Journal of Chemical Health Risks

www.jchr.org

JCHR (2026) 16(1), 2179-2186 | ISSN:2251-6727

A Clinical Comparative Study Evaluating Complications and Assessing Quality of Life Outcomes Following the Implementation of Single-Splint versus Double-Splint Techniques in Orthognathic Surgery for Patients exhibiting Class II Asymmetry: An Original Research Study

Dr. Prerna Kumari Roy[1], Dr. Indira Priyadharshini[2], Dr. Prachi Dwivedi[3], Dr. Rupa Sharma[4], Dr. Poonam Malviya[5], Dr. Rajnandini Hardia[6]

[1]Third Year Post Graduate Student, Department of Prosthodontics and Crown & Bridge, Kalinga Institute of Dental Sciences, Bhubaneswar, Odisha, India (Corresponding Author)

[2]MDS, Department of Orthodontics and Dentofacial Orthopaedics, Senior Lecturer, Sri Ramakrishna Dental College and Hospital, Coimbatore, Tamil Nadu, India

[3]MDS, Oral and Maxillofacial Surgery, Consultant, District Hospital Shivpuri, Madhya Pradesh, India

[4]PG Student, Department of Oral Pathology and Microbiology, Sri Aurobindo College of Dentistry, Indore, Madhya Pradesh, India

[5]PG Student, Department of Oral Pathology and Microbiology, Sri Aurobindo College of Dentistry, Indore, Madhya Pradesh, India

[6]PG Student, Department of Oral Pathology and Microbiology, Sri Aurobindo College of Dentistry, Indore, Madhya Pradesh, India

Corresponding Author: Dr. Prerna Kumari Roy

(Received: 05 December 2025 Revised: 15 January 2026 Accepted: 10 February 2026)

KEYWORDS

Single-Splint, Double-Splint Techniques, Orthognathic Surgery, Class II Asymmetry.

ABSTRACT:

Aim: This study aims to evaluate complications and assess quality-of-life outcomes following the implementation of single-splint versus double-splint techniques in orthognathic surgery for patients with class II asymmetry.

Materials and Methods: This study involved 40 participants (20 males and 20 females) aged 18 to 35, each presenting various orthodontic issues, including chin deviation, dental crowding, and uneven smile aesthetics. For consistency, participants were required to have an Angle Class II molar relationship, a deviation of the mandibular midline, and specific dentition criteria, excluding third molars. They also needed a Class II facial profile and proper consent. The study enforced strict exclusion criteria to limit confounding variables, disqualifying individuals with a history of orthodontic treatments, trauma, certain syndromes, or severe TMJ disorders. Participants were systematically divided into two groups of 20, focusing on Class II skeletal asymmetry. Group I was treated with a three-dimensional guided single-splint technique while Group II received a double-splint approach. Both involved surgical procedures like Le Fort I osteotomy and bilateral sagittal split osteotomy. Outcomes were evaluated one year post-surgery to assess complications and quality of life following the procedures.

Statistical Analysis and Results: This study examined 40 patients diagnosed with Class II skeletal asymmetry, involving both genders aged 18 to 35. The sample included 22 males and 18 females, detailed in Table 1, which outlines demographic characteristics. Patients were split into two treatment groups of 20: Group I received a three-dimensional guided single-splint technique,

Journal of Chemical Health Risks

www.jchr.org

JCHR (2026) 16(1), 2179-2186 | ISSN:2251-6727

while Group II underwent a double-splint technique with an intermediate splint, both involving Le Fort I osteotomy and bilateral sagittal split osteotomy (BSSO). One-year post-operative follow-ups evaluated surgical outcomes. Group I's results, shown in Table 2, included scores for patient outcomes (4), symmetry (3), treatment accuracy (4), intraoperative adjustments (3), surgical demands (4), and quality of life (2). In contrast, Group II's scores, presented in Table 3, were patient outcomes (5), symmetry (4), accuracy (5), intraoperative adjustments (2), surgical demands (3), and quality of life (1). Overall findingswas summarized and utilised one-way ANOVA to compare the effectiveness of the two techniques, aiming to inform future treatment protocols for Class II skeletal asymmetry.

