Volume 6, No. 5 May, 2025
p ISSN 2723-6927-e ISSN 2723-4339

Craniocervical Posture Improvement Using Twin Block: A Scoping Review

Mulia Ayu Hanifa, Ratna Indriyanti
Universitas Padjadjaran, Indonesia
E-mail : muliahanifa@gmail.com

ABSTRACT
Functional appliances, such as twin block, effectively treat for skeletal class II malocclusion. The twin block exerts a significant influence on mandibular growth, that contributes to the improvement of craniocervical posture. This scoping review aims to systematically map and evaluate the current literature on the effects of twin block appliance treatment on craniocervical posture. A scoping review followed to PRISMA-ScR guidelines. A comprehensive research conducted in three online databases- Scopus, Pubmed, Springer Link- from 2014-2024. Article selection followed the PCC framework. Studies about the impact of twin block appliance on craniocervical posture were included. A total of 49 articles selected after eliminating duplicates, four articles met the inclusion criteria. The findings from these studies indicate the effect of twin block appliance usage on craniocervical posture. The twin block appliance not only impacts skeletal and dentoalveolar changes, but also craniocervical posture. Evidence suggest that mandibular advancement may induce postural adaptations by altering the craniofacial and cervical spine relationship.

Keywords: Skeletal class II malocclusion; twin block appliance; mandibular improvement; craniocervical posture

INTRODUCTION

Malocclusion is an abnormality of teeth and craniofacial structure that influenced by genetic and environmental (Peng et al., 2024). Class II skeletal pattern associates with prognathic maxilla, retrognathic mandibula, or both conditions (Khan et al., 2022; Krishna et al., 2023). Study found that more than 20% of population in North America, Europe, and North Africa is affected by skeletal class II malocclusion (Khan et al., 2022). This malocclusion gives negative impacts to dental aesthetics and functional, like phonetic and mastication. The stomatognathic system is a system that consists of several interconnected structures that work together to perform various functions, such us sucking, mastication, speech, respiration, and swallowing. This system also maintains postural system through its various muscle groups and functions. The stomatognathic is anatomically and functionally related to the cervical spine and hyoid bone, forming cranio-cervical mandibular unit. When there are interferences and abnormalities within the system, it can affect the function of other system. It may lead to cranio-cervical mandibular disorder (Di Giacomo et al., 2018; Peng et al., 2024).

Craniocervical posture refers to alignment of the head in relation to the cervical vertebrae and reflects of biomechanical equilibrium between muscular and skeletal components. This posture is influenced by morphological and functional interrelationship

between cervical spine and craniofacial structures, which together form a transitional zone linking the head and cervical region (Kui et al., 2024; Peng et al., 2024)**.** Normally, the cervical spine has a natural lordotic curve which is important for maintaining optimal posture and functional stability of the head and neck region (Chang et al., 2025). The connection between mandibular position and cervical spine alignment has attracted interest, indicating that changes in the position mandible may affect cervical posture, and conversely, cervical alignment may also impact mandibular positioning (Kui et al., 2024).

Functional appliances have been shown to be effective in influencing craniofacial growth during growth and developmental stage (Murali et al., 2024). These appliances use the forces generated by surrounding muscles to induce both skeletal and dental changes. Twin block is one of the example of functional appliances. It has been extensively used to treat class II division I malocclusion. Twin block appliance functions by advancing the mandible anteriorly, which can stimulate mandibular growth and influence the posture of head and neck. Alterations in mandible are believed to influence cranio-cervical posture, especially regarding the cranio-cervical angle, muscular balance in the neck, and the function of the temporomandibular joint (Buyukcavus & Kale, 2021; Dogra et al., 2022; Kamal & Fida, 2019). Additional research has supported these results. Murali et al., (2024) conducted a comparison between the use of twin block appliances, forsus, and bilateral sagittal split osteotomy (BSSO), finding that the twin block group showed a greater enhancement in cervical spine posture, especially in relation to the OPT-CVT angle.

