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Management Of Maxillary Midline Diastema (MMD) With Removable Orthodontic Appliance

Queneessa Cahya Albetra[1)*], Aya Dini Oase Caesar[2)]
[1,2)] Department of Oral Diseases and Dentistry, Faculty of Dentistry, University of Muhammadiyah Surakarta, Indonesia

*Corresponding Author
Email : qalbetra@gmail.com

Abstract

Maxillary midline diastema (MMD) is a space between the middle incisors of the upper jaw which is often an aesthetic problem in adolescents and young adults because it can affect the appearance and decrease the patient's confidence. This condition has a multifactorial etiology, such as genetic factors, high labial frenulum attachment, bad habits of the oral cavity, and impaired growth and development of teeth. In mild diastema cases, the use of removable orthodontic devices can be a treatment option because it is simple, conservative, and effective in correcting the position of the teeth. This case report aims to describe the management of the maxillary midline diastema using removable orthodontic devices. A 19-year-old woman came to the Soelastri Dental and Oral Hospital with a complaint of a gap in the anterior teeth of the upper jaw that interfered with appearance and confidence. Patients also complained that food often got stuck between the teeth and complaints had been felt since high school. The results of the examination showed the presence of a maxillary midline diastema between teeth 11 and 21. Treatment is performed using a removable orthodontic device with an active component of the finger spring for the correction of the central diastema. The patient underwent treatment for 6 months accompanied by regular control and activation of the device. The results of the treatment showed a satisfactory closure of the diastemic space. The use of removable orthodontic devices is effective in correcting mild cases of maxillary midline diastema and can improve the patient's aesthetics and confidence.

Keywords: ***Maxillary Midline Diastema, Detached Orthodontic Device, Central Diastema, Finger Spring, Mild Malocclusion.***

INTRODUCTION

Maxillary midline diastema (MMD) is the space between the middle incisors of the upper jaw that is often an aesthetic problem in adolescents and young adults. This condition can have psychological impacts such as lack of confidence, discomfort when speaking, and aesthetic disturbances when smiling, so many patients come to the dentist to seek appropriate treatment. In addition to affecting aesthetics, the central diastema can also cause food to get easily caught between the teeth and affect the phonetic function of the patient. According to Keene, *the maxillary midline diastema* is the distance between the proximal surfaces of adjacent teeth by more than 0.5 mm and belongs to the form of malocclusion. The prevalence of MMD in the adult population ranges from 1.6% to 25.4% and the prevalence is higher in young than in adulthood. The central diastema is also more commonly found in the upper jaw than the lower jaw and varies in prevalence based on race and specific ethnic characteristics. The high public attention to dentofafacial aesthetics has caused the need for orthodontic care in diastema cases to increase over time. This condition suggests that MMD is not only a clinical problem, but also related to the psychosocial aspects of the patient that can affect the quality of daily life (Setiawan et al., 2025; Tadros et al., 2022).

The etiology *of the maxillary midline diastema* is multifactorial, including high adhesion of the labial frenulum, microdontia, mesiodens, dental agenesis, peg-shaped teeth, cysts, dental malformations, to genetic factors and ethnic characteristics. In addition, impaired growth of hard tissues and imperfect interdental septa can also be an etiopathogenic factor in the formation of the central diastema. Parafunctional habits such as thumb sucking, lip biting, and *tongue thrusting* are known to affect the position of the anterior teeth, increasing the space between the central incisors. This habit causes an imbalance of muscle pressure against the teeth and supporting tissues so that there is a slow change in the position of the teeth. Proper etiology identification is essential to determine an appropriate treatment plan, whether in the form of orthodontic, restorative, or prosthodontic treatments. In mild cases of diastema, orthodontic treatment is often the preferred choice because it is

able to conservatively correct the position of the teeth without reducing the structure of the tooth tissue. Proper diagnosis enforcement through clinical examination, study model analysis, and radiography is also necessary to obtain optimal and stable treatment outcomes in the long term (Lay & Supandi, 2022; Romulo et al., 2022).

