QUALITY IMPROVEMENT IN DENTAL AND MEDICAL KNOWLEDGE, RESEARCH, SKILLS AND ETHICS FACING GLOBAL CHALLENGES

Edited by
Armelia Sari Widyarman, Muhammad Ihsan Rizal,
Moehammad Orliando Roeslan & Carolina Damayanti Marpaung

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The proceedings of FORIL XIII 2022 Scientific Forum Usakti conjunction with International Conference on Technology of Dental and Medical Sciences (ICTDMS) include selected full papers that have been peer-reviewed and satisfy the conference's criteria. All studies on health, ethics, and social issues in the field of dentistry and medicine have been presented at the conference alongside clinical and technical presentations. The twelve primary themes that make up its framework include the following: behavioral epidemiologic, and health services, conservative dentistry, dental materials, dento-maxillofacial radiology, medical sciences and technology, oral and maxillofacial surgery, oral biology, oral medicine and pathology, orthodontics, pediatrics dentistry, periodontology, and prosthodontics. This proceeding will be beneficial in keeping dental and medical professionals apprised of the most recent scientific developments.

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Quality Improvement in Dental and Medical Knowledge, Research, Skills and Ethics Facing Global Challenges

Edited by

Armelia Sari Widyarman, Muhammad Ihsan Rizal, Moehammad Orliando Roeslan and Carolina Damayanti Marpaung
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Preface

Faculty of Dentistry Universitas Trisakti (Usakti) presents FORIL XIII 2022 Scientific Forum Usakti conjunction with International Conference on Technology of Dental and Medical Sciences (ICTDMS) on December 8th–10th 2022. The theme of the conference is "Quality Improvement in Dental and Medical Knowledge, Research, Skills and Ethics Facing Global Challenges".

The triennial conference has served as a meeting place for technical and clinical studies on health, ethical, and social issues in field medical and dentistry. It is organized around 12 major themes, including behavioral, epidemiologic, and health services, conservative dentistry, dental materials, dento-maxillofacial radiology, medical sciences and technology, oral and maxillofacial surgery, oral biology, oral medicine and pathology, orthodontics, pediatrics dentistry, periodontology, and prosthodontics.

The most recent findings in fundamental and clinical sciences related to medical and dental research will be presented in the conference that will be published as part of the conference proceeding. This proceeding will be useful for keeping dental and medical professionals up to date on the latest scientific developments.

Dr. Aryadi Subrata
Chairman FORIL XIII conjunction with ICTDMS

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Endodontic management of S-shaped root canal on mandibular first molar: A case report

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ABSTRACT: Knowledge of root canal anatomy and its variation are essential to enhance the success of endodontic treatment. Morphology of S-shaped root canals often becomes a challenge in endodontic treatment. Common causes of failure can be loss of the original shape of root canals, fractured instruments, ledge, and zip. Objective: The present case report describes the potential problem of losing the original shape of the root canal in the endodontic treatment of curvature root canals. A 30-year-old female patient with a spontaneous toothache on her left mandibular first molar in the past six months. She described having intense, lasting, nocturnal pain that lasted for a few minutes. The clinical examination showed a cavity at the proximal-distal. Radiographic examination showed an S-shaped on the mesial root canal. Preoperative periapical radiographs are required to assess these morphological variations in the root canal system. Glide path preparation was sequentially established by K-file #08, #10 up to size #15, followed by Pro Glider. Biomechanical preparation was done by reciprocal file with thermomechanical blue treatment to improve material properties, which increase their fatigue resistance and flexibility. The canals were obturated using a warm vertical compaction technique. The final restoration was restored with a composite overlay. The flexibility and diameter of the instrument affect the outcome of root canal instrumentation.

1 INTRODUCTION

Root canal curvature has different shapes, such as s-shaped, gradual, dilacerated, apical, sickle-shaped, and severe-moderate-straight curves are among the possible shapes (Khan et al. 2017). The root canal system's anatomical intricacy makes endodontic therapy challenging to clean, shape, and obturate (Machado et al. 2014). The success of endodontic treatment depends on the microorganisms' elimination from the root canal system and the adequate canal biomechanical debridement (Sakkir et al. 2014). Root canals that are not cleaned and filled properly might provide a source of persistent irritation, affecting the prognosis of the endodontic treatment (Machado et al. 2014).

