Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 9, Issue, 10, pp.59348-59352, October, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

CASE REPORT

ENDODONTIC MANAGEMENT OF TYPE I CANAL CONFIGURATION IN PERMANENT MAXILLARY FIRST MOLAR WITH NON-SYNDROMIC GENERALIZED MICRODONTIA DIAGNOSED USING CONE BEAM COMPUTED TOMOGRAPHY - A RARE CASE REPORT

***,[1]Dr. Manoj Ramugade and [2]Dr. Sapna Sonkurla**

[1]MDS, MA, LLB, Associate Professor, Dept. of Conservative Dentistry and Endodontics, Govt. Dental College and Hospital, Mumbai, India

[2]MDS, Assistant Professor, Dept. of Conservative Dentistry and Endodontics, Govt. Dental College and Hospital, Mumbai, India

ARTICLE INFO

Article History:
Received 24th July, 2017
Received in revised form
18th August, 2017
Accepted 26th September, 2017
Published online 31st October, 2017

Key words:

Anatomical Variations, Maxillary First Molar, Microdontia, Cone Beam Computed Tomography.

ABSTRACT

Knowledge of root canal anatomy and their variation, straight line access to apical terminus, thorough cleaning and shaping with three dimensional obturation of root canals system are the keys to successful and predictive endodontics. Anatomical variations are more frequent in maxillary first molars in the form of additional canal, C-shaped canal configuration or fused roots but variation such as occurrence of Type I canal configuration is very rare in maxillary first molar. This article describes a patient with non-syndromic true generalized microdontia with endodontically involved single rooted permanent maxillary first molar having Type I root canal configuration managed successfully using cone beam computed tomography (CBCT) as a diagnostic tool.

Citation: Dr. Manoj Ramugade and Dr. Sapna Sonkurla, 2017. "Endodontic management of Type I canal configuration in permanent maxillary first molar with non-syndromic generalized microdontia diagnosed using cone beam computed tomography - A rare case report", *International Journal of Current Research*, 9, (10), 59348-59352.

INTRODUCTION

Endodontic triad comprises of proper access cavity preparation, thorough cleaning-shaping and three dimensional obturation of entire root canal system. To clean the root canal system effectively a straight line access to the apical foramen is required. Teeth with relatively straight roots and canals provide straight line access to the apical foramina without any difficulty whereas; teeth having anatomical variations in the form of extra or curve root canal causes difficulty in cleaning and shaping procedure especially in the apical third. Such anatomical variations in the form of additional canal are frequently encountered in maxillary and mandibular molars. Maxillary first molars are reputed for their complex root canal configuration such as having an extra root and canal (Shin SJ *et al*. 2007, Gopikrishna *et al*. 2008b), C- shaped canal configuration or fused roots (Kottor *et al*. 2011). They usually have 3 roots and 3 canals. The presence of second mesiobuccal (MB2) canal is the most common deviation found in 36-72% of cases and known cause for root canal failure when remained unidentified and unprepared (Das *et al*. 2015). Permanent maxillary first or second molar having only a single root and root canal was rarely reported in the literature with the incidence of 0.25% cases (Chhabra *et al*. 2013, Cobankara *et al*. 2008, de la Torres *et al*. 2008, Gopikrishna *et al*. 2006a, Kim *et al*. 2012, Shigli *et al*. 2010). This article elaborates a very rare case of successful endodontic management of patient having true generalized microdontia and diagnosed with single rooted, Type I root canal configuration in maxillary first molar while emphasizing the role of cone beam computed tomography (CBCT) as a diagnostic aid in its management.

Case report

A 32 year old healthy, average built female patient reported to the Department of Conservative Dentistry and Endodontics with a chief complaint of continuous pain in upper left back tooth region since one week. Pain intensity was increased since 2 days and aggravated after intake of hot and cold beverages. Intraoral examination showed healthy soft tissues with abnormally smaller teeth with small clinical crowns indicating microdontia. Tooth #26 showed deep mesio-occlusal caries

Corresponding author:* **Dr. Manoj Ramugade,
MDS, MA, LLB, Associate Professor, Dept. of Conservative Dentistry and Endodontics, Govt. Dental College and Hospital, Mumbai, India.

with carious pulp exposure. It also showed prosthetic crown with teeth #11, #21 and #22 with deep bite (Fig. 1).