The development of orthodontic science and technology has led to an increase in treatment options to improve malocclusion, including *maxillary midline diastema*. One method that is still widely used in mild malocclusion cases is a removable orthodontic device because it has a simple design, is relatively economical, easy to clean, and can be removed by the patient. Active components such as *finger springs* are able to produce simple tipping motions to gradually close the diastemic space. The success of using removable orthodontic devices is influenced by the proper diagnosis, appropriate device design, and the patient's compliance in using the device according to the dentist's instructions. Patients also need to carry out periodic controls so that the activation of the device can be carried out optimally and the results of treatment can be evaluated periodically. In mild diastema cases, the use of detached orthodontic devices is known to provide good results in a relatively short time if the patient is cooperative during the treatment period. Therefore, this case report aims to describe the management of *maxillary midline diastema* using detachable orthodontic devices as one of the alternative aesthetic treatments in mild central diastema cases (Utari et al., 2024; Setiawan et al., 2025).

RESEARCH METHODS

This study uses *a case report* design that aims to describe the diagnosis and management of *Maxillary Midline Diastema* (MMD) using removable orthodontic devices. The subject of the study was a 19-year-old female patient who came to Soelastri Dental and Oral Hospital Surakarta with a complaint that there was a gap in the anterior teeth of the upper jaw that interfered with the patient's aesthetics and confidence. The examination was carried out through anamnesis, extraoral and intraoral clinical examinations, study model analysis, and cephalometric radiography examination. The results of the examination showed the presence of a diastema between teeth 11 and 21 of 1 mm accompanied by skeletal malocclusion class I bimaxillary protrusion.

Treatment is carried out using removable orthodontic devices on the upper and lower jaw consisting of *labial arch*, *Adam clasp*, *finger spring*, and *simple spring*. Activation of the tool is carried out periodically to correct the central diastema and correct the position of the teeth. Evaluation was carried out through clinical examination and study models during the control period until diastema closure was obtained at the seventh control. Patients are also given education on the use of tools and maintaining oral hygiene. This research has obtained *informed consent* from patients for medical procedures and scientific publications.

RESULTS AND DISCUSSION

Case Report

A 19-year-old woman came to the Soelastri Dental and Oral Hospital with a complaint that there were loose teeth on the upper front. These complaints interfere with the patient's appearance and confidence. Patients complain that food often gets stuck. The patient has complained of upper front loose teeth since he was in high school. The patient has an allergy to the antibiotic metronidazole. The patient has a habit of supporting the chin with strong pressure.

The patient's body mass index is in the normal category. On an extra oral examination, the patient had a Leptoprosop face shape with a convex facial profile. The patient's simon line is within normal limits. The patient has a history of clicking in the TMJ joint. Competent resting position lips. Free way space 2 mm. In intraoral examination, the oral hygiene status is good, there is a pattern of physiological attrition. The tongue of the macroglysium patient with the patient's mucosa has morsicatio buccarum on both sides. Medium palate. Gingiva within normal limits. Lip tone and

mastication muscles within normal limits. The patient's frenulum is moderate. There is an enlargement of the tonsils.

Based on the analysis, there is a diastema between teeth 11 and 21 measuring 1 mm with an overbite of 3 mm and an overjet of 3.1 mm. There are open bites in teeth 22, 23, 42, and 43. There are also scissor bites in teeth 14, 15, 16, 17, and 26.

