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REVIEW ARTICLE

ACCESS RELATED ENDODONTIC PROCEDURAL ACCIDENTS: A REVIEW

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ABSTRACT:
Access-related endodontic mishaps or procedural accidents are unfortunate occurrences that happen due to inattention or unpredictability. First and foremost, an accurate diagnosis is essential for success of any treatment. Once established, flawless treatment requires an adequate armamentarium and magnification comprising of loupes and microscopes. Even after adopting a correct regimen, mishaps may occur, which have been classified into five broad categories, treating the wrong tooth, missed canals, damage to existing restoration, perforations and crown fractures. In consideration of treatment of a wrong tooth, as before-mentioned, a correct diagnosis is essential for rehabilitation. Once the diagnosis has been established, the tooth should be marked with a felt-tip pen to prevent misconstrued treatment of a healthy tooth. Proceeding further, a misdirected and/or incomplete access to the root canal system could increase the probability of missed canals, later regressing the success of endodontic treatment. To prevent such an occurrence, various armamentaria apart from magnification and radiographs are: piezoelectric ultrasonics, micro-openers, dyes, champagne test, transillumination, explorer pressure, white line & red line tests, perio-probing, symmetry and color. A controversial matter, the removal of an existing crown with coronal disassembly devices has been recommended, to allow exploration of the actual tooth surface. Even if prosthesis or a large restoration has to be retained, specific cavosurface angles to the occlusal table have to be maintained specific to each material. One more colossal aberration is the creation of a perforation, which is a communication between the root canal system and the external tooth surface. Perforations have to be sealed surgically or non-surgically as soon as possible to prevent bacterial ingress and worsening of the prognosis of a tooth. A wide array of materials have been advised for example, glass ionomer cement and calcium silicate materials like MTA. Lastly, preexistent infractions may be present which could becomea true fracture when the patient chews on the tooth weakened additionally by an access preparation. This can be averted by occlusal reduction of the tooth. In conclusion, adequate access has to be accomplished to suitably clean and shape the canal system and obturate the space. Moreover, acknowledging the long term prospects, the structural integrity of the tooth being treated must also be given due importance. Granting all this, if mishaps occur, appropriate management should be undertaken to prevent extraction.
Key words: Access, calcium silicate, champagne, disassembly, mishap, perforation

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INTRODUCTION

Endodontic mishaps or procedural accidents are those unfortunate occurrences that happen during treatment, some owing to inattention to detail, others totally unpredictable.[1] Procedural errors accounted for 66% of cases treated, considering 34% were error free. Of all the procedural mishaps, gouging had occurred in 0.6% erroneous cases, over preparation in 1.8% and strip perforations in 0.9% .[2]

Establishing an accurate diagnosis is the first step to success in endodontic therapy.[3]The location, cleaning, and shaping of the entire canal system may present a difficult challenge in nonsurgical endodontic treatment; aberrant canal configurations, accessory canals, bifurcations, isthmuses, and anastomoses are often difficult to identify, thus causing incomplete cleaning and filling. An adequate armamentarium is required, comprising of micro-openers, dyes, sodium hypochlorite, transillumination, ultrasonic tips and/ or an explorer along with the supplementary use of magnification.[4]

Furthermore, a mechanical or pathological communication between the root canal system and the external tooth surface could occur.[5]These communications are known as perforations which could occur cervically and furcally while exploring the pulp chamber for root canal orifices. They are the second greatest cause of endodontic failure and **Ingle** has accounted for 9.6% of all unsuccessful cases to perforations.[6] Perforations in the coronal third can be repaired both surgically and non-surgically with various materials such as MTA, Biodentine etc. with an overall success rate at 92%.[4,6]

Often, the tooth structure is weakened by an access preparation and/or caries. It may have a preexistent infraction that becomes a true fracture when the patient chews on the tooth additionally resulting in fracture of the crown, decreasing the longevity of the tooth.[1]

The clinicians must always have a scientifically sound evidence based rationale for every treatment decision that is made so that they may best serve the patients who entrust them with their care.

Therefore, this review attempts to entail various mishaps which could occur during the preparation of an access cavity alongwith the methods and equipment required for their recognition, prevention, treatment and how they affect the long term prognosis of a tooth.

