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Optimising Orthognathic Surgery: A Comparative Review of the Conventional and Surgery-First Approaches

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ABSTRACT

Objectives: This review explores and compares the Conventional Orthognathic Approach and the Surgery-First Approach in orthognathic surgery.

Materials and Methods: A comprehensive narrative review was conducted by systematically examining peer-reviewed literature, including clinical trials, retrospective studies, systematic reviews, and meta-analyses. Databases such as PubMed, Scopus, and Web of Science were searched using relevant keywords including "Conventional Orthognathic Approach," "Surgery-First Approach," and "Orthognathic Surgery." Studies were selected based on their relevance to the comparative evaluation of COA and SFA in terms of treatment duration, surgical planning complexity, postoperative stability, complication rates, and patient-reported outcomes.

Results: The SFA demonstrated several advantages, including earlier facial improvement, reduced total treatment time, and improved patient cooperation. Patients treated with SFA often reported enhanced psychological well-being due to the early correction of facial aesthetics. On the other hand, COA remains widely used due to its predictable occlusal outcomes and suitability for a broader patient population. Both approaches showed similar long-term skeletal and dental stability in many studies. In terms of complications, both approaches had comparable safety profiles, though SFA demands greater surgical precision. Notably, SFA also showed promising results in selected cases of facial asymmetry and did not appear to increase the risk of temporomandibular joint dysfunction when carefully managed.

Conclusions: Both COA and SFA are effective and safe strategies in orthognathic surgery. The choice should be guided by patient-specific needs and clinical judgment. SFA may be preferred when quicker

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aesthetic results and shorter treatment duration are priorities, assuming careful planning and appropriate case selection.

1. INTRODUCTION

In contemporary society, there is a growing demand for orthognathic surgery driven by rising living standards and a growing desire for enhanced facial aesthetics and optimal occlusal function. When orthodontic treatment alone fails to produce the desired results, orthognathic surgery becomes a common option for patients with moderate to severe dental deformities. This surgical intervention offers a range of psychological and physiological benefits, contributing to the continuous rise in demand over recent years.

Orthognathic surgery is routinely performed in patients with moderate to severe dento-skeletal deformities, particularly when orthodontic treatment alone cannot achieve optimal outcomes. Studies have consistently reported favourable post-surgical results and high levels of patient satisfaction associated with the procedure (Pachêco-Pereira et al., 2016). The high patient satisfaction following orthognathic surgery is often attributed to various psychological benefits, including improvements in self-confidence, self-esteem, and perceived facial attractiveness (Baherimoghaddam et al., 2014; Barbosa et al., 1993; Bertolini et al., 2000). In addition, there is an increasing number of individuals seeking treatment to improve both their facial aesthetics and occlusal function (Baherimoghaddam et al., 2014). As a result, the demand for orthognathic surgery has continued to rise in recent years.

2. HISTORY OF ORTHOGNATHIC SURGERY

In 1849, Hullihen performed the first mandibular osteotomy to correct a protruded mandibular alveolar segment (Hullihen, 1849). Subsequently, in 1925, Limberg introduced the subcondylar osteotomy, a procedure that involved the condylar neck through an extraoral approach (Limberg). Two years later, in 1927, Wassmund described the inverted “L” mandibular osteotomy (Boutault et al., 1994). These earlier surgeries have focused on the mandible only. A major advancement in orthognathic surgery occurred in 1969 when Obwegeser performed a LeFort I osteotomy to correct maxillary deformities (Obwegeser, 2007).

In 1963, Poulton et al. (Poulton et al., 1963) documented five cases of mandibular prognathism successfully treated with bilateral vertical osteotomy, all without the need for orthodontic intervention. However, it became apparent that the extent of mandibular setback was limited by the overjet between the upper and lower anterior incisors. To enable a more significant surgical setback for correcting mandibular prognathism, orthodontic treatment was required to optimally align the mispositioned teeth in the individual jaws prior to surgery (Bell & Creekmore, 1973).

