



CT-Assisted Management with Biodentine Obturation and Aesthetic Rehabilitation of a Geminated Maxillary Central Incisor with Mid-Root Fracture: A Rare Case Report

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Abstract

Gemination, a rare aberration in tooth development, results from the incomplete division of one tooth germ into two. In this case report, a true geminated permanent maxillary central incisor tooth with a horizontal mid-root fracture is successfully treated by non-surgical endodontic treatment. To elucidate the intricate root canal anatomy of this rare geminated incisor, we employed computed tomography imaging technology, enhancing our understanding of this complex case. Utilizing biodentine for obturation proved pivotal, as its capacity to accelerate reparative dentin formation facilitated prompt healing, particularly beneficial in fracture cases. This was followed by aesthetic rehabilitation to achieve a pleasing mesio-distal dimension for both the central incisors using a zirconia-reinforced porcelain crowns.

Keywords: Computed Tomography (CT), Gemination, Horizontal root fracture, Biodentine Obturation

INTRODUCTION

Gemination is a developmental anomaly arising from the unique splitting of a tooth germ by an invagination involving ectoderm and mesoderm, leading to incomplete formation of two teeth. Despite extensive study, the exact cause of gemination remains largely elusive.

Its occurrence in permanent dentition is notably rare, with only 0.1- 0.2% incidence¹, most commonly affecting maxillary central incisor. Aguiló *et al.*² classified gemination into four morphological types.

In the context of dental trauma, crown-root fractures occur in 38% of the permanent dentition (Mier *et al.*, 2013) with horizontal root fracture located predominantly in the middle third (57%).

This case report presents a unique scenario of a geminated maxillary central incisor with a horizontal mid-root fracture. The tooth underwent endodontic treatment, followed by aesthetic rehabilitation using zirconia-reinforced porcelain crowns, emphasizing both functional and cosmetic restoration.

CASE REPORT

A 23-year-old male reported with pain in his fractured upper incisors following trauma due to fall 2 weeks back. Clinically, a wide crown of the left central incisor [Figure 10] was noted with a buccal groove demarcating it in two incompletely fused crowns. Tooth mobility and periodontal probing depth were within normal limits. Vitality testing showed non-vital response in both the central incisors and the left lateral incisor.

Preoperative radiograph showed a single root with a large pulp chamber and a horizontal fracture line along the mid-root of the malformed tooth [Figure 1]. The diagnosis of gemination was made clinically based on the normal number of teeth in the dental arch, excluding the possibility of fusion.

A CT was advised to study root canal morphology and fracture. [Figures- 6, 7, 8] The cross-sectional CT images showed two fused crowns, a large pulp chamber with single root canal and a horizontal fracture line at the mid-root level in the left central incisor. [Figure 9].

Based on the classification given by Aguiló *et al*², the present case is of type 2 gemination as inferred from the clinical and radiographic appearance of the tooth. The tooth presented as

two fused crowns with a buccal groove running vertically, and a large fused pulp chamber.

Non-surgical root canal treatment followed by an aesthetic restoration with crown was planned for both the incisors and left lateral incisor with informed consent.

Under local anaesthesia and rubber dam, endodontic access was prepared with Endo-Access bur and Endo-Z bur. Working length was measured till fracture line [Figure 2] using #15 K-file, cleaning was performed in a crown-down manner. Irrigation was done using side-vented needles inserted 3mm short of the level of the fracture line to prevent the flow of irrigants beyond the fracture line. Paper points were used to dry the canal, a collagen plug was placed at working length and obturation was done using biobond, up to the middle third, just above the fracture line. [Figure 3]

Access cavities were restored by restorative GIC and packable composite and tooth preparation for crown placement was done. Permanent crowns were given in both the incisors such that an aesthetic mesio-distal width for both the crowns were achieved. [Figure 4, 11] A 12-month post-operative periapical radiograph shows a healing periapical radiolucency [Figure 5]

DISCUSSION

The limitation of a two-dimensional radiograph is the compression of 3D anatomy into a two-dimensional image. This necessitates additional imaging modalities like CT scans to provide a comprehensive assessment of the anatomy of the root canal for a more effective endodontic intervention.^{3,4}

In this present case, the canal preparation is confined to only above the fracture line leaving the apical segment untouched due to the perceived vitality as there were no periapical signs of inflammation or bone resorption, etc., and pulp necrosis was limited to the coronal fragment.

