

Surgery-First Approach in Orthognathic surgery: Literature review

Protocolo de Benefício Antecipado em Cirurgia ortognática: Revisão de literatura

Protocolo de Benefícios Tempranos en Cirugía ortognática: Revisión de la literatura

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Abstract

The early benefit protocol in orthognathic surgery or surgery-first approach (SFA) has as its main idea the surgical approach before previous orthodontic preparation, in contrast to the idea of the traditional approach, which advocates a preoperative orthodontic treatment, which may present more uncomfortable for the patient when compared to surgery-first because it takes a very long time, discomfort during the orthodontic treatment, and the patient may present psychosocial problems related to the delay in the resolution of the main complaint and/or even the aggravation of such complaint due to attenuation of facial asymmetry resulting from the correct position of the teeth in the arches, and possible intra-oral complications related to hygiene and oral health with the use of intra-oral orthosis. The surgery-first approach is based on initially improving facial aesthetics, which is usually the patient's main complaint, and then moving on to the second stage of occlusal movement and alignment. This literature review aims to evaluate and compare the findings regarding the conventional protocol. and the suggestion-first protocol. A MEDLINE search. Inclusion criteria were 1) human study and 2) orthognathic surgery with surgical-first approach or equivalent, and 3) three-dimensional planning with virtual flow in a suggestion-first approach. After an evaluation of the contemporary literature, it was concluded that this approach is positive when related to treatment time, patient's quality of life, post-surgical orthodontic time and occlusal stability. Overall, the SFA achieved optimal results comparable to the conventional protocol regarding treatment success.

Keywords: Orthognathic surgery; Quality of life; Treatment time.

Resumo

O protocolo de benefício antecipado em cirurgia ortognática ou surgery-first approach (SFA) tem como ideia principal a abordagem cirúrgica antes de um preparo ortodôntico prévio, contrapondo a ideia da abordagem tradicional, que preconiza um tratamento ortodôntico pré-operatório, que pode se apresentar mais desconfortável ao paciente quando comparada a surgery-first por ter um tempo bastante prolongado, desconforto ao longo do tratamento ortodôntico, podendo o paciente apresentar problemas psicossociais relacionados ao atraso da resolução da queixa principal e/ou até mesmo o agravamento de tal queixa pela atenuação da assimetria facial decorrente da correta posição dos dentes nos arcos, e possíveis complicações intra-orais relacionadas a higiene e saúde oral com o uso da órtese intra-oral. A surgery-first approach se baseia em aprimorar inicialmente a estética facial que geralmente se apresenta como a queixa principal do paciente e depois partir para a segunda etapa de movimentação e alinhamento oclusal. Esta revisão de literatura visa avaliar e comparar os achados acerca do protocolo convencional e do protocolo surgery-first. Uma busca no MEDLINE.

Os critérios de inclusão foram 1) estudo em humanos e 2) cirurgia ortognática com abordagem cirúrgica em primeiro lugar ou equivalente, e 3) planejamento tridimensional com fluxo virtual em surgery-first approach. Após uma avaliação da literatura contemporânea conclui-se que esta abordagem é positiva quando relacionada ao tempo de tratamento, qualidade de vida do paciente, tempo de ortodontia pós-cirúrgica e estabilidade oclusal. De modo geral, o SFA obteve resultados ótimos comparáveis aos do protocolo convencional quanto ao sucesso do tratamento.

Palavras-chave: Cirurgia ortognática; Qualidade de vida; Tempo de tratamento.