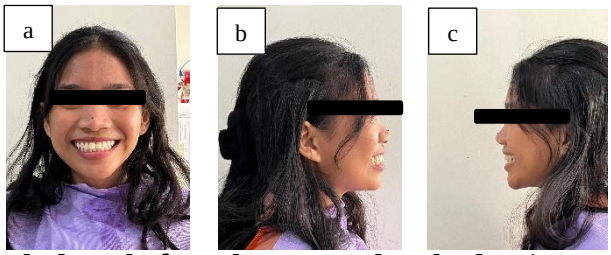

Photo 1. Extraoral photo before the removal orthodontic treatment. (a) front view (b) right view (c) left view

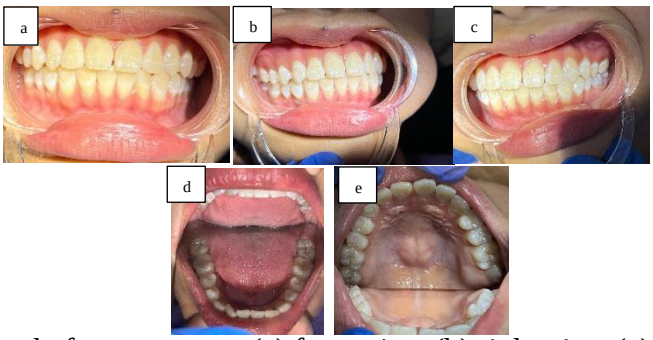

Photo 2. Intraoral photo before treatment (a) front view (b) right view (c) left view (d) occlusal upper jaw appearance (e) occlusal lower jaw appearance. There is a diastema between teeth 11 and 21 The diagnosis of kasusu is based on the angle classification, namely the first molar relationship of the lower right and upper molar class III, while the first molar relationship of the upper right and lower molar of class I. Classification according to Dewey, the relationship of the right canine of class I and the relationship of the left canine of class 2. There is a 1.1 mm midline shift on the anterior left of the lower jaw.

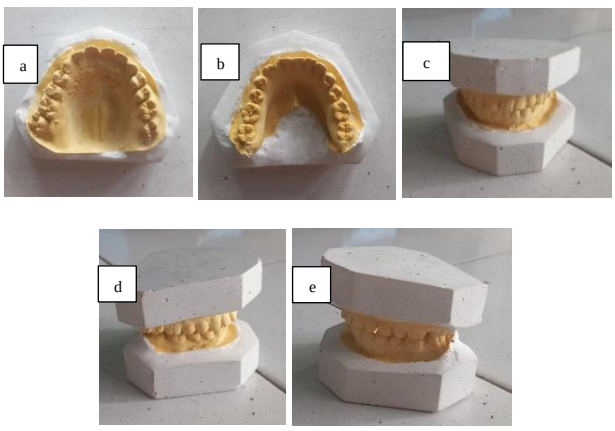

Photo 3. Photograph of the patient's teeth before treatment (a) upper jaw (b) lower jaw (c) front-view centric occlusion (d) right-view centric occlusion (e) left-sided centric occlusion

Based on the patient's dental model, the results of the calculation of the pont method showed that the growth and development of the jaw laterally in the premolar region experienced a mild distraction of 3.58 mm, in the molar region experienced a moderate distraction of 7.57 mm. The results of the korkhaus method showed that the growth and development of the tooth curve towards the anterior direction experienced a retraction of 1.6 mm. The results of the calculation of the howes method show that the tooth curve can accommodate the tooth with a P index of 55.60% and the basal curve can accommodate the tooth with an FC index of 53.52%. The index of the canine fossa is smaller than the premolar index which is a contraindication of jaw expansion surgery. The measurement of

ALD space in RA obtained the result of a discrepancy of +4.3 mm, there was an excess of space on the right side of +1.5 mm and there was an excess of space on the left side of +2.8 mm.

The measurement of ALD space in RB was obtained as a result of a discrepancy of +0.7 mm, there was an excess of space on the left side of +0.6 mm and an excess of space on the right side of +0.1 mm. From the results of the determination of the tooth curve, it was found that the upper jaw had a discrepancy of +0.6 mm while the lower jaw had a discrepancy of +0.1 mm. The results of the appearance were obtained that there was a lack of space in region 3 of -0.2 mm, the width of 1/4 of the mesiodistal tooth P1 = 1.8 mm could be grinded if the patient was not prone to caries.

