

# Root Canal Treatment of Mandibular Second Premolars with Three Root Canals- Report of Four Rare Cases

## SUMMARY

**Background/Aim:** The aim of root canal treatment is the thorough cleaning, shaping and obturation of the root canals. Variations in root canal anatomy increase the difficulty of the root canal treatment and therefore the possibility of failure. The mandibular premolars often present complex anatomy and the existence of mandibular second premolars with three root canals is very scarce. This report presents the successful endodontic management of four mandibular second premolars with three root canals.

**Cases Report:** In all cases working length was estimated using the working length radiograph and an apex locator. Canal orifices were enlarged with Gates-Glidden drills and manual instrumentation performed with Stainless Steel reamers and Hedstroem files, using either step-back or crown-down technique. Sodium hypochlorite (NaOCl) 2.5% was used as an irrigant. Root canal obturation were then performed using the cold lateral condensation technique with gutta-percha points and Roth's 801 canal sealer. The cases were scheduled for clinical and radiographic follow-up examination. Clinically in all follow-up examinations the teeth were asymptomatic. For the three cases with periapical lesions, post treatment radiographs, demonstrated periapical healing. Additionally, in the case without periapical lesion, the 9 months recall radiograph revealed healthy periapical conditions.

**Conclusions:** Mandibular premolars should never be underestimated and the clinician should always be alerted for anatomic variations.

**Key words:** Anatomic Variations, Endodontic Treatment, Mandibular Premolars, Second, Three Root Canals

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CASE REPORT (CR)

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## Introduction

In order to have a successful endodontic treatment, all root canals should be accessed, cleaned and shaped to receive a three-dimensional hermetic filling of the entire root canal space. Variations in root canal anatomy increase the difficulty of the root canal treatment and therefore the possibility of failure. The clinician should accurately diagnose the morphology of the root canal system of the tooth to be treated and thus should consider all possible anatomic variations. Failure in the detection of the morphological variations of the root canal system of a tooth will eventually lead to unsuccessful root canal treatment.

The mandibular premolars are considered to be challenging teeth for root canal treatment probably

because of their very complex internal anatomy<sup>1-3</sup>. Moreover 0,4% of the mandibular second premolars have three root canals according to Zillich and Dowson<sup>1</sup>.

This report presents the successful endodontic management of four mandibular second premolars with three root canals.

## Case Report

The patients, all Caucasian adults, with non-contributory medical history, were referred by their general dental practitioners to the Department of Endodontology of School of Dentistry, Aristotle

University of Thessaloniki for evaluation and treatment. Non-surgical management of all cases was decided.

## Case Report 1

A 39-year-old female patient was referred, suffered from severe and continuous pain in the region of #45. The preoperative radiograph revealed incomplete root canal treatment of this tooth, with a silver point only in the mesiobuccal root canal and a periapical lesion (Figure 1a). The tooth had an acceptable metal-ceramic crown which was decided to be removed. Access cavity was prepared and the silver point was removed, using the proper ultrasonic tips (ProUltra Endo Tips, DENTSPLY, Tulsa Dental, York, USA). Rigorous examination revealed triangular shape of the pulp chamber floor with three different canals orifices (Figure 1b).

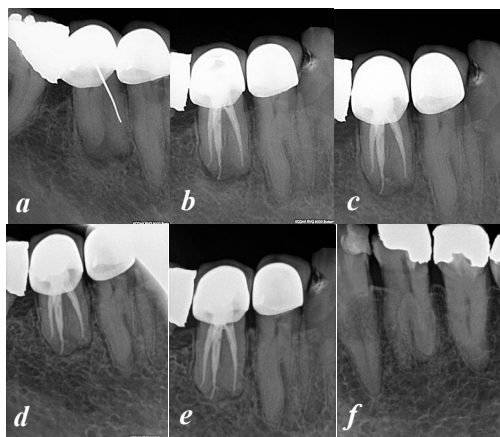


Figure 1. First case of retreatment of #45: (a) preoperative, (b) final, (c) 6 months control, (d) 16 months control, (e) 27 months control and (f) controlateral radiographs. Healing of the periapical lesion after the endodontic retreatment of the tooth. The controlateral second premolar appears the anatomic abnormality, also

## Case Report 2

A 27-year-old male patient was referred for retreatment of a symptomless tooth #45. The preoperative radiograph revealed incomplete obturation with gutta-percha, which placed only in the cervical part of mesial root canal (Figure 2a). After the removal of the resin filling, access cavity was prepared and the previous material was removed with Hedstroem files (MICRO-MEGA, Besancon Cedex, France). Examination of the pulp chamber floor revealed two canal orifices, one mesial, larger, and one distal, smaller (Figure 2b). Further examination, during the chemomechanical preparation of the mesial root canal, revealed that the canal system of

this root was bifurcated into two different canals, at the middle third of the root (Figure 2b).