Figure 1. Labial view intraoral photograph showing prosthetic crowns and deep bite

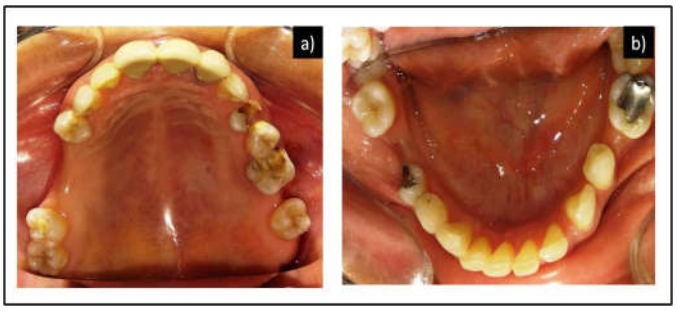

Figure 2. Intraoral photograph of maxillary (a) and mandibular arch (b)

Figure 3. IOPA radiograph of teeth #26 and #28 showing single root with single canal

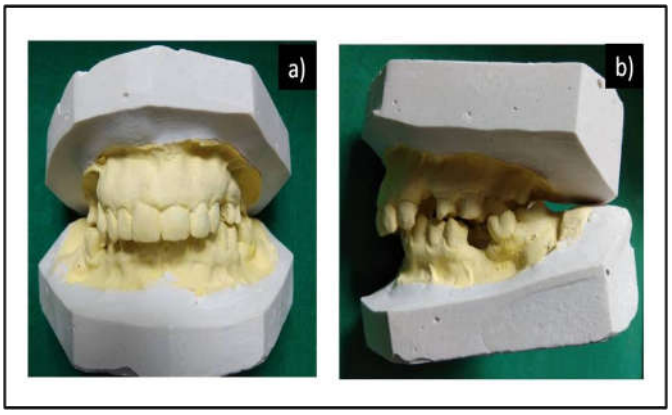

Figure 4. Diagnostic casts of maxillary and mandibular teeth in occlusion, labial (a) and left side view (b)

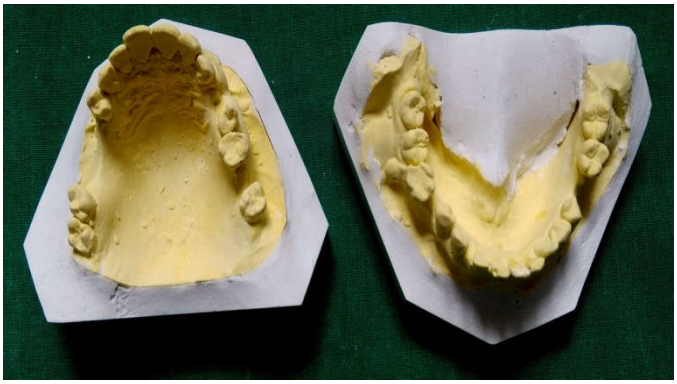

Figure 5. Diagnostic casts of maxillary and mandibular teeth

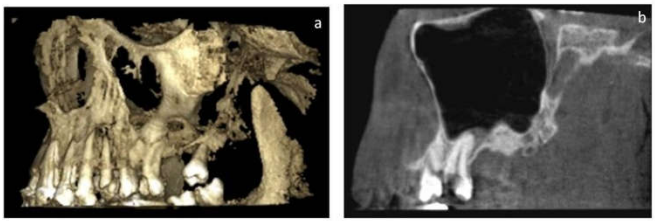

Figure 6. 3-D constructed image (a) of left maxillary teeth and CBCT scan showing single rooted tooth #26(b)

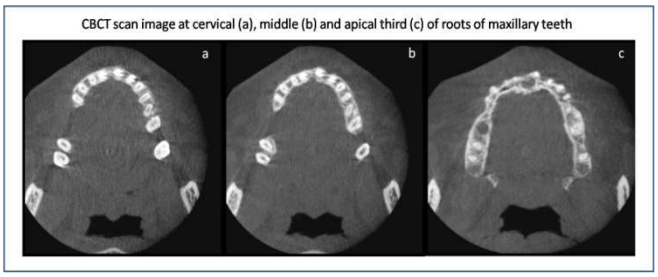

Figure 7. Composite CBCT scan image at cervical, middle and apical third of roots of maxillary teeth

Figure 8. Root canal orifice of tooth #26 after access cavity preparation

The teeth #16, #17, #27, #35, #46 were missing and tooth #24 was grossly mutilated (Fig. 2). No tenderness was observed during percussion or palpation test in tooth #26.After prompt isolation, pulp vitality test was advised using an electric pulp tester (Parkell, USA) which showed exaggerated response lasted for several minutes. Intraoral periapical (IOPA) radiograph of tooth # 26 revealed deep mesio-occlusal caries involving the pulp.