Biobond, chosen for its unique properties, has a micromechanical adhesion as due to its high pH it causes organic tissues of the dentin tubule to dissolve and itself gets keyed into these spaces as innumerable microscopic cones, creating a stable anchorage and a bacteria-tight seal.^{6,7} Moreover, its application also induces mineralization by expressing odontoblastic markers & increases TGF- β 1 secretion from pulpal cells enabling early mineralization in the form of reparative dentin formation.⁵ These factors expedite healing, especially beneficial in scenarios of tooth fracture, where delayed healing can lead to re-infection of the root canal space and thus compromise the prognosis.



Figure 1: Pre-operative IOPA radiograph



Figure 2: Working length IOPA radiograph

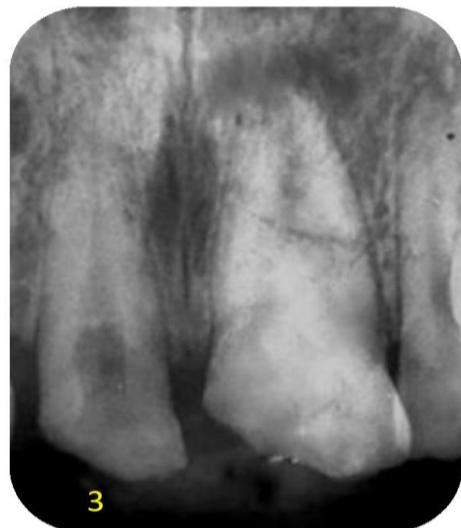


Figure 3: Biobond obturation IOPA Radiograph



Figure 4: Radiograph following crown placement



Figure 5: Radiograph after 12- month follow-up period

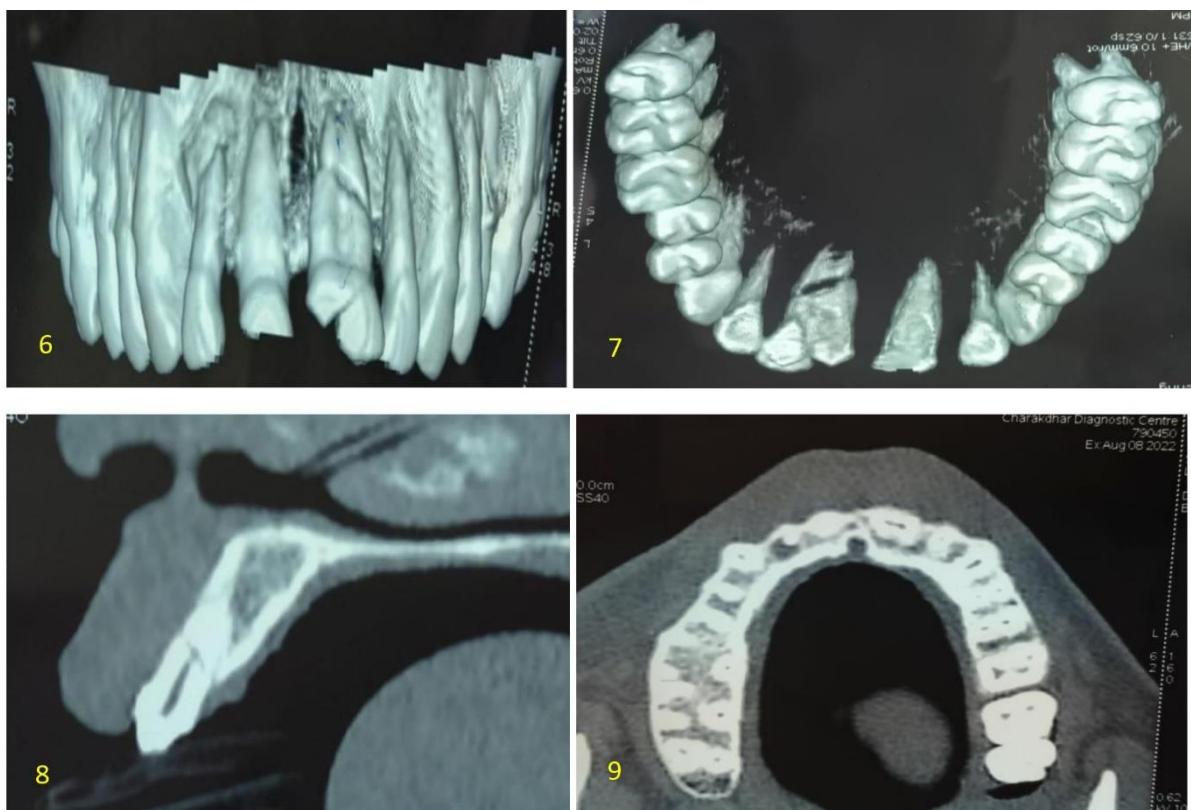


Figure 6-9: CT images of fractured geminated central incisor



Figure 10: Pre- operative Intra-oral image

Figure 11: Intra-oral image following crown placement

CONCLUSION

Gemination presents as a challenge in endodontic management due to its unusual root canal morphology. However, with thorough clinical and radiographic assessment, successful management is achievable.

This case report demonstrates the effective endodontic management of a rare and complex scenario of horizontal mid-root fracture of a geminated maxillary central incisor.

Authorship Declaration

Hereby we acknowledge that all authors mentioned above have contributed significantly, and all the authors are in agreement with the submission of this manuscript to the journal- Asian Journal of Dental Sciences

Author's Contribution

Dr. Neelam Mittal: Conceptualization, Supervision, Validation, Visualization, Project administration, Writing – review & editing.

