

## Management of perforated C-shaped canal with intentional replantation

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### I. Introduction

C-shaped teeth, an anatomical variation of a root fusion, generally have conical fused roots and a longitudinal groove on lingual or buccal surface of the roots. Since it is very difficult to identify atypical configuration of root canal, there is a risk of overinstrumentation or perforation into the longitudinal groove.

Grooves are capable of initiating localized periodontal destruction along the root surface. Once plaque and calculus invade the epithelial attachment, the groove becomes a pathway for microbes and their noxious toxins, with ample substrate from food debris to create a self-supporting periodontal lesion.

This case report presents the management of perforated C-shaped canal through intentional replantation along with longitudinal groove restoration.

### II. Case Presentation

1. Sex/age : F/54
2. Chief Complaint (CC): Discomfort on Rt. Mn. post. area
3. Past Dental History (PDH): Root canal treatment and cast post restoration on #47, gold bridge restoration on #45-47,  
3 years ago
4. Present Illness (PI): #47 per (-), pal (-), mob (0), PD (465/6105), buccal fistula opening (+), pus discharge (+)
5. Impression : Periapical abscess on #47
6. Tx plan : Intentional replantation on #47

### III. Conclusion

In this clinical case, management of perforated C-shaped canal is fulfilled by intentional replantation. On examination of extracted tooth, a perforation was observed on the longitudinal groove. The perforation site and groove were cleaned and sealed with MTA, retrograde filling material, to control the infection and thus prevent further destruction of periodontal tissue. The treatment result was satisfactory, with a favorable sign of healing on clinical and radiographic examinations.

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## **Cemental tear that can be confused with pulpally induced bony lesions**

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### **I. Introduction**

The cemental tear-associated lesion often presents itself on the radiograph as a periapical lesion or a periodontal lesion with angular bone loss along the root surface with variable extension. In this report, two clinical cases present the treatment of cemental tears of a maxillary incisor having periapical/ periodontal lesion with normal pulp or not.

### **II. Case Presentation**

<Case 1>

1. Sex/age : M/60
2. Chief Complaint (C.C) : Swelling, pus on #11 labial area
3. Past Dental History (PDH) : Canal filling state of #11
4. Present Illness (P.I) : #11 Per.(+), Mob.(-),labial sinus tract(+), P.A. lesion(+)/ #21 EPT(+), per(+) cold (-)
5. Impression : Cemental tear of #21
6. Tx. Plan : Re-RCT of #11 and surgical approach, debridement

<Case 2>

1. Sex/age: M/45
2. Chief Complaint (C.C): Pain on # 11, 21
3. Past Dental History (PDH): N.S
4. Present Illness (P.I): EPT(+), Cold(+), Per.(+)of #11, 21 and P.A. lesion of # 11 mesial area
5. Impression: Cemental tear of #11
6. Tx. Plan: Surgical approach, debridement

### **III. Conclusion**

Tissue swelling, narrow deep pocket, the predilection for vital teeth, periodontal/periapical bone destruction, and the presence of a radiopaque fragment on the root surface are the major clinical characteristics of teeth with cemental tears. To rule out the presence of an endodontic-periodontal lesion, the standard of care requires pulp vitality tests and careful radiographic examination to aid in the diagnosis and treatment options. The predictability and success of treating cemental tears has not yet been determined. However with appropriate early diagnosis and surgical treatment, prognosis can be improved. This case report illustrates the need to completely debride the loose cementum to achieve reattachment.

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## **Surgical Root Restoration & Root Canal Treatment in External Root Resorption due to Trauma**

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### **I. Introduction**

External root resorption is a progressive and destructive loss of tooth structure, initiated by a mineralized or denuded area of the root surface. External inflammatory root resorption can occur after pulpal infection and/or injury to the precementum. In cases of surgical intervention to treat progressive external root resorption, treatment is required to prevent tooth loss.

This case report describes the use of a pozzolan cement (Endocem) and root canal treatment to restore an extensive defect resulting from external root resorption.

