Maxillary First Molar with Aberrant Morphology: Four Roots and Six Canals: Case Report

Atipik Morfolojili Maksiller Birinci Molar: Dört Kök, Altı Kanal

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ABSTRACT A complete knowledge of root canal morphology is extremely important in terms of the success of endodontic treatment. Lack of cleaning, shaping or obturation may end up with failure. It is important to present cases about unusual anatomy of teeth to clinicians to make them aware of extra roots and canals so that they could recognize the unusual morphology and treat the teeth successfully without dentists' failure. This case report describes a literature review pertaining to the variable root canal morphology of maxillary first molars and presents nonsurgical root canal treatment of a 28-yr-old male patient's maxillary first molar that have 4 roots and 6 canals. During root canal treatment, six canal orifices were determined. The working lengths were determined with an electronic apex locater and confirmed with radiography.

Key Words: Molar; anatomy; root canal therapy

ÖZET Endodontik tedavinin başarıya ulaşması için kök kanal morfolojisi hakkında tam bir bilgi sahibi olunması çok önemlidir. Kök kanal sisteminin eksik temizlenmesi, şekillendirilmesi ve doldurulması başarısızlıkla sonuçlanır. Bu tür olgu sunumlarında olağandışı anatomiye sahip dişler hakkında bilgi verilmesi, klinisyenlerin fazladan kök ve kanallarının farkında olmaları, böylece klinisyen kaynaklı hatalar olmadan dişleri başarılı bir şekilde tedavi etmelerini sağlamaktadır. Bu olgu sunumunda değişik kök kanal morfolojilerine sahip maksiller birinci büyük azı dişleri ile ilgili literatür bilgisi verilmekte ve 21 yaşında bir erkek hastanın 4 köklü 6 kanallı maksiller birinci büyük azı dişinin cerrahi olmayan kök kanal tedavisi sunulmaktadır. Kök kanal tedavisi sırasında 6 kanal ağzı belirlendi. Çalışma uzunluğu elektronik apeks bulucu ile belirlendi ve radyografi ile doğrulandı.

Anahtar Kelimeler: Azıdişi; anatomi; kök kanalı tedavisi

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The purpose of root canal treatment is to eliminate microorganisms by cleaning and shaping root canals, and then filling root canals in all dimensions. Performing root canal treatment as it should be conducted requires an in-depth knowledge of the morphology of the root canal system.

Many previous studies have examined the morphology of maxillary first molars. Pineda and Kuttler, in 1972, studied maxillary first molars using X-rays, and found the percentage of one and two canals in mesio-

buccal roots to be 39.3% and 60.7%, respectively. In distobuccal roots, they found two canals in 3.6% of teeth. All palatal roots had a single canal.[1]

In 1984, Vertucci reported that 55% of mesiobuccal roots of maxillary first molars had two canals. All distobuccal and palatal roots had a single canal.[2] Pecora et al. in 1992, examined maxillary first molars following injection of India ink and making them translucent. He found 25% of mesiobuccal roots with two canals and 75% with one canal.[3]

In a study of the Turkish population in 1995, Caliskan et al. examined maxillary first molars with a clearing procedure and stereomicroscopy at x12 magnification. In this study, a second canal was found in 65% of mesiobuccal roots and in 7% of palatal roots. In distobuccal roots, the incidence of one canal was 100%.[4]

In 2004, a study of maxillary first molars was performed using a clearing procedure by Sert and Bayirli in a Turkish population.[5] They found two or more canals in mesiobuccal, distobuccal, and palatal roots in 93.5%, 9.5%, and 5.5% of teeth, respectively.

In recent years, studies that have examined root canal morphology with cone beam CT (CBCT) have increased.[6-9] In 2009, Somma et al. examined mesiobuccal roots of maxillary first molars and they found a two canal incidence of 80%.[7] Baratto-Filho et al. also examined maxillary first molars using different methods.[6] They found the most frequent number of canals was 4, followed by 3 canals, in both *ex vivo* and CBCT examination. They found maxillary molars to have six canals in CBCT examination in 1.85% of teeth. Only one tooth (0.72%) showed seven canals in their *ex vivo* study. In 2010, Verma and Love examined maxillary first molars using CBCT and found the 90% of teeth had multiple mesiobuccal canals.[8] Analysis of the morphology of maxillary first molars by Zhang et al. in 2011 using CBCT showed that 52% of mesiobuccal roots had two canals.[9] All distobuccal and palatal roots had only one canal.