Resumen

El protocolo de beneficio temprano en cirugía ortognática o cirugía-primero abordaje (SFA) tiene como idea principal el abordaje quirúrgico antes de la preparación ortodóncica previa, en contraste con la idea del abordaje tradicional, que aboga por un tratamiento de ortodoncia preoperatorio, que puede presentar más incómodo para el paciente en comparación con la cirugía-primero porque lleva mucho tiempo, molestias durante el tratamiento de ortodoncia, y el paciente puede presentar problemas psicosociales relacionados con la demora en la resolución de la queja principal y/o incluso el agravamiento de dicha queja se debe a la atenuación de la asimetría facial resultante de la correcta posición de los dientes en las arcadas, y posibles complicaciones intraorales relacionadas con la higiene y la salud bucal con el uso de ortesis intraorales. El enfoque de cirugía primero se basa en mejorar inicialmente la estética facial, que suele ser la principal queja del paciente, y luego pasar a la segunda etapa de movimiento y alineación oclusal. Esta revisión de la literatura tiene como objetivo evaluar y comparar los hallazgos con respecto al protocolo convencional. y el protocolo de sugerencia primero. Una búsqueda en MEDLINE. Los criterios de inclusión fueron 1) estudio en humanos y 2) cirugía ortognática con primer abordaje quirúrgico o equivalente, y 3) planificación tridimensional con flujo virtual en un primer abordaje por sugerencia. Después de una evaluación de la literatura contemporánea, se concluyó que este abordaje es positivo cuando se relaciona con el tiempo de tratamiento, la calidad de vida del paciente, el tiempo de ortodoncia posquirúrgica y la estabilidad oclusal. En general, SFA logró resultados óptimos comparables con el protocolo convencional en cuanto al éxito del tratamiento.

Palabras clave: Cirugía ortognática; Calidad de vida; Tiempo de tratamiento.

1. Introduction

Since the beginning of the modern era in orthognathic surgery marked by the technique of bilateral sagittal split osteotomy (BSSO) developed by Trauner and Obwegeser (1957), the first surgical approach, known in the literature by the term “surgery-first approach”, was the most commonly used technique, as it brings an immediate aesthetic and functional result. However, this term emerged only in 1988, when a dichotomy of ideas was observed as to what should be treated first in a patient candidate for orthognathic surgery, in which groups were divided that defended the change of the facial profile in the first place and another group. which sought to establish a correct occlusion prior to the surgical procedure.

Clinical evidence quickly demonstrated limitations of repositioning with the immediate surgical approach. Since then, studies have focused on a new approach aimed at planning and orthodontic movement prior to surgery, correctly aligning the dental arches for the correction of malocclusions and allowing greater movement of the gnathic bones. Currently, it has become the most common approach in orthognathic surgery which has become known as “orthodontics-first”. The initial orthodontic approach has become the standard procedure for the treatment of orthognathic surgery after studies published by Worms et al. carried out in the 1970s, in which he sought to standardize this approach for all cases of decompensation. (Bell & Creekmore, 1973; Worms, et al., 1976)

However, it is known that among the various factors, needs and values that lead a patient to undergo an orthognathic surgery procedure, the psychosocial effect is usually the most relevant aspect in its indication. The conventional approach advocates a pre-surgical orthodontic phase, which can have several disadvantages when compared to surgery-first because it takes a very long time, discomfort during the orthodontic treatment, and the patient may present psychosocial problems related to the delay in the resolution of the main complaint. and/or even the aggravation of such complaints due to the attenuation of facial asymmetry resulting from the correct position of the teeth in the arches, and possible complications of oral hygiene related to oral hygiene and health with the use of intraoral orthosis. Surgery-first is based on initially improving facial aesthetics, which is usually the main complaint of the patient, and then moving on to the second stage of occlusal movement and alignment. (Shah,

et al., 2017)

With the advent of the fourth industrial revolution, several new technologies were introduced in the medical reality and the evolutions regarding the planning of orthognathic surgery have improved and brought promising results regarding the use of 3D technology, diverging from the traditional two-dimensional planning protocol and the use of models. plaster and articulator physicists that have limitations and material changes, the technology of three-dimensional reconstruction by means of computed tomography, has allowed a better and more accurate study for surgical simulation in a virtual environment, as well as the manufacture of guides and millimetrically faithful models that allow the surgeon a very high predictability regarding the postoperative results. The production of the occlusal splint can also be made much faster and simpler by the 3D method than compared to manual fabrication using models in the articulator. (Sharma, et al., 2015)

The present literature review aims to evaluate the currently available evidence on the surgery-first approach and compare it with the conventional approach.