Although these findings offer valuable insights, existing literature reveals considerable variability in research methods, outcome assessments, and conclusion concerning the degree and characteristics of craniocervical posture improvements associated with twin block therapy. This scoping review aims to systematically map and evaluate the current literature on the effects of twin block appliance treatment on craniocervical posture.

The novelty of your research lies in its systematic scoping review approach to evaluate the effects of the twin block appliance on cranio-cervical posture, an area that has not been thoroughly explored. While previous studies have focused on the skeletal and dental changes caused by the appliance, your research addresses the inconsistencies in findings regarding its impact on cranio-cervical posture. Additionally, this study provides a clearer understanding of how the twin block appliance affects overall body posture, which has not been extensively discussed in earlier research.

METHOD

Database Sources and Search Strategies

This scoping review followed the guidelines for Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Review Guidelines (PRISMA-ScR). Articles were conducted in the online data-bases through Scopus, PubMed, Springer Link from 2014-2024. The search used all the identified keywords (Table 1). The question of this review was:

1. Does the use of a twin block appliance influence the improvement of craniocervical posture in patients with class II skeletal malocclusion?
2. How does the twin block appliance work to improve craniocervical posture?

The selection of the articles was formulated using PCC (Population-Concept-Context) Framework and done by two reviewers in the phase one, independently identified and checked the titles and abstracts. Title and abstract screening were done using pre-defined inclusion and exclusion criteria (Table 2). The articles that met the eligibility criteria were included in the review. In the second phase, the full-text articles were retrieved for further assessment. Articles that met the eligibility criteria at this stage were subsequently included in the final selection.

Table 1. Keywords

Database	Query
Scopus	TITLE-ABS-KEY (craniocervical AND posture AND twin AND block) AND TITLE-ABS-KEY (cervical AND posture AND twin AND block)
Pubmed	(""cervic""[All Fields] OR ""cervicals""[All Fields] OR ""cervices""[All Fields] OR ""neck""[MeSH Terms] OR ""neck""[All Fields] OR ""cervical""[All Fields] OR ""uterine cervicitis""[MeSH Terms] OR (""uterine""[All Fields] AND ""cervicitis""[All Fields]) OR ""uterine cervicitis""[All Fields] OR ""cervicitis""[All Fields]) AND (""postural""[All Fields] OR ""posturally""[All Fields] OR ""posture""[MeSH Terms] OR ""posture""[All Fields] OR ""postures""[All Fields] OR ""postured""[All Fields] OR ""posturing""[All Fields]) AND (""twins""[MeSH Terms] OR ""twins""[All Fields] OR ""twin""[All Fields]) AND (""block""[All Fields] OR ""blocked""[All Fields] OR ""blocking""[All Fields] OR ""blockings""[All Fields] OR ""blocks""[All Fields]) AND (""malocclusal""[All Fields] OR ""malocclusion""[MeSH Terms] OR ""malocclusion""[All Fields] OR ""malocclusions""[All Fields] OR ""malocclusive""[All Fields]))
Springer Link	Cervical posture AND Twin block

Source: Scopus Database, Pubmed Database, SpringerLink Database

Table 2. Inclusion and Exclusion Criteria

Eligibility Criteria	Inclusion Criteria	Exclusion Criteria
Study Type	Observational or experimental study	Case report, review study
Publication Type	Scientific published journal	
Language	English	Non-English
Year Range	2014-2024	
Data Collection	Evaluation of craniocervical posture using cephalometric analysis	
Study Population	Children with class II skeletal malocclusion	
Concept	Improvement of craniocervical posture	
Context	Twin block appliance usage on growth phase	

Source: Scopus Database, Pubmed Database

Data Charting

Data charting was conducted by extracting relevant information from each study that met the inclusion criteria. The extracted data included the author(s), title, year of publication, study design, population, research location, total number of participant, research result, and research limitation.

Data Synthesis

The data extracted from selected studies will be synthesized narratively using a descriptive analytical approach to highlighting key findings. Variations in study outcomes will be identified, including differences based on study design, population characteristics, or intervention protocols.