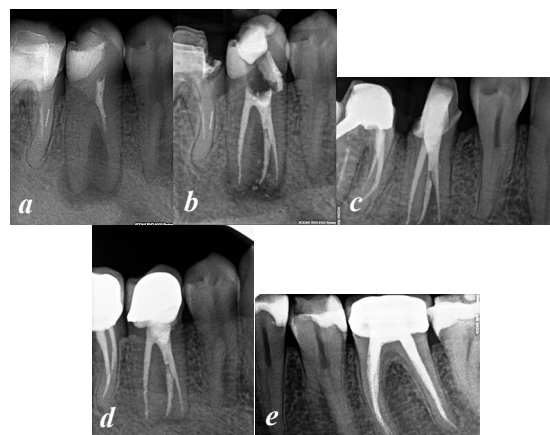


Figure 2. Second case of retreatment of #45: (a) preoperative, (b) final, (c) 6 months control, (d) 66 months control and (e) controlateral radiographs. Healing of the periapical lesion after the endodontic retreatment of the tooth. The controlateral second premolar appears the anatomic abnormality, also

## Case Report 3

A 65-year-old male patient was referred for retreatment of a symptomless tooth #35. The preoperative radiograph revealed incomplete root canal treatment and a separated instrument (Figure 3a). After the removal of the amalgam filling, access cavity was prepared and the gutta-percha was removed with Hedstroem files. A large canal orifice and a trifurcation of root canal system at its medial part were found (Figure 3b). The separated instrument was removed with the file bypass technique using Hedstroem files.

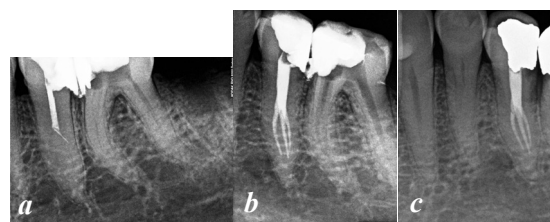


Figure 3. Third case of retreatment of #35: (a) preoperative, (b) final and (c) 9 months control radiographs. The cervical part of the root canal appears to be very wide until the point of trifurcation. Healthy periapical conditions after 9 months of the endodontic retreatment of the tooth are observed

## Case Report 4

A 55-year-old female patient was referred for treatment of a painful tooth #35, with a periapical lesion (Figure 4a). The conscientious clinical examination of the pulp chamber floor revealed three different canal orifices (Figure 4b).

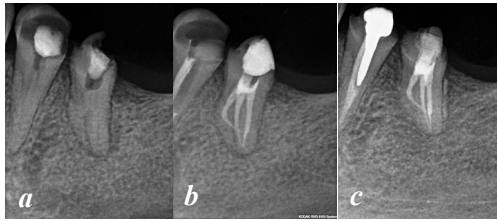


Figure 4. Fourth case, treatment of #35: (a) preoperative, (b) final and (c) 14 months control radiographs. Healing of the periapical lesion after the endodontic treatment of the tooth

## Clinical procedure in all cases

In all cases working length was estimated using the working length radiograph and an apex locator (i-Pex, model NE 181, NAKANISHI Inc., Japan). Canal orifices were enlarged with Gates-Glidden drills and manual instrumentation performed with Stainless Steel reamers and Hedstroem files using either step-back or crown-down technique. Sodium hypochlorite (NaOCl) 2.5% was used as an irrigant. Root canal obturation were then performed using the cold lateral condensation technique with gutta-percha points (HYGENIC, Coltene/Whaledent Inc., OH, USA) and Roth's 801 canal sealer (Roth International LTD, Chicago, IL, USA) (Figure 1-4b). The cases were scheduled for clinical and radiographic follow-up examination.

Clinically in all follow-up examinations the teeth were asymptomatic. For the three cases with the periapical lesions, post treatment radiographs, demonstrated periapical healing (Figure 1c-e, 2c-d, 4c). Additionally, in the case without periapical lesion, the 9 months recall radiograph revealed healthy periapical conditions (Figure 3c). Radiographs of the contralateral second premolar were also obtained and revealed the same anatomic variation in two cases (Figure 1f, 2e), whilst in the other two cases these teeth were missing.