### **II. Case Presentation**

< Case >

1. Sex/age : F/54
2. Chief Complaint(C.C) : Referred from Dept. of Perio for external root resorption on #22
3. Past Dental History(PDH) : 10 years ago, crown fracture without pulp exposure by trauma on #22
4. Present Illness(P.I) : Per(-), EPT(+), Mob(-), External root resorption on #22

Resorptive lesion involved the root canal

5. Impression : External root resorption on #22
6. Tx plan : Root canal treatment on #22

Surgical Root Restoration with Endocem on #22

### **III. Conclusion**

External root resorption is a perplexing problem for all the dental practitioners. This lesion is initiated by damage to the root cementum caused by trauma and inflammation of the periodontium.

In this case, the use of Endocem to rebuild a root was successful. And the debridement of resorptive lesion and rebuilding a part of root with Endocem can be treatment option of external root resorption in middle third of the root.

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## Success and failure of autogenous transplantation of mandibular third molar: 2 case reports

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### I. Introduction

Autogenous transplantation is a viable option for the treatment of hopeless teeth when a suitable donor tooth is available. This report involves two cases: successful case of mandibular third molar with complete root formation and failed case of mandibular third molar with immature root formation to replace a non-salvageable mandibular second molar.

### II. Case Presentation

< Case 1 >

1. Sex/Age: F/25
2. Chief complaint (C.C): Pain on biting, Intermittent spontaneous pain on #37
3. Past Dental history (PDH): RCT on #37 (15 years ago, L/C), re-RCT & post, crown (7 years ago, L/C)
4. Present illness (P.I): Per (+) Bite (+) Mob (-) Large apical radiolucency
5. Impression : Previously treated tooth with chronic apical periodontitis
6. Tx plan: Ext of #37, Auto-transplantation of #48 to #37

< Case 2 >

1. Sex/age: F/16
2. Chief Complaint (C.C): Pain on biting, Spontaneous pain on #47
3. Past dental history (PDH): RCT & crown on #47 (few months ago, L/C)
4. Present illness (P.I): Per (±) Mob (-) Large periapical cystic lesion on #47
5. Impression: Severe root caries, Previously treated tooth with large cystic lesion
6. Tx plan: Ext of #47, Auto-transplantation of #48 to #47

### III. Conclusion

Autogenous transplantation has several benefits compared with other methods, such as implant. But good patient cooperation is mandatory, especially when transplanting immature tooth. In the failed case, root was formed about 2/3 of original length, so we expected root development with canal obliteration. Periodic follow up was recommended, noticing the possibility of endodontic treatment. But the patient never followed up, and 3 years later, showed up with necrotic severely calcified tooth. With good observance of periodic follow up, better outcome could have been obtained.

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## Comparison of elemental characteristics between natural and artificially-induced caries-affected root dentin

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### I. Objectives:

The aim of this study was to analyze mineral composition of root dentin with natural caries and biologically- and chemically-induced artificial caries.

### II. Materials & Methods:

Ten caries-free upper premolars extracted during dental treatment were used for the study. Each root portion was vertically sectioned in buccal and lingual halves and a box-formed cavity was prepared on the buccal or lingual surface of each root segment. One segment was exposed to microbial artificial caries system using a strain of *Streptococcus mutans*, and the other segment was subjected to pH cycling using demineralizing solution. For evaluation of natural caries lesions, ten molars with root caries were used. Demineralized dentin tissue was removed from natural and artificial caries lesion using a carbide bur and a hand excavator with assistance of a dyeing technique. The cavities were restored with resin-modified glass ionomer (FujiII LC, GC Corporation, Tokyo, Japan) and the specimens were horizontally sectioned for scanning electron micrograph (SEM) and electron probe microanalysis (EPMA).

### III. Results:

SEM showed different patterns of demineralization in the affected dentin areas between natural and biologically- and chemically-induced caries lesions. Elemental profiles were in accordance with degrees of demineralization in the caries-affected dentin. Biologically-induced and chemically-induced caries lesions were similar in width and amount of demineralization.

### IV. Conclusion:

Natural root caries lesion showed different mineral composition of demineralized dentin compared to artificial root caries lesion. Biological caries model produced a similar caries-affected zone compared to pH cycling model.

