

Surgery First Orthognathic Approach Versus Conventional Orthognathic Approach- A Systematic Review

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Abstract:

Surgery-First Approach (SFA) Has Been Introduced As An Alternative For Conventional Orthognathic Approach (COA) In The Treatment Of Patients With Dentoskeletal Deformities. This Review Aimed To Compare And Evaluate, Treatment Time And Quality Of Life And Stability In SFA And COA. The Electronic Search Was Performed From 2012 To 202 Producing A Total Of 230 Records By Different Databases: Pubmed, Web Of Science, Scopus. After Title And Abstract Reading, Data Extraction Was Performed From Eligible Articles. Seven Articles Were Included In The Review. As An Overall Consideration About Quality Of Life Assessment, We Can State That The Surgery-First Orthognathic Approach Has Proven To Provide An Immediate Improvement Of The Quality Of Living And To Avoid The Worsening Caused By Presurgical Treatment And The Discomfort Of Long Presurgical Orthodontic Treatment, Although Results Should Be Better Corroborated By Further Studies With A Larger Group Of Patients.

Key Word: Surgery-First Approach (SFA), Conventional Orthognathic Approach (COA), Treatment Time, Stability, Quality Of Life.

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I. Introduction

Jaw malrelations and discrepancies refer to a wide range of oral disorders characterised by maxillo-mandibular variations and irregularities in the alveolar bone and teeth. A large proportion of the general population, ranging from 50% to 75%, has some type of malrelation known as malocclusion¹, while jaw discrepancies affect nearly 28% of the population. Treatment of these cranio-dentofacial issues has been shown to improve oral function and oral health-related quality of life.

Dentofacial abnormalities and jaw discrepancies frequently require a multidisciplinary approach involving dentofacial orthopedists/orthodontists, dental and oral surgeons, craniofacial and plastic surgeons, and others surgeons. The treatment of severe deformities in patients requires surgical intervention. Dentofacial deformities are an array of conditions (congenital or acquired) that result in alteration to the shape of the mouth and face, which can cause facial deformities and dysfunction and have serious social and psychological implications. For severe and complex deformities, orthodontic treatment alone would be insufficient to correct the deformity or would otherwise fail to achieve satisfactory results. In such instances, joint orthognathic-orthodontic treatment would be often necessary for patients to obtain an ideal facial profile and for stable occlusion.

The conventional orthodontics first approach (COA) gained prominence in the 1970s. The first orthognathic surgeons realized that the amount of mandibular setback was limited by the magnitude of overjet between the maxillary and mandibular incisors. Though there exist contradicting evidence in this regard, it seems clear that the possible effect of orthognathic surgery on upper airway must be taken into consideration at all stages of treatment from diagnosis to treatment planning and treatment execution to prevent any possible adverse event post-surgically. Consequently, the "orthodontics-first" concept became a widely acknowledged dogma. It

emphasized that optimal surgical repositioning of the jaw was possible only after the removal of all dental compensations before surgery. Conventional orthognathic technique however, is a time-consuming and tedious procedure. The treatment cycle is considerably longer, typically exceeding two years⁴. These factors lead to negative repercussions on the patient's psychological state which are probably related to the long orthodontic treatment and decompensation of the dental elements causing temporary worsening of the facial esthetics, transitory worsening of mastication, and improvement of oral discomfort.