Conclusion: The study concluded that the double-splint technique is more reliable for complex three-dimensional planning, enabling a precise transfer of the surgical plan to the operating table. While both methods achieve similar patient outcomes, the double-splint technique is preferred for its reliability and reduced reliance on the surgeon's judgment.

Introduction

Class II asymmetry, commonly referred to as Class II subdivision, is a specific type of malocclusion characterised by an uneven dental relationship between the two sides of the mouth. In this condition, patients exhibit a Class I molar relationship on one sidewhere the upper and lower molars fit together properly, while the opposing side displays a Class II relationship, where the lower molars are positioned more toward the back of the mouth relative to the upper molars.[1,2] This malocclusion affects a significant proportion of individuals diagnosed with Class II malocclusion, estimated at around 50%. The underlying causes of Class II asymmetry can stem from a variety of dental and skeletal factors. Dental causes often include the distal positioning of the lower molars, while skeletal factors might encompass a shorter mandible or variations like mandibular yaw. These factors frequently lead to a noticeable deviation of the dental midline, which can impact both function and aesthetics.[3,4] The aetiology of Class II asymmetry predominantly revolves around dentoalveolar issues, particularly concerning the positioning of the mandibular first molar. However, it is also important to consider other variations in molar positioning that could exacerbate the situation, such as a mesially positioned upper molar. In cases where skeletal factors are influential, patients may present an observable shift in their dental midline, typically veering toward the side exhibiting the Class II relationship.[5,6] When it comes to treatment options for Class II asymmetry, the approach is highly individualised and contingent upon the severity and specific nature of the malocclusion. Non-extraction methods can range from utilising asymmetric elastics to direct the movement of teeth, to the application of headgear or functional appliances designed to aid in the distalization of upper teeth. In cases where extractions are deemed necessary, dentists may opt for either unilateral or bilateral upper premolar extractions, which can effectively assist in correcting both the midline and molar relationships.[7,8] For patients exhibiting significant skeletal asymmetry, particularly in non-growing adults, orthognathic surgery may be indicated. This type of surgical intervention typically combines procedures to advance the mandible and level the maxilla, aiming to rectify severe skeletal discrepancies while also enhancing overall facial aesthetics. Diagnosis of Class II asymmetry necessitates a thorough and meticulous evaluation process. This often includes the use of intraoral scanning and dental models, alongside panoramic and posteroanterior cephalometric radiographs which are essential for assessing dental and mandibular positions.[9,10] Advanced imaging techniques, such as 3D models, can provide an even more comprehensive analysis of the degree and nature of the asymmetry, allowing for precise treatment planning. Within the realm of surgical correction for Class II asymmetry, two notable techniques often come into play: the single-split technique and the double-split technique. The single-split technique presents a highly effective solution for addressing severe facial asymmetry by enabling the precise alignment of the mandibular-maxillary complex within a single surgical procedure.[11] This method is often enhanced through the

Journal of Chemical Health Risks
www.jchr.org
JCHR (2026) 16(1), 2179-2186 | ISSN:2251-6727

use of advanced 3D virtual planning, which greatly improves the accuracy of the surgery and the overall outcomes for patients. On the other hand, the double-split technique serves as a refined adaptation of the Bilateral Sagittal Split Osteotomy (BSSO). It is specifically tailored for cases that necessitate substantial movement of the distal segment while ensuring that bony contact is preserved.This innovative technique adeptly accommodates asymmetric movements, playing a crucial role in achieving a more harmonious facial symmetry and improving soft tissue relations for those affected. Ultimately, effectively understanding and managing Class II asymmetry demands a nuanced grasp of the intricate interplay among dental, skeletal, and surgical factors. This complexity highlights the importance of a comprehensive and collaborative approach among healthcare professionals to guarantee the best possible outcomes for patients.[12,13] This study aimed to evaluate complications and assess quality-of-life outcomes following the implementation of single-splint versus double-splint techniques in orthognathic surgery for patients with class II asymmetry.