CLASSIFICATION

According to Robert J. Frank[1], Access Related Mishaps can be categorized as:

1. Treating the wrong tooth
2. Missed canals

3. Damage to existing restoration
4. Access cavity perforations
5. Crown fractures

In addition, Ingle[7] described the mishaps related to access cavity preparation as:

1. Underextension
2. Overextension

Lastly, Gutmann[8] has collocated the major problems or errors in endodontic access openings as:

1. Failure to identify and excavate all caries and to remove unsupported, weak tooth structure or faulty restorations
2. Failure to establish proper access to the pulp chamber space and root canal system
3. Failure to identify the angle of the crown to the root and the angle of the tooth in the dental arch
4. Failure to recognize potential problems in access openings through crowned teeth or teeth with excessively large restorations.

TREATMENT OF THE WRONG TOOTH

Total failure of endodontic treatment would be the result of incorrect diagnosis entailing failure to diagnose present complaint or disease and the etiology of the disease.[9]In case of pulpal pain, it is often difficult for the patient to pinpoint the tooth causing the discomfort.[3]Correct pulpal diagnosis should be based on presenting symptoms, history of symptoms, diagnostic tests and clinical findings. If it is not possible to establish a diagnosis, therapy should not be initiated (**Sigurdsson** 2003).[3]

A few guidelines can be followed to avoid incorrect diagnosis and subsequently inadequate procedures:

- A patient's description of the location of pain must be treated with caution.
- The history of symptoms provides diagnostic help in determining the tooth causing the pain; (**Bender** 2000).[3]

If there is no question about diagnosis, treating the wrong tooth falls within the category of inattention on the part of the dentist.[1]

RECOGNITION

Misdiagnosis

A tooth can only be the source of pain if there are objective signs associated with that tooth.

- The possibility of **Phantom Tooth Syndrome** should be taken into consideration as a possible cause of the pain in presence of a confusing situation (**Battrum** & **Gutmann** 1996).[3]
- In a case report by **Matwychuk** (2004), it was found that initial diagnosis could be compromised by conflicting reports of the nature and source of the patient's pain, which is considered to be a common occurrence in neuropathic conditions.[10] Neuropathic pain in the head and neck region is common and can result in multiple unnecessary dental treatments. Trigeminal neuralgia and atypical odontalgia are 2 neuropathic conditions that may compromise accurate diagnosis of orofacial pain.[10]

CORRECTION

- Appropriate treatment of both teeth: the one incorrectly opened and the one with the original pulpal problem.
- Do not hide errors from the patient. The safest approach is to explain to the patient what happened and how the problem may be corrected.[1]

PREVENTION

- Before making a definitive diagnosis, obtain at least three good pieces of evidence supporting the diagnosis.
  - The patient may request that something be done if a diagnosis is not made, because the symptoms are too unpleasant to endure. In such a case, it may be necessary to extirpate the pulp as a diagnostic procedure to obtain more information for a definitive diagnosis.
  - If the patient agrees and understands that such a diagnostic procedure also requires completion of the root canal therapy even if it turns out that the problem is with another tooth, then it is not unreasonable to proceed.
  - Once a correct diagnosis has been made, this mishap can be easily prevented by marking the tooth to be treated with a felt-tip pen before isolating it with a rubber dam[1].
  - Preparation of an initial access cavity into the enamel or dentino-enamel junction can be completed before rubber dam application.[11]

MISSED CANALS

Some root canals are not easily accessible or readily apparent from the chamber; additional canals in the mesial roots of maxillary molars and distal roots of mandibular molars are good examples of canals often left untreated. Other canals are also missed because of a lack of knowledge about root canal anatomy or failure to adequately search for these additional canals. The advent of high-resolution magnification has also increased the ability to locate canals.

CORRECTION

Re-treatment is recommended and should be done before going for surgical correction.[1]

PROGNOSIS

A missed canal decreases the prognosis and will most likely result in treatment failure. As long as the apical seal adequately seals both canals, it is possible that the bacterial content in a missed canal may not affect the outcome for some time.[1]

PREVENTION

Locating all of the canals in a multicanal tooth is the best prevention of treatment failure. Adequate coronal access allows the opportunity to find all canal orifices. Knowledge of root canal morphology and knowing which teeth have multiple canals is a good foundation.[1]

Armamentaria and techniques associated with missed canals

There are multiple concepts, armamentaria and instruments that are useful to find missed canals and the following represent the most important.