A new concept known as the "surgery-first orthognathic approach (SFOA)" which starts the orthognathic surgery in the beginning of the treatment cycle without preoperative orthodontic preparation or with a minimum preoperative orthodontic treatment of less than 6 months, has been created to solve the drawbacks of conventional orthognathic surgery. In 1959, Skaggs⁴ raised the issue of surgical timing in relation to orthodontic treatment and suggested that surgery should precede orthodontic treatment if a satisfactory interarch relationship can be reached surgically. The case report by Nagasaka et al in 2009⁵ is often cited as the first clinical application of this approach. Subsequent research has demonstrated that compared with the traditional scheme, surgery-first protocols seem to reduce total treatment time and obtain immediate improvement of the facial profile or upper airway constriction. These factors may lead to high patient satisfaction rates from the early stages of treatment and improved cooperation during postoperative orthodontics. The ability to eliminate or reduce pre-surgery orthodontic treatment, surgically moving the jaws directly into the desired position, and a brief orthodontic therapy following are the key advantages of this procedure which leads to patient satisfaction with the treatment. This new approach is also frequently requested by patients because it is possible to see improvements in facial esthetics immediately as the duration of the therapy is significantly shortened. The surgical technique differs from the typical strategy in orthognathic surgery in that it only includes two phases: surgery and post-operation orthognathic therapy. The proposed benefits of surgery first have led to a growing acceptance in surgical and orthodontic communities toward these protocols. Nevertheless, there is currently no consensus regarding surgical protocols, specific complications or limitations of this treatment sequence, and stability of the results. Patients often desire this new technique since it allows them to witness results².

In literature, heterogeneity in methodology, statistics, and clinical features made it unreliable to quantitatively analyze the results. The goal of this research was to compare SFA and COA in order to highlight the benefits and drawbacks of each, allowing doctors to choose the best surgical technique.

II. Material And Methods

A systematic review was conducted following criteria based on PICOS schema to evaluate any difference between surgery first approach (SFA) and conventional orthognathic approach (COA).

SEARCH STRATEGY

PICO (Glossary of Evidence Based Terms 2007)

1. In the population, patients who are receiving orthodontic treatment are chosen.
2. Intervention of dentoskeletal deformities with Surgery-first orthognathic approach and conventional orthognathic approach.
3. Treatment of dentofacial deformities with a Surgery-First Orthognathic Approach and a Conventional Orthognathic Approach were compared.

Evaluation of treatment success in terms of skeletal stability, treatment time, and quality of life.

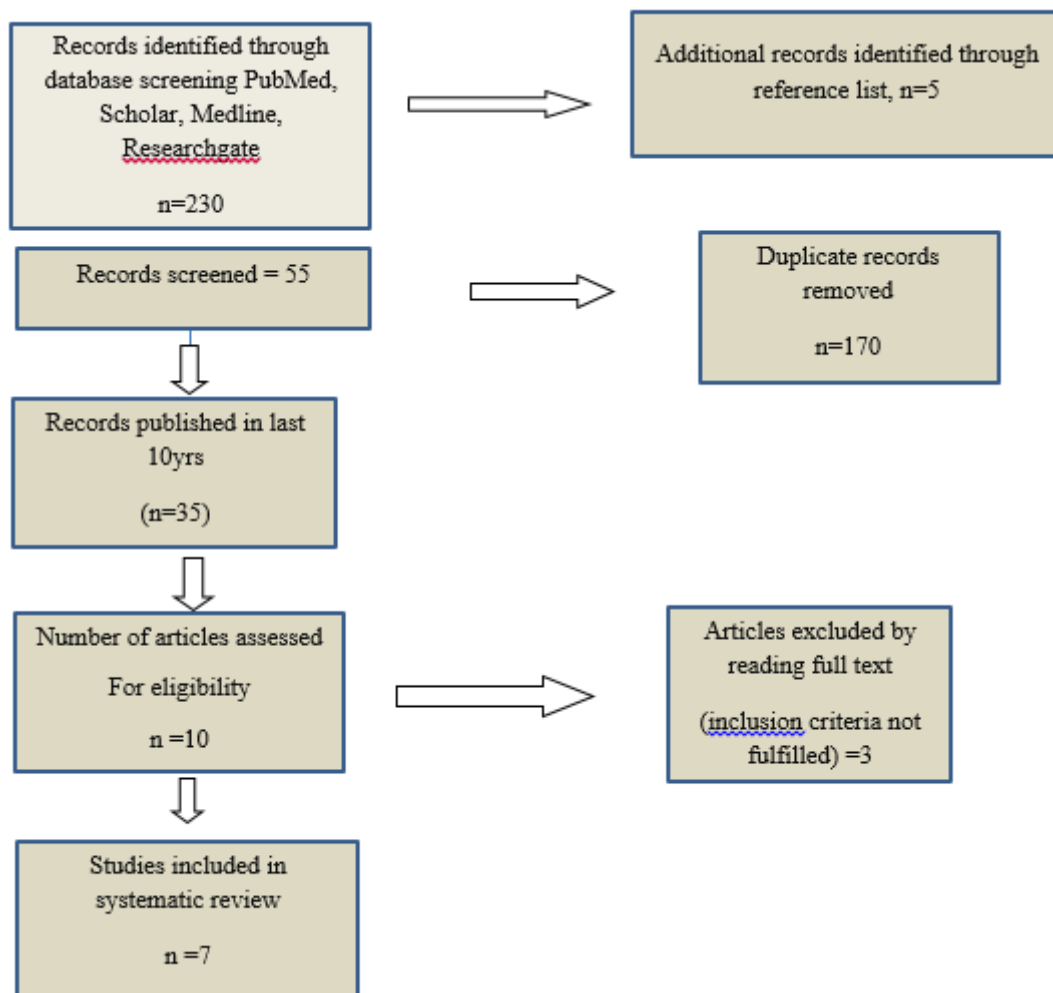
Inclusion criteria:

1. Age—18 to 30 years (both sexes inclusive).
2. Availability of complete set of medical and orthodontic treatment records.
3. Skeletally mature patients with a prognathic mandible (negative overjet).
4. Medical history indicating no evidence of any systemic condition/syndrome/pathology which can affect bone metabolism or contradict general anaesthesia and orthognathic surgery.

Exclusion criteria:

1. Animal studies
2. Review Article
3. Case study/ Report
4. Comments articles
5. Letter to Editor

PRISMA FLOW CHART



III. Results

The electronic search was performed from 2012 to 2021 producing a total of 230 records by different databases: Pubmed, Web of Science, Scopus. After duplicates removal, a total of 10 potentially significant records were assessed. Titles and abstracts were screened and 7 full-text articles were identified for eligibility, while 3 records were excluded.

S. No.	FIRST AUTHOR	STUDY DESIGN	SAMPLE TYPE	SAMPLE SIZE	OUTCOME MEASURE	OUTCOME AND AUTHORS CONCLUSION
1.	Selene Barone (2020)	Retrospective Study	Comparative study		Less treatment time was reported for SFA than COA with a moderate quality level.	SFA may represent a reasonable alternative to COA and could be associated with shorter postoperative orthodontic treatment time.
2.	YANG Le. (2021)	Retrospective Study	Comparative study	Patient between Jan.2016-2019.	The treatment period of the surgery-first group was significantly shorter than that of the orthodontic-first group.	the surgery-first orthognathic approach can achieve similar results in correcting dentofacial deformities in terms of postoperative skeletal stability.

3.	S. Agarwal (2020)	Prospective Study	Randomized Control trails	20 Patients	study indicate a statistically significant reduction in airway volume and area at T1 in both modalities..	SFOA has greater airway reduction immediate post-surgically and greater relapse at 01-year follow-up.
4.	Hongpu Wei (2018)	Prospective Study	Randomized Control trails	12 studies (total of 498 participants)	The pooled estimate suggested that the SFA group manifested less postoperative stability than COA group	SFA may yield poorer postoperative stability than COA. Specifically, the mandible tends to rotate counterclockwise more in SFA
5.	Sandro Pelo (2017)	Prospective Study	Comparative study	30 patients (15 patients were treated with the COA and 15 with SFA)	showed significant differences in terms of the Orthognathic Quality of Life and the Oral Health Impact Profile	The worsening of the facial profile during the traditional orthognathic surgery approach decompensation phase has a negative impact on the perception of patients' quality of life.
6.	Maria A (2016)	Prospective Study	Comparative study	295 patients were managed with a surgery-first approach.	heterogeneity and low evidence levels of the retrieved articles, and the lack of prospective longterm follow-ups.	Studies have reported satisfactory outcomes and high acceptance.
7.	Yu H.B. (2015)	Retrospective study	Comparative Study	50 cases	SFA is regarded as an ideal and valuable alternative for this potentially complicated procedure.	Patients were satisfied with the results of treatment. No relapse was recorded during 6–12 months of follow-up.