Photo 4. X-ray cephalometry

	Reference Measurement	Patient Measurement
	SKELETAL	
SNA	820 ± 2	**850**
SNB	800 ±2	**860**
ANB	20±2.	**40**
OCC-SN	140±8.	**300**
GO-GN-SN	310±2.	**350**
	DENTAL	
WHEN	22°±4	**250**
INA linear	4 mm	**10 mm**
INB	25°±4	**200**
Linear INB	4 mm	**10 mm**
Interincisal angle	131±2°	**1300**
	SOFT NETWORKING	
Upper lip against the S-Line	Located in front of the S Line	+3 mm
Lower lip against the S-Line	Located in front of the S Line	+3 mm

Steiner's analysis showed that the patient had prognatic skeletal malocclusion class I bimaxilla with a distance of the maxillary incisvus with a protrusive N-A line and a mandibular incisive with a protrusive N-B line along with protrusive upper and lower lip
Malposition of indivdual teeth as follows

Upper jaw	Lower jaw
11: Dystolabiotorsiversion 21: Mesiolabiotorsiversion	32: Mesiolinguotorsiversion 33: Dystolabiotorsiversion 34 : Dystotorsiversion 35 : Dystotorsiversion 37: Mesiobudirtiversion 42 : Labiaversion 47: Dystolinguotorsiversion 44 : Dystotorsiversion 45 : Dystotorsiversion

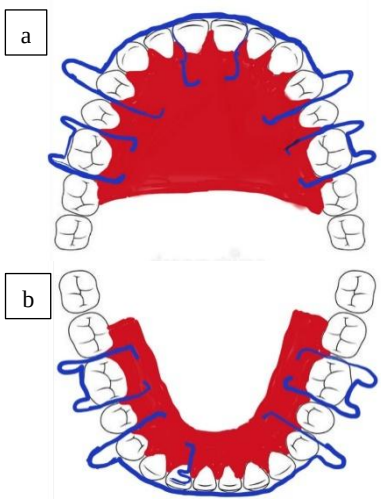

Figure 5. (a) Upper jaw design (b) Lower jaw design

The design of the upper jaw removal orthodontic device consists of a medium type labial arch in teeth 14 to 24, a clamour in teeth 16 and 26, and a fingger spring in teeth 11 and 21 for central diastema correction. The design of the lower jaw orthodontic device consists of a medium type labial arch in teeth 34 to 44, a clammer in teeth 36 and 46, and a simple spring in teeth 42.

The device is inserted into the patient and adjustments are made to the patient. In the first control, finger spring activation was carried out in teeth 11 and 21, activation of the labial arch, grinding in teeth 42, and giving instructions to the patient. In the second control, finger spring activation was carried out in teeth 11 and 21, labial arch activation, and simple activation of gear spring 42.

In the third control, activation of the labial arch and simple spring of the 42nd tooth was performed. In the fifth control, activation of the labial arch and simple tooth spring 42 was carried out and evaluation printing was carried out on the patient. From the results of the printout, the evaluation of the central diastema is not corrected. In the sixth control, finger spring activation was carried out in teeth 11 and 21, labial arch activation, and simple activation of gear spring 42. In the seventh control, finger spring activation was carried out in teeth 11 and 21, labial arch activation, and simple activation of gear 42 spring again.

