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Root separation and resection of a tooth with class II subclass B2 furcation involvement in a periodontitis patient: a case report

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Abstract

Furcation involvement is a clinical condition resulting from severe attachment loss and consequently requires complex periodontal management. Successful furcation closure can be achieved through nonsurgical and surgical management, although this is limited to proper case selection. This is a case report of a periodontitis patient with class II subclass B2 furcation involvement associated with moderate attachment loss. Based on the amount of bone loss and depth of furcation involvement, root separation and resection were planned for tooth 27 aimed at eliminating furcation involvement and facilitate plaque control. Following comprehensive nonsurgical periodontal therapy and elective endodontic therapy root separation and resection were performed. Buccal furcation was eliminated with larger space existed for oral hygiene maintenance. The objective of this case report was to comprehensively discuss the management of furcation involvement which involve resection of the root that cause inaccessibility to plaque control. The prognosis and alternative options for such therapy are comprehensively discussed. The results of this case may help clinician to decide the best therapy for their patient.

Keywords: *furcation involvement, nonsurgical periodontal therapy, periodontal therapy, periodontitis, surgical periodontal therapy*

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Introduction

Periodontitis is a multifactorial and chronic disease of the tooth-supporting structures, known to affect 38% of the Malaysian population (Oral Health Division, 2020). Worldwide, 12.5% of the population are affected (Nascimento *et al.*, 2024). Periodontitis is characterised by gingival inflammation and bleeding, deep periodontal pockets, tooth mobility, and alveolar bone loss. Long-standing periodontitis may result in periodontal abscess and eventually, tooth loss.

The first line of therapy involves improving plaque control through oral hygiene education and motivation followed by professional removal of calculus by scaling and root surface debridement (Badersten *et al.*, 1984; Suvan *et al.*, 2020). However, several factors may limit the effectiveness of nonsurgical therapy such as noncompliance, presence of furcation, pocket depth (Heitz-Mayfield *et al.*, 2020), therapist experience and infrabony pocket (Greenstein *et al.*, 1992) which may subsequently necessitate surgical management.

Currently several surgical interventions are available for the management of residual pockets using advanced biomaterials including open flap debridement, guided tissue regeneration, and minimally invasive surgical techniques. Furcation involvements are managed using techniques such as furcation plasty, guided tissue regeneration, root resection and tunnelling. This is a case report of a patient with furcation involvement managed using root separation and resection technique.

Case Report

A 70-year-old female patient was referred by an undergraduate student due to the presence of furcation involvement. She complained of food impaction at the upper left posterior teeth and requested a crown. Previously, she had undergone multiple nonsurgical periodontal therapies by an undergraduate dental student. The patient reported having hepatitis B, but in a dormant stage. She has never taken any medication for the disease. The discovery was incidental and she has never experienced any consequences from the disease. She is otherwise healthy. The patient reported discomfort due to large spaces between her teeth and hopes that crowns can close these spaces.

Extraoral examination revealed no facial asymmetry, cervical lymphadenopathy, or other abnormalities. Intraoral examination showed moderate oral hygiene, with a 25% plaque score and a 35% bleeding score. Generalized probing depths of 3 to 4mm were observed, with localised deep pockets at teeth 26 and 27. For tooth 26, buccal probing depths were 7mm, 3mm and 7mm at mesial, midbuccal and distal respectively. Palatal probing depths were 5mm, 2mm and 5mm at mesial, midpalatal and distal surfaces. Class II furcation involvement was present at the buccal and distal aspects, while mesial furcation was not involved. Severe gingival recession of 6mm was noted at the midpalatal surface, and the tooth exhibited grade II mobility.

Intraoral examination at tooth 27 revealed 4mm, 4mm and 6mm probing depths at mesiobuccal, midbuccal and distobuccal respectively. Palatally, the probing depths are 3mm, 2mm and 5mm at mesial, midpalatal and distal surfaces respectively. Furcation assessment revealed class I furcation involvement at buccal and class II at distal, with no mesial furcation involvement. Gingival recession was 1mm at all buccal and palatal surfaces except for distopalatal surface, 2mm. There was no mobility tooth 27. The gingiva surrounding tooth 27 furcation area was firm but slightly edematous with bleeding on probing observed. Both teeth 26 and 27 were confirmed vital via electric pulp testing. Figure 1 shows the furcation involvement at tooth 27 as measured with a Naber's probe.