RESULT AND DISCUSSION

An initial database search resulted 49 potentially relevant articles. Following the removal of duplicates, 31 articles remained for screening based on the predefines inclusion criteria. After full-text assessment, only four studies were eligible and included in this scoping review. The study selection process is illustrated in figure 1. The articles have various type of research design, 2 articles are retrospective study, 1 article is prospective study, and 1 article is randomized control trial.

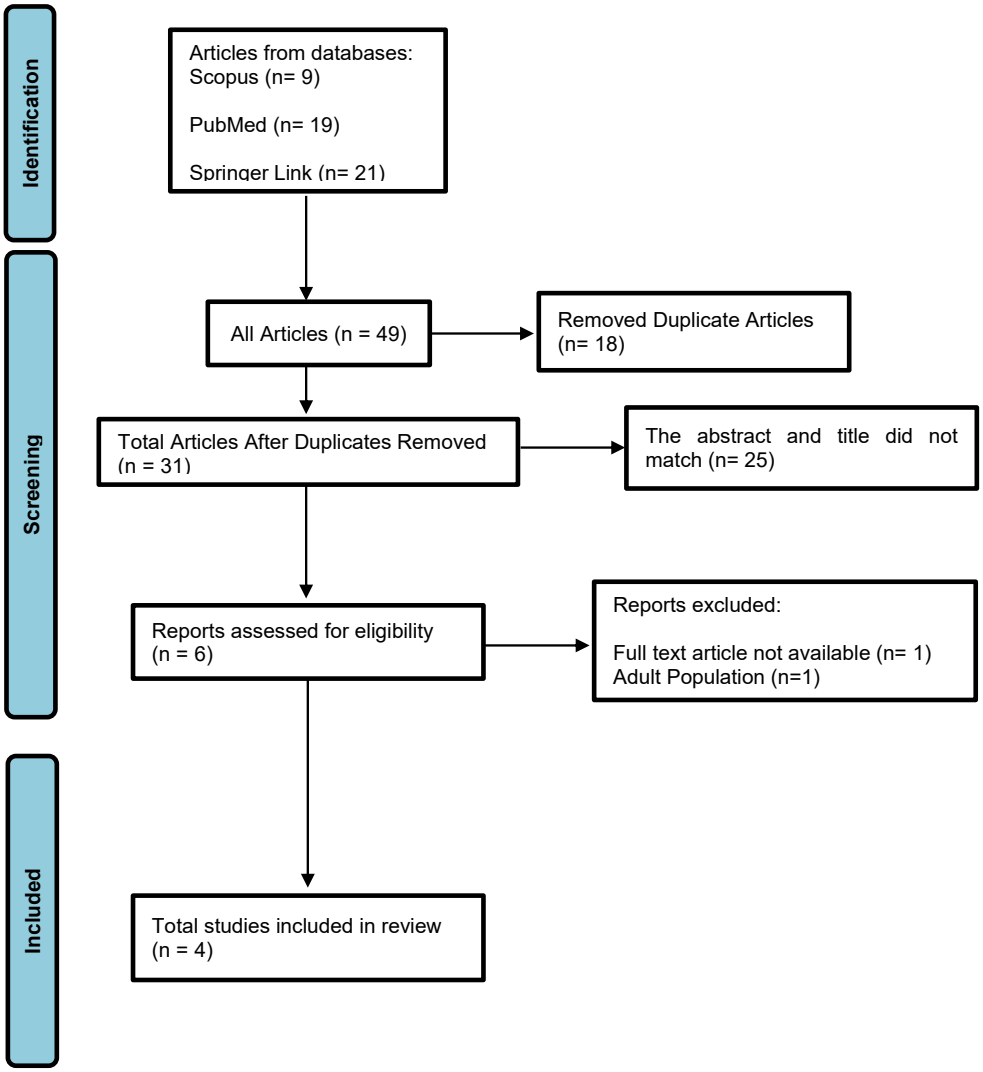

Figure 1. PRISMA flow diagram showing the selection of articles.

Discussion

The relation between mandibular positioning and craniocervical posture has been a focal point in orthodontic studies, especially concerning in the therapeutic impact of functional appliances, such as twin block. This scoping review synthesizes existing research on the effects of twin block therapy influences cervical spine alignment in individuals with skeletal class II malocclusion.