Materials and Methods

This study encompasses a total of 40 participants, evenly distributed between males and females, with ages ranging from 18 to 35 years. These individuals presented with a diverse array of orthodontic concerns, including notable chin deviation, dental crowding or spacing issues, and frequently, uneven smile aesthetics. A prevalent finding among the participants was the flaring of the upper incisors, which not only impacted their visual appearance but also led to functional difficulties during chewing and contributed to discomfort in the temporomandibular joint (TMJ). Additionally, for certain participants, deep bite situations exacerbated the risk of soft tissue damage. To ensure a homogeneous group, the inclusion criteria for the study were meticulously defined. Participants were required to exhibit an Angle Class II molar relationship, a deviation of the mandibular midline towards the Class II side, and a unilateral Class II canine relationship. Other specific requirements included the presence of either maxillary excess or mandibular deficiency on the affected side of the jaw, a subdivision discrepancy that exceeded 1.5 mm at the molar level, and an age span of 18 to 35 years to guarantee the completion of skeletal growth. Adolescents could also be considered for inclusion if the focus was on growth modification strategies. Additionally, all participants needed to have achieved permanent dentition or be in the late mixed dentition phase without any missing teeth, apart from the third molars. Furthermore, they were required to display a Class II facial profile, typically characterized by a convex appearance. The consent form from the patient was obtained and duly signed, confirming their agreement to proceed with the necessary procedures and treatments. Conversely, the study implemented stringent exclusion criteria to minimize potential confounding variables. Individuals with prior orthodontic interventions, a history of trauma, fractures, or any surgical procedures impacting craniofacial or temporomandibular structures were disqualified. Participants diagnosed with specific syndromes such as hemifacial microsomia or cleft lip/palate, as well as those characterized by condylar hyperplasia or hypoplasia, were likewise excluded. Additionally, any individuals exhibiting deviations in mandibular movement during opening and closing, or those suffering from severe TMJ disorders were excluded from the study to focus exclusively on skeletal and dental factors. Cases presenting with insufficient or low-quality three-dimensional scans (cone beam computed tomography, CBCT) or subpar study models, along with patients experiencing significant loss of posterior teeth, were also excluded from participation. The sample group was systematically subdivided into two distinct cohorts of 20 participants each, specifically targeting Class II skeletal asymmetry. Group I comprised patients treated using a three-dimensional guided single-splint technique, incorporating a final occlusal splint. In contrast, Group II was treated via a three-dimensional guided double-splint technique, which involved the application of an intermediate splint designed for optimal positioning of the maxilla, followed by the final splint. Both groups underwent comprehensive surgical interventions that included Le Fort I osteotomy intended to reposition the maxilla and bilateral sagittal split osteotomy (BSSO) for adjustment of the mandible. The evaluation of surgical outcomes is scheduled to occur one year post-operatively. This study was to systematically assess complications associated with each treatment technique and analyse the quality-of-life outcomes for patients who have undergone orthognathic surgery utilising either the single-splint or

Journal of Chemical Health Risks

www.jchr.org

JCHR (2026) 16(1), 2179-2186 | ISSN:2251-6727

double-splint approaches in addressing Class II asymmetry.

Statistical Analysis

In this research, we utilised SPSS software version 30.0 to carry out all statistical analyses in a systematic manner. To evaluate the significance of our findings, we employed the chi-square test, a statistical method that allowed us to compare the proportions of different variables across various groups. This approach enabled us to draw meaningful insights by examining the relationships and differences between the categories we studied. This method ensured our results accurately represented the trends and relationships in the categorical data.