2. Methodology

This integrative literature review aims to assess and compare the findings between the conventional protocol comparison and the surgery-first approach. Synthesizing the results obtained in a systematic way from the search performed in MEDLINE (Entrez PubMed, www.ncbi.nlm.nih.gov) using the subject headings “surgery-first” and “orthognathic surgery” between the years 2012 to 2022, were 742 articles were obtained. The abstracts of these articles were reviewed to select studies that used a surgical approach in the first place. The reference list of each selected article was examined to include articles not retrieved by the MEDLINE search. Inclusion criteria were 1) human study; 2) orthognathic surgery with initial surgical approach or equivalent and 3) three-dimensional planning with virtual flow in the surgery-first approach. in addition to classic contents of international literature on the topic addressed, with a historical educational character.

3. Results

The articles selected to compose this integrative review are found below (Table 1) The authors' personal opinion was excluded. 21 articles were selected to compose this integrative study, considering their methodology, delineation, objectives and main results, there were evaluate to understand what the literature has addressed on this subject regarding the comparison of different protocols.

Table 1. Methodological description of the studies included in this review.

Study	Delineation of Study	Objective	Methodology	Main Results
Adeni et al, 2021	Qualitative and descriptive study, reporting in detail the surgical approach and the evolution of the patient.	Observe possible benefits by relating the suggested protocol to patient satisfaction.	Report of a unique, detailed clinical case, approaching from planning and trans-surgical to surgical evolution. Evaluating postoperative results	The protocol can be addressed in patients with severe periodontal problems, being successful with regard to the skeletal, aesthetic and even periodontal factor. Improving the patient's quality of life.
Bell & Creekmore 1973	Qualitative and descriptive study about conventional orthognathic surgery.	To report and show the techniques of diagnosis and planning of orthognathic surgery.	Report of a series of 06 cases, mostly female, with surgical treatment in patients with mandibular prognathism, class III profile.	Short and long term findings were reported at the end. Where the objectives of the treatment were achieved.
Choi & Lee, 2021	Qualitative study, literature review about SFA, along with analysis based on 15 years of experience in the subject.	Addressing current and relevant issues about the protocol. Seeking to standardise the approach.	Descriptively and in detail reports the protocol defined by the author for planning surgeries with SFA.	It was observed that SFA can achieve good results compared to conventional approach surgery and it can be an alternative treatment.