Functional appliances are orthodontic devices that use muscle-generated forces to induce dentoskeletal changes by modifying skeletal growth (Dogra et al., 2022). The twin block appliance, developed by William Clark, is a type of functional appliance consisting of upper and lower bite blocks that interlock at 70 degree and guide the mandible forward and downward. It is worn-full time and utilizes all functional forces of the dentition, including masticatory forces (Clark, 2015; Ehsani et al., 2014).

Dentoalveolar and Skeletal Improvement

The twin block appliance is widely as a functional orthodontic device to correct skeletal class II malocclusion. Recent studies highlight its effectiveness in inducing both skeletal and dentoalveolar changes.

Skeletal Effects:

The use of twin block appliance induces significant changes in the neuromuscular proprioceptive response, reflecting the close interaction between function and craniofacial growth. As stated by Clark, bone adapts thorough remodeling in response to functional forces, influencing not only skeletal structures, but also dental and neuromuscular systems. Orthopedic effects of twin block appliances are average growth of the anterior mandible of 2.4mm (Ar-Pog), restriction of nterior maxillary growth, stimulation of condylar growth, remodeling of the glenoid fossa in a downward and forward direction, and increase in lower anterior facial height (Lubis et al., 2024).

Dentoalveolar Effects:

During treatment, the interaction between myotatic reflexes and the viscoelastic properties of muscle generates mechanical stresses on both dental and skeletal structures This muscular activity plays a critical role in producing the desired orthodontic and orthopedic forces, which are transmitted to the dentoskeletal system. These forces contribute to the correction of malocclusion by enhancing the sagittal intermaxillary relationship, as evidenced by improvements in molar alignment and reduction in overjet (Yoana et al., 2017). A research by Khan et al., (2022) demonstrated that efficacy of the twin block appliance, as evidenced by consistent distal movement of the maxillary molars, mesial and extrusive displacement of the mandibular molars, and proclination of the mandibular incisors.

Mandibular Advancement and Craniocervial Posture

Class II malocclusion patients often exhibit long face syndrome and cervical spine kyphosis. A study conducted by Sandoval et al., (2021) revealed that skeletal class II malocclusion cases demonstrate more posterior rotation of the mandibular ramus relative to

the cranium, along with cervical spine lordosis. Maxillary and mandibular prognathism may shift the head's center of gravity, potentially triggering compensatory responses in the neck muscles and leading to alterations in cervical spine alignment. Other studies have also highlighted a tendency toward cervical inclination and head extension associated with retrognathic mandibular (Zokaitė et al., 2022).

The cranio-cervical mandibular system consist of three primary components: the temporomandibular joint (TMJ), the occipital-atlas-axis articulation, and the hyoid bone along with suspensory apparatus. These structures function in close coordination while being connected to the rest of the body, particularly the vertebral column, through a network of muscles and ligaments (Suleman Shah et al., 2015). The mandible functional coordination with the cranio-cervical complex through interconnected muscle chains, including suprahyoid and infrahyoid muscle (Zokaitė et al., 2022). The craniocervical posture has an essential role in craniofacial development and function. The upper cervical spine comprises the atlas (C1) and axis (C2), which forms a complex anatomical link between the spine and skull. Suboccipital muscle in this region contribute significantly to head stabilization and facilitate essential movements such as flexion, extension, lateral movements, and rotation (Dr. Risti Saptarini Primarti., 2019).

One of alternatives treatment for skeletal class II malocclusion is directing the growth of the bone (growth modification) Dr. Risti Saptarini Primarti.,(2019) Functional appliances for class II are specifically designed to reposition the mandible in a downward and forward direction, with the primary objective of stimulating or enhancing mandibular growth through functional orthopedic adaptation. Functional appliances also can influence the development of facial bones in children, particularly in the condylar and sutural regions (Dr. Risti Saptarini Primarti., 2019). Distraction of the mandibular condyle from the glenoid fossa decreases the load on the condylar cartilage and modifies the surrounding muscular forces, which in turn promotes greater-than-normal endochondral bone growth. When twin block appliance positions the mandible downward and forward, it induces adaptive stretching and toning of these associated musculatures. This will generate pressure and stretching of the surrounding muscles and soft tissues, known as "viscoelastic stretch"(Kamal & Fida, 2019; Zokaitė et al., 2022).