Results

This study focused on a cohort of 40 patients diagnosed with Class II skeletal asymmetry, which is characterized by a misalignment of the dental and skeletal structures of the jaw. The participants included both males and females, aged between 18 and 35 years, ensuring a diverse representation of young adults who are often affected by this condition. A comprehensive analysis of the age and gender distribution of these participants can be found in Table 1, which provides detailed statistical data highlighting the demographic characteristics of the sample population. Specifically, the sample comprised 22 males and 18 females, offering insight into gender representation within the study. To evaluate the surgical outcomes associated with Class II skeletal asymmetry, the participants were systematically divided into two distinct treatment cohorts, each consisting of 20 patients. Group I received treatment via a three-dimensional guided single-splint technique, which aims to enhance surgical precision and improve patient outcomes. In contrast, Group II was treated utilizing a double-splint technique that included the use of an intermediate splint designed for optimal positioning of the maxilla. Both treatment groups underwent significant surgical interventions, specifically Le Fort I osteotomy and bilateral sagittal split osteotomy (BSSO), which are well-established procedures for correcting skeletal discrepancies. To assess the effectiveness of these surgical techniques, follow-up evaluations were scheduled one year post-operatively. Table 2 provides an in-depth analysis of the outcomes for Group I, which utilized the single-splint technique. A comprehensive evaluation was conducted to assess the efficacy of this method, considering various parameters crucial to patient recovery. The statistical significance of the outcomes was determined using the Pearson Chi-Square test, a robust statistical method that analyzes categorical data. The results for Group I revealed scores across multiple categories: patient-related outcomes (4), symmetry results (3), accuracy of treatment (4), intraoperative adjustments (3), surgical demands (4), and the impact on quality of life (2). These scores reflect a range of experiences and results from the surgical intervention, highlighting areas of success and potential improvement. Similarly, Table 3 details the outcomes for Group II, whose treatment relied on the double-splint technique. A year after their respective surgeries, these patients underwent a thorough evaluation to measure treatment effectiveness. The same rigorous statistical analysis using the Pearson Chi-Square test was applied, allowing for a fair comparison of results. The outcomes for Group II scored as follows: patient-related outcomes (5), symmetry outcomes (4), accuracy (5), intraoperative adjustments (2), surgical demands (3), and the influence on quality of life (1). These outcomes illustrate the varied effectiveness of the double-splint technique compared to the single-splint approach. Finally, Table 4 offers a synthesis of the overall estimations derived from all studied groups. Utilizing one-way ANOVA, a comprehensive statistical analysis was conducted to elucidate the comparative effectiveness of both the single-splint and double-splint techniques in treating Class II skeletal asymmetry. This collective analysis aims to provide valuable insights into the optimal surgical approaches for patients presenting with this specific type of skeletal discrepancy, guiding future treatment protocols and improving patient care outcomes.

Table 1: Age & gender based statistical description of contributing patients

Age Group (Yrs)	Male	Female	Total	P value
18-21	4	5	9	0.06

Journal of Chemical Health Risks
www.jchr.org
JCHR (2026) 16(1), 2179-2186 | ISSN:2251-6727

22-25	5	4	9	0.40
26-29	4	3	7	0.02*
30-33	4	4	8	0.30
34-35	5	3	7	0.50
Total	22	18	40	*Significant
*p<0.05 significant				

Graph 1: Patients demographic distribution and associated details

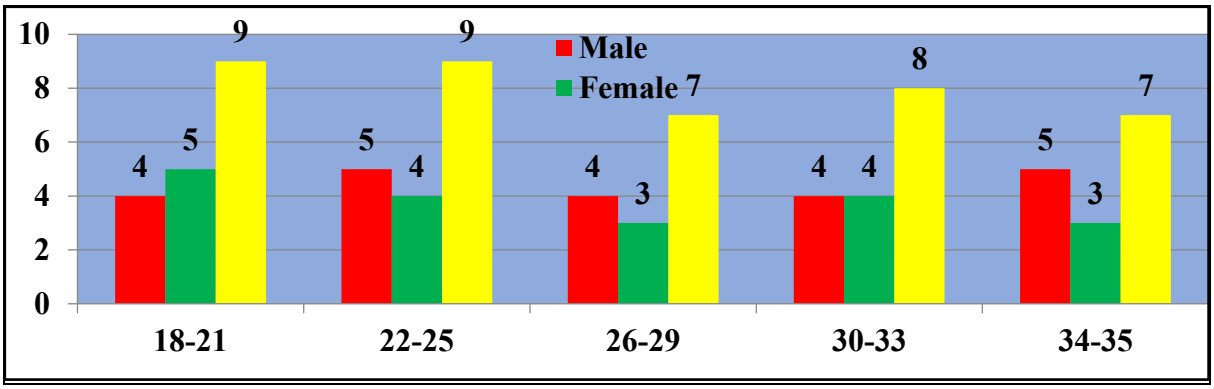

Table 2: Group 1 (N=20) Patients diagnosed with Class II asymmetry underwent a single-splint technique as part of their treatment plan. One year following the surgical intervention, a comprehensive evaluation was conducted to assess the outcomes of this approach. The Pearson Chi-Square test was employed, allowing for a thorough statistical examination to determine the significance of the results obtained