Worms et al. in 1976 (Worms et al., 1976) extended the "orthodontics first" approach to all orthognathic cases, including mandibular prognathism, mandibular retrognathism, and vertical skeletal discrepancies with anterior open bite or deep bite. They emphasised the importance of achieving optimal surgical repositioning of the jaw, which could only be achieved by addressing all dental compensations before surgery. This approach involved comprehensive orthodontic treatment to align dental occlusion, address incisor decompensation, correct tooth rotations, and coordinate arch alignment. By the 1970s, the "preoperative orthodontics-orthognathic surgery-postoperative orthodontics" sequence had become the standardised approach for orthognathic surgical treatment (Barrer, 2009; Epker & Bronson, 1978; Ngan, 2012). This concept has since gained widespread acceptance worldwide. During the pre-surgical orthodontic phase, both jaws' dentitions are adjusted to establish a stable occlusion that can be maintained during surgery. The post-surgical phase mainly focuses on fine-tuning the occlusion following the surgical procedure.

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Typically, the pre-surgical orthodontic treatment lasts between 8 and 18 months, leading to an overall treatment duration of at least one and a half years (Bell & Creekmore, 1973; Luther et al., 2003; O'Brien et al., 2009; Obwegeser, 2007). In some cases, this period may extend to two or even three years, including both orthognathic surgery and post-surgical orthodontic treatment (Luther et al., 2003). As a result, this conventional orthognathic approach (COA) often incurs significant treatment costs. Additionally, patients commonly experience an "awkward" phase during this process, as the pre-surgical decompensation of the upper or lower teeth may make existing deformities more apparent.

3. SURGERY-FIRST APPROACH (SFA) IN ORTHOGNATHIC SURGERY

The Surgery-First Approach (SFA) is a unique method in orthognathic surgery that involves performing surgery before any orthodontic treatment, with orthodontic treatment occurring only after the surgical procedure (Choi & Bradley, 2017). This approach represents a paradigm shift from the traditional orthognathic method, the COA. SFA has been shown to effectively reduce the overall treatment duration (Prakash et al., 2023). This concept was first proposed by Behrman and Behrman (Behrman & Behrman, 1988) in 1988 and later reiterated by Brachvogel et al. (Brachvogel et al., 1991) in 1991, but primarily as conceptual suggestions only.

It was not until 2009 that Nagasaka et al. (Nagasaka et al., 2009), through interdisciplinary collaboration between orthodontists and surgeons, first applied the SFA clinically in orthognathic surgery. This technique involves conducting orthognathic surgery without prior orthodontic preparation, with orthodontic treatment beginning only after the surgery. The focus of the surgery is on addressing dento-skeletal deformities and achieving a relatively stable occlusion (Leelasinjaroen et al., 2012; Mahmood et al., 2018). As a result, patients experience significant improvements in facial appearance early in the treatment process, while the final stable occlusion is achieved during the post-surgical orthodontic phase. Numerous studies have consistently shown that most SFA patients perceive significant improvement in their facial profile and occlusion after surgery (Liao et al., 2022).

One of the major benefits of SFA is the significant reduction in overall treatment time, which simplifies the orthodontic process and reduces its complexity for patients (Peiró-Guijarro et al., 2016). Orthodontic treatment typically begins two weeks after surgery (Lee et al., 2014). Research has consistently demonstrated that the overall treatment duration is shorter with the SFA compared to the conventional approach (Peiró-Guijarro et al., 2016). In a systematic review, Peiro-Guijarro et al. (Peiró-Guijarro et al., 2016) reported a mean total treatment duration of 14.2 months, with a range of 10.2 to 19.4 months for SFA, which is approximately 6 to 12 months shorter than the COA.