Dehghani et al, 2017	Quantitative, longitudinal and retrospective study of patients who completed conventional treatment.	To research treatment time and factors that may increase patients' treatment time by peer review rating.	The records of 50 patients were analysed between 2010 and 2013 in a hospital in the UK, the evolution characteristics were evaluated and data such as age, gender, number of consultations, change of orthodontist, exodontia or not prior to treatment, and peer review classification were extracted.	The mean duration observed was 27.0 months, factors such as age, malocclusion, gender and skeletal pattern did not change treatment time. Changing orthodontist in the middle of the treatment and extractions before the procedure increased the treatment time.
Hernández-Alfaro et al, 2014	Study of series of cases addressed by SFA, with pre-established protocol.	Provide a surgical protocol that can be used, discuss benefits, limitations and update indications about the protocol.	Forty-five patients were selected, treated with SFA, with no need for extractions and assisted maxillary expansion. Patients with periodontal problems, TMD and treated by inexperienced orthodontists were exclusion criteria. Virtual planning of all patients. Orthodontic treatment started 2 weeks after surgery. Evaluation 12 months later with a scale of 1 to 10 on patient and orthodontist satisfaction.	The patient satisfaction index averaged 9.4 and orthodontist satisfaction averaged 9.7. The average duration of orthodontic treatment was 37.8 months, with an average of 22 visits to the orthodontist. The correct indication and alignment of the case between surgeon and orthodontist is essential for treatment success.
Jeong, Lee & Choi, 2017	Large-scale and long-term study on postoperative stability in SFA approach.	To compare the long-term postoperative stability between the SFA and conventional approaches.	Class III patients between the years 2007 and 2015 were included, 104 treated with conventional protocol and 55 with SFA. Syndromic, cleft palate, class II and severe open bite patients were not included.	Well planned SFA as well as conventional surgery showed optimal results and maintained occlusal stability. No patient required further surgery to correct occlusal or skeletal characteristics.
Kim et al, 2020	Analysis of clinical variables that interfere with treatment time in patients treated with SFA.	To analyse factors interfering in the treatment time of patients treated with SFA.	Patients who had been treated with orthodontics previously, suffered trauma, treated for cleft palate and patients who required maxillary or mandibular segmentation were excluded. In all, 50 patients diagnosed with skeletal class III deficiency and treated with SFA were included and compared to a control group of 175 patients.	Patients who had severe crowding, required exodontia, who had anterior open bite, with transverse jaw deficiencies and presented with a discrepant midline postoperatively, had a longer treatment time. Patients who had molar class I postoperatively and 4 minimal contact points in the postoperative occlusion, had shorter treatment time.
Ko et al, 2011	Quantitative study of progressive cephalometric changes in patients treated with the SFA and conventional protocol.	Compare progressive dental and skeletal changes, post-surgical stability and treatment effectiveness.	Fifty-three patients with class III deformity were included. 18 treated with the SFA approach and 35 treated with the conventional protocol.	Both protocols, after analysis, suggested good post-surgical occlusal stability. As well as treatment success. The changes, in general, occurred but did not result in treatment failure.
Lee, 2018	Integrative literature review, clarifying about corticotomy and its acceleration factors in tooth movement.	To elucidate the history of corticotomy, its effects, mechanism of action, surgical act and indications.	90 articles were included in the review, whose search methodology was not informed by the author.	Although corticotomy is an invasive procedure, it increases the speed of tooth movement, reducing orthodontic treatment time.
Liou et al, 2011	Qualitative study, literature review, based on concepts about SFA and case reports establishing treatment guidelines.	To introduce the CSS concept, its advantages and establish protocols in model surgeries.	Twelve articles were used in the review, their search methodology was not reported. In the demonstrated cases some parameters were considered, such as: slight crowding, smooth spee curve, incisors with not very accentuated overjet.	Facial aesthetics and function are improved at the beginning of treatment. In addition, the phenomenon of postoperative acceleration in orthodontic movements is observed.
Liou et al, 2011	Prospective clinical study observing post-operative changes regarding orthodontic movement.	To study post-operative changes in physiology, bone metabolism and dentoalveolar changes that involve orthodontic movement.	The study included 22 patients who had undergone orthognathic surgery; they were assessed at one-week, second, third and fourth month postoperatively.	Tooth mobility and orthodontic movement increased significantly in the first three months. Period in which osteoblastic activities were elevated and dentoalveolar changes that possibly gave the fastest movement response.
Oueis et al, 2019	Qualitative and descriptive study, reporting the faces of a challenging treatment.	Highlighting challenging treatment and planning taking into account the unpredictability of certain treatments.	The study considered a patient with skeletal class II and biprotrusion, with deep bite and vertical maxillary excess..	The treatment was successful and according to the virtual planning. The patient's complaint was resolved at the end of treatment..