Cephalometric analysis can be utilized to evaluate alterations in skeletal relationships and craniocervical posture. The parameters for assessing cervical posture are categorized into those evaluating the upper and middle cervical regions. Upper cervical posture is assessed using the SN-OPT, PP-OPT, MP-OPT angles; while middle cervical posture is evaluated through the SN-CVT, PP-CVT, MP-CVT, OPT-CVT angles (Krishna et al., 2023) .

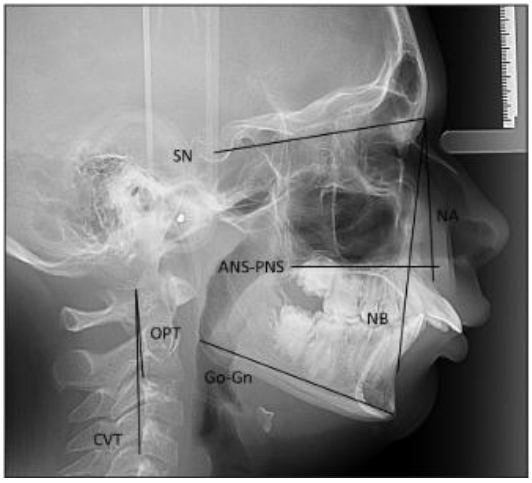

Figure 2. Reference lines on the cephalometric radiograph (Aglarci, 2016)

A study conducted by Kamal & Fida, (2019) evaluated for cervical parameters after therapy with twin block appliance. The result showed a significant improvement in upper cervical parameters and middle cervical parameters, especially in SN-OPT angle that can be interpreted as an uprighting of the upper cervical posture. Similarly, Zeynep Coban B. and Hasan Camci (Çoban Büyükbayraktar & Camcı, 2023) compared twin block therapy with myobrace, finding that twin block therapy group exhibited increased SN/OPT and SN/CVT angle. It indicated that more upright cervical spine posture. A research by Smailiene et al., (2017) stated that treatment with twin block appliance in growing class II malocclusion patients resulted in significant reduction in craniocervical angle. Unlike previous studies, the investigation by Alsheikho et al., (2024) demonstrated significant skeletal alteration; however the changes in cervical posture angles were not statistically significant.