The present case report describes a case of a maxillary first molar that had 4 roots and six canals. This report may confirm the complex morphology of maxillary first molars and may increase the awareness of clinicians regarding the complexity of morphology of maxillary first molars. Few reports have yet presented four-rooted maxillary first molars (Table 1).[10-14]

CASE REPORT

A 28 yr-old male was referred for endodontic treatment of a maxillary right first molar tooth, with the chief complaint of a toothache in his right maxilla. Due to deep decay in the maxillary right first molar tooth, a diagnosis of symptomatic irreversible pulpitis with a normal periapex was made (Figure 1). In radiographic examination, four roots were observed (Figure 2). The patient's medical history was not contributory. Patient was informed about endodontic treatment and he signed informed consent form. The tooth was anaesthetized and isolated with a rubber dam and an

TABLE 1: Case reports of maxillary first molars with 4 roots.

Number of roots	Number of canals	Canal configuration			Author(s)	Year
		MB	DB	P		
4 roots	4	1 MB	1 DB	1 MP, 1 DP	Christie et al.[10]	1991
4 roots	4	1 MB	1 DB	1 MP, 1 DP	Di Fiore[14]	1999
4 roots	4	1 MB	1 DB	1 MP, 1 DP	Baratto-Filho et al.[12]	2002
4 roots	4	1 MB	1 DB	1 MP, 1 DP	Barbizam et al.[13]	2004
4 roots	6	3 (MB, 1, MP)	2 (DB, 1 DP)	1 P	Adanir[11]	2007

MB: Mesiobuccal; MP: Mesiopalatal; DB: Distobuccal; DP: Distopalatal; P: Palatal.

FIGURE 1: Preoperative radiograph of right maxillary first molar.

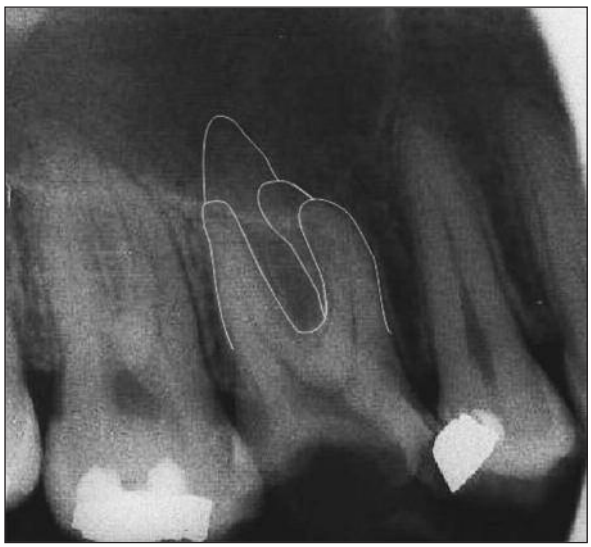

FIGURE 2: Lines indicates the roots.

endodontic access cavity was established. During root canal treatment, six canal orifices were determined, as follows: a mesiobuccal canal in the mesiobuccal root, mesial and mesiopalatal canals in the mesiopalatal root, one in the palatal root, and two in the distobuccal root (Figure 3). The working lengths were determined with an apex locater (Propex, Dentsply Maillefer, Ballaigues, Switzerland) and confirmed with radiography (Figure 4). Root canals were initially instrumented with #10 and then #15 NiTi files. Thereafter, canals were prepared chemomechanically with HeroShaper Niti files, using 5% sodium hypochlorite (White Med) as an irrigation solution and a crown down technique. Canals were medicated with $Ca(OH)_2$ (Calcicur, Voco, Cuxhaven, Germany) for one week.