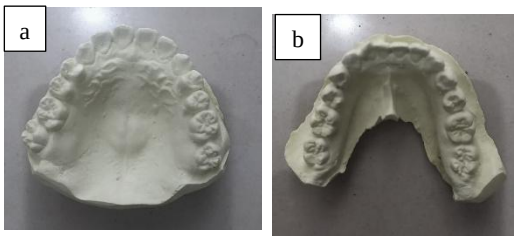

Figure 6. Mold results on the fifth control (a) upper jaw (b) lower jaw

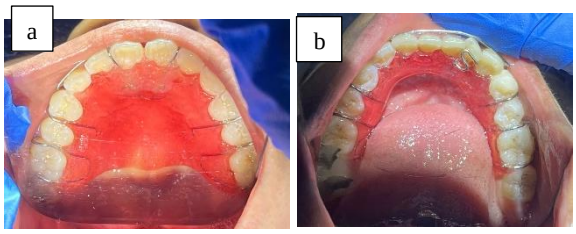

Figure 7. Control photo to 6 (a) upper jaw (b) lower jaw

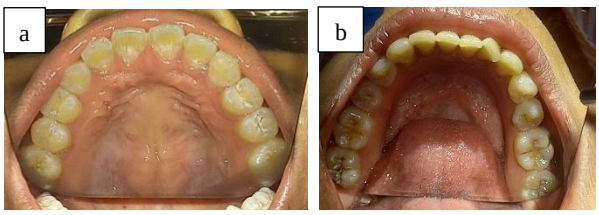

Figure 8. Control photo 7 (a) upper jaw (b) lower jaw

Discussion

Diastema is the distance between two or more teeth in a row. Diastema is an aesthetic problem for young people. Maxillary midline diastema (MMD) is the presence of space between the middle incisors of the upper jaw. Maxillary midline diastema (MMD) can occur during the mixed tooth phase, but this is not seen in some individuals and diastema persists into adulthood. The treatment of diastema depends on etiological factors. Sometimes diastema is not mentioned as the main complaint during a visit to the dentist due to a lack of awareness of it. The patient has undergone an examination and is willing to undergo removable orthodontic treatment for correction of tooth position errors. orthodontic nature. Patients' adherence to treatment consists of several variables that are highly correlated with their motivation, honoring appointments, maintaining good oral hygiene, and wearing orthodontic equipment for as long as necessary.

Detachable orthodontic tools consist of active components, retention components, and acrylic bases. In this case, on the upper jaw a detached orthodontic device consisting of a finger spring with a diameter of 0.6 mm on the distal surface of teeth 11 and 21 as an active component, a medium type labial arc with a U-circle of 0.6 mm diameter in teeth 14 to 24 as a passive component, a 0.7 mm Adam clamp on teeth 16 and 26 for the retention and stability of the tool, and acrylic plates. The maxillary midline diastema (MMD) can be achieved by using a finger spring, which is activated by holding and then moving the coil with pliers and moving the spring arm towards the target tooth using semi-round pliers. In this case, the finger spring is placed on the 11th and 21st teeth. In teeth 11 and 21 finger springs are placed on the distal side of the tooth and moved in the mechanical direction. The goal is to close the midspace between teeth 11 and 21.

The movement produced by the finger spring on a detached orthodontic appliance is a type of uncontrolled tilt, which is a type of simple tooth movement in which the application of force to the crown of the tooth causes the crown to move in the direction of the force and the root to move in the opposite direction. In general, the optimal force needed to achieve an oblique movement is 35-60 grams. Research by Tadros et al. (2022) states that the use of removable orthodontic devices in *mild maxillary midline diastema* cases can provide good results if the diagnosis, design of the device, and selection of active components are carried out appropriately. The use *of finger springs* produces a

simple tipping movement that is effective to gradually close the diastemal space with a light and controlled style so that it is more comfortable for the patient.

The success rate of orthodontic treatment using removable devices in diastema cases is highly dependent on the patient's motivation and discipline in using the device. The use of removable orthodontic appliances can correct mild diastema in 3-6 months. In this case, the closure of the central diastema occurs in less than 6 months of treatment. At the seventh control, it was seen that the space between the middle incisors had closed. The results of this case report are in line with the research of Romulo et al. (2022) which showed that central diastema correction using a detached orthodontic device with *a finger spring* was able to produce satisfactory closure of the space in patients who were cooperative and routinely controlled. The success of treatment is also influenced by the patient's compliance in using the device according to the instructions and maintaining the cleanliness of the oral cavity during the treatment period.