Piezoelectric ultrasonics: Synergistically, a piezoelectric generator in conjunction with ultrasonic intruments are used to transfer energy and perform a variety of clinical procedures.[40,41]The working ends of specific ultrasonic instruments are 10 times smaller than the smallest manufactured round burs and their abrasive coatings allow them to precisely prepare away dentin when exploring for missed canals.[4]

Micro-Openers: Micro-openers have limited length cutting blades which, in conjunction with their 0.04 and 0.06 tapers, enhance tensile strength, making it easier to locate, penetrate, and perform initial canal enlargement procedures. These instruments provide unobstructed vision when operating in difficult teeth with limited access.[4]

Dyes: Various dyes like methylene blue can be irrigated into the pulp chambers of teeth to aid in diagnosis. The chamber is subsequently rinsed thoroughly with water, dried and visualized. Frequently the dye will be absorbed into orifices, fins and isthmus areas and serves to "roadmap" the anatomy.

Champagne test/ Sodium hypochlorite: A positive "bubble" reaction signifies that NaOCl is either reacting with residual tissue within a missed canal or with residual chelator still present within a canal being prepared.[4]

Transillumination: A fiber optic wand either above or below the rubber dam and directing light buccal to lingual. Diagnostics are, at times, improved by turning off the overhead or microscope light source to achieve a different optical effect.[4]

Explorer pressure: It can help to identify a missed canal. Firm explorer pressure is used to punch through a thin layer of secondary dentin.[4]

White line test: During ultrasonic procedures necrotic canals, dentinal dust moves into available anatomical space, such as the isthmus, and forms a visible white line. The white line test is a visible road map that can be followed and diagnostically aid in identifying as an example an MB2 orifice or canal.[4]

Red line test: In vital cases, blood frequently moves into an isthmus area. Like a dye, blood absorbs into orifices, and fins and isthmuses which serves to roadmap and aid in the identification of the underlying anatomy.[4]

Perio-probing: Probing the sulcus can provide important information as to the relationship between the long axis of the clinical crown and the underlying root as well as indicate possible root fracture.[4]

Symmetry: The rules of symmetry suggest that if any given root contains only one canal, then regardless of its anatomical configuration, the orifice should be positioned an equal distance from the external cavo-surface of the root.[4]

Color: Color changes indicate developmental grooves in the pulp chamber floor. Oftentimes, a dark groove on the pulpal floor of a multi-canal tooth can be followed and will lead to another canal orifice. Additionally, orifices frequently appear a darker color than the surrounding dentin in teeth exhibiting mineralization.[4]

If discovered, missed canals can usually be thoroughly cleaned, shaped and sealed. However, if a missed canal is suspected but cannot be readily identified, then an endodontic referral may be prudent to avoid further complications. Caution should be exercised when contemplating surgery due to the aforementioned concerns, but at times, surgery may be necessary in the hopes of salvaging the tooth.[4]

DAMAGE TO EXISTING RESTORATION

An existing porcelain crown presents the dentist with its own unique challenges. In preparing an access cavity through a porcelain or porcelain-bonded crown, the porcelain will sometimes chip, even when the most careful approach using water-cooled diamond stones is followed. There is usually no way to predict such an occurrence. Knowing when to exercise caution can, however, reduce unwanted results. A significant portion of all root canal procedures is performed through existing crowns.

CORRECTION

Minor porcelain chips can at times be repaired by bonding composite resin to the crown. However, the longevity of such repairs is unpredictable.

PREVENTION

Placing a rubber dam clamp directly on the margin of a porcelain crown is may result in damage to the crown margin and/or fracture of the porcelain. Even removal of a provisionally cemented new crown prior to endodontic therapy may also pose a problem. These crowns can be difficult to remove, and often a margin will be damaged, or the porcelain may chip.

Coronal disassembly

If the restorative material is deemed inadequate or additional access is required, the restoration should be sacrificed. However on specific occasions it is desirable to preserve and remove the existing restorative dentistry.[4] A clinician must obtain a good history, confer with the original treating dentist (if appropriate), consult with the patient and clearly define the risk versus benefit when entertaining the intact removal of an existing restoration. Grasping, Percussive and Active instruments can be used. According to **Clark** and **Khademi**[12] (2010), cavosurface angle of access cavities differ according to the condition of the tooth, whether non mutilated, mutilated or restored. The 6 types of molar cavosurface and chamber access:

Restorative Case Type	Cavosurface Angle (To Occlusal Table)
Non mutilated molar to receive bonded indirect onlay or composite onlay	1 mm of anatomic flattening (2 mm cusp tip flattening); then 45° angle of penetration until reaching the dentinal map
Nonmutilated molar to receive full crown	1.5 mm of anatomic flattening (2.5 mm cusptip flattening); then 45° angle of penetration until reaching the dentin map
Mutilated molar to receive full crown	2–3 mm of flattening
Gold crown to be retained	80° angle of penetration until reaching the dentin map
PFM crown to be retained	45° angle of penetration through the crown until reaching the dentin map
Zirconia based porcelain crown to be maintained	70–90° angle of penetration until reaching the dentin map

PERFORATION

Furcal perforation is usually an undesired complication that can occur during opening of endodontic access cavities or exploring canal orifice of multirooted tooth. They may also be the result of iatrogenic causes such as caries or resorption.[4] The **American Association of Endodontists** Glossary of Endodontic Terms defines perforation as the mechanical or pathological communication between the root canal system and the external tooth surface.[5]

Perforations adversely affect the prognosis of the endodontic treatment, occurring most frequently on the floor of the pulp chamber because of presence of accessory canals and less remaining dentin thickness. Furcal perforations are comparatively less difficult to treat than root perforations because of ease of access and visibility to the operator.[4, 13] **Fuss&Trope** have classified root perforations as fresh, old, small, large, coronal, crestal and apical perforations.[14]

ETIOLOGY

1. Iatrogenic
2. Tooth resorption
3. Caries

RECOGNITION

When the crown is perforated into the periodontal ligament, bleeding into the access cavity is often the first indication of an accidental perforation.[1]

DIAGNOSIS

Radiographs from multiple angles, including bitewing radiographs, will dramatically improve the clinicians - diagnostic acuity. The apex locator, normally used to determine canal working length, is an invaluable instrument in confirming the presence of a perforation.

PREVENTION

- Thorough examination of diagnostic preoperative radiograph
- Checking the long axis of the tooth and aligning the long axis of the access bur with the long axis of the tooth
- Presence, location, and degree of calcification of the pulp chamber
- Inadequate access preparation.

MANAGEMENT OF PERFORATIONS

Perforation size, interval as the defect was created and periodontal status are factors that have major influences on the prognosis for success.[15] Critical to the successful nonsurgical management of any type of perforation are the following:

1. Location, with any perforation in close proximity to the gingival sulcus exhibiting a highly guarded prognosis, and with furcation perforations exhibiting the worst prognosis.
2. Prevention of bacterial contamination.
3. Prevention of contact with intracanal medicaments such as formocresol, camphorated paramonochlorophenol, or cresatin.
4. Use of a filling material which has minimal cytotoxicity or inflammatory potential.
5. Prevention of excessive filling material beyond the confines of the perforation into the peri radicular tisues.
6. The time from perforation to its seal.
7. The use of hard-setting sealants versus resorbable sealants.

   The prognosis for nonsurgical management of tooth perforations is always guarded, and periodic radiographic and clinical evaluation is necessary.

With proper reassessment of these cases, the need for surgical intervention can be determined prior to the development of an unsalvageable situation.

Supracrestal perforations: Perforations coronal to the crestal bone can frequently be managed non-surgically. In order to facilitate the repair, it may be necessary, at times, to extrude the tooth orthodontically.[48] Alternatively, the defect may be exposed surgically or the tooth may be intentionally replanted surgically following repair of the perforation defect. Surgical crown lengthening may be indicated or used to assist in the surgical access to coronal-third root perforation.

Figure 1: Repair of a cervical perforation in upper central incisor with White Pro-Root MTA

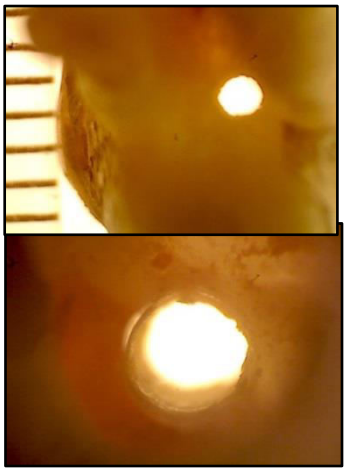

Figure 2: A stereomicroscopic image of a furcal perforation as viewed apically and coronally as a part of an in-vitro research comparing repair materials MTA, Biodentine and GIC Type II in Department Of Conservative Dentistry & Endodontics at Swami Devi Dyal Hospital & Dental College.