Evaluation criteria	N	Mean	Std. Dev.	Std. Error	95% CI	Pearson Chi-Square Value	df	p value
Patient-related outcomes	4	1.06	1.04	1.03	1.05	1.37	1.46	0.01*
Symmetry outcomes	3	1.04	1.03	1.02	1.03	1.04	1.02	0.07
Accuracy	4	1.06	1.04	1.03	1.05	1.37	1.46	0.01*
Intraoperative adjustment	3	1.04	1.03	1.02	1.03	1.04	1.02	0.07
Surgical demands	4	1.06	1.04	1.03	1.05	1.37	1.46	0.01*
Lowered quality of life	2	1.03	1.02	1.02	1.01	1.02	1.02	0.02*
*p<0.05 significant								

Journal of Chemical Health Risks
www.jchr.org
JCHR (2026) 16(1), 2179-2186 | ISSN:2251-6727

Table 3: Group 2 (N=20) Patients diagnosed with Class II asymmetry underwent a double-splint technique as part of their treatment plan. One year following the surgical intervention, a comprehensive evaluation was conducted to assess the outcomes of this approach. The Pearson Chi-Square test was employed, allowing for a thorough statistical examination to determine the significance of the results obtained

Evaluation criteria	N	Mean	Std. Dev.	Std. Error	95% CI	Pearson Chi-Square Value	df	p value
Patient-related outcomes	5	1.08	1.07	1.06	1.06	1.07	1.50	0.06
Symmetry outcomes	4	1.06	1.04	1.03	1.05	1.37	1.46	0.01*
Accuracy	5	1.08	1.07	1.06	1.06	1.07	1.50	0.06
Intraoperative adjustment	2	1.03	1.02	1.02	1.01	1.02	1.02	0.02*
Surgical demands	3	1.04	1.03	1.02	1.03	1.04	1.02	0.07
Lowered quality of life	1	1.02	1.01	1.02	1.01	1.01	1.02	0.01*
*p<0.05 significant								

Table 4: Estimation amongst all studied groups using one-way ANOVA

Variables	Degree of Freedom	Sum of Squares ∑	Mean Sum of Squares m∑	F	Level of Sig. (p)
Between Groups	5	2.421	2.276	1.4	0.01*
Within Groups	20	2.834	2.251	_	
Cumulative	213.14	5.912	*p<0.05 significant		

Discussion

Ghodasra R et al reviewed in their study that Class II subdivision malocclusions are common dental and skeletal problems that create asymmetry in the jaw. They can result from various factors, such as differences in the shape of the lower jaw, height differences in jaw joints, or the position of the upper back teeth. A key feature of Class II subdivision is that one side has a Class I molar relationship and the other side has a Class II relationship.[14,15] Ghodasra R et al showed in their study that on the Class II side, the lower molars often sit farther back (Type 1), while the upper molars may be positioned more forward (Type 2). The affected lower jaw is often shorter, and there may be clear differences in the height of the jaw joints. Diagnosis usually shows that the middle line of the lower teeth shifts toward the Class II side, while the middle line of the upper teeth may shift in the opposite direction.[16,17] Jearanaiet al included in their study that treatment options depend on how severe the malocclusion is. Milder cases can be treated with techniques like selective tooth removal or moving teeth back on one side. For growing patients with jaw size issues, functional appliances can help. Rubber bands can also help correct bite issues, and there's a trend toward using devices like mini-screws for effective

Journal of Chemical Health Risks
www.jchr.org
JCHR (2026) 16(1), 2179-2186 | ISSN:2251-6727