Table 1. Comparison of standard average clinical dimensions of tooth crown (Ash *et al*., 2003) with patient's clinical crown dimensions measured in mm at the widest portion on maxillary and mandibular diagnostic casts. (IG/OG-Inciso-gingival/Occluso-gingival, MD-Mesio-distal, LL-Labio-lingual)

Teeth	Central incisor	Lateral incisor	Canine	First premolar	Second premolar	First molar	Second molar
Right Maxillary teeth	IG	IG	IG	OG	OG	OG	OG
	MD	MD	MD	MD	MD	MD	MD
	LL	LL	LL	LL	LL	LL	LL
Average dimensions	10.5	9.0	10.0	8.5	8.5	7.5	7.0
	8.5	6.5	7.5	7.0	7.0	10.0	9.0
	7.0	6.0	8.0	9.0	9.0	11.0	11.0
Patients teeth dimensions	7.0	6.5	7.5	7.5	4.5		6.5
	7.0	4.5	5.0	5.0	5.0	Absent	7.0
	6.5	5.0	5.5	6.5	6.0		7.0
Left Maxillary teeth	IG	IG	IG	OG	OG	OG	OG
	MD	MD	MD	MD	MD	MD	MD
	LL	LL	LL	LL	LL	LL	LL
Patients teeth dimensions	7.0	6.5	7.0		6.0	6.5	
	7.0	4.5	5.0	Absent	6.5	6.5	Absent
	6.5	5.0	5.5		6.5	8.0	
Left Mandibular teeth	IG	IG	IG	OG	OG	OG	OG
	MD	MD	MD	MD	MD	MD	MD
	LL	LL	LL	LL	LL	LL	LL
Average dimensions	9.0	9.5	11.0	8.5	8.0	7.5	7.0
	5.0	5.5	7.0	7.0	7.0	11.0	10.5
	6.0	6.5	7.5	7.5	8.0	10.5	10.0
Patients teeth dimensions	5.5	5.5	7.5	7.0		7.0	6.5
	4.0	4.5	5.0	5.0	Absent	8.0	7.0
	4.5	4.0	4.5	5.0		8.0	6.5
Right Mandibular teeth	IG	IG	IG	OG	OG	OG	OG
	MD	MD	MD	MD	MD	MD	MD
	LL	LL	LL	LL	LL	LL	LL
Patients teeth dimensions	5.5	5.5	7.5	7.0	6.5		6.5
	4.0	4.5	5.0	5.5	5.0	Absent	7.5
	4.5	4.0	4.5	5.0	5.5		7.0

Single root with single canal classified as Vertucci's Type I canal configuration was observed in tooth # 26 and #28 (Vertucci F J 1984) (Fig. 3). The tooth #26 showed a gradual distal curvature of root with hypercementosis and the root apex showed closed approximation to the floor of left maxillary sinus. Considering the clinical and radiographic findings, the diagnosis of non-syndromic true generalized microdontia with acute irreversible pulpitis in relation to tooth #26 was made. Patient was advised for endodontic treatment in tooth #26 and extraction of tooth #24. Diagnostic casts were made and inciso-gingival/occluso-gingival, mesio-distal (MD), labio-lingual (LL) dimensions of teeth were measured (Fig. 4, 5). These dimensions were compared with standard average teeth dimensions to ascertain microdontia (Table 1) (Ash *et al*., 2003).