Periapical radiographs (Figure 2 and Figure 3a) show horizontal bone loss affecting half the root length at teeth 26 and 27. There was a secondary caries underneath the restoration and extending into dentine at distal of tooth 27. The furcation radiolucency was not clear. There was 70% bone loss surrounding the distobuccal root of tooth 27. The separation angle and divergence of the roots of tooth 27 were small (Figure 3b). Figure 3c shows the root trunk of tooth 27. The coefficient of separation is defined as the length of root cones divide by the length of root complex. The coefficient of separation for tooth 27 is 0.79 (Figure 3d).

Figure 1. Tooth 27 with furcation involvement.

Figure 2. Intraoral periapical radiograph of tooth 27.

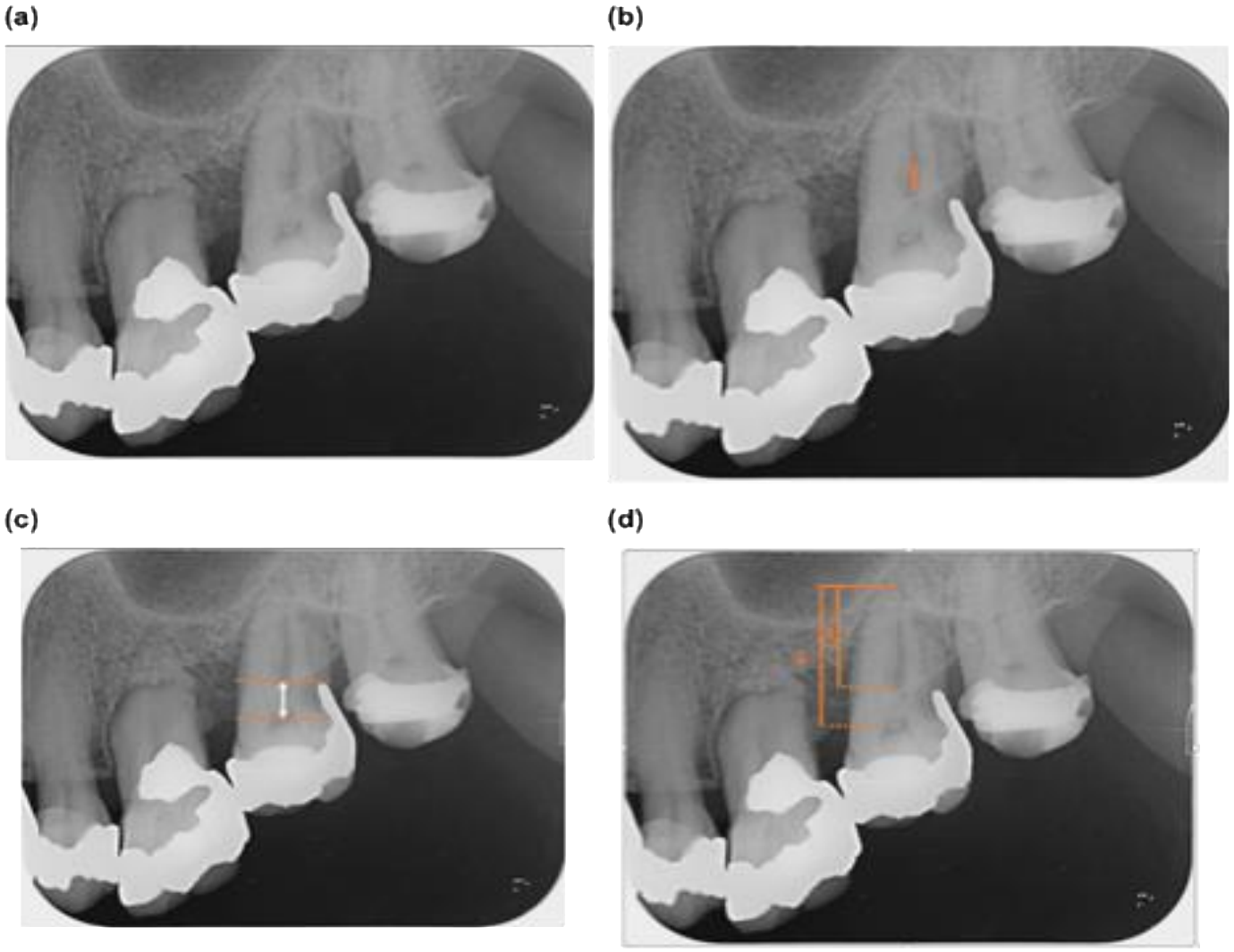

Figure 3. (a) Baseline radiograph. (b) Degree of separation. (c) Root trunk. (d) Coefficient of separation of the tooth 27.

Based on the clinical and radiographic findings, the patient was diagnosed with localised periodontitis stage III grade B currently unstable with no risk factors (Caton *et al.*, 2018). Stage III was given due to moderate to severe bone loss at tooth 27 while grade B due to moderate rate of progression. Bone loss to age ratio for this patient is 1. The patient received one round of nonsurgical periodontal therapy under the care of a periodontist to remove any residual calculus. At re-evaluation, the furcation involvement persisted. Surgical periodontal therapy was planned with the objective to eliminate distal furcation involvement and facilitate plaque control. Due to severe bone loss and significant furcation involvement, root resective surgery was planned for the distobuccal root of tooth 27, with elective endodontic therapy to be performed beforehand. Open flap debridement will be performed along on tooth 26 during surgery.

Elective endodontic therapy was carried out by a restorative specialist. The completed endodontic treatment of tooth 27 is shown in Figure 4(a). Surgical consent was obtained prior to the surgery date. During surgery, a mucoperiosteal flap was elevated from teeth 25 to 27 (Figure 4b). Root debridement was performed and teeth 26 and 27. There was class II furcation involvement at the distal furcation of tooth 27 (Figure 4c). The distobuccal root was separated and its mobility assessed. The root alone was mobile grade II, with approximately 20% of alveolar bone remaining. The root was resected (Figure 4d). Root surfaces and surrounding bone were smoothened. The flap was repositioned and sutured using 4-0 vicryl suture. Post-operative instructions were given. Analgesics and chlorhexidine mouthwash were prescribed.