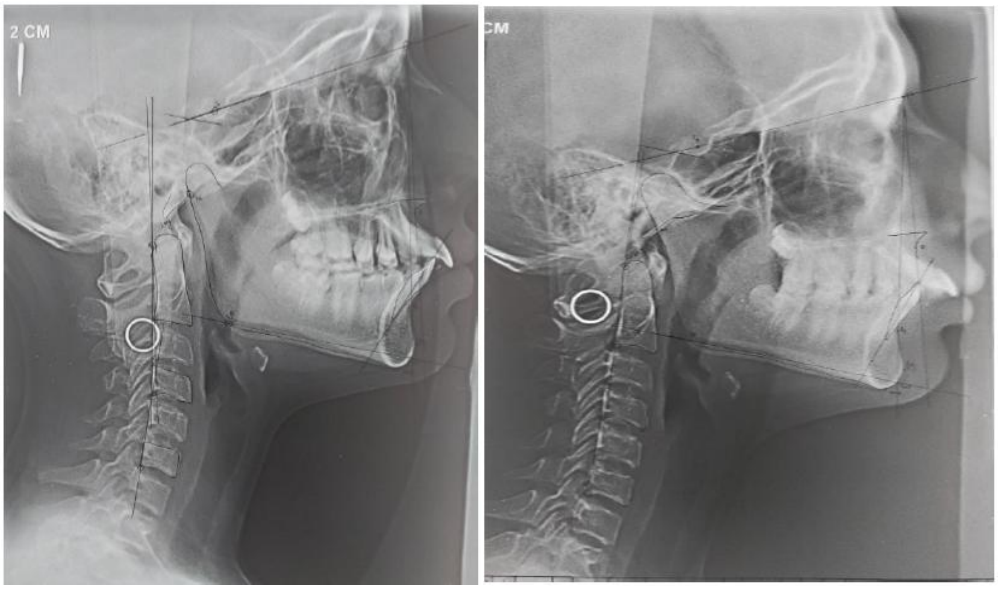

Figure 3. (Left) Pre-treatment cephalogram using the twin block appliance. (Right) Post-treatment cephalogram. A significant change is observed in the middle segment of the cervical spine, which may indicate an improvement in the cervical curvature (Sharmila & Balashanmugam, 2022).

CONCLUSION

The use of twin block appliance not only contributes to skeletal and dentoalveolar changes, but also demonstrates a measurable influence on craniocervical posture. Current evidence suggest that mandibular advancement achieved through twin block therapy may induce postural adaptations by altering the spatial relationship between the craniofacial complex and the cervical spine. Further studies should include standardized cephalometric measurement and long-term follow up to better confirm how functional appliance affect craniocervical posture.

REFERENCES

Aglarci, C. (2016). Evaluation of cervical spine posture after functional therapy with twin-block appliances. *Journal of Orthodontic Research*, *4*(1), 8. https://doi.org/10.4103/2321-3825.179739

Alsheikho, H. O., Jomah, D. H., Younes, M., Tizini, M., Hassan, H., & Khalil, F. (2024). Evaluation of head and cervical spine posture after functional therapy with Twin-Block and Bionator appliances: A pilot randomized controlled trial. *Cranio - Journal of Craniomandibular and Sleep Practice*, *42*(1), 102–111. https://doi.org/10.1080/08869634.2021.1909455

Buyukcavus, M. H., & Kale, B. (2021). Skeletal and Dental Effects of Twin-Block Appliances in Patients Treated with or without Expansion. *Turkish Journal of Orthodontics*, *34*(3), 155–162. https://doi.org/10.5152/TurkJOrthod.2021.20103

Chang, J., Park, S. H., Park, J. H., Lee, S., Yu, H. S., Lee, K. J., Chung, C. J., & Kim, K. H. (2025). Craniocervical Posture and Cervical Curvature Variations in Adult Females with Different Vertical Facial Patterns: A Cross-Sectional Study. *Applied Sciences (Switzerland)*, *15*(5), 1–14. https://doi.org/10.3390/app15052391

Clark, W. J. (2015). *Twin block functional therapy*.

Çoban Büyükbayraktar, Z., & Camcı, H. (2023). Dentoalveolar, skeletal, pharyngeal airway, cervical posture, hyoid bone position, and soft palate changes with Myobrace and Twin-block: a retrospective study. *BMC Oral Health*, *23*(1), 1–12. https://doi.org/10.1186/s12903-023-02773-x

Di Giacomo, P., Ferrara, V., Accivile, E., Ferrato, G., Polimeni, A., & Di Paolo, C. (2018). Relationship between cervical spine and skeletal Class II in subjects with and without temporomandibular disorders. *Pain Research and Management*, *2018*. https://doi.org/10.1155/2018/4286796

Dogra, B., Handa, A., Chakravarthy, N., Sarda, A. S., Chavan, A., & Nalawade, K. (2022). Different realms of twin block- A review article. *IP Indian Journal of Orthodontics and Dentofacial Research*, *7*(4), 291–300. https://doi.org/10.18231/j.ijodr.2021.048

Dr. Risti Saptarini Primarti., S. K. (2019). *Perawatan maloklusi Kelas II divisi I dengan Twin Blok*.