IV. Discussion

Orthognathic surgery aims to correct severe skeletal dentofacial deformities, in order to improve aesthetic and functional features. The achievement of these objectives is related to good surgical planning and an accurate orthodontic treatment. However, differences in the timing of these phases can modify the effectiveness of the final result. The therapeutic dogma provides three phases of treatment: pre-surgical orthodontic phase, skeletal surgical correction, and post surgical orthodontic phase. In this conventional orthognathic approach (COA), the patient undergoes dental decompensations of the arches, which worsens his/her facial profile¹³. After surgical treatment, a short occlusal refinement is required to improve stability and aesthetics. Recently, to overcome the disadvantages of this traditional therapeutic sequence, the surgery-first approach (SFA) has been introduced and is still developing. In the philosophy of SFA, the orthodontic pre-surgical treatment is completely bypassed, and the first step is represented by the surgical correction of the jaws.

SFA has recently emerged as a viable option to COA for patients who require orthognathic surgery to correct dentoskeletal abnormalities. The main benefits of SFA include a shorter treatment time, the facial profile is improved from the onset of treatment as a result of skeletal base correction. Patient and orthodontist satisfaction rates are high, high patient satisfaction is associated with improved cooperation during postoperative orthodontics. Orthodontic decompensation is efficient and effective in response to the establishment of a proper maxillomandibular relationship and the regional acceleratory phenomenon. Patient recovery takes place rapidly. When sleep-disordered breathing is the main indication for treatment, early maxillomandibular advancement increases the dimensions of the upper airway immediately, but postsurgical skeletal stability and operative problems should be monitored¹¹.

This is a systematic review of 7 studies to evaluate the treatment time, quality of life and postoperative stability of SFEA compared with COA. This systematic review was organized according to previously recommended guidelines and was written in line with PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) checklist. Electronic searches were performed independently on PubMed, Embase, and Cochrane Database for records reporting the comparison between SFEA and COA. The detailed PubMed

search strategy was as follows: [(surgery first) OR (surgery early)] Orthognathic Surgery and conventional or traditional orthognathic surgery).

Initial search was carried out, duplicate records were deleted, the titles and abstracts were screened for relevance, and were identified as excluded or requiring further assessment. Discrepancies were resolved by discussion. A manual search was also carried out using the reference lists of selected articles and previous reviews to identify additional eligible studies.

The qualitative analysis of the included studies allowed to summarize the postsurgical skeletal stability after SFA and COA³. This systematic review was performed to evaluate the postoperative stability of SFEA compared with COA. The anteroposterior position of pogonion plays a vital role in the aesthetics and harmony of the human facial profile. In the study conducted by Wei et al³, the postoperative horizontal changes of pogonion were recorded as the primary outcome and postoperative changes of other facial hard tissue landmarks.

According to Wie et al³, the postoperative horizontal changes of pogonion and point B and the postoperative vertical changes of point B were found to have significant differences, which indicate that the relapse amount of mandible in the SFEA group is bigger than COA group. More specifically, the mandible tends to rotate counter clockwise more in the SFEA group, although the relapse of the maxilla was found to have no significant difference between the SFEA group and COA group.

The reason for the high relapse tendency of the mandible may lie in the temporomandibular joint dysfunction and muscular factors⁹. A similar analysis reported by Yang et al.¹⁰ indicated that the surgery-first group has similar postoperative stability of the mandible and maxilla compared with the COA group. However, the analysis by Yang et al¹⁰ included a total of only 6 related studies with 284 participants, with some existing relevant studies excluded. The use of the effect model by Yang et al.¹⁰ is also debatable. Wei et al³ also related 3 other articles^{2,13,16} without combined statistical analysis concerning the same topic. Huang et al.²² analyzed 3 relevant articles and found that no differences existed in the postoperative stability between the SFEA group and COA group in 3-dimensional directions (transverse, vertical, and sagittal direction). Sharma et al.¹⁷ also concluded that no significant difference existed between SFEA and a conventional approach. Peiró guijarro et al.¹³ analyzed 2 articles and suggested that good stability was found both in horizontal and vertical planes compared with a conventional approach. However, a higher relapse rate was also found in relation to the position of the mandible. Considering the conflicting views of these articles, Wei et al³ combined all the available studies and found that the mandible tends to rotate counterclockwise more in the SFEA group than the COA group, which indicates an unfavorable postoperative stability in the SFEA group.