Pelo et al, 2017	Qualitative comparative study, assessing quality of life between patients treated with conventional protocol and patients treated with SFA.	Compare the approaches regarding quality of life and satisfaction of patients undergoing orthognathic surgery..	30 patients were evaluated, 15 in each approach were applied questionnaires for satisfaction evaluation in different moments of the treatment.	The treatment with the SFA showed an immediate improvement in the patient's quality of life. As well as in the patient's oral health. The orthodontic decompensation in patients submitted to the conventional protocol brings a worsening in the aesthetics and quality of life of patients.
Shah, Desmukh & Patil, 2017	Integrative review, qualitative study of revisional nature about the SFA.	To provide the scientific community with an overview of the SFA.	Twenty-two articles were used in the review, but the author did not specify the methodology used to search for them.	The total duration of treatment with the CSS was substantially shorter, in terms of occlusal relationship, the results were comparable to the conventional protocol, but with greater chances of relapse. In addition to accelerating postoperative orthodontics.
Sharma, Yadav & Tandon, 2017	Qualitative, longitudinal review study of the SFA.	Provide an overview of the approach, including indications, protocols, success rate and possible complications.	25 articles were included in the review, whose methodology and inclusion and exclusion criteria were not specifically informed by the author.	The SFA is positive, but it depends on the surgeon's skill and on the orthodontist's experience. Characteristics such as occlusal stability and treatment time depend on a good indication and case management.
Trauner & Obwegeser, 1957	Qualitative, descriptive and longitudinal study. To evaluate different types of osteotomies for nerve preservation.	To report and describe surgical techniques regarding orthognathic surgery, also considering genioplasty.	Human research at 02 different techniques created by the authors, which after continuous improvements were associated in a single technique.	The technique of bilateral sagittal osteotomy in the mandible has brought excellent results in mandibular movements and is considered a promising technique.
Uribe et al, 2015	A two-centre, retrospective clinical study of patients treated with the SFA.	Evaluate the duration of treatment and number of consultations of patients who underwent orthognathic surgery in SFA.	Sixty-six patients treated with SFA in different hospitals were evaluated and the characteristics of the treatment were observed as variables for the study.	SFA decreased the patients treatment time and was considered a positive approach. Factors such as the need for assisted maxillary expansion increase treatment time.
Uribe & Farrell, 2019	Qualitative study offering analysis on SFA, protocol for treatment and case report.	Explain indications for SFA, show and suggest protocol for treatment, report cases addressed with SFA.	The author used 15 articles in his review, but did not show his methodology.	The duration of treatment can be reduced in cases that do not require much postoperative orthodontic movement. Use of mini implants and miniplates allows the implementation of this technique in most dentofacial discrepancies.
Worms, Isaacson & Speidel, 1976	Qualitative, descriptive and longitudinal study.	To describe and suggest planning steps in orthognathic surgery in the mandible only, based on cephalometric analyses.	Descriptively and in detail reports the protocol defined by the author for planning orthognathic surgery.	He established orthodontic compensation protocol before surgical treatment as the gold standard, with great results reported.

Source: Authors.

3.1 Surgery-First Approach vs Conventional Orthognathic Surgery

The early benefit protocol in orthognathic surgery or surgery-first approach (SFA) has as its main idea the surgical approach before previous orthodontic preparation, in contrast to the idea of the traditional approach, which advocates preoperative orthodontic treatment. The objective of the surgical treatment of facial deformities is to restore aesthetics and function to the patient, factors that affect their interpersonal relationship and cause psychosocial problems in patients who have deformities in the development of the gnathic bones. In a conventional approach, the pre-surgical period can cause frustration in the patient who is submitted to a long orthodontic treatment that brings problems such as: decompensation of the dental elements that causes a worsening in the aesthetics of the smile and occlusal traumas greater than those previously reported by the patient. In addition to the foreseen situations, discomfort and the possible long postoperative orthodontic treatment can also be scored. Surgery-first seeks not only a complete and faster treatment, but also to alleviate this patient's discomfort and improve the patient's quality of life as soon as possible.

The indications for surgery-first are broad and this approach can be used to treat most skeletal discrepancies, taking advantage of a virtual precision planning with the orthodontist, there are excellent results and in a short period of time when compared to the conventional approach. (Choi & Lee, 2021) As it is a virtual simulation of postoperative orthodontic correction, the SFA could theoretically be applied to all surgical cases, however, clinically, we can find certain limitations regarding the indication of the technique that makes it infeasible. Mostly, we found applicability in the literature for the technique in class III patients. Uribe and Farrell (2019) established the following factors as indications (excluding any possibility of preoperative extraction): Patients without crowding or mild dental crowding; close to normal overjet and patients who have a favorable occlusal relationship after planning surgical movements. The authors' criteria were based on maintaining a good anteroposterior relationship of the dental arch, in order to reduce the postoperative orthodontic treatment.

The mentioned contraindications were based on the establishment of the final occlusion: Class II deformities have their limitations regarding the centric relation of occlusion, which will be an obstacle to be measured and balanced when adopting the protocol to be followed, especially in patients with severe overbite related that can cause a post-surgical anterior crossbite. Since condyle stabilization is a key factor and following this same reasoning, patients with TMD requiring joint treatment, patients with multiple missing teeth, severe horizontal asymmetry, severe crowding in maxillary incisors, maxillary second molars cause premature postoperative contact, very pronounced Spee curve and overjet become ineligible candidates for surgery-first due to postoperative