Crown lengthening may be performed either by using:

- A simple gingivectomy technique that will sacrifice attached gingiva and not permit any bone contouring or
- Surgically reflecting tissue and performing an ostectomy and/or osteoplasty.

If no bone is removed, care must be taken to ensure that there will be enough biologic width space created or the gingival margin will creep back towards its original position, resulting in a 'shortening' of the clinical crown.

Surgical management of perforation defects

Three broad categories of crestal zone perforation defects exist that can potentially be repaired surgically. These are:

(1) Strip perforations
(2) Furcation perforation
(3) Perforations related to external cervical root resorption:

Ideally, furcation and strip perforations should initially be managed using a non-surgical technique. Only when disease persists should surgical management of strip and furcation perforations be considered. [15,16]

The external approach to the management of cervical root resorption has been achieved using two techniques:

(1) A chemical cauterization of the lesion using 90% trichloroacetic acid and
(2) Surgical removal of the lesion.

The surgical repair of any perforation defect can be broken into soft-and hard-tissue managementeven though they are clinically inseparable.

Soft-tissue management during surgical repair of perforation defects

The soft-tissue access window is formed by combining a horizontal relieving incision and if necessary vertical relieving incision(s).

Horizontal relieving incision: The incision extends from the gingival sulcus through the periodontal ligament fibers and terminate at the crestal bone and pass adjacent to each tooth. When a defect extends interproximally, the tissue is reflected on both the lingual and buccal sides of the tooth.

Vertical relieving incision: Made over healthy bone distant from the site of the defect, beginning at the midpoint between the dental papilla and the horizontal aspect of the buccal gingival sulcus avoiding dissection of the dental papilla.

Soft-tissue access window design:

Combinations of vertical and horizontal incisions are used to achieve various soft-tissue access window designs: Limited triangular, Limited rectangular, Envelope.

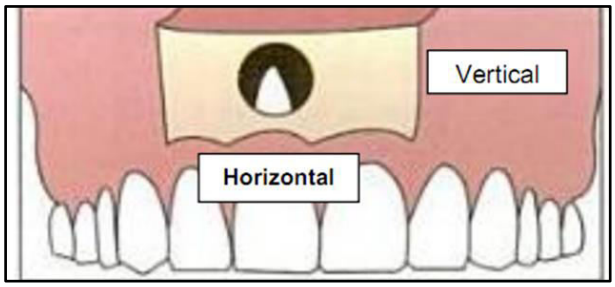

Figure 3: Combination of vertical and horizontal incision for soft tissue access

Once the tissue adjacent to the defect has been elevated, the surgeon should use a gentle rocking motion to continue the elevation and reflection in a mesial and distal direction as required.

Typically, the tissue should be reflected to include teeth adjacent to the tooth with the defect.

Hard-tissue management: Similar to root-end surgery, hard-tissue management involves **five** phases.

- Removal of healthy tissue to gain access to the diseased tissues using a surgical high-speed bur
- Removal of the diseased tissues and foreign material using a surgical high-speed bur
- Formation of an appropriate cavity form to receive the restorative material
- Achieve a dry surgical field using appropriate hemostatic techniques and materials followed by placement of the restorative material in the cavity
- The root surface is conditioned if appropriate, prior to tissue re-approximation

Design of the surgical flap should allow for tissue over teeth adjacent to the tooth with the defect, to be reflected. This will provide for good access and visibility.

Hard-tissue management: furcation and strip perforation

- Lesion perforates the cortical plate
  - Soft tissue should first be peeled away from the osseous crypt. Starting at the lateral borders using the curette with the concave surface

facing the internal envelop of the osseous opening.
    - curette can be used in a scraping manner to remove the remainder of the granulomatous tissue from the opposing wall of the osseous defect.
- Intact cortical plate
    - A hard-tissue access window can be made using a multi-fluted round bur in a rear vented high-speed hand piece applying copious sterile irrigation reducing the heat generated.
    - Temperature increases above normal body temperature have been shown to be detrimental to the osseous tissue.

Having removed the lesion, the focus of the procedure is now to identify and clean the perforation. Ultrasonic root-end preparation tip can be used to clean and simultaneously establish a cavity form.
As this type of perforative defect is typically encased in bone, the material of choice to restore this type of defect is mineral trioxide aggregate (MTA).