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## Comparison of internal adaptations on class II bulk-fill composite restorations using micro-CT

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**I. Object:** The purpose of this study is to evaluate internal adaptation on class II bulk-fill composite resin restorations. The degree of internal adaptation can be compared by silver nitrate infiltration and micro-CT taking.

1. To see if there is any difference on facial, lingual wall and gingival floor of proximal box.
2. To see if there is any difference on gingival floor of proximal box and pulpal floor of the cavity.
3. To see if there is any difference of internal adaptation depending on the material which the cavity was filled by.

### II. Materials & Methods

5 different kinds of composite resins (one control, two flowable type bulk fill, two non-flowable type bulk fill) were used in this study. Forty caries-free, lower 3rd molars were collected and divided into five groups. A standard MOD cavity was prepared using a diamond bur.

Group 1: The cavities were filled by 2mm thick layering technique with Filtek Z350 (3M)

Group 2: SDR (Dentsply) bulk-fill resin was filled as 3.5mm thickness of base. Z350 layer was placed on top of it.

Group 3: Venus Bulk fil (Heraeus Kulzer) was filled as the same way as group 2.

Group 4: Tetric N-ceram bulkfil (Ivoclar vivadent) was filled as 3.5mm thickness. Another layer was placed on top.

Group 5: Sonicfill (Kerr) was used upto the full depth of the cavity.

After thermo-mechanical loading cycling, silver nitrate was infiltrated from pulpal side of the specimen. Micro-CT was taken to evaluate the internal adaptation of each specimen.

### III. Results

1. At proximal box, gingival floor showed less internal adaptation (more microleakage) than facial or lingual wall.
2. There was no difference of internal adaptation between gingival floor of proximal box and pulpal floor of the cavity.
3. Some flowable bulk-fill resin showed less internal adaptation (more microleakage) than other composite resins.

### IV. Conclusion

Some flowable type bulk-fill resins may cause more microleakage inside the restoration especially at gingival floor of the proximal box or pulpal floor of the cavity.

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## **Effect of 457 nm DPSS laser on the polymerization composite resins: microhardness, cross-link density, and polymerization shrinkage**

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**I. Object:** The purpose of the present study was to test the usefulness of 457nm DPSS laser which can activate camphorquinone having absorption peak around 465 nm, as a light source to cure composite resins. **II. Materials & Methods:** Five different composite resins were light cured using three different light-curing units (LCUs): a diode-pumped solid state (DPSS; LASER) 457 nm laser, a light-emitting diode (LED), and quartz-tungsten-halogen (QTH) units. The light intensity of Laser was 560 mW/cm<sup>2</sup>, whereas LED and QTH LCUs was approximately 900 mW/cm<sup>2</sup>. Degree of polymerization was tested by evaluating microhardness, cross-link density, and polymerization shrinkage.

**III. Results:** Before water immersion, the microhardness of Laser treated specimens ranged 40.8-84.7 Hv and 31.7-79.0 Hv on top and bottom surfaces, respectively, and these values were 3.3-23.2% and 2.9-31.1% lower than the highest microhardness obtained using LED or QTH LCUs. Also, Laser treated specimens had lower top and bottom microhardness than the other LCUs treated specimens by 2.4-19.4% and 1.4-27.8%, respectively. After ethanol immersion for 24 h, the microhardness of Laser treated specimens ranged from 20.3 to 63.2 Hv on top and bottom surfaces, but from 24.9 to 71.5 Hv when specimens were cured using the other LCUs. Polymerization shrinkage was 9.8-14.7 μm for Laser treated specimens and these were significantly similar or lower (10.2-16.0 μm) than those obtained using the other LCUs.

**IV. Conclusion:** The results may suggest that the DPSS 457 nm laser may be potentially used as a light source for light curing dental resin composites.

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## **Partial pulpotomy and crown fragment reattachment in fractured upper anterior teeth**

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### **I. Objectives:**

The crown fracture of upper incisors is a common type of traumatic dental injury and its percentage is 11-15% for complicated coronal fractures in permanent dentition. The methods available for treating traumatic pulp exposures include pulp-capping, partial pulpotomy, pulpotomy or root canal therapy. Restorative options vary: composite resin restorations, porcelain veneers, or full-coverage crowns. If a broken tooth fragment is available, reattachment technique can be applied as an alternative treatment. This case report describes two clinical cases of tooth reattachment performed in a fractured upper incisor with pulp exposure, which was treated with partial pulpotomy.