4. COA VERSUS SFA IN ORTHOGNATHIC SURGERY

Conventionally, presurgical orthodontic treatment has been considered a crucial step in addressing postoperative occlusal instability in orthognathic procedures. This preparatory phase allows clinicians to uncover the true extent of skeletal discrepancies by reversing dental compensations, thereby facilitating a more accurate surgical correction of the underlying deformity (Liao et al., 2010). As a result, the COA has been associated with predictable treatment outcomes and is applicable to a broad range of dentofacial deformities without requiring highly selective case criteria (Grubb & Evans, 2007). By correcting occlusal and arch discrepancies in advance, COA also provides orthodontists the opportunity to address the aetiology of malocclusion and implement targeted interventions aimed at optimising oral function, aesthetics, and long-term stability (Sabri, 2006).

However, COA necessitates extended orthodontic treatment both before and after surgery, which is associated with several disadvantages. The preoperative orthodontic phase alone can last 12 to 24 months, significantly prolonging the overall treatment time (Liao et al., 2010). Extended duration of orthodontic therapy has been correlated with increased risks of adverse effects such as dental caries, gingival recession,

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and root resorption (Grubb & Evans, 2007; Sabri, 2006). Moreover, patients may experience temporary deterioration in facial aesthetics during the decompensation phase, which can be particularly distressing for those seeking treatment primarily for cosmetic reasons (Sabri, 2006). Orthodontic appliances can also contribute to masticatory and speech discomfort. In some cases, patients may become discouraged during the lengthy presurgical period and opt to withdraw from surgery altogether, rendering the orthodontic preparations ineffective (Sabri, 2006). Additionally, prolonged presurgical decompensation may negatively affect surrounding soft tissues by disrupting functional adaptations, potentially complicating postoperative recovery (Grubb & Evans, 2007).

In contrast, the SFA has emerged as a patient-centred alternative, offering several notable advantages. By omitting the presurgical orthodontic phase, SFA allows for early improvement in facial aesthetics and dental function, the factors that are especially important for adolescents and young adults who are often highly conscious of their appearance (Jeong, Choi, et al., 2017). Improvements in speech and swallowing are realised earlier in the treatment course when compared to COA, enhancing patient satisfaction (Huang et al., 2014). Moreover, orthodontic tooth movement occurs more rapidly following surgery due to the regional acceleratory phenomenon, thereby reducing the overall treatment time significantly, often by months (Huang et al., 2014; Jeon, 2017). The restoration of functional skeletal and soft tissue relationships post-surgery also facilitates more efficient and manageable orthodontic adjustments (Jeon, 2017). Patients tend to demonstrate improved compliance, which may be attributed to the immediate aesthetic benefits and functional relief achieved through surgery (Huang et al., 2014). Notably, studies have shown that long-term stability and treatment outcomes achieved with SFA are comparable to those of COA (Liao et al., 2010).

Despite its advantages, SFA is not universally applicable and requires careful patient selection (Ahmadvand et al., 2021). The planning phase can be more complex and time-consuming due to the need for accurate prediction of postoperative occlusion, often necessitating detailed digital simulations or model surgery (Choi & Lee, 2021). Additionally, the concurrent removal of impacted third molars during surgery, rather than in advance, may increase the risk of unfavourable fractures and postoperative complications (Ahmadvand et al., 2021). In some instances, a prolonged period of intermaxillary fixation may be required to ensure postoperative stability (Choi & Lee, 2021). Postoperative malocclusion can also lead to initial chewing difficulties, and the final occlusion may be less predictable than with COA (Ahmadvand et al., 2021).

5. CASE SELECTION FOR SFA

Careful patient selection is paramount for the successful implementation of the SFA. Although SFA offers the advantages of reduced overall treatment duration and early improvement in facial aesthetics, it is not universally applicable. Careful identification of suitable candidates is essential to optimise skeletal stability, functional occlusion, and long-term treatment outcomes.