Hard-tissue management: cervical root resorption: Clinically, the lesion that forms adjacent to cervical root resorption can vary from a small defect at the gingival margin (**Heithersay** Class I) to extensive undermining cavitations of the tooth enamel that produces a pink coronal discoloration of the tooth crown.[15,16, 17]
Several different types of burs are useful in removing resorptive tissue. These include slow-speed burs such as the **Muller** bur, the LN bur and round #1 surgical length latch burs.[15]
Once all of the diseased tooth structure has been removed, the tooth needs to be thoroughly examined to assess the viability of the pulp. If the long-term integrity of the pulp is compromised or a pulpal exposure is present, then non-surgical root canal treatment is indicated. If rubber dam isolation can be established, performing root canal treatment through the existing defect, if possible, can prevent further destruction of the tooth. [15,16]

Placement of the restorative material: localized hemostasis: Hemostatic agents used during endodontic surgery are intended to control bleeding from small blood vessels or capillaries. Localized hemorrhage control enhances visibility and facilitates assessment of root structure and ensures establishment of a dry environment for the placement of restorative materials. Several agents have been advocated to control hemostasis during surgery.`[15,16]
Local hemostatic agents include:

- Collagen-based materials,
- Ferric sulfate,
- Calcium sulfate,
- Epinephrine soaked cotton or cotton pellets
- Cautery/electrosurgery.
- Unlike many periradicular surgical procedures, surgery in the cervical region of the tooth can sometimes be isolated using a rubber dam. The use of a rubber dam, if physically possible, provides ideal control of bleeding.

Root surface preparation: It is argued that this treatment produces a biocompatible surface, conducive to periodontal cell colonization without compromising the adjoining periodontium. A number of solutions have been advocated for root surface modification: citric acid, tetracycline and ethylene diamine tetra-acetic acid (EDTA).
The use of conditioning agents is not recommended when using MTA either as a perforation repair material or as a root-end filling material.[15]

Guided tissue regeneration and repair of root perforations: A barrier interposed between the gingival tissue and the exposed root surfaces and supporting alveolar bone prevents colonization of the exposed root surface by gingival cells. This encourages the selective repopulation of the root surface by periodontal ligament cells.
Barriers can be grouped into two broad categories: non-resorbable and resorbable membranes. Resorbable membranes are generally better suited as a second surgical procedure is not required to remove the membrane.
Graft materials have two main functions: first as a mechanical substructure to support a membrane and the overlying soft tissues and second as a biological component that enhances bone formation.

Figure 4: A bone graft with a barrier membrane place over the defect

Furthermore, postoperative administration of antibiotics has not been shown to enhance the prognosis for these cases; however, many clinicians empirically recommend antibiotic use.
In addition, the use of enamel proteins to enhance new attachment has been advocated. Emdogain is a derivative of porcine enamel proteins.[15,16]

Materials available for repair of perforation defects: Historically, a plethora of materials have been suggested for use in perforation repairs. Chloroform-rosin and guttapercha cones with phosphate cement were first introduced in 1967.[4] Zinc oxide eugenol cements, Glass ionomer cements, Cavit, Amalgam and Super EBA were also used to repair perforations. This, however always resulted in a chronic inflammatory response indicating a

continuous destructive process.[17,18] **Beavers** et al showed calcium hydroxide prevented ingrowth of granulation tissue into the perforation defect.[19]
So, Supracrestal perforations demand the use of a material such as amalgam or composite that will be resistant to dissolution by oral fluids or abrasion and erosion by foods, dentifrices or oral hygiene aids. Materials such as Intermediate Restorative Material (IRM), Super EBA, Diaket orMTA are not considered suitable materials in these situations.
Moreover, a number of materials have been developed specifically for repair of tooth structure in the subgingival area including resin-ionomer suspensions such as Geristore and compomers such as Dyract.
When used as root-end filling materials in vitro, leakage assessments of Geristore and Dyract indicate that they leak less than IRM, amalgam or Super EBA. Compared with MTA root-end fillings, Geristore has a similar leakage pattern. Geristore and Dyract are less sensitive to moisture than conventional glass ionomer cement; however, dry environments produced stronger bonds Geristore appears to facilitate regeneration of the periradicular tissues.[15]
The main disadvantage of currently-available MTA is a setting time of approximately 3 to 4 h, compromising the application in supracrestal cases. The possibility of being washed out during setting time needs to be considered.
To overcome these disadvantages, other bioactive calcium silicate materials are being introduced for example Biodentine andTheracal LC. The compressive strength of Biodentine is around 100 MPa in the first hour, which continues to improve until it reaches to 300 MPa after 1 month.[21]Theracal LC has an advantage of being a light cured CSM.
To restore subgingival defects, a resin-bonded materialsuch as Geristore is also recommended.