### **II. Materials, Methods & Results:**

The first case involves a 20-year-old male who was referred to the clinic with crown fracture of the maxillary right central incisor 2 hours after the trauma. Intraoral and radiographic examinations revealed a complicated crown fracture of the maxillary right central incisor with exposed pulp and complete root development. The second case involves an 18-year-old female who was seen in the clinic with trauma to her crown fractures of the maxillary both central incisors, received 3 hours previously. Intraoral and radiographic examination revealed a complicated crown fracture of the both central incisors with exposed pulp and complete root development. For both cases, the treatments were partial pulpotomy with TheraCal LC<sup>®</sup> (Bisco, USA) and reattachment of the crown fragment. At 12 months' follow up, the teeth remained vital without any periodontal or periapical pathology in both cases,.

### **III. Conclusions:**

The advantage of partial pulpotomy as compared with capping lies in better control of the surgical wound and retention of the sealing material. Compared with pulpotomy, the pulp is not deprived of the possibility of continued physiologic dentin production in the crown and the cervical area of the tooth. The reattachment of fractured tooth fragment also offers an excellent restorative option, because it restores tooth function and aesthetics, requires less time in the dental office and represents a cost-effective approach. The combined therapy of partial pulpotomy and tooth fragment reattachment can be recommended for the management of the complicated crown-fractured teeth.

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## Effect of resin-based desensitizing agent on dentin bond strength of two-step self-etch adhesive

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**I. Object:** The aim of this study was to evaluate the effect of desensitizing agent on dentin bond strength of a two-step self-etch adhesive.

**II. Materials & Methods:** Twenty human third molars were used in this study. They were ground flat to expose the dentin and randomly divided into four groups as follows: group 1 was only treated with a resin-based desensitizer (Seal and Protect®); group 2 was treated with a desensitizer and 5,000 cycles of tooth-brushing; group 3 was treated with a desensitizer and 10,000 cycles of tooth-brushing; group 4, no desensitizer and no tooth brushing. Then, two-step self-etch adhesive (Clearfil SE primer and bond™) was used for bonding in all groups. All groups were restored with a composite resin (Filtek™ Z250). The microtensile bond strength ( $\mu$ TBS) was tested ( $n = 30$  beams per group). The result of bonding strength was statistically analyzed using ANOVA and multiple comparisons are made using Turkey's test at  $p < 0.05$  level.

**III. Results:** Group 4 (control) showed significantly higher bond strength than group 1, group 2 and group 3 ( $p < 0.05$ ). No significant differences were found among group 1, group 2 and group 3 ( $p > 0.05$ ).

**IV. Conclusion:** Resin-based desensitizing agent reduced the bond strength of a two-step self-etch adhesive and tooth brushing did not affect the bond strength of an adhesive.

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## **An evaluation of degradation in dental adhesives using quantitative light-induced fluorescence**

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**I. Object:** The aim of this study was to evaluate the degradation in commercial dental adhesive resins using quantitative light-induced fluorescence (QLF).

**II. Materials & Methods:** Three adhesives were selected: D/E resin (DR), Single Bond Plus (SB), and G-Bond™ (GB). The adhesives were mixed with porphyrin for the QLF analysis. Specimens were prepared by dispensing blended adhesives into a flexible mold and polymerizing. Then, the QLF analysis of the specimens was done and the porphyrin values (Simple Plaque Score™ and  $\Delta R$ ) were measured. After thermocycling of the specimens (5000 cycles, 5 to 55 °C) for the degradation, the specimens were assayed by QLF again. The porphyrin values were analyzed using paired t-test at a 95% confidence level.

**III. Results:** A significant reduction in SPS™ was observed in all groups after thermocycling. The  $\Delta R$  significantly decreased after thermocycling except area  $\Delta R_{30}$  of SB group. Overall, porphyrin values decreased after thermocycling which indicates that the degradation of the adhesive resins may be measured by the change of porphyrin value. The QLF method could be used to evaluate the degradation of adhesive resin.