The preparation of S-shaped canals presents one of the most significant challenges in endodontic treatment (Sakkir et al. 2014). S-shaped root canal preparation has been associated with unfavorable outcomes, such as ledge formation, canal obstructions, perforations, apical transportation, loss of working length, and loss of the original root canal shape (Matta & Kaur 2021).

2 CASE REPORT

A 30-year-old female patient with a spontaneous toothache on her left mandibular first molar in the past six months visited the Department of Endodontics at Trisakti University.

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She described having intense, lasting, nocturnal pain that lasted for a few minutes. She stopped biting on the left side of her jaw and took 500mg of mefenamic acid to ease the pain. She has no previous medical history.

The clinical examination showed a cavity at the proximal-distal tooth #36 (Figure 1a). A vitality test utilizing a cold thermal stimulation caused a sharp, lingering pain that persisted for a short period after the stimulus had been removed. Percussion received an excessive response. Palpation testing came out normal.

The distal part of tooth #36 had radiolucency that had entered the pulp chamber, according to a periapical radiograph (Figure 1b). Southard's method was used to calculate the curvature of the root by sketching the intersection of lines 1 and 2 yields the coronal angle of first curvature and the apical angle of the second curvature is produced by the intersection of lines 2 and 3 (Southard et al. 1987). Using Schneider's method, the root canal curvature degree was classified as straight for angles of 5° or less, moderate for angles of 10°–20°, and severe for angles of 25°–70° (Schneider 1971). The mesial root canal presented with a 17,9° at first curvature was considered moderate. The second curvature was 29,6° and considered severe (Figure 2).

The diagnosis of 36 was symptomatic irreversible pulpitis and symptomatic apical periodontitis. Endodontic treatment was scheduled.

Figure 1. a. Preoperative photograph, and b. Preoperative radiograph.

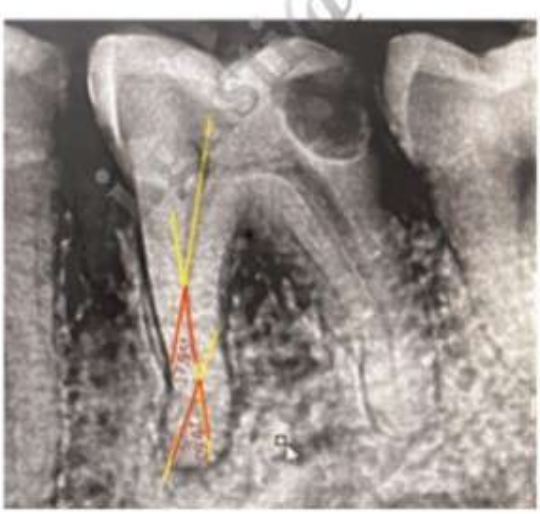

Figure 2. The mesial root canal has two curved. The first curvature was 17,9°, considered moderate, while the second curvature was 29,6°, which was considered severe.

3 CASE MANAGEMENT

For patient visits during the COVID-19 pandemic, there are mandatory swab antigens on the patient and an operator who handles them before treatment procedures are carried out and adheres to strict health protocols to avoid infection. The operator must wear level 3 PPE, and treatment is carried out in a negative pressure room.

Patients were required to sign consent forms before having the inferior alveolar nerve anesthetized with Lidocaine HCl 2% and 1:100.000 epinephrine administered through the pterygomandibular space. The buccal nerve was also anesthetized by injecting 0,5 ml of local anesthetic into the tissues surrounding tooth #36. A round bur was used to remove dental cavities after tooth 36 was isolated using rubber dams. Tooth #36 was prepared for coronal access utilizing an endo-access bur. The distal artificial wall was build-up using bulk-fill flowable composite restoration (Figure 3a).

A manual glide path was consecutively established using K-file #08, #10, and up to size 15. The working length was validated using an electronic apex locator and a periapical radiograph (Figure 3b). The temporary restoration was used.