The patient was reviewed at one week for suture removal, and at two weeks, one month, and three months for post-operative care. At one-week post-surgery, the distal surface was restored using glass ionomer and composite resin. By the three-month review, the distal area of tooth 27 demonstrated complete healing with the gingiva fully covering the resected root area (Figure 5). Buccal probing depths were 4 mm at mesial, midbuccal and distal. Palatally, the probing depths were 4mm, 4mm and 5mm at mesial, midpalatal and distal. Buccal furcation involvement was eliminated by the removal of distopalatal root. There was a class II furcation involvement at distal with larger spacing and thus, more accessible oral hygiene compared to before root resection. The restoration surface was further smoothened using white stone bur. Fluoride was applied to the root of 27 to prevent root caries. Motivational advice was given to the patient regarding plaque control maintenance and frequent toothbrushing using interdental cleaning.

Discussion

Current evidence reports successful periodontal therapy following plaque control and non-surgical debridement (Suvan *et al.*, 2020; Albeshri & Greenstein, 2022). However, several limitations exist, including infrabony defect (Iorio-Siciliano *et al.*, 2025), furcation involvement (El Mobadder *et al.*, 2024), diabetes status (Hsu *et al.*, 2019), and the skill of the therapist, which contribute to the maintenance of the deep pocket following reassessment. In this case, the patient received several cycles of nonsurgical periodontal therapy which include oral hygiene education and motivation, scaling and root surface debridement by undergraduate student, supervised by periodontist. This is in line with the S3 level clinical practice guideline which involve supragingival dental biofilm control through behavioural change and professional mechanical plaque removal (PMPR) in the first step of therapy (Sanz *et al.*, 2020). The second therapy which is aimed at controlling subgingival biofilm and calculus are also delivered by undergraduate student through root surface debridement and reassessment.