The existing literature suggests that SFA is most appropriate for skeletal Class III patients exhibiting mandibular prognathism with or without maxillary hypoplasia, particularly when mild dental crowding and minimal dental compensation are present (Choi et al., 2019). Baek et al. (Baek et al., 2010) recommended the use of SFA in Class III patients who do not require tooth extractions, have at least three stable occlusal stops, exhibit a positive overbite involving six anterior teeth, and show coordinated dental arches without significant discrepancies. However, these recommendations should be interpreted with caution. For instance, the Sendai protocol advises against the routine establishment of three-point occlusal contact during mandibular setback procedures, as this may predispose to postoperative relapse due to posterior ramus elongation (Mahmood et al., 2018). Furthermore, Liao and Lo observe that stable occlusion can still be achieved with contact limited to one or two anterior segments, particularly when occlusal contact is maintained around teeth #5 and #6 (Liao & Lo, 2018).

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The surgery-first approach is generally recommended for patients with well-aligned or mildly crowded anterior teeth, a flat or mild curve of Spee, minimal transverse discrepancies, and slight proclination or retroclination of the incisors, provided that little to no preoperative dental decompensation is required (Liou et al., 2011; Reddy & Potturi, 2021; Hernández-Alfaro et al., 2014). In contrast, this approach is not recommended for individuals with severe dental crowding necessitating extractions or those with Class II Division 2 malocclusion associated with deep overbite and a pronounced curve of Spee. Similarly, cases requiring surgically assisted rapid palatal expansion (SARPE) to correct maxillary transverse deficiencies, or those with significant skeletal asymmetries and complex three-dimensional dental compensations are considered unsuitable for this approach. These factors increase treatment difficulty and reduce the ability to achieve predictable and stable postoperative occlusion. (Hernández-Alfaro et al., 2014).

These insights underscore the importance of individualised planning and careful case selection. Success with SFA depends heavily on a thorough diagnosis, accurate prediction of postoperative outcomes, and precise surgical simulation using models. Therefore, this technique requires strong collaboration between experienced orthodontists and surgeons, along with sound clinical judgment (Ahmadvand et al., 2021).

6. POST-SURGICAL STABILITY OF ORTHOGNATHIC SURGERY

Postoperative dento-skeletal relapse following orthognathic surgery can be influenced by several factors, including fixation techniques, muscle activity, maxillary constriction, the curve of Spee, and the degree of overjet and overbite (Seifi et al., 2018). Patients presenting with a flatter curve of Spee and minimal overbite typically demonstrate better post-surgical stability (Ahmadvand et al., 2021).

Multiple studies (Hoang et al., 2021; Liao et al., 2010; Soverina et al., 2019) have indicated that the SFA offers post-surgical stability comparable to that of the COA. No significant differences have been observed in the stability of transverse dimensions between these two techniques (Jeong, Lee, et al., 2017; Jeong et al., 2018). Furthermore, a meta-analysis conducted by Yang et al (Yang et al., 2017) found that the surgical stability associated with SFA is on par with COA, while also contributing to a reduced overall treatment duration.

Regarding maxillary stability, no statistically significant differences have been found between SFA and COA (Baek et al., 2010; Choi et al., 2015; Yang et al., 2017). However, mandibular stability remains more contentious, particularly in cases involving bimaxillary surgery or isolated mandibular procedures performed with the SFA. (Kim et al., 2014; Liao et al., 2010) A meta-analysis by Wei et al. (Wei et al., 2018) reported a greater degree of counter clockwise mandibular rotation in SFA patients postoperatively, suggesting potentially poorer postoperative stability when compared to the COA group. Conversely, Jeong et al. (Jeong et al., 2017; Jeong et al., 2018) argued that this rotation is a natural aspect of treatment and not necessarily indicative of long-term bone relapse. Nonetheless, concerns about stability in the SFA have persisted.