On the second visit, glide path preparation was completed using ProGlider (Dentsply Sirona), and biomechanical preparation was carried out using Reciproc Blue R25/08 file (VDW, Munich, Germany) with a reciprocating system. K-file #25 was used for apical gauging to identify the master apical file and to be fitted to length. The canals were irrigated with sodium hypochlorite 5,25% in between each file application. The solution was rinsed with aquadest and rinsed with 15% EDTA for 3 minutes. Sonic agitation was used to activate the irrigant solutions. The final rinse was performed with distilled water. The canals were dried with the paper point (Figure 3c).

Figure 3. a. Artificial wall on distal b. Working length confirmation; c. Cleaning and shaping.

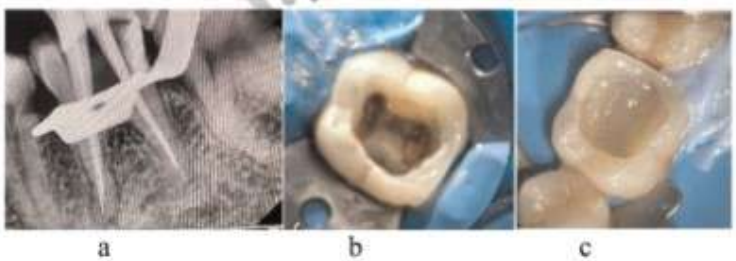

Figure 4. a. Try in Gutta-percha, b. Obturation was done by warm vertical compaction technique, c. Dentin replacement by fiber-reinforced composite.

a b c

Figure 5. a. Obturation radiograph, b. Composite overlay cementation, c. Final radiograph after restoration.

Try-in master cone was inserted in the root canal until 'tug back' was achieved and confirmed radiographically (Figure 4a). Obturation was done by warm vertical compaction technique using gutta-percha with calcium hydroxide-based root canal sealer cement. The quality of obturation was confirmed by a radiograph. The gutta-percha was cut and vertically compacted 1mm below the orifices using a heated plugger (Figure 4b). Bulkfilled flowable composite was placed on the gutta-percha as the coronal seal. Dentin replacement was attained using fiber-reinforced composite (everX Posterior, GC, Tokyo) (Figure 4c). Obturation was confirmed by a periapical radiograph (Figure 5a).

On the next appointment, preparations were made for composite overlay. Two weeks later, a composite overlay was conducted (Figure 5b). Self-adhesive resin cement is used to cement the overlay, and confirmed by radiograph (Figure 5c).

4 DISCUSSION

S-shaped canal diagnosis and treatment present endodontic challenges. Periapical radiographs taken before endodontic treatment are essential for determining the degree of root canal curvature (Machado et al. 2014). The S-shaped canal has two curves, the most challenging of which is the apical curve. In these root canals, the risk of strip perforation is very high. To lessen the angle of curvature, Guttman advised preflaring the coronal third, which makes the approach to the second curve easier (Sakkir et al. 2014).

Three stages of root canal preparation were involved: initial canal negotiation, establishing a glide path and shaping canal (Nyongesa et al. 2018). K-file #08, #10, and #15 are used to establish the initial pathway to create a smooth canal pathway. Before introducing a rotary or reciprocating root canal instrument, the glide path was prepared using Proglider (Dentsply Sirona), which effortlessly created an adequate, secure, smooth tunnel from the canal orifice to the apical foramen (Nyongesa et al. 2018).

Reciproc Blue (VDW, Munich, Germany), a single-file system with thermomechanical blue treatment, has recently been created with a reciprocating action. Even in highly curved root canals, endodontic reciprocating files are safe tools for canal preparation that shorten operating time. The reciprocating files have enhanced flexibility and fatigue fracture resistance during canal instrumentation (Silva et al. 2021).