Use of a matrix: MTA does not require the use of an internal matrix when sealing furcal perforations. **Alhadainy** & **Himel** reported a 60% incidence of extrusion of resin-modified glass ionomer, producing additional inflammation and a foreign body reaction. **Arens** &**Torabinejad** demonstrated that cementum not only forms in continuance with the existing root cementum but also attaches itself directly to MTA even when the material has been extruded into furcal defects. It has been stated that extrusion of MTA into the alveolar bone does not pose a problem.[20]
A variety of resorbable barriers exist (e.g., collagen, freeze-dried demineralized bone allograft, hydroxy apatite, Gelfoam (Pfizer, New York, NY, USA), or calcium sulphate); if the use of a barrier is required, collagen and calcium sulphate materials are best employed because of ease ofhandling, research, and observed clinical results.

Prognosis: Prognosis for a perforated tooth must generally be downgraded. [1,15]**Sinai** proposed that the prognosis for a tooth with a perforation depends on the location of the perforation, the length of time the perforation is open to contamination,the ability to seal the perforation, and accessibility to the main canal.[17] The overall success rate for perforation repairs based on 55 cases was reported by **Kvinnsland** et al. as 92%.[6] Generally, it can be said that the sooner repair is undertaken, the better the chance of success.
Fuss &**Trope** presented a classification that emphasized the relationship of the perforation site to the 'critical crestal zone.'[15] This classification divides the root into coronal, crestal and apical portions: coronal being defined as 'coronal to the crestal bone and epithelial attachment'; crestal being defined as 'at thelevel of the epithelial attachment and crestal bone' and apical being defined as 'apical to the crestal bone and epithelial attachment.' In addition to considering the position of the perforation in relation to the 'critical crestal zone,' its position in the mesial distal and facial lingual planes must also be taken into account.
The decision to repair perforations surgically can only be made when a number of considerations have been addressed. These considerations include adequate access and visibility, protection of adjacent structures and creation of an untreatable periodontal defect after perforation repair.

CROWN FRACTURE

The tooth may have a preexistent infraction that becomes a true fracture when the patient chews on the tooth weakened additionally by an access preparation.

RECOGNITION of such fractures is usually by direct observation. When infractions become true fractures, parts of the crown may be mobile.

TREATMENT: Crown fractures usually have to be treated by extraction unless the fracture is of a "chisel type" in which only the cusp or part of the crown is involved; in such cases, the loose segment can be removed and treatment completed.

PROGNOSIS for a tooth with a crown fracture, if it can be treated at all, is likely to be less favorable than for an intact tooth, and the outcome is unpredictable. Crown infractions may spread to the roots, leading to vertical root fractures.

PREVENTION is simple: reduce the occlusion before working length is established. In addition to preventing this mishap, it also will aid in reducing discomfort following endodontic therapy. Bands and temporary crowns are also valuable.[1]

CONCLUSION

In restorative dentistry, the final restoration is no better than the initial cavity preparation. Before commencement of the cavity preparation, a lack of awareness and knowledge could lead to incorrect diagnosis and a misdirected access to a tooth requiring endodontic treatment. The decision to remove the existing restorations has to be made on the basis of the number of ways the tooth has been violated. If the tooth has been violated two or more ways, it is exceptionally unlikely that a long-term result can be delivered to the patient with even the most exceptional endodontic care.

Therefore, prevention being better than cure, the clinician must be well learned in the prevailing armamentaria and regimen. Endodontic cavity preparation begins the instant the tooth is approached with a cutting instrument. The advent of magnification and contemporary instruments decreases the frequency of procedural accidents and increases the skillfulness with which they can be adequately diagnosed and corrected.

Hence, it is important that adequate access be developed to properly clean and shape the canal system and obturate the space. Moreover, acknowledging the long term prospects, the structural integrity of the tooth being treated must also be given due importance. Granting all this, if mishaps occur, appropriate management should be undertaken to prevent extraction.

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