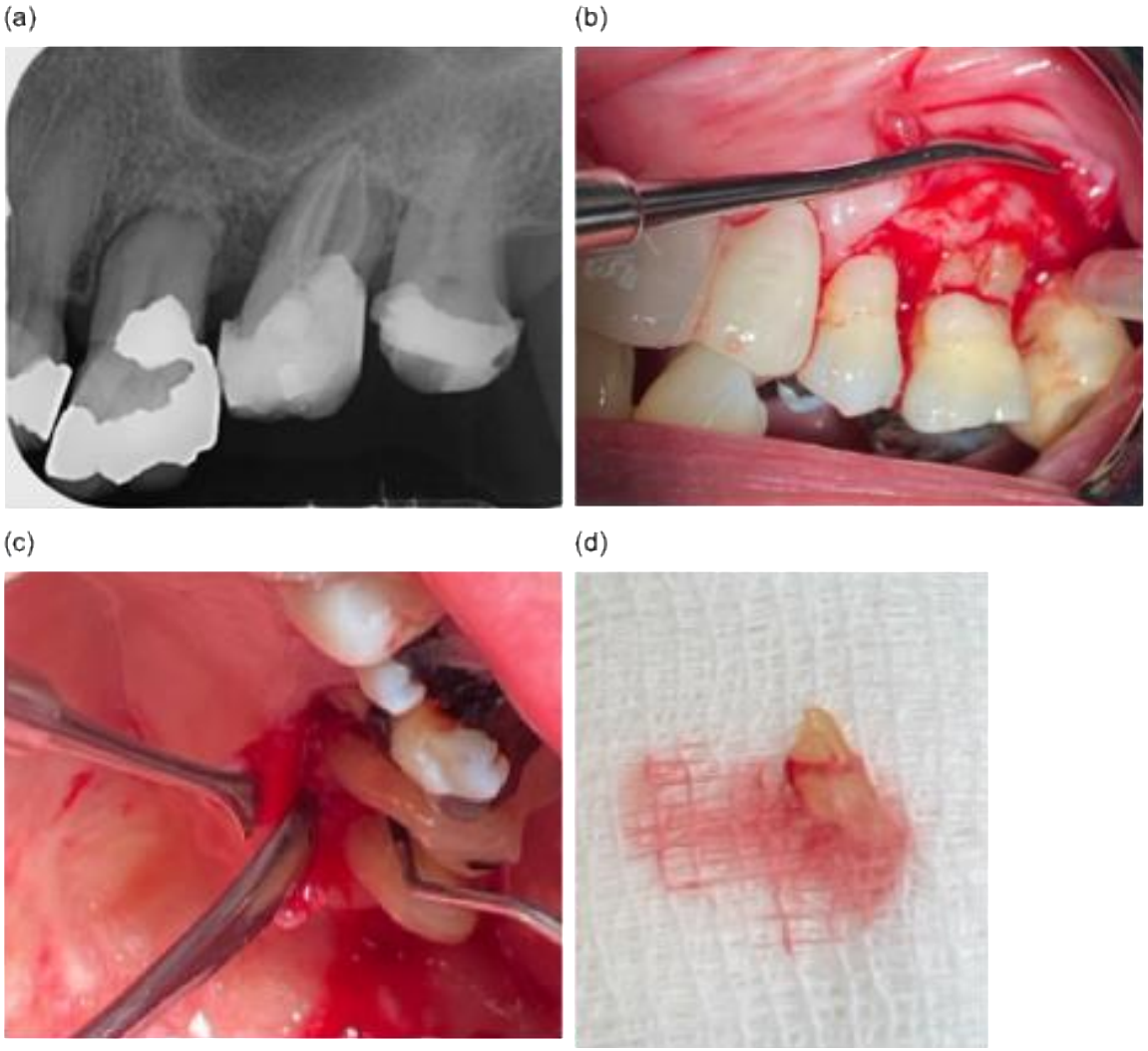

Figure 4. Intraoral periapical radiograph of obturated tooth 27, (b) mucoperiosteal flap elevation (c) class II furcation involvement of distal tooth 27 (d) resected distal root of tooth 27.