Sodium hypochlorite 5,25% as an irrigant for endodontic therapy has an antibacterial impact, dissolves organic tissue, and has a more alkaline pH (Marion et al. 2012). The chelating agent Ethylenediaminetetraacetic acid (EDTA) is responsible for eliminating the smear layer. EDTA has a greater affinity for calcium ions in an alkaline environment created by the reaction of sodium hypochlorite with EDTA, which increases pH (Zaparolli et al. 2012). Sonic agitation was introduced to increase intracanal irrigant tissue dissolution capacity by producing the hydrodynamic phenomenon. Intracanal agitation increases the irrigant to reach the inaccessible region of the root canal system through acoustic streaming (Forghani et al. 2017).

Several factors influence the final result of the preparation of curved canals, such as the diameter and flexibility of the endodontic instruments, location of apical foramen, techniques of instrumentation, and hardness of the dentin. Therefore, the flexibility of the preparation instruments has a significant role (Matta & Kaur 2021).

Endodontic files are prone to straighten up in the canal; therefore, it is tough to control the dentine removal in the root canal (Sakkir et al. 2014).

In this case, several approaches have been proposed to lessen the procedural mistakes made during canal enlargement and shaping. Deviation with NiTi instruments can be avoided by creating smooth and clean pathways in the canal, utilizing the instruments for a few seconds at their intended length, and avoiding large taper when the anatomy is most complex. In particular, if too much pressure is applied to the instrument and the anatomy is highly curved, repeated placement of these instruments at length or holding them at length during rotation will result in canal deviations and perhaps break the instrument (Shen & Gutmann 2016).

5 CONCLUSION

The flexibility and diameter of the instrument affect the outcome of root canal instrumentation.

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Endodontic Management of S-shaped Root Canal on Mandibular First Molar: A Case Report

by Meiny Faudah Amin

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Endodontic Management of S-shaped Root Canal on Mandibular First Molar: A Case Report

Manajemen Perawatan Endodontik pada Molar Pertama Mandibula dengan Saluran Akar Berbentuk S : Laporan Kasus

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ABSTRACT

Background: Knowledge of root canal anatomy and its variation are essential to enhance the success of endodontic treatment. Morphology of S-shaped root canals often becomes a challenge in endodontic treatment. Common causes of failure can be loss of the original shape of root canals, fractured instruments, ledge, and zip. Objective: The present case report describes the potential problem of losing the original shape of the root canal in the endodontic treatment of curvature root canals.

Case report: a 30-year-old female patient with a spontaneous toothache on her left mandibular first molar in the past six months. She described having intense, lasting, nocturnal pain that lasted for a few minutes. The clinical examination showed a cavity at the proximal-distal. Radiographic examination showed S-shaped on the mesial root canal.

Case management: Pre-operative periapical radiographs are required to assess these morphological variations in the root canal system. Glide path preparation was sequentially established by K-file #08, #10 up to size #15, followed by Pro Glider. Biomechanical preparation was done by reciproc file with thermomechanical blue treatment to improve material properties, which increase their fatigue resistance and flexibility. The canals were obturated using warm vertical compaction technique. The final restoration was restored with a composite overlay.

Conclusion: The flexibility and diameter of the instrument affect the outcome of root canal instrumentation.

Keywords: curved canal, endodontic therapy; S-shaped canal.

BACKGROUND

Root canal curvature has different shapes, such as apical, gradual, sickle-shaped, severe-moderate-straight, s-shaped, and dilacerated curves are among the possible shapes. [1,2,3] The root canal system's anatomical intricacy makes endodontic therapy challenging to clean, shape, and obturate.[4] The success of endodontic treatment depends on the adequate biomechanical debridement of the canals and the elimination of microorganisms from the root canal system.[2] Root canals that are not cleaned and filled properly might provide a source of persistent irritation, affecting the prognosis of the endodontic treatment.[4]

Preparation of S-shaped canals presents one of the most significant challenges in endodontic treatment.[2] S-shaped root canal preparation has been associated with unfavourable outcomes, such as ledge formation, canal obstructions, perforations, apical transportation, loss of working length, and loss of the original root canal shape.[2,3]

CASE REPORT

A 30-year-old female patient with a spontaneous toothache on her left mandibular first molar in the past six months visited the department of endodontics at Trisakti University. She described having intense, lasting, nocturnal pain that lasted for a few minutes. She stopped biting on the left side of her jaw and took 500mg of mefenamic acid to ease the pain. She has no previous medical history.