movement of upper back teeth. For more severe jaw issues, surgery may be needed, typically involving a two-jaw approach to correct both vertical and forward-backward positions of the jaw. Surgery can greatly improve the position of the lower jaw, chin, and lower front teeth, although small differences may still exist.[18,19] Wang Y et al included in their study that studies show that soft tissue unevenness often decreases significantly, but lasting stability can depend on how severe the original issues were. A genioplasty may be done after surgery to fix any remaining jaw asymmetry. Orthodontic treatment before and after surgery is crucial for proper alignment and bite. In summary, achieving a good appearance and function for Class II subdivision cases requires a deep understanding of the complexities involved, especially in severe cases. The Single-Splint Technique for Class II asymmetry aims to fix both forward-backwards jaw problems and side-to-side or vertical differences, like chin position.[20,21] Silinevica S et al reviewed in their study this method uses a special surgical splint, often created with Computer-Assisted Surgical Simulation (CASS), to move the upper and lower jaws into their intended positions. This usually includes a Le Fort I osteotomy to adjust the upper jaw and a bilateral sagittal split osteotomy (BSSO) for the lower jaw. A genioplasty is often added for precise chin positioning. One main benefit of the single-splint approach is its efficiency, which reduces the overall surgical time. Research shows it improves facial midline and symmetry of the lower jaw. While it works well for Class II asymmetries, some may prefer the two-splint technique for more control in cases with serious bite issues.[22,23] Lin X et al included in their study that generally, the results for post-surgery stability and soft tissue improvements are positive, with effects of genioplasty stabilising within six months. In contrast, the Double-Split Technique prevents the upper jaw segment from shifting during major adjustments, lowering the chances of post-surgery bite issues or jaw joint problems. In severe asymmetry cases, enhanced BSSO strategies may include a bone shim to better align the bone pieces. Unlike the standard technique, which treats the jaw as a single piece, the "double split" method allows for better handling of any bite or midline issues.Results from bimaxillary surgeries using the double-split technique show improvements in symmetry of the midline and chin, with better bony contact and less need for bone grafts. However, some soft tissue unevenness may still remain, particularly in cases where initial differences were significant.[24,25]

Conclusion

In a clinical comparative study focused on orthognathic surgery for patients with Class II asymmetry, the authors investigated the complications and quality-of-life outcomes associated with single-splint versus double-splint techniques. The findings suggest that the double-splint technique is generally more reliable for complex three-dimensional planning. This method allows for a more accurate transfer of the virtual surgical plan to the operating table, thereby reducing the reliance on the surgeon's experience compared to the single-splint technique. While overall patient-centred outcomes, particularly quality of life, are similar for both methods, the double-splint technique is preferred due to its greater reliability in translating the virtual plan into the final surgical outcome and its reduced dependence on the surgeon's intra-operative assessment.

References

1. Sencak RC, Benavides E, Cevidanes L, et al. Asymmetry in Class II subdivision malocclusion: Assessment based on 3D surface models. Orthod Craniofac Res. 2024;27(2):267-275.
2. Apostolopoulos K, Palomo JM, Rizzante FAP, Pugliese F. A 3D mirroring and colormap asymmetry study of Class II subdivision patients. Orthod Craniofac Res. 2022;25(3):429-436.
3. Guo JE, Yang LJ, Zhang SE, Zheng GS, Liao GQ, Wang L. Asymmetry of the alveolar ridge in Class II maxillary defects reconstructed by an osseo-myocutaneous flap: A CBCT evaluation. J Prosthet Dent. 2026;135(1):179-186.
4. Li J, Wu S, Mei L, et al. Facial asymmetry of the hard and soft tissues in skeletal Class I, II, and III patients. Sci Rep. 2024;14(1):4966. Published 2024 Feb 29.
5. Kurt G, Uysal T, Sisman Y, Ramoglu SI. Mandibular asymmetry in Class II subdivision malocclusion. Angle Orthod. 2008;78(1):32-37.
6. Veli I, Yuksel B, Uysal T. Longitudinal evaluation of dental arch asymmetry in Class II subdivision malocclusion with 3-dimensional digital models. Am J Orthod Dentofacial Orthop. 2014;145(6):763-770.