Figure 5. Post-operative review of tooth 27.

The goal of root surface debridement is to render the root free of microbial deposits and plaque-retentive factors such as calculus (Rateitschak-Pluss *et al.*, 1992). The hand instrument most suitable for subgingival debridement is the curette. Effective debridement depends on correct usage, with 80º being the optimal angle; too acute an angle results in inefficient calculus removal, while too obtuse an angle causes roughening of the surface. A finger rest enables the operator to achieve optimal angulation and allows wrist-forearm motion, as well as the use of different angles of debridement strokes to cover all aspects of the root surface (Lang & Lindhe, 2015). These correct debridement techniques must be practised and improved over time. Evidence shows a significantly inferior periodontal treatment outcome following therapy by undergraduate students compared to periodontal residents (Kozlovski *et al.*, 2018).

Nevertheless, several limitations exist independent of the therapist's level, such as bone irregularities, pocket depth (Heitz-Mayfield *et al.*, 2002), and furcation involvement, which require surgical management (Sekino *et al.*, 2022). The patient in this case has class II furcation involvement at teeth 26 and 27 at the time of referral. Class II is characterised by probable furcation involvement of more than 3 mm, but the involvement is not through and through (Hamp *et al.*, 1975). Several other classifications exist (Patil & Shetty, 2021) based on the anatomical area involved. Rasperini and colleagues introduced a decision guideline using two types of classification: horizontal and vertical criteria (Rasperini *et al.*, 2020). The vertical classification describes three subclasses: A, when bone loss extends to the coronal third of the root; B, when bone loss extends to the middle third; and C, when bone loss extends to the apical third (Tonetti *et al.*, 2017). The patient in this case has bone loss extending to the middle third at the mesial of 27, but at the distal area, bone loss extends nearly to the apical third of the root length. Therefore, subclass B2 was assigned.

Based on Sanz *et al.*, 2020, the third step of therapy is aimed at treating those areas of dentition non-responding adequately to the second step of therapy which may include interventions such as repeated subgingival instrumentations, access flap, regenerative and resective periodontal surgery (Sanz *et al.*, 2020). Several options are available in this case to eliminate the furcation involvement: furcation plasty, root separation and resection (RSR), and regeneration. Furcation plasty is not possible due to extensive bone loss. For

regenerative therapy to be successful, there should be a keyhole type of class II involvement to allow the membrane to be retentive. In addition, there were less favourable results following GTR in maxillary molars (Pontoriero & Lindhe, 1995). The decision regarding root separation and resection in this case was based on the aim to eliminate furcation involvement and facilitate plaque control. A short root trunk, wide divergence, and stability of individual roots are criteria that increase the success rate of such therapy. The distobuccal root of a maxillary molar is the shortest of the three roots; thus, the distal root has a small amount of bone support. Once separated, the individual root cone may exhibit increased mobility. The distobuccal root is often removed in root separation and resection cases (Ross & Thompson 1980).

However, the prognosis of such tooth following RSR remains questionable. The survival rates of a tooth following RSR depends on factor such as self-plaque control, remaining bone level and corrective therapy. Based on a systematic review on resective surgery, for class II furcation involvement, scaling and root debridement resulted in similar survival rate as root resection (Dommisch *et al.*, 2020). However, it was also reported that class II and III furcation involved teeth exhibits significantly higher risk of tooth loss compared to class I furcation involved teeth. Therefore, resective surgery is applied to improve long-term survival of these teeth (Dommisch *et al.*, 2020). In another retrospective study, only 3.5% of cases with class II furcation had furcation closure after nonsurgical periodontal therapy (Hamp *et al.*, 1975). Rasperini *et al.* stated that cases with C2 classification should be managed with advanced nonsurgical periodontal therapy and maintenance. Resective surgery was indicated only in Class III furcation, regardless of the level of bone loss (Tonetti *et al.*, 2017). When favourable root attachment is present, it is recommended to separate the crown from its respective portions by performing a bicuspidalisation procedure to eliminate the furcation area. Additionally, Carnevale reported a 93% survival rate for root-resected teeth in a 10-year longitudinal study (Carnevale *et al.*, 1998). Similar results were observed in another study in 2024 (Fugazzotto *et al.*, 2024).