To rule out anatomy of concerned and other teeth CBCT scan for maxillary arch with its three dimensional digital reconstruction was advised after obtaining patient's informed consent. CBCT scan of concerned area showed single rooted teeth #26 and #28 confirming Vertucci's type I root canal configuration (Vertucci 1984) (Fig. 6). Cross sectional slicing images at cervical, middle and apical third of roots of maxillary teeth confirmed a single continuous canal showing Type I configuration (Fig. 7). All other teeth also observed to be short as compared to identified teeth length confirmed the true generalized microdontia. Local anesthesia (LA) was administered and the tooth #26 was isolated under rubber dam. Using magnification loupe at 3.5X magnification caries was removed and access cavity was prepared in tooth #26 which showed presence of a single, bucco-palatally extended root canal orifice (Fig. 8). Working length was measured using Ingle's radiographic method and confirmed with an electronic apex locator (Root ZX, Morita, Tokyo, Japan) (Fig. 9). The tooth has working length of 16 mm indicating true microdontia of the tooth. Crown down method for cleaning and shaping was used and the root canal orifice enlargement was done using Protaper Sx. An apical preparation was done to Protaper F2 file (Dentsply, Maillefer) with continuous, copious irrigation by warm 3% sodium hypochlorite solution. The root canal was then irrigated with 17% EDTA (Ethylene diamine tetra acetic acid) solution followed by final rinsing with saline. Root canal was then dried with Protaper universal F2 absorbent paper points (Dentsply, Tulja Dental). Master cone IOPA was advised to check proper fit and extension (Fig. 10). Obturation was done using AH plus endodontic sealer (Dentsply, Detrey) and Protaper F2 gutta percha point with warm vertical compaction technique. Post operative IOPA radiograph was advised after intermediate coronal restoration (Fig. 11) and patient was recalled for post endodontic permanent restoration. To rule out the probability of other single rooted molars and their root anatomy an orthopantomogram (OPG) was advised after obtaining patients informed consent.

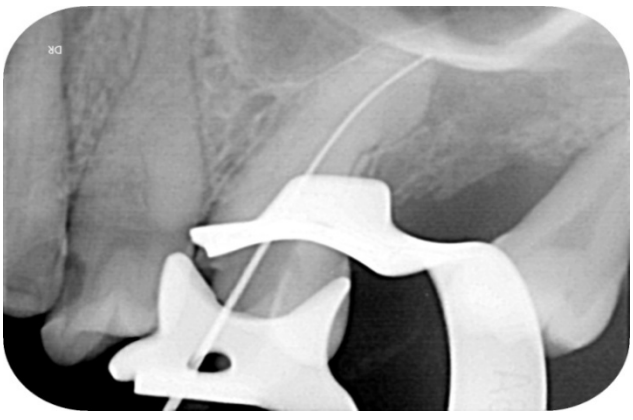

Figure 9. Working length IOPA radiograph of tooth #26

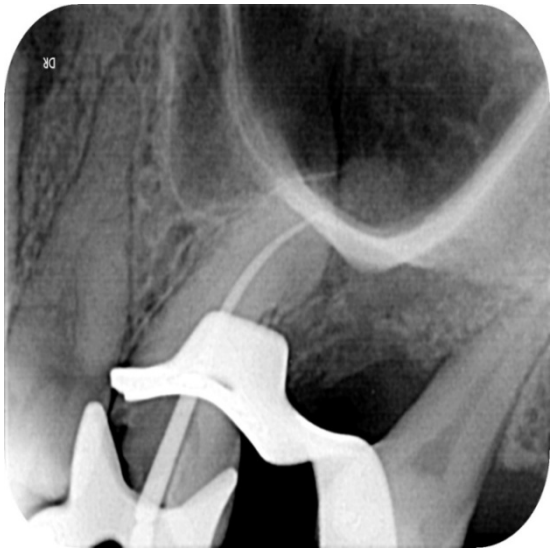

Figure 10. Master cone IOPA radiograph of tooth #26

Figure 11. Immediate post obturation IOPA radiograph of tooth #26

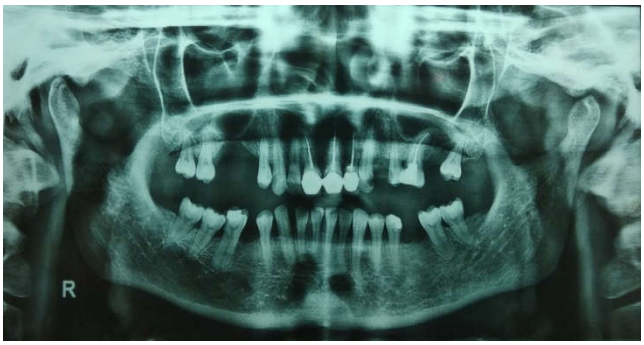

Figure 12. OPG of patient showing multiple single rooted molars with generalized short roots

OPG showed single rooted maxillary molars and mandibular second molar teeth with single conical roots with all shorter teeth (Fig. 12). Patient was further advised full coverage restoration in tooth #26 and replacement of other missing teeth.