**IV. Conclusion:** Overall, porphyrin values decreased after thermocycling which indicates that the degradation of the adhesive resins may be measured by the change of porphyrin value. The QLF method could be used to evaluate the degradation of adhesive resin.

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## Evaluation of the Color Stability of Light Cured Composite Resins according to their Resin Matrices

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**I. Object:** The purpose of this study was to evaluate the color stability of light cured composite resins according to the resin matrices with accelerated test.

**II. Materials & Methods:** Three kinds of resin matrices such as Bis-GMA(Venus® Diamond, VD), Silorane(Filtek™ P90, P90), and Ormocer(Admira, Ad) were selected. Each of the selected composite resin was used to prepare 30 specimens in 5 millimeters in diameter and 2.5 millimeters in thickness. The specimens were polished with #1500 sandpaper. The initial CIE L\*a\*b\* values of specimens were measured according to the Commission International de l'Eclairage(CIE) L\*a\*b\* color scale by means of a Spectrophotometer (NF999, Nippon Denshoku, Japan). To minimize discoloration factors, all specimens were stored in three stainless steel cases according to the resin matrices. For accelerated aging process, the specimens were immersed in a refrigerated bath circulator with distilled water at 60°C. Spectrophotometric analyses were made after immersion of 8, 16, 24, 41 days and the color difference( $\Delta E^*$ ) was calculated. The mean, standard deviation(SD), and color difference( $\Delta E^*$ ) of measured CIE L\*a\*b\* values of the specimens were compared and evaluated.

### III. Results

1. The L\* value increased compared with initial L\* value. VD had the greatest L\* value change and Ad had the smallest L\* value change during the study period( $p < 0.05$ ).
2. The a\* value was positive(+) initially, and changed with time to negative(-) for every resin specimens(VD, P90, Ad). Among the three kinds of resin specimens, Ad had the greatest a\* value change and VD had the smallest a\* value change during the study period( $p < 0.05$ ).
3. The b\* value of P90 increased steadily in positive value(+)( $p < 0.05$ ).
4. The color difference( $\Delta E^*$ ) of Ad had the smallest value and that of P90 had the greatest change with time among the three kinds of resin matrices.

**IV. Conclusion:** According to this study, the L\* value of light cured composite resins was increased with time and color of those changed into greenish and yellowish. And according to the evaluation of color stability, Admira(Ormocer) had the best color stability and Filtek P90(Silorane) had the lowest color stability. Venus(Bis-GMA) had the greatest  $\Delta E^*$  after 8 days of this study.

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## **An interdisciplinary approach for improved esthetic results in the anterior maxilla**

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### **I. Introduction:**

A peg lateral is defined as an undersized, tapered, maxillary lateral incisor. Because of their reduced size, the malformed lateral incisors may also allow the formation of diastema in the anterior region. Treatment option may vary depending on different clinical approaches. The type of treatment should be selected by function, esthetics, the need for extractions, position of the canines, and the potential for coordinating restorative and orthodontic treatment. This case report presents that with the rearrangement of the teeth, the anterior maxillary esthetics can be restored with porcelain laminate veneers for minimal teeth preparations, which can preserve sound tooth structure and prevent pulp-irritation.

### **II. Case Presentation:**

< Case 1 >

1. Sex/age : F/21
2. Chief Complaint (C.C) : Anterior diastema resulting from the presence of 2 peg-shaped lateral incisors
3. Past Dental History (PDH) : N/S
4. Present Illness (P.I) : Peg lateralis on #12, 22  
per (-), pal (-), mob (0), cold (+), EPT (+), PD (WNL)
5. Impression : Peg lateralis on #12, 22
6. Tx plan : Tooth rotation of #12 and #22 with utilizing clear removable appliances  
Porcelain laminate veneer on #12, 11, 21, 22

### **III. Conclusion:**

This case report shows that an interdisciplinary approach to an esthetic defect that result from diastema and peg-shaped lateral incisors. In this clinical situation, the restorative treatment benefited from the orthodontic correction of local tooth malposition through a removable appliance. Coordinated treatment with careful consideration of patient expectations and requests were critical for successful outcome and patient's satisfaction.