Significant mandibular forward relapse has been reported, especially in SFA patients with Class III deformities, with over 50% of patients experiencing more than 2 mm of relapse at the pogonion (Kim et al., 2014). It has been suggested that SFA procedures are associated with an increase in vertical dimension due to premature contacts, resulting in more vertical bite settling after surgery, which can lead to subsequent mandibular forward relapse (Ko et al., 2011; Lee et al., 2014). These findings emphasise the importance of monitoring vertical dimension changes after SFA orthognathic surgery. Additionally, the magnitude of surgical movement in SFA may be larger than COA due to the additional surgical adjustments needed to cover the decompensatory presurgical orthodontic movements typically performed in the conventional approach. Therefore, even though the overall stability of the SFA may be comparable to the COA, the possibility of mandibular anterior relapse should be considered during the treatment planning stage (Kwon & Han, 2019).

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7. DENTAL AND SKELETAL MOVEMENTS

Comparative assessments of skeletal and dental changes following the SFA and the COA have demonstrated that both techniques yield comparable outcomes in terms of bone and dental movements in Class III malocclusion cases, with no significant statistical differences noted between the two methods (Florentine et al., 2022). Wang et al. (Wang et al., 2010) investigated the transverse dimensional changes of the dental arches in Class III patients who received preoperative orthodontic treatment. Their analysis revealed consistent trends across both treatment groups. Specifically, maxillary canines demonstrated buccal tilting, maxillary molars showed lingual tilting, mandibular canines were tilted lingually, and mandibular molars exhibited buccal tilting.

These findings suggest that the pattern of dental compensation and skeletal adaptation remains relatively consistent regardless of whether a patient is treated using SFA or COA, reinforcing the clinical applicability of both approaches in achieving the desired occlusal and skeletal outcomes.

8. DURATION OF TREATMENT

The SFA has been associated with a notable reduction in overall treatment duration compared to the COA. Studies have reported that the average total treatment time for SFA ranges from approximately 14.3 to 20.88 months, whereas COA typically requires between 22.0 and 25.31 months (Mirhashemi et al., 2022). The extended duration in COA is largely attributed to the comprehensive pre- and post-surgical orthodontic phases, with pre-surgical orthodontics alone often taking 15 to 24 months to complete (Choi et al., 2019).

In contrast, SFA eliminates the pre-surgical orthodontic phase, offering a substantial reduction in overall treatment time. However, there is no consensus on the optimal timing for initiating orthodontic treatment post-surgery in SFA patients. Recommendations vary, with some suggesting initiation as early as one week postoperatively, while others recommend a delay of up to one month (Gandedkar et al., 2016).

Since dental compensation is not addressed prior to surgery in SFA, patients often present with unstable occlusion immediately postoperatively due to premature contacts. To take full advantage of the Regional Acceleratory Phenomenon (RAP), a biological response that enhances bone remodelling and accelerates tooth movement, an early initiation of orthodontic treatment is advocated (Choi et al., 2019). Some clinicians recommend beginning alignment and arch coordination immediately after surgery to eliminate occlusal interferences (Ko et al., 2011). Additionally, to help accelerate post-surgical orthodontic treatment, some clinicians suggest replacing the initially used rigid stabilising wires with lighter, more flexible wires after surgery (Choi et al., 2019).

9. COMPLICATIONS OF ORTHOGNATHIC SURGERY

The overall complication rate for orthognathic surgery performed for non-traumatic indications, including Le Fort I and/or bilateral sagittal split osteotomy (BSSO), has been reported at approximately 4.5%, with postoperative infection being the most commonly observed complication (Bacos et al., 2019). Additionally, both intraoperative and postoperative bleeding have been documented following Le Fort I maxillary osteotomy procedures (Girard et al., 2022).