In addition, retaining natural teeth is more cost-effective than implant tooth replacement therapy. When compared towards implant-supported crown, retained natural teeth with furcation management is less costly (Schwendicke *et al.*, 2014). Furthermore, when compared with most periodontal treatments, implant-supported crowns were retained for shorter time regardless of the degree of furcation involvement, the patient's age or profile (smoker) (Schwendicke *et al.*, 2014).

In general, teeth with a questionable prognosis require complex therapy to prolong their survival. It is crucial to consider every patient-related criterion before making any decision. The side effects and any required changes in oral hygiene must be discussed with the patient. Within the limitations of the present article, the author suggests a thorough anatomical assessment and prognostic evaluation prior to root resection to ensure a favourable outcome.

Conclusion

In conclusion, the management of deep periodontal pockets with furcation involvement, as illustrated in this case, highlights the limitations of nonsurgical therapy alone, particularly when performed by less experienced clinicians such as undergraduate students. While initial debridement achieved partial pocket reduction, persistent class II furcation with advanced vertical bone loss necessitated consideration of surgical intervention. Given the anatomical characteristics and

classification of the furcation defects, root separation and resection were deemed appropriate to improve access for plaque control and potentially enhance long-term tooth retention. However, the success of such procedures remains highly dependent on accurate diagnosis, proper case selection, and ongoing patient commitment to oral hygiene and maintenance. Therefore, comprehensive clinical evaluation and informed patient involvement are critical in managing teeth with a compromised prognosis.

Consent for Publication

Written informed consent was obtained from the patient prior to publication.

Competing Interests

The author declares that there are no competing interests.

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References

Albeshri, S., & Greenstein, G. (2022). Efficacy of nonsurgical periodontal therapy for treatment of periodontitis: practical application of current knowledge. *General Dentistry*, 70(5), 12-19.

Badersten, A., Nilveus, R., & Egelberg, J. (1984). Effect of nonsurgical periodontal therapy: II. Severely advanced periodontitis. *Journal of Clinical Periodontology*, 11(1), 63-76.

Carnevale, G., Pontoriero, R., & Di Febo, G. (1998). Long-term effects of root-resective therapy in furcation-involved molars: a 10-year longitudinal study. *Journal of Clinical Periodontology*, *25*(3), 209-214.

Caton, J. G., Armitage, G., Berglundh, T., Chapple, I. L., Jepsen, S., Kornman, K. S. *et al.* (2018). A new classification scheme for periodontal and peri-implant diseases and conditions–Introduction and key changes from the 1999 classification. *Journal of Periodontology*, 89, S1-S8.

Dommisch, H., Walter, C., Dannewitz, B., & Eickholz, P. (2020). Resective surgery for the treatment of furcation involvement: a systematic review. *Journal of Clinical Periodontology*, 47, 375-391.

El Mobadder, M., El Kontar, M., & Husseini, B. (2024). Minimally invasive non-surgical periodontal therapy and photoactivated disinfection for the treatment of furcation involvement. *Cureus*, 16(10).

Fugazzotto, P. A. (2001). A comparison of the success of root resected molars and molar position implants in function in a private practice: results of up to 15-plus years. *Journal of Periodontology*, 72(8), 1113-1123.

Greenstein, G. (1992). Periodontal response to mechanical non-surgical therapy: a review. *Journal of Periodontology*, 63(2), 118-130.

Hamp, S. E., Nyman, S., & Lindhe, J. (1975). Periodontal treatment of multi rooted teeth. Results after 5 years. *Journal of Clinical Periodontology*, 2(3), 126-135.

Heitz-Mayfield, L. J. A., Trombelli, L., Heitz, F., Needleman, I., & Moles, D. (2002). A systematic review of the effect of surgical debridement vs. non-surgical debridement for the treatment of chronic periodontitis. *Journal of Clinical Periodontology*, 29, 92-102.