The clinical examination showed a cavity at the proximal-distal tooth 36 (Figure 1). A vitality test utilizing a cold thermal stimulation caused a sharp, lingering pain that persisted for a short period after the stimulus had been removed. Percussion received an excessive response. Palpation testing came out normal.

Periapical radiograph showed radiolucency on the distal part of tooth 36 had penetrated the pulp chamber(Figure 2A). Southard's method was used to determine the root curvature by drawing The intersection of lines 1 and 2 yields the coronal angle of first curvature and the apical angle of the second curvature is produced by the intersection of lines 2 and 3.[5] Using Schneider's method, the degree of root canal curvature was classified as straight for angles of 5° or less, moderate for angles of 10°–20°, and severe for angles of 25°–70°.[6] The mesial root canal presented with a 17,9° at first curvature which was classified as moderate. While, the second curvature was 29,6° which was classified as severe (Figure 2B).

The pulpal diagnosis of 36 was symptomatic irreversible pulpitis, and the periapical diagnosis was symptomatic apical periodontitis. Endodontic treatment was scheduled.

Patient visits during the COVID-19 pandemic, There is mandatory swab antigens on patient, and operator who handles them before treatment procedures are carried out and adhere to strict health protocols to avoid infection. The operator must wear level 3 PPE, and treatment is carried out in a negative pressure room.

Patients were required to sign consent forms before having the inferior alveolar nerve anesthetized with Lidocaine HCl 2% and 1:100.000 epinephrine administered through the pterygomandibular space. The buccal nerve was also anesthetized by injecting 0,5 ml of local anesthetic into the tissues surrounding tooth 36. A round bur was used to remove dental cavities after tooth 36 was isolated using rubber dams. Tooth 36 were prepared for coronal access utilizing an endo-access bur. The distal artificial wall was build-up using bulkfill flowable composite restoration (Figure 3).

Manual glide path was sequentially established using K-file #08, #10, and up to size 15. The working length was validated using an electronic apex locator and a periapical radiograph (Figure 4). The temporary restoration was used.

On the second visit, glide path preparation was completed using ProGlider (Dentsply Sirona) and biomechanical preparation was carried out using Reciproc Blue R25/08 file (VDW, Munich, Germany) with reciprocating system. K-file #25 was used for apical gauging to identify the master apical file and to be fitted to length. The canals were irrigated with sodium hypochlorite 5,25% in between each file application. The solution was flushed out with distilled water and rinsed with 15% EDTA for 3minutes. Sonic agitation was used to activate the irrigant solutions. The final rinse was performed with distilled water. The canals were dried with the paper point (Figure 5). Try in master cone was placed in the canals until 'tug back' was achieved and confirmed radiographically (Figure 6). Obturation was accomplished using gutta-percha with calcium hydroxide-based root canal sealer cement employing the warm vertical compaction technique. A radiograph was taken to confirm the quality of obturation.

The gutta-percha was cut and vertically compacted with a heated plugger 1mm beneath the canal orifices (Figure 7). Bulkfilled flowable composite was placed on the gutta-percha as the coronal seal. Dentin replacement was attained using fiber-reinforced composite (everX Posterior, GC, Tokyo) (Figure 8). Obturation was confirmed by periapical radiograph (Figure 9).

On the next appointment, preparations were made for composite overlay. Two weeks later, a composite overlay was conducted (Figure 10). Self-adhesive resin cement is used to cement the overlay, and a radiograph is taken to confirm it (Figure 11).