When comparing the SFA to the COA, no statistically significant differences have been found in relation to temporomandibular joint (TMJ) pain outcomes in either group (Zhai et al., 2020). However, it has been suggested that the risk of complications with SFA is slightly higher than COA due to an increase in segmental osteotomies (Pelo et al., 2017). Moreover, patients with temporomandibular joint or periodontal problems may not be suitable candidates for the SFA (Hernández-Alfaro et al., 2011). Given the added complexity and surgical precision required for this approach, SFA should be performed only by highly experienced surgeons to minimise the risk of adverse outcomes (Wei et al., 2018).

10. PSYCHOLOGICAL OUTCOMES

In recent years, patient satisfaction has become a central focus in evaluating the quality and effectiveness of medical services. As a result, patients' perceptions and expectations now play a critical role in determining the success and justification of treatment outcomes (Njio et al., 2008). Orthognathic surgery, by altering facial and alveolar structures, has been reported to improve interpersonal relationships (Hunt et al., 2001) and potentially enhance employment opportunities (Pithon et al., 2014). However, dissatisfaction may arise when patient expectations are not met, especially in the presence of temporary oral dysfunction, paresthesia, or unexpected changes in facial appearance following surgery (Bailey et al., 1998).

A recent systematic review (Yao et al., 2020) indicated that patients undergoing SFA and COA reported comparable improvements in quality of life. In contrast, an earlier review (Huang et al., 2016) found greater patient satisfaction in the SFA group, suggesting variability in psychological outcomes based on the approach used. One of the notable psychological drawbacks of COA is the temporary worsening of facial appearance during the presurgical orthodontic phase, which can lead to increased anxiety and reduced self-esteem (Jacobs & Sinclair, 1983; Jeong et al., 2017). Furthermore, the lengthy treatment duration associated with COA has been linked to reduced patient satisfaction over time (Bock et al., 2007).

Conversely, patients undergoing the SFA have shown higher levels of satisfaction, particularly due to the shortened overall treatment time and early aesthetic and psychological improvements (Beccuti et al., 2022). These early positive changes contribute significantly to boosting self-confidence and reducing treatment-related psychological stress, highlighting the growing appeal of the SFA from a patient-centred care perspective.

11. SFA IN ORTHOGNATHIC PATIENTS WITH FACIAL ASYMMETRY

Facial asymmetry poses a significant challenge in orthognathic surgery due to the complex relationship between dental and skeletal structures. Orthodontic intervention plays a critical role in such cases by aligning the teeth and jaws to achieve harmonised facial aesthetics and functional symmetry (Chen et al., 2023). SFA has been considered less suitable for class III patients with facial asymmetry, primarily due to concerns about postoperative skeletal instability stemming from unstable surgical occlusion (Liao et al., 2022). However, emerging evidence suggests that SFA can be effectively applied in these challenging cases. A study utilising three-dimensional CT reconstruction to assess bilateral morphological changes in hard tissue demonstrated that key asymmetrical regions showed significant improvement following surgery, i.e. the menton, mandibular body length, the angulation between the ramus and the midsagittal plane (MSP), and the gonion-to-MSP distance (Guo et al., 2018). These corrections were maintained postoperatively, indicating favourable skeletal stability in both symmetry and asymmetry groups.

Chen et al. (Chen et al., 2023) further supported these findings in their study comparing preoperative and postoperative hard tissue symmetry using 3D imaging in SFA patients. They concluded that SFA is clinically effective and efficient in managing skeletal dentofacial asymmetry. These results were corroborated by additional studies (Choi et al., 2022; Choi et al., 2021; Guo et al., 2018), which found comparable outcomes between SFA and the COA in patients with facial asymmetry. Moreover, a patient-reported outcomes study by Liao et al. (Liao et al., 2019) revealed that individuals treated with SFA reported improvements in facial symmetry and expressed high levels of satisfaction with their overall appearance post-treatment. These findings emphasise that, with proper case selection and surgical planning, SFA can be a viable and successful option for treating facial asymmetry in orthognathic patients.

