<ul style="list-style-type: none"> <li>• Extraction in most cases</li> <li>• Multirrooted teeth – resecting the fractured root by root amputation or hemisection</li> </ul> 	<ul style="list-style-type: none"> <li>• Avoid overpreparing the canals</li> <li>• Use of passive – less forceful obturation techniques and seating of posts</li> <li>• Full cuspal coverage post endodontic restorations</li> </ul>

	<ul style="list-style-type: none"> <li>• GP tracing through sinus- extends to apical part of fracture</li> </ul> 		
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**MISCELLANEOUS MISHAPS**

**POST SPACE PERFORATION**

Causes	Recognition	Management	Prevention
<p>overzealous use of Peeso reamers</p> 	<p>Sudden presence of blood in the canal &amp; pain</p>	<ol style="list-style-type: none"> <li>1. Non-surgical repair if the post can be removed (as stated in management of root perforation)</li> <li>2. Surgical repair if the post cannot be removed and the perforation is accessible</li> <li>3. Otherwise extraction is required</li> </ol> 	<ul style="list-style-type: none"> <li>• Planning post space on radiograph by observing location of root and its direction in alveolus</li> <li>• GP removal using heated pluggers-safer</li> </ul>

**IRRIGATION RELATED MISHAPS**

- Sodium hypochlorite extrusion into periradicular tissues, regardless of toxicity –causes potential problems

Causes	Recognition	Management	Prevention
<ul style="list-style-type: none"> <li>• Extrusion of irrigant mainly occur in teeth with wide apical foramina or resorption</li> </ul>	<ul style="list-style-type: none"> <li>• Patient may immediately complain of severe pain</li> <li>• Profuse bleeding from the root canal</li> </ul>	<ul style="list-style-type: none"> <li>• Abundant irrigation with saline</li> <li>• Regional block with a long acting anaesthetic solution</li> </ul>	<ul style="list-style-type: none"> <li>• Needle should not be wedged in the canal</li> <li>• Express irrigant slowly and gently</li> </ul>

<p>or through root perforations</p> <ul style="list-style-type: none"> <li>• Extreme pressure during irrigation</li> <li>• Binding of the irrigation needle tip in the root canal with no release for the irrigant to leave the root canal coronally</li> </ul>	<ul style="list-style-type: none"> <li>• Swelling can be violent and alarming</li> <li>• Initial response stage - swelling, pain, interstitial hemorrhage and ecchymosis</li> <li>• Effects depends on type of solution used, concentration and amount of exposure</li> </ul>	<ul style="list-style-type: none"> <li>• Antibiotics only if high risk of necrosis &amp; secondary infection</li> <li>• Antihistamines – reduce inflammation &amp; analgesics for pain</li> <li>• During first day, use of icepacks to prevent swelling</li> <li>• From 2<sup>nd</sup> day, use of hot compression &amp; warm saline rinses to stimulate local circulation</li> </ul>	<ul style="list-style-type: none"> <li>• Side vented needles are preferred over open ended needles</li> </ul>
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### TISSUE EMPHYSEMA

- Passage and collection of gas in tissue spaces or fascial planes

Causes	Recognition	Management	Prevention
<p>Compressed air being forced into the tissue space during</p> <ul style="list-style-type: none"> <li>• During canal drying</li> <li>• During apical surgery, air from a high-speed hand pieces</li> </ul>	<ul style="list-style-type: none"> <li>• Rapid swelling</li> <li>• Erythema</li> <li>• Crepitus</li> <li>• Migration of air into the neck region causes respiratory difficulty and progression into the mediastinum could cause death</li> </ul>	<ul style="list-style-type: none"> <li>• Palliative care and immediate medical attention if the airway or mediastinum is compromised</li> <li>• Broad spectrum antibiotics – prevent secondary infection</li> </ul>	<ul style="list-style-type: none"> <li>• Paper points to dry the root canal</li> <li>• If air syringe to be used to dry the canal – cross positioning over canal orifices i.e. VENTURI EFFECT<sup>®</sup></li> <li>• In apical surgical procedures, handpiece that exhausts spent air out from the back of the handpiece is preferred</li> </ul>

### INSTRUMENT ASPIRATION & INGESTION

- Endodontic instruments in absence of rubber dam can easily be aspirated or swallowed if accidentally dropped in the mouth

Cause	Recognition	Management	Prevention
<p>Endodontic instruments in absence of rubber dam can easily be aspirated or swallowed if accidentally dropped in the mouth</p>	<ul style="list-style-type: none"> <li>• Could be seen swallowed</li> <li>• Sudden discomfort in throat</li> <li>• Drooling of saliva and inability to swallow</li> <li>• Compromised airway</li> </ul> <p><u>INVESTIGATIONS:</u> Abdominal and chest X rays Endoscopy CT Scans</p>	<ul style="list-style-type: none"> <li>• Remove any object causing acute airway obstruction – readily accessible in the throat</li> <li>• Keep patients head low – turn to the side and ask to cough</li> <li>• Administer sharp blows on patients back</li> <li>• If object is visible- grasp with hemostats or high-volume suction tips or cotton pliers</li> <li>• If breathing obstructed – Heimlich Maneuver attempted</li> </ul>	<ul style="list-style-type: none"> <li>• Use rubber dam during all phases of RCT</li> <li>• Attach floss to the rubber dam clamp</li> <li>• Use a gauze throat pack</li> <li>• High velocity suction</li> <li>• More upright positioning of patient</li> </ul>