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## The effect of shade and thickness on polymerization of silorane-based composite resin

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**I. Object:** The purpose of this study was to evaluate the influence of the polymerization on shade of a silorane-based composite resin.

**II. Materials & Methods:** Three shades A2, A3 and C2 of silorane –based composite resin (Filtek P90) were selected. The number of photons were detected using the photodiode detector at the different prepared specimens. The microhardness of the specimen light-cured using LED light unit after aging for 24hr and immersion in ethanol for 24hr was measured using a Vickers hardness with 200-gf load and 15 second dwell time conditions at the different thicknesses (thickness ; top, 1mm, 2mm, 3mm). The degree of conversion (DC) of the specimens was determined using Fourier transform infrared spectroscopy (FTIR). To measure the polymerization shrinkage, a linometer (RB 404, R&B Inc., Daejeon, Korea) was used. Data were statistically analyzed by ANOVA and Tukey's test.

**III. Results:** In the subsurface, the incident light (photons) decreased exponentially. Among the specimens, A2 group showed less light attenuation than the other two shade products. After aging for 24hr, the microhardness of A2 shade specimens ranged 52.0-62.3 Hv on top and bottom surfaces, A3 and C2 groups were ranged 48.5-58.3 Hv and 51.6-61.5 Hv, respectively. A3 group specimens had significantly lower top and bottom microhardness than the other A2 and C2 groups( $p<0.05$ ). After ethanol immersion for 24 h, the microhardness of A2 groups ranged from 40.9 to 51.9 Hv on top and bottom surfaces, but from 37.7 to 52.2 Hv and from 41.4 to 53.4 Hv when specimens were prepared with the other A3 and C2 groups, respectively. In the DC, A3 groups showed significantly lower when compared to A2 group( $p<0.05$ ). Polymerization shrinkage was 7.3-7.6  $\mu\text{m}$  and these were significantly similar regardless of the specimens ( $p>0.05$ ).

**IV. Conclusion:** The number of photons decreased exponentially with increasing specimen thickness. The microhardness after aging and ethanol immersion for 24h, and the DC of A3 group were significantly lower than those of A2 and C2 groups. Polymerization shrinkage had statistically similar values regardless of the groups.

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## Endodontic Treatment of Maxillary 1st Molar with Fused Root

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### I. Introduction

Successful root canal treatment requires accurate knowledge of tooth anatomy and root canal morphology. Sometimes morphologic features of tooth can have unfavourable effect on endodontic procedures.

During endodontic treatment, it must be noted that variations in anatomical configuration are occasionally exist. Cone-beam CT is a useful diagnostic instrument in endodontic treatment with abnormal tooth anatomy. Maxillary 1st molars usually have 3 roots and canals. Fused root of maxillary 1st molars is uncommon, however, distobuccal-palatal root fusion is most common kind of root fusion. This case report present the endodontic treatment of maxillary 1st molar that has fused c-shaped buccal root with 2 canals which cannot be identified in routine periapical x-ray.

### II. Case Presentation

1. Sex/Age : M/55
2. Chief Complaint (C.C) : Broken tooth of #26
3. Past Dental History (PDH) : mandibular body fx, #26 palatal cusp fx. by traumatic injury yesterday.
4. Present Illness(P.I) : #26 palatal cusp fx. with pulp exposure
5. Impression : Complicated Cr. fx. on #26
6. Tx.plan : non-surgical root canal treatment

### III. Conclusion

The Maxillary 1st molar in this case has fused c-shaped buccal root with 2 canals and separated palatal root with 1 canal. It looks like common maxillary 1st molar in routine periapical x-ray, and this type of anatomical variation is uncommon.

Cone-beam CT is a useful instrument in difficult root canal treatment and can show abnormal root canal morphology in various cross sections. With Cone-beam CT aid, complicated root canal treatment cases can be successfully treated.

### IV. Conclusion

Maxillary 1st molar with fused c-shaped buccal root can be successfully treated with Cone-beam CT aid.

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