12. TEMPOROMANDIBULAR DISORDERS (TMD) IN ORTHOGNATHIC PATIENTS

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Temporomandibular joint disorder is a common condition within oral and maxillofacial pathology, characterised primarily by joint hypermobility, abnormal mandibular movements, and pain in the TMJ region (Durham et al., 2015). If left untreated, TMD can contribute to a range of complications, including facial asymmetry, malocclusion, headaches, and impaired quality of life (Bryndahl et al., 2006; Byun et al., 2005; Yang et al., 2012).

The condylar displacement that occurs during orthognathic surgery depends on various factors, including the surgeon's experience, the bony interferences between the proximal and distal segments, the type of fixation, etc (Baek et al., 2006). The displacement of the condylar head during orthognathic surgery, especially during bilateral sagittal split ramus osteotomy (SSRO) for mandibular setback, is a critical factor influencing postoperative joint stability. During SSRO, the proximal mandibular segment is moved posteriorly, but muscular forces from the masseter and temporalis muscles often induce a counter-clockwise rotation, making precise condylar repositioning essential to avoid relapse or functional disturbances (Baek et al., 2006; Cho, 2007; Kim et al., 2014; Komori et al., 1989; Xi et al., 2015). Inaccurate positioning of the condyle during surgery has been shown to compromise surgical outcomes and negatively affect both anatomical and functional results, particularly in bilateral sagittal split procedures (Holzinger et al., 2019).

In the study examining the impact of the SFA on TMJ, the results indicated an overall improvement in pain assessment for the TMJ and masticatory muscles, except for the masseter muscle and neck region (Pelo et al., 2018). Notably, there was a significant reduction in joint noise, improvement in TMJ function, and relief from migraines and headaches (Pelo et al., 2018). These findings indicate that SFA may help relieve or even resolve existing TMD symptoms in certain cases.

Kim et al. (Kim et al., 2022) analysed postoperative TMJ position changes in 16 orthognathic patients and observed no significant differences in condylar displacement or angulation between deviated and non-deviated sides in both SFA and COA groups. This suggests that SFA does not result in greater condylar displacement risk when compared to the conventional approach. These results align with the findings of Pelo et al. (Pelo et al., 2018), who observed no statistically significant differences in TMJ function or symptoms over a 12-month follow-up in Class III patients treated with either SFA or COA.

Importantly, studies have emphasised that pre-existing TMJ clicking or pain are strong predictive factors for postoperative TMD symptoms, regardless of the surgical protocol employed (Zhai et al., 2020). Therefore, careful preoperative evaluation of TMJ health is essential in orthognathic planning, particularly for SFA candidates.

13. CONCLUSION

The SFA has emerged as a promising alternative to the COA in the management of dentofacial anomalies. Its main advantages—such as reduced treatment duration, early improvement in facial appearance, and enhanced patient satisfaction—make it especially appealing for individuals concerned about prolonged orthodontic treatment. Although the SFA has raised concerns regarding postoperative stability and technical complexity, studies have shown that, with appropriate case selection, it can achieve skeletal stability and dental outcomes comparable to those of the COA. Moreover, advancements in imaging, surgical planning, and orthodontic techniques have further supported the safe and effective application of SFA, even in patients with facial asymmetry or temporomandibular joint involvement. As research continues to expand, further high-quality studies are needed to refine patient selection criteria and optimise treatment protocols, ensuring that the benefits of SFA can be fully realised without compromising long-term results.

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CONFLICT OF INTEREST STATEMENT

The authors agree that this research was conducted in the absence of any self-benefits, commercial or financial conflicts and declare the absence of conflicting interests with the funders.

AUTHORS' CONTRIBUTIONS

Tian HuiMin conducted the research, including study design, data collection, analysis, and manuscript preparation. **Tan Su Keng** provided overall guidance in study conception, methodology, critical revision, and supervision throughout the project. **Azmeel Mazlee Anuar** and **Leung Yiu Yan** offering expert input in study design, data interpretation, and manuscript review.

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14. APPENDIX

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