Journal of Chemical Health Risks

www.jchr.org

JCHR (2026) 16(1), 2179-2186 | ISSN:2251-6727

7. Ghodasra R, Brizuela M. Orthodontics, Malocclusion. In: Stat Pearls. Treasure Island (FL): Stat Pearls Publishing; April 23, 2023.
8. Chen YF, Baan F, Bergé S, Liao YF, Maal T, Xi T. Facial asymmetry outcome of orthognathic surgery in mild craniofacial microsomia compared to non-syndromic class II asymmetry. Clin Oral Investig. 2024;28(9):502.
9. Nunes de Lima V, Faverani LP, Santiago JF Jr, Palmieri C Jr, Magro Filho O, Pellizzer EP. Evaluation of condylar resorption rates after orthognathic surgery in class II and III dentofacial deformities: A systematic review. J Craniomaxillofac Surg. 2018;46(4):668-673.
10. Raposo R, Peleteiro B, Paço M, Pinho T. Orthodontic camouflage versus orthodontic-orthognathic surgical treatment in class II malocclusion: a systematic review and meta-analysis. Int J Oral Maxillofac Surg. 2018;47(4):445-455.
11. Swennen GRJ, de O. Andriola F, Weinberg Y. Minimally Invasive (MI) Sagittal Split Osteotomy. In: Swennen GRJ, ed. Minimally Invasive (MI) Orthognathic Surgery: A Systematic Step-by-Step Approach. Cham (CH): Springer; November 28, 2023.89-123.
12. Zhu Z, Sun X, Chen K, Zhang M, Wu G. Comprehensive evaluation of advanced platelet-rich fibrin in common complications following sagittal split ramus osteotomy: a double-blind, split-mouth, randomized clinical trial. Int J Oral Maxillofac Surg. 2025;54(2):134-142.
13. Ege B, Ege M, Koparal M, Alan H. Comparison of the Anesthetic Efficiency of Lidocaine and Tramadol Hydrochloride in Orthodontic Extractions: A Split-Mouth, Prospective, Randomized, Double-Blind Study. J Oral Maxillofac Surg. 2020;78(1):52-62.
14. Ghodasra R, Brizuela M. Orthodontics, Malocclusion. In: StatPearls. Treasure Island (FL): Stat Pearls Publishing; April 23, 2023.
15. Chen YF, Liao YF, Chen YA, Chen YR. Surgical-orthodontic treatment for class II asymmetry: outcome and influencing factors. Sci Rep. 2019;9(1):17956. Published 2019 Nov 29.
16. Bühling S, Neidhardt S, Sayahpour B, Eslami S, Plein N, Kopp S. The effects of professional expertise on perceptions of treatment need in patients with class II division 1 malocclusion: a comparison between orthodontists, general dentists, and lay people in Germany. J Orofac Orthop. 2026;87(1):16-27.
17. Chen PR, Chuang KT, Hsu SS, Chen YR, Chen CT. Modification of Sagittal Split Osteotomy in Class II Asymmetry: Optimizing Bone Contact between Proximal and Distal Segments. Plast Reconstr Surg. 2024;153(6):1142e-1151e.
18. Jearanai T, Samruajbenjakun B, Chanmanee P. Relationship between Bilateral Landmarks of Facial Asymmetry in Skeletal Class II and Class III in Vertical Dimension: 3D Facial Scan and Cone-Beam Computed Tomography. Diagnostics (Basel). 2024;14(6):590.
19. Nike E, Radzins O, Vuollo V, Slaidina A, Abeltins A. Changes in Facial Soft Tissue Asymmetry in Class II Patients One Year After Orthognathic Surgery. J Clin Med. 2025;14(9):2912.
20. Wang Y, Wang Y, Wang C, et al. Mandibular asymmetry in patients with skeletal class I and skeletal class II Malocclusions: A cone-beam computed tomography study. J Stomatol Oral Maxillofac Surg. 2023;124(6):101441.
21. Janson G, Cruz KS, Barros SE, et al. Third molar availability in Class II subdivision malocclusion. Am J Orthod Dentofacial Orthop. 2007;132(3):27(9)15-27.
22. Silinevica S, Lokmane K, Vuollo V, Jakobsone G, Pirttiniemi P. The association between dental and facial symmetry in adolescents. Am J Orthod Dentofacial Orthop. 2023;164(3):340-350.
23. Eckmüller S, Paddenberg E, Hiller KA, Proff P, Knüttel H, Kirschneck C. Relapse in class II orthognathic surgery: a systematic review. BMC Oral Health. 2022;22(1):605.
24. Lin X. Orthognathic surgery improves compromised natural head position and pharyngeal airway in patients with Skeletal Class II or III malocclusion. J Oral Rehabil. 2024;51(9):1778-1784.
25. Kuik K, De Ruiter MHT, De Lange J, Hoekema A. Fixation methods in sagittal split ramus osteotomy: a systematic review on in vitro biomechanical assessments. Int J Oral Maxillofac Surg. 2019;48(1):56-70.