DISCUSSION

For successful endodontic treatment complete knowledge of tooth anatomy and anatomical variations is essential. Intraoral periapical (IOPA) radiographs taken at different angulations have a vital role in providing two dimensional information of tooth anatomy with their variation. IOPA radiographs are also helpful in determination of correct working length when used in conjunction with electronic apex locator. Unfortunately, conventional IOPA radiographs have their inherent limitations such as providing a two-dimensional image of a three-dimensional (3D) object. Additionally in conventional IOPA, due to improper angulation technique, superimposition of important anatomic structures might occur which results in incorrect interpretation, diagnosis and wrong treatment rendered to the patient.

CBCT has evolved to overcome the limitations of conventional IOPA such as its high imaging quality with accuracy and potential to digitally reconstruct 3-D structure of concern object. CBCT has also proved to be very helpful in diagnosing osseous defects as well as dental anatomic deviations such as additional roots and canals, curve roots, fused roots, detection of any fracture line and internal or external resorptive lesions (Cotton TP *et al*. 2007). It not only helps in diagnosing the precise location of root canal orifice but also prevents unnecessary tooth structure removal while achieving straight line access to the apex. Any tooth having specific number of roots and same number of root canals is an exception rather than a rule. Presence of additional, supplementary or accessory canal is more frequent than the presence of less number of canals, especially in the cases of permanent maxillary first molars. Maxillary first molars usually have 3 roots and 3 canals namely mesiobuccal, distobuccal and palatal canal. Cases have been reported in literature describing variations present in the anatomy of maxillary first molars such as having additional mesiobuccal canal or palatal canal, C-shaped canal configuration (Kottor *et al*. 2011) two separate roots, two or three fused roots and four separate roots (Neelakantan *et al*. 2010) and on rare occasions single root with single canal (de la Torre *et al*. 2008). Incidence of single rooted maxillary first molar is as rare as 0.25% was observed in Korean people when diagnosed using computed tomography (CT) (Kim *et al*. 2012). The presence of single rooted maxillary molar is not exclusively found in permanent dentition but also reported as an unusual case in deciduous dentition described by Jeevanandan *et al*. (Jeevanandan *et al*. 2012). In the present case CBCT scan images confirmed a single root configuration in tooth #26 with centrally located single canal within the confines of the conical root.

In the reported case, the patient was identified with small clinical crowns and generalized short roots of all present teeth. The etiological factors responsible for microdontia are unclear but genetic mutations well as environmental factors are indentified to have their prime role. Microdontia might affect one tooth, several teeth or all teeth and could be classified as single tooth microdontia, relative microdontia or true generalized microdontia (Shafer WG *et al*. 1958). It could also affect entire tooth or crown or only root. Generalized microdontia is rare and found to be associated with several conditions like pituitary dwarfism (Shafer WG *et al*. 1958), Fanconi's anaemia (Opinya *et al*. 1988) and syndromes such as, Trisomy 13, Williams's syndrome, Hallermann-Streiff syndrome, Type 1 Branchio-oculo-facial syndrome, Oro-faciodigital syndrome (Type 3), Oculo-mandibulo-facial syndrome and Tricho-Rhino-Phalangeal syndrome (Bargale SD *et al*. 2011). In the reported case the OPG revealed the concurrent occurrence of single rooted maxillary molars and mandibular second molars with generalized microdontia. The patient had no history of any condition or syndrome that has

usually been associated with microdontia. Clinically the anterior teeth are smaller than the normal dimensions. All posterior teeth were also small and showed a short clinical crown dimensions (Table 1). In literature a similar rare type of case was reported by Fava *et al*. describing multiple second molars with single root and Type I root canal configuration in the same patient (Fava *et al*., 2000). The presented case was diagnosed as non-syndromic generalized microdontia associated with conical roots and Type I canal configuration of all maxillary molars and mandibular second molars which is very rare in itself. Consideration should be given while endodontic treatment of such teeth as external and internal anatomy is smaller than usual teeth especially during access cavity preparation, working length determination and root canal instrumentation to prevent unnecessary removal of tooth structure and endodontic failure.