DISCUSSION

S-shaped canal diagnosis and treatment present endodontic challenges. Periapical radiographs taken before endodontic treatment are essential for determining the degree of root canal curvature.[4] The S-shaped canal has two curves, the most challenging of which is the apical curve. In these root canals, the risk of strip perforation is very high. To lessen the angle of curvature, Guttman advised preflaring the coronal third.[2] The coronal third was flared to reduce the angle of curvature, that makes the approach to the second curve easier.[3]

Three stages of root canal preparation were involved: initial canal negotiation, establishing a glide path, and canal shaping.[7] K-file #08, #10, and #15 are used to establish the initial pathway to create a smooth canal pathway. Before introducing a rotary or reciprocating root canal instrument, the glide path was prepared using Proglider (Dentsply Sirona), which effortlessly created an adequate, smooth, secure, and reproducible tunnel from the canal orifice to the apical foramen. [7,8]

Reciproc Blue (VDW, Munich, Germany), a single-file system with thermomechanical blue treatment, has recently been created with a reciprocating action. Even in highly curved root canals, endodontic reciprocating files are safe tools for canal preparation that shorten operating time. The reciprocating files have enhanced flexibility and fatigue fracture resistance during canal instrumentation.[9]

Sodium hypochlorite 5,25% as an irrigant for endodontic therapy have an antibacterial impact, dissolve organic tissue, and have a more alkaline PH.[10] The chelating agent Ethylenediaminetetraacetic acid (EDTA) is responsible for eliminating the smear layer. EDTA has a greater affinity for calcium ions in an alkaline environment created by the reaction of sodium hypochlorite with EDTA, which increases pH. [11] Sonic agitation was

introduced to increase intracanal irrigant tissue dissolution capacity by producing the hydrodynamic phenomenon. Intracanal agitation increases the irrigant to reach the inaccessible region of the root canal system through acoustic streaming.[12]

Several factors influence the final result of the preparation of curved canals, such as the flexibility and diameter of the endodontic instruments, instrumentation techniques, the foramen apical's location, and the dentin's hardness. Therefore, the flexibility of the preparation instruments has a significant role.[2,3]

Endodontic files are prone to straighten up in the canal; therefore, it is tough to control the removal of dentine in the root canal.[2]

In this case, several approaches have been proposed to lessen the procedural mistakes made during canal enlargement and shaping: Deviation with NiTi instruments can be avoided by creating smooth and clean pathways in the canal, utilizing the instruments for a few seconds at their intended length, and avoiding large taper when the anatomy is most complex. In particular, if too much pressure is applied to the instrument and the anatomy is highly curved, repeated placement of these instruments at length or holding them at length during rotation will result in canal deviations and perhaps break the instrument.[8]

CONCLUSION

The flexibility and diameter of the instrument affect the outcome of root canal instrumentation.

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FIGURES

Figure 1 Pre-operative photograph shows a cavity in the distal wall.

Figure 2A. Preoperative radiograph. **B**. The mesial root canal has two curved. The first curvature was 17,9°, considered moderate, while the second curvature was 29,6°, which was considered severe.

Figure 3. Building an artificial wall using flowable composite.

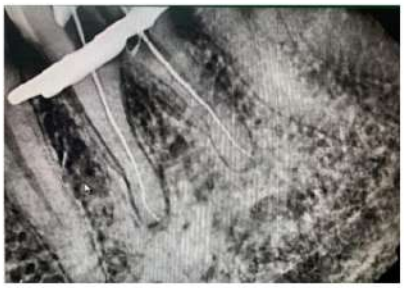

Figure 4. Working length was confirmed by radiograph.

Figure 5. Canals were dried with paper point after biomechanical debridement.

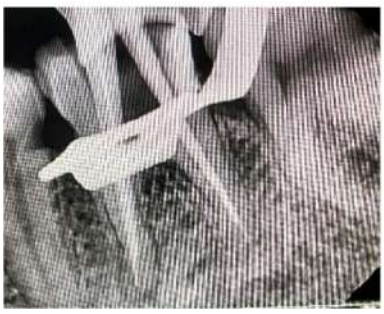

Figure 6. Master gutta percha try in and confirmed by radiograph.

Figure 7. Obturation was done by warm vertical compaction technique.

Figure 8. Dentin replacement by fiber reinforced composite.

Figure 9. Obturation radiograph tooth 36.

Figure 10. Composite overlay cementation.

Figure 11. Final radiograph after restoration.

Endodontic Management of S-shaped Root Canal on Mandibular First Molar: A Case Report

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