Instructions given to patients during removable orthodontic treatment

(a) Patients are given education on how to remove and install removable orthodontic devices
(b) Patients are instructed to keep oral cavity clean and removable orthodontic devices
(c) Minimum use of the appliance 8 hours per day
(d) Control is carried out for the evaluation and activation of removable orthodontic devices

Further treatment involves the installation of a retainer to maintain the corrected tooth curve and prevent relapse.

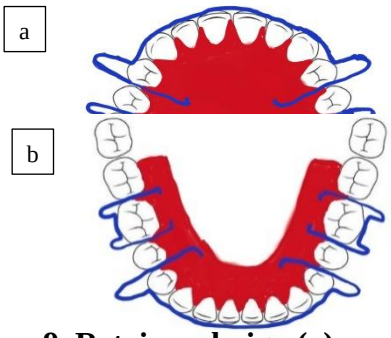

Figure 9. Retainer design (a) upper jaw (b) lower jaw

CONCLUSION

Removable orthodontic treatment is effectively used in the management of mild *maxillary midline diastema* cases because it is able to gradually repair the gap between the anterior teeth with a simple and conservative approach. The use of an active component in the form of *a finger spring* in a detached orthodontic appliance can result in a simple tipping movement that helps in the effective closure of the central diastema. In this case report, the results of treatment after seven controls showed that the diastema between teeth 11 and 21 had been successfully corrected along with improvements in the patient's aesthetics. The success of treatment is influenced by the proper diagnosis, appropriate device design, and the patient's adherence to using removable orthodontic devices as instructed. The recommendation for patients in this case report is the use of retainers after active treatment is completed to maintain the corrected tooth position and prevent relapse.

REFERENCES

AboulHosn, M., Noujeim, Z., Nader, N., & Berberi, A. (2019). Decompression and enucleation of a mandibular radicular cyst followed by bone regeneration and implant-supported dental restoration. *Case Reports in Dentistry, 2019*, Article 9584235. https://doi.org/10.1155/2019/9584235

Al, T., & Sugiharto, K. (2025). Tantangan penegakan diagnosis dan tatalaksana bedah kista radikular asimtomatik: Laporan kasus. *Jurnal Kedokteran Gigi, 37*(3), 400–410. https://doi.org/10.24198/jkg.v37i3.61488

Bane, S. P., Rathi, N. V., Thosar, N. R., & Deulkar, P. V. (2022). Surgical enucleation of radicular cyst in endodontically treated primary mandibular molar. *BMJ Case Reports, 15*(3), 1–4. https://doi.org/10.1136/bcr-2021-248376

Bonanthaya, K., Panneerselvam, E., Manuel, S., Kumar, V. V., Rai, A., Samson, J., & others. (2021). *Oral and maxillofacial surgery for the clinician*. Springer. https://doi.org/10.1007/978-981-15-1346-6

Djati, F. K., & Dewi, C. K. (2018). Tatalaksana hematoma akibat trauma. *Jurnal Kedokteran Gigi Universitas Jember, 15*(2), 26–29.

Firgina, W., & Setyawan, E. (2024). Extraction management of gangrene radix with radicular cyst. *Proceeding Improve Quality Dentistry, 1*(1), 36–41. https://doi.org/10.18196/imunity.v1i1.5

Lay, S. H., & Supandi, A. (2022). Etiological factors and orthodontic treatment considerations in maxillary midline diastema. *World Journal of Advanced Research and Reviews, 15*(2), 315–321. https://doi.org/10.30574/wjarr.2022.15.2.0721

Nainar, S. M. H., & Gnanasundaram, N. (1989). Incidence and etiology of midline diastema in a population in South India (Madras). *The Angle Orthodontist, 59*(4), 277–282. https://doi.org/10.1043/0003-3219(1989)059<0277:IAEOMD>2.0.CO;2

Nair, P. N. R. (2004). Pathogenesis of apical periodontitis and the causes of endodontic failures. *Critical Reviews in Oral Biology & Medicine, 15*(6), 348–381.