Conclusion

Successful endodontics demands thorough knowledge regarding morphology of teeth and their internal anatomy including the variation such as additional canals, C- shaped canal, lateral canals and apical delta. The case of generalized microdontia without any positive family history or associated syndrome with single rooted maxillary and mandibular molars is the rare combination and need to be identified by advance imaging techniques like CBCT or spiral CT which enables the operator to detect and manage such anomalies precisely.

REFERENCES

Ash, Nelson 2003. *Wheeler's: Textbook of Dental Anatomy, Physiology and Occlusion,* edn.8, W. B. Saunders Company, 18.

Bargale, S.D., Kiran, S.D. 2011. Non-syndromic occurrence of true generalized microdontia with mandibular mesiodens - a rare case. *Head and Face Medicine,* 7, 19.

Chhabra, N., Singbal, K.P., Chhabra, T.M. 2013. Type I canal configuration in a single rooted maxillary first molar diagnosed with an aid of cone beam computed tomographic technique: A rare case report. *Journal of Conservative Dentistry,* 16, 385–87.

Cobankara, F.K., Terlemez, A., Orucoglu, H. 2008. Maxillary first molar with an unusual morphology: report of a rare case. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology,* 106, e62-5.

Cotton, T.P., Geisler, T.M., Holden, D.T., Schwartz, S.A., Schindler, W.G. 2007. Endodontic applications of cone-beam volumetric tomography. *Journal of Endodontics,* 33, 1121–32.

Das S., Warhadpande M., Redij S., Jibhkate N., Sabir H. 2015.Frequency of second mesiobuccal canal in permanent maxillary first molars using the operating microscope and selective dentin removal: A clinical study. *Contemporary Clinical Dentistry,* 6, 74–8.

de la Torre, F., Cisneros-Cabello, R., Aranguren, J.L., Estévez R., Velasco-Ortega, E., Segura-Egea, J.J. 2008. Single-rooted maxillary first molar with a single canal: Endodontic retreatment. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology,* 106, e66-8.

Fava LR, Weinfeld I, Fabri FP, Pais CR. 2000. Four second molars with single roots and single canals in the same patient. *International Endodontic Journal* 33, 138-42.

Gopikrishna, V., Bhargavi, N., Kandaswamy, D. 2006a. Endodontic management of a maxillary first molar with a single root and a single canal diagnosed with the aid of spiral CT: A case report. *Journal of Endodontics* 32, 687-91.

Gopikrishna, V., Reuben, J., Kandaswamy, D. 2008b. Endodontic management of a maxillary first molar with two palatal roots and a single fused buccal root diagnosed with spiral computed tomography: A case report. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology* 105, e74-8.

Jeevanandan, G., Subramanian, E., Muthu, M.S. Single-rooted primary first molars 2012. *Indian Journal of Dental Research* 23, 104–6.

Kim, Y., Lee, S.J., Woo, J. 2012. Morphology of maxillary first and second molars analyzed by cone-beam computed tomography in a Korean population: Variations in the number of roots and canals and the incidence of fusion. *Journal of Endodontics* 38, 1063–8.

Kottoor, J., Velmurugan, N., Ballal, S., Roy, A. 2011. Four-rooted maxillary first molar having C-shaped palatal root canal morphology evaluated using cone-beam computerized tomography: A case report. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology* 111, e41-5.

Neelakantan, P., Subbarao, C., Ahuja, R., Subbarao, C.V., Gutmann, J.L. 2010. Cone-beam computed tomography study of root and canal morphology of maxillary first and second molars in an Indian population. *Journal of Endodontics* 36, 1622-7.

Opinya, G.N., Kaimenyi, J.T., Meme, J.S. 1988. Oral findings in Fanconi's anemia. A case report. Journal of Periodontology 59, 461-3.

Shafer, W.G., Hine, M.K., Levy, B.M. 1958. *A Textbook of Oral Pathology.* 1st edn. Philadelphia: W. B. Saunders Co.

Shigli, A., Agrawal, A. 2010. Permanent maxillary first molar with single root and single canal: A case report of a rare morphology. *Journal of Indian Society of Pedodontics and Preventive Dentistry* 28,121-5.

Shin, S.J., Park, J.W., Lee, J.K., Hwang, S.W. 2007. Unusual root canal anatomy in maxillary second molars: Two case reports. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology* 104, e61-5.

Vertucci, F.J. 1984. Root canal anatomy of the human permanent teeth.*Oral Surgery, Oral Medicine, Oral Pathology* 58, 589–99.

****