One week later, under rubber dam isolation, all canals were obturated with AH Plus sealer (Dentsply, Konstanz, Germany) and laterally condensed gutta percha points. After the obturation

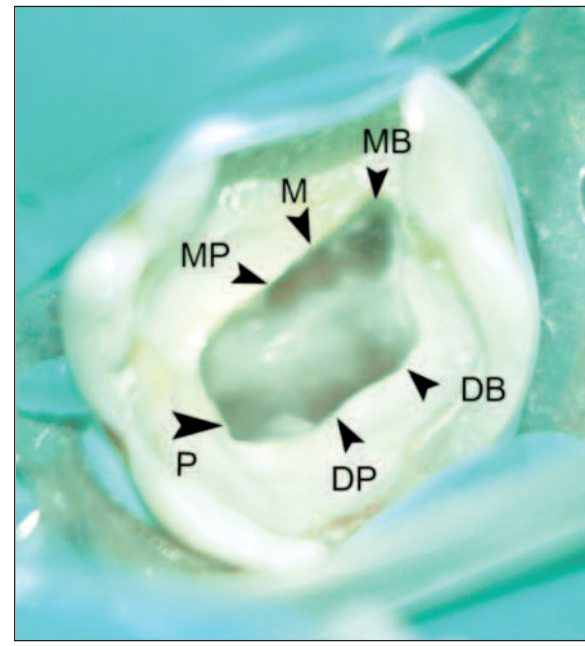

FIGURE 3: Occlusal view of canal openings.
(See color figure at http://dishekimligi.turkiyeklinikleri.com/)

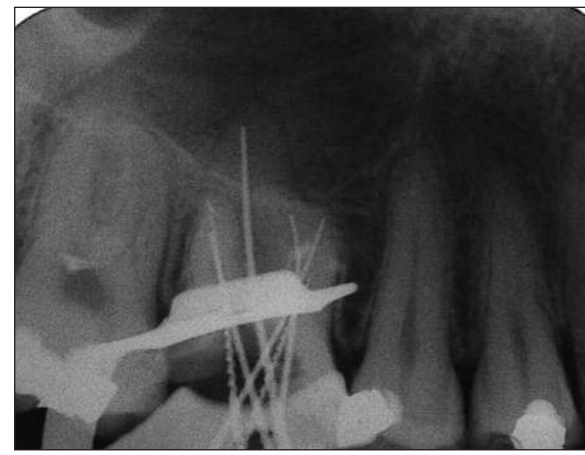

FIGURE 4: Radiograph was taken to determine working length.

was complete, the tooth was restored with glass-ionomer cement (GC Corporation, Tokyo, Japan) before crown restoration. Final radiograph was taken to evaluate the quality of obturation (Figure 5).

DISCUSSION

It is crucial that clinical and radiological analysis of maxillary first molars be performed due to their complex morphology. Otherwise, incomplete treatment of maxillary first molars, such as undetected canals, may result in failure.

Case reports related to maxillary molars commonly present three-rooted maxillary first molars. Four-rooted maxillary first molars are less often reported.[10-14] In a recent study that used CBCT, Zhang et al. found that all maxillary first molar specimens were three-rooted.[9] In the present case report, a maxillary first molar with four roots located as mesiobuccal, mesiopalatal, distobuccal and palatal was presented. Configuration of the canals was as follows; one canal in the mesiobuccal root, two canals in mesiopalatal root, two canals in the distobuccal root, and one canal in the palatal root. The second canal in the mesiopalatal root was very difficult to find and it was integrating into the other canal in the middle third of the mesiopalatal root.

There are a few studies in the literature that mention maxillary first molars with distobuccal roots that have two canals.[11,15-18] In 2004, Sert and Bayirli[5] examined the morphology of maxillary first molars by a clearing procedure and they found a second canal in distobuccal roots in 9.5% of teeth.

FIGURE 5: Post obturation radiograph.

Zhang et al., in 2011, reported a CBCT study that showed that all distobuccal and palatal roots had a single canal.[9] In the present case, a distobuccal root of a maxillary first molar tooth had two canals.

Most authors have tried to reveal the complex morphology of maxillary first molars by using different methods such as clearing and CBCT. In the present case, CBCT was not used to examine the canals because of the radiation dose exposure that the patient would receive. Clinical examination of the floor of the pulp chamber and radiographic examination were performed to examine the morphology of tooth. Before and during treatment, radiological and clinical examination should be carefully performed to localize extra roots and canals and to treat the tooth properly.

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