## Discussion

Hoen and Pink have reported that 42% of failed cases are due to missing root canals during endodontic procedures<sup>4</sup>. The mandibular premolars are considered to be among the most difficult teeth to be treated endodontically due to their very complex internal anatomy<sup>1-3</sup>. Thus, possible anatomic variations of mandibular second premolars should always consider from the clinician when those teeth are to be treated.

Several clinical and in vitro studies have tried to categorize anatomical variations of mandibular second premolars according number of roots, root canals, ethnicity or gender. Zilligh and Dowson<sup>1</sup>, Vertucci<sup>2</sup> and Cleghorn

*et al.*<sup>3</sup> have reported that the incidence of mandibular second premolars with three root canals to be 0,4%, 0% and 0,1% respectively. Moreover, cases of mandibular second premolars with four or five root canals have been reported<sup>5-7</sup>. In studies among multinational population Trope *et al.* have reported higher occurrence of more than one canal in mandibular premolars in Negroids than in Caucasian (32,8% versus 13,7% for the first premolar and 7,8% versus 2,8% for the second)<sup>8</sup>. Amos has also found more than one canal in mandibular premolars to be 21,6% in Negroids and 16% in Caucasian<sup>9</sup>. A study in Turkish population reported that more than two canals were more frequently found in men (43%) than women (15%)<sup>10</sup>. In another study it was reported higher frequency of multiple roots in women for the first premolar and the opposite for the second premolar<sup>11</sup>.

In the cases presented in this report, the anatomic abnormalities that were observed, exhibited wide variety and each case was different from the others. According to bibliography, mandibular premolars present five or six different types of root canal system<sup>2,12</sup>. Research and clinical experience although, prove that the range of root canal system types of mandibular premolars is much greater; it can be stated with absolute certainty that these teeth present the larger diversity of the number, course and shape of root canal system<sup>12</sup>.

In cases that teeth with anatomic variations have to be treated, the first step for the clinician is the preoperative identification of them and afterwards the clinical negotiation. Preoperative radiographic examination is elementary for every root canal treatment. In cases of mandibular second premolars with three root canals more than one preoperative radiographs with different horizontal angulations are recommended<sup>13,14</sup>. Sudden changes, narrowing or loss of root canal route and space should suggest root canal multiplicity<sup>3</sup>. Also, when the file in the radiograph seems to be out of the periodontal ligament an extra canal should be suspected. In many cases of mandibular premolars with three root canals, the upper half of the root canal appeared wider until the point of the trifurcation<sup>14</sup>, as it can be seen in our third case.

Another, more sophisticated tool for the preoperative detection of root canal system variations, when conventional radiographic imaging is not enough, is the cone-beam computed tomography (CBCT). Several studies have previously described the usefulness and the advantages of CBCT in the identification of anatomic variations<sup>15</sup>.

Extremely attention must be paid when mandibular second premolars with three root canals have to be treated. Access cavity should be modified accordingly, to provide unobstructed passage of the instruments and the ability to observe and investigate the pulp chamber floor for the detection of canal orifices. The use of operating microscope and/or dies can be very helpful for the identification or the magnification of the pulp chamber

floor<sup>5,16</sup>. A triangle-shaped pulp chamber should be expected in three-rooted mandibular premolars according to many authors<sup>17,18</sup>, as in our first and fourth case, without excluding a linear configuration.

Working length estimation can be rather difficult in such teeth, if the clinician is only based on radiographs. Confirmation with an apex locator is the safest way. Increased caution should be given during chemomechanical preparation in those premolars. Unused instruments, healing agents and gentle motions are recommended<sup>12,14</sup>.

Sabata *et al.* have reported that bilateral occurrence of anatomic aberrations can be found at almost 90 % of the cases and that the rarer the prevalence of the abnormality the higher the odds of bilateral existence<sup>19</sup>. In this study, in the two of four cases, bilateral occurrence was found, whilst for the other two cases no conclusions could be made, due to the extraction of the bilateral teeth. There is a great possibility, that those teeth were extracted because of their great difficulty to be endodontically treated, due to their anatomical complexity.

## Conclusions

Successful endodontic treatment of mandibular second premolars with three root canals depends on clinician ability to identify and negotiate them. Although, more advanced and sophisticated tools, like digital radiography, operating microscope, apex locators and CBCT, are available, they would always consider a challenge in the partly unsighted procedure of root canal treatment. Mandibular premolars should never be underestimated and the clinician should always be alerted for anatomic variations.

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