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

by Meiny Faudah Amin

Submission date: 07-Jan-2025 09:28AM (UTC+0700)
Submission ID: 2427490523
File name: FULLPAPER_FORIL_-_NOVALIA_TANURI.doc (1.3M)
Word count: 2055
Character count: 11942

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

Novalia Tanuri[1], Meiny Faudah Amin[§], Selviana Wulansari[3]

[1] Postgraduate Student, Department of Restorative/ Conservative Dentistry, Trisakti University, Kyai Tapa Road no.260, Jakarta, Indonesia.

[§] Department of Restorative/ Conservative Dentistry, Trisakti University, Kyai Tapa Road no.260, Jakarta, Indonesia.

[3] Department of Restorative/ Conservative Dentistry, Trisakti University, Kyai Tapa Road no.260, Jakarta, Indonesia.

[§]Corresponding author: Meiny Faudah Amin

Email Addresses:

Corresponding author: meiny.faudah@trisakti.co.id

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.

REFERENCES

1. Khan R, Gupta M, Neeraj, Samant PS. Negotiating the double curvature. International Dental Journal of Student's Research;5(2):61-5.
2. Sakkir N, Thaha KA, Nair MG, Joseph S, Christalin R. Management of Dilacerated and S-shaped Root Canals - An Endodontist's Challenge. Journal of Clinical and Diagnostic Research. 2014 Jun, Vol-8(6): ZD22-4.
3. Matta MS, Kaur M. Endodontic management of thin and double-curved root of maxillary lateral incisor. Saudi Endod J 2021;11:252-5.
4. Machado R, Chaniottis A, Vera J, Saucedo C, Vansan LP, Silva EJNL. S-Shaped Canals: A Series of Cases Performed by Four Specialists around the World. Hindawi Publishing Corporation. 2014.
5. Southard DW, Oswald RJ, Natkin E. Instrumentation of curved molar root canals with the Roane technique. Journal of Endodontics 1987;13(10):479–89.
6. Schneider SW. A comparison of canal preparations in straight and curved root canals. Oral Surgery, Oral Medicine, and Oral Pathology, 1971: 271–5.
7. Nyongesa BS, Luna KGD, Dey GES, Viloria IL. Management of a severely curved canal with Proglider and WaveOne gold compounded with a separated instrument. Oral Rehabil Dent 2019;1(1): 2-10
8. Ling-Chang S, Gutmann JL. Management of a mandibular second molar with dilacerated and S-shaped root canals. ENDO (Lond Engl) 2016;10(4):225–9.
9. Silva RV, Alcalde MP, Horta MCR, Rodrigues CT, Da Silveira FF, Hungaro MA, et al . Root canal shaping of curved canals by reciproc blue system and protaper gold: A micro computed tomographic study. J Clin Exp Dent 2021;13(2):e112-8.
10. Marion J, Manhães F, Bajo H, Duque T. Efficiency of different concentrations of sodium hypochlorite during endodontic treatment. Literature review. Dental Press Endodontics 2012;2(4):32-7.
11. Zaparolli D, Saquy PC, Cruz-Filho AM. Effect of Sodium Hypochlorite and EDTA Irrigation, Individually and in Alternation, on Dentin Microhardness at the Furcation Area of Mandibular Molars. Braz Dent J 2012;23(6): 654-8.
12. Forghani M, Afshari E, Parisay I, Garajian R. Effect of a passive sonic irrigation system on elimination of *Enterococcus faecalis* from root canal systems of primary teeth, using different concentrations of sodium hypochlorite: An in vitro evaluation. *J Dent Res Dent Clin Dent Prospects*. 2017;11(3):177-82.

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.

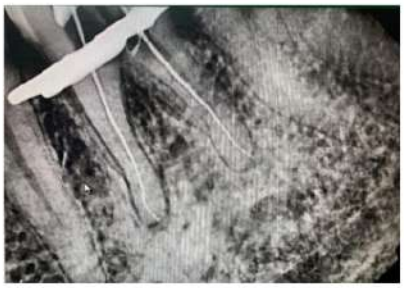

Figure 4. Working length was confirmed by radiograph.

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

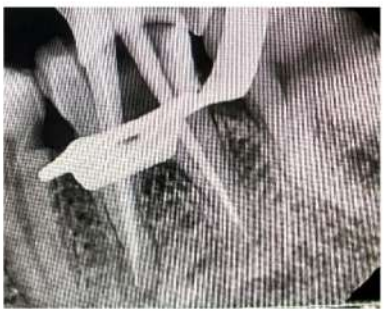

Figure 6. Master gutta percha try in and confirmed by radiograph.

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

ORIGINALITY REPORT

18%	15%	7%	1%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	jcdr.net Internet Source	4%
2	balimedicaljournal.org Internet Source	4%
3	saudiendodj.com Internet Source	3%
4	www.endodonticsociety.ph Internet Source	3%
5	James L. Gutmann, Paul E. Lovdahl. "Problem-Solving Clinical Techniques in Enlarging and Shaping the Root Canal", Elsevier BV, 2011 Publication	1%
6	www.hindawi.com Internet Source	1%
7	K. A. Asyrafi, W. Septiani, D. M. Safitri. "Usability testing and heuristic evaluation for improving usability registration of website hospital", AIP Publishing, 2023 Publication	1%

8	Michael Hulsmann. "Mechanical preparation of root canals: shaping goals, techniques and means", Endodontic Topics, 3/2005 Publication	1 %
9	journal.unpad.ac.id Internet Source	1 %

Exclude quotes	On	Exclude matches	< 15 words
Exclude bibliography	On		