Ehsani, S., Nebbe, B., Normando, D., Lagravere, M. O., & Flores-Mir, C. (2014). Short-term treatment effects produced by the Twin-block appliance: A systematic review and meta-analysis. *European Journal of Orthodontics*, *37*(2), 170–176. https://doi.org/10.1093/ejo/cju030

Kamal, A. T., & Fida, M. (2019). Evaluation of cervical spine posture after functional therapy with

twin-block appliances: A retrospective cohort study. *American Journal of Orthodontics and Dentofacial Orthopedics*, *155*(5), 656–661. https://doi.org/10.1016/j.ajodo.2018.06.012

Khan, M. I., Neela, P. K., Unnisa, N., Jaiswal, A. K., Ahmed, N., & Purkayastha, A. (2022). Dentoskeletal effects of Twin Block appliance in patients with Class II malocclusion. *Medicine and Pharmacy Reports*, *95*(2), 191–196. https://doi.org/10.15386/mpr-1989

Krishna, S. S. S., Shashikumar, B., & Naik, R. D. (2023). Evaluation and Comparison of Cervical Spine Posture in Class II Division I Patients Treated with Twin Block Appliances, Forsus Appliances, and Bilateral Sagittal Split Osteotomy: A Cephalometric Study. *Contemporary Clinical Dentistry*, *8*(September), 157–165. https://doi.org/10.4103/ccd.ccd

Kui, A., Bereanu, A., Condor, A. M., Pop, D., Buduru, S., Labunet, A., Șoicu, S., Buduru, R., & Chisnoiu, A. (2024). Craniocervical Posture and Malocclusion: A Comprehensive Literature Review of Interdisciplinary Insights and Implications. *Medicina (Lithuania)*, *60*(12), 1–17. https://doi.org/10.3390/medicina60122106

Lubis, H. F., Idrus, E., S, D. F. S., Widayati, R., & P, M. K. (2024). Biological Mechanism of Orthodontic Movement in The Treatment of Skeletal Class II Malocclusion Using Twin Block. *Interdental Jurnal Kedokteran Gigi (IJKG)*, *20*(3), 395–399. https://doi.org/10.46862/interdental.v20i3.9656

Murali, S., Kannan, A., & Kailasam, V. (2024). Cervical spine changes with functional appliance treatment: A systematic review and meta-analysis. *Journal of Oral Biology and Craniofacial Research*, *14*(4), 446–454. https://doi.org/10.1016/j.jobcr.2024.05.015

Peng, H., Liu, W., Yang, L., Yan, P., Zhong, W., Gao, X., & Song, J. (2024). Craniocervical posture in patients with skeletal malocclusion and its correlation with craniofacial morphology during different growth periods. *Scientific Reports*, *14*(1), 1–11. https://doi.org/10.1038/s41598-024-55840-w

Sandoval, C., Díaz, A., & Manríquez, G. (2021). Relationship between craniocervical posture and skeletal class: A statistical multivariate approach for studying Class II and Class III malocclusions. *Cranio - Journal of Craniomandibular Practice*, *39*(2), 133–140. https://doi.org/10.1080/08869634.2019.1603795

Sharmila, R., & Balashanmugam, B. (2022). Assessment of Correction of Cervical Hypolordosis in Class II Skeletal Patients with Mandibular Retrognathism after Twinblock Therapy. *International Journal of Innovative Science and Research Technology*, *7*(5).

Smailiene, D., Intiene, A., Dobradziejute, I., & Kusleika, G. (2017). Effect of Treatment with Twin-Block Appliances on Body Posture in Class II Malocclusion Subjects : A Prospective Clinical Study. *Medical Science Monitor*, *23*, 343–352. https://doi.org/10.12659/MSM.899088

Suleman Shah, S., Rasool, G., & Faiz-Ul-Hassan. (2015). Relationship Between Head Posture and Lower Arch Dental Crowding. *Pakistan Oral & Dental Journal*, *35*(3), 420–423.

Yoana, Y., Chemiawan, E., & Setiawan, A. S. (2017). Dentoalveolar changes in post-twin block appliance orthodontic treatment class II dentoskeletal malocclusion. *Dental Journal (Majalah Kedokteran Gigi)*, *50*(4), 211. https://doi.org/10.20473/j.djmkg.v50.i4.p211-215

Zokaitė, G., Lopatienė, K., Vasiliauskas, A., Smailienė, D., & Trakinienė, G. (2022). Relationship between Craniocervical Posture and Sagittal Position of the Mandible: A Systematic Review. *Applied Sciences (Switzerland)*, *12*(11). https://doi.org/10.3390/app12115331