Ogawa, M., Yokoo, S., Yamaguchi, T., Suzuki, K., & Makiguchi, T. (2025). Over ten-year survival rates of radicular cyst-causing teeth and factors affecting long-term outcomes with apical microsurgery: A single-centre retrospective analysis. *Cureus, 17*(8). https://doi.org/10.7759/cureus.89770

Rios Osorio, N., Caviedes-Bucheli, J., Mosquera-Guevara, L., Adames-Martinez, J. S., Gomez-Pinto, D., Jimenez-Jimenez, K., & others. (2023). The paradigm of the inflammatory radicular cyst: Biological aspects to be considered. *European Endodontic Journal, 8*(1), 20–36. https://doi.org/10.14744/eej.2022.26918

Romulo, M. G., Santos, P. R., & Villanueva, R. M. (2022). Orthodontic treatment on a patient with maxillary diastema: A case report. *International Journal of Medical Dentistry, 26*(3), 210–216.

Romulo, M. G., Santos, P. R., & Villanueva, R. M. (2022). Orthodontic treatment on a patient with maxillary diastema: A case report. *International Journal of Medical Dentistry, 26*(3), 210–216.

Saputra, D. R., Nugraha, A. P., Baydowi, G., Kamadjaja, D. B., & Indiralia, A. (2023). Guided bone regeneration reconstruction of extensive alveolar bone defect due to infected radicular cyst enucleation: Two case reports. *International Journal of Surgery Case Reports, 106*, Article 108280. https://doi.org/10.1016/j.ijscr.2023.108280

Setiawan, A., Pratiwi, D., & Nugroho, R. (2025). Management of maxillary midline diastema using removable orthodontic appliance: A case report. *Interdental Journal of Dentistry, 21*(1), 45–52.

Setyawan, E. (2017). Gambaran pola densitas kista radikuler pada sisa akar dengan cone beam computed tomography (CBCT). *Insisiva Dental Journal, 6*(1), 109–110.

Siahaan, S. M., & Kesuma, H. P. (2025). Laporan kasus: Ekstraksi open method disertai kista radikular pada regio gigi 24. *Stomatognatic: Jurnal Kedokteran Gigi, 22*(1), 85–88. https://doi.org/10.19184/stoma.v22i1.53703

Tadros, S., Abbassy, M. A., & El-Bialy, T. (2022). Maxillary midline diastema: Aetiology, diagnosis and treatment modalities. *Dental Press Journal of Orthodontics, 27*(2), 1–12. https://doi.org/10.1590/2177-6709.27.2.e222145.oar
Tadros, S., Abbassy, M. A., & El-Bialy, T. (2022). Maxillary midline diastema: Aetiology, diagnosis and treatment modalities. *Dental Press Journal of Orthodontics, 27*(2), 1–12. https://doi.org/10.1590/2177-6709.27.2.e222145.oar
Utari, N. P., Rahmawati, D., & Sari, I. M. (2024). Effectiveness of removable orthodontic appliances in mild malocclusion treatment: A literature review. *Proceedings of International Meeting of Dental Science*, *3*(1), 55–61.
Utari, N. P., Rahmawati, D., & Sari, I. M. (2024). Effectiveness of removable orthodontic appliances in mild malocclusion treatment: A literature review. *Proceedings of International Meeting of Dental Science*, *3*(1), 55–61.
Wang, J., Yao, Q. Y., & Zhu, H. Y. (2022). Efficacy of bone grafts in jaw cystic lesions: A systematic review. *World Journal of Clinical Cases, 10*(9), 2801–2810. https://doi.org/10.12998/wjcc.v10.i9.2801

Wu, Y. H., Wu, Y. C., Sun, A., & Chiang, C. P. (2022). Radicular cyst with features mimicking a verruciform xanthoma. *Journal of Dental Sciences*, *17*(3), 1425–1427. https://doi.org/10.1016/j.jds.2022.04.003