When comparing SFA with COA in terms of treatment time, great agreement was found among authors included in this review. For the surgery-first approach, one of two possible outcomes could be anticipated. The whole treatment period will be lengthened if the post-operative occlusion cannot be properly overcome. This is due to the fact that post-surgical orthodontic therapy takes longer to attain the desired occlusion. Second, because this procedure does not include pre-surgical orthodontic treatment, the duration will be reduced¹⁷.

Despite the studies' variability, evidence of a shorter treatment time in the SFA group was reported. The average treatment time with the surgery first method was 14.2 months, while the conventional orthognathic approach required 20.2 months, resulting in a 6-12 month difference in post-operative treatment time.^{5,16-18} Together with the decrease in total treatment time, early improvement of the facial profile was the most commonly reported advantage of a surgery-first approach.

Early correction of facial deformity, irrespective of ethnicity, leads to an improvement in facial esthetics from the onset of treatment, and this may have a positive impact on quality of life and satisfaction with treatment. The surgery-first strategy yielded rapid improvements in the quality of life as a result of an immediate facial improvement.

In recent years, Yu HB⁶ and Barone S¹ have reported that quality of life assessment has increased, and, more importantly, the focus has widened, with a greater emphasis on social well-being rather than disease mortality, tumour growth, and so on, providing much-neglected subjective views of treatment outcomes. With increased relevance of health-related quality of life (HRQoL), it is now recognized that quality of life (QoL) assessment is a key outcome measure in the management of dentofacial deformities. It is well known that the primary motive for undergoing orthognathic surgery is to improve one's appearance.

The Oral Health Impact Profile (OHIP) questionnaire was also used to assess patients' perceptions of their quality of life in connection to oral problems⁴. The results of the quality of life evaluation, however, reveal significant limits in the analysis of ethnic, cultural, and socioeconomic aspects that may differ between communities. As an overall consideration about quality of life assessment with questionnaires, Flavio U⁴ states that the surgery-first orthognathic approach has proven to provide an immediate improvement of the quality of living and to avoid the worsening caused by presurgical treatment and the discomfort of long presurgical orthodontic treatment, although results should be better corroborated by further studies with a larger group of patients.

SFA may represent a reasonable alternative to COA and could be associated with shorter postoperative orthodontic treatment time, increased quality of life immediately after surgery, and the trend continues throughout the entire course of treatment, with no presurgical deterioration. However, high heterogeneity was found in the data collected and therefore more studies are required comparing SFA and COA.

V. Conclusion

This review's findings should be interpreted with caution.

SFA may be a viable alternative to COA and may result in a shorter postoperative orthodontic treatment time. However, the authors discovered a high degree of heterogeneity in studies, with the majority of them having low evidence levels. Aside from the reasons stated above, there is a wide range of outcome variables in orthognathic surgery, making a meaningful comparison between the two techniques difficult.

As an overall consideration about quality of life assessment, we can state that the surgery-first orthognathic approach has proven to provide an immediate improvement of the quality of living and to avoid the worsening caused by presurgical treatment and the discomfort of long presurgical orthodontic treatment, although results should be better corroborated by further studies with a larger group of patients.

Until now, any skeletal and/or occlusal condition that could jeopardise the clinical outcome was considered a contraindication to surgery first. However, computer vision, virtual orthodontic setups, three-dimensional analysis, and computer-assisted design – computer-assisted production intraoperative splints may help the surgeon and orthodontist forecast the extent of dentoskeletal correction more correctly. To clarify the findings of this analysis, large-scale 3D studies and well-designed RCTs with long-term follow-up are required.

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