Dr. Harshitaa Aggarwal: Data curation, Methodology, Investigation, Writing – original draft, Writing – review & editing.

Dr. Shelly Sharma: Validation, Writing – review & editing.

Dr. Shubham Kharat: Investigation.

Dr. Thivyashankari Thangamuthu: Investigation.

Dr. Aiyman Ayubi – Investigations

Dr. Silviya Samad - Investigations

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Abbreviations: IOPA – Intraoral Periapical Radiograph, CT- Computed Tomography

REFERENCES

1. Duncan WK, Helpin ML. Bilateral fusion and gemination: A literature analysis and case report. *Oral Surg Oral Med Oral Pathol*. 1987;64:82-7. [https://doi.org/10.1016/0030-4220\(87\)90121-6](https://doi.org/10.1016/0030-4220(87)90121-6) PMid:3475662
2. Aguiló L, Gandia JL, et al. M. Primary double teeth. A retrospective clinical study of their morphological characteristics and associated anomalies. *Int J Paediatr Dent* 1999;9:175-83. <https://doi.org/10.1046/j.1365-263x.1999.00131.x> PMid:10815574
3. Neville BW, Damm DD, et al. JE. *Oral and Maxillofacial Pathology*. 2nd ed. Philadelphia, PA: WB Saunders; 2002. Abnormalities of teeth; pp. 74-5.
4. Joshi V, Pavankumar K, et al. Bilateral fusion of mandibular primary incisors: A case report. *Int J Oral Maxillofac Pathol*. 2011;2:40-3.
5. Laurent P, Camps J, About I. Biodentine(TM) induces TGF- β 1 release from human pulp cells and early dental pulp mineralization. *Int Endod J*. 2012 May;45(5):439-48. PMid:22188368 <https://doi.org/10.1111/j.1365-2591.2011.01995.x>
6. S, Priyalakshmi & Ranjan. Review on Biodentine-A Bioactive Dentin Substitute. *IOSR Journal of Dental and Medical Sciences*. 2014;13:13-17. <https://doi.org/10.9790/0853-13131317>
7. Jacobsen I, Kerekes K. Diagnosis and treatment of pulp necrosis in permanent teeth with root fractures. *Scand J Dent Res* 1980;88:370-6. <https://doi.org/10.1111/j.1600-0722.1980.tb01241.x> PMid:6936763