Hsu, Y. T., Nair, M., Angelov, N., Lalla, E., & Lee, C. T. (2019). Impact of diabetes on clinical periodontal outcomes following non-surgical periodontal therapy. *Journal of Clinical Periodontology*, 46(2), 206-217.

Iorio-Siciliano, V., Blasi, A., Mauriello, L., Salvi, G. E., Ramaglia, L., & Sculean, A. (2025). Non-Surgical Treatment of moderate periodontal intrabony defects with adjunctive cross-linked hyaluronic acid: a single-blinded randomized controlled clinical trial. *Journal of Clinical Periodontology*, 52(2), 310-322.

Kozlovsky, A., Rapaport, A., & Artzi, Z. (2018). Influence of operator skill level on the clinical outcome of non-surgical periodontal treatment: a retrospective study. *Clinical Oral Investigations*, 22(8), 2927-2932.

Lang, N. P., & Lindhe, J. (Eds.). (2015). *Clinical Periodontology and Implant Dentistry, 2 Volume Set*. John Wiley & Sons.

Nascimento, G. G., Alves-Costa, S., & Romandini, M. (2024). Burden of severe periodontitis and edentulism in 2021, with projections up to 2050: the global burden of disease 2021 study. *Journal of Periodontal Research*, 59(5), 823-867.

Oral Health Division. (2020). National Oral Health Survey for Adults 2020. Page 9, Retrieved from: https://hq.moh.gov.my/ohp/index.php/ms.

Patil, A., & Shetty, S. (2021). Classification of furcation involvement-a literature review. *International Journal of Research and Review*, 9(3), 6-17.

Pontoriero, R., & Lindhe, J. (1995). Guided tissue regeneration in the treatment of degree III furcation defects in maxillary molars. *Journal of Clinical Periodontology*, 22(10), 810-812.

Rasperini, G., Majzoub, J., Limiroli, E., Barootchi, S., & Hill, R. (2020). Management of furcation-involved molars: recommendation for treatment and regeneration. *International Journal of Periodontics & Restorative Dentistry*, 40(4).

Rateitschak-Plüss, E. M., Schwarz, J. P., Guggenheim, R., Duggelin, M., & Rateitschak, K. H. (1992). Non-surgical periodontal treatment: Where are the limits? an SEM study. *Journal of Clinical Periodontology*, 19(4), 240-244.

Ross, I. F., & Thompson Jr, R. H. (1980). Furcation involvement in maxillary and mandibular molars. *Journal of Periodontology*, 51(8), 450-454.

Sanz, M., Herrera, D., Kebschull, M., Chapple, I., Jepsen, S., Berglundh, T., Sculean, A., Tonetti, M.S., & Wennström, J. (2020). Treatment of stage I–III periodontitis—the EFP S3 level clinical practice guideline. *Journal of Clinical Periodontology*, 47, 4-60.

Schwendicke, F., Graetz, C., Stolpe, M., & Dörfer, C. E. (2014). Retaining or replacing molars with furcation involvement: A cost-effectiveness comparison of different strategies. *Journal of Clinical Periodontology*, 41(11), 1090-1097.

Sekino, S., Wada, K., Sano, T., Inoue, Y., Komaki, R., Yabuki, K., Fukuda, T., & Numabe, Y. (2022). The effect of non-surgical periodontal therapy on furcation involvement: Retrospective study. *Journal of Interdisciplinary Clinical Dentistry*, 3(2), e002.

Suvan, J., Leira, Y., Moreno Sancho, F. M., Graziani, F., Derks, J., & Tomasi, C. (2020). Subgingival instrumentation for treatment of periodontitis. A systematic review. *Journal of Clinical Periodontology*, 47, 155-175.

Tonetti, M. S., Christiansen, A. L., & Cortellini, P. (2017). Vertical subclassification predicts survival of molars with class II furcation involvement during supportive periodontal care. *Journal of Clinical Periodontology*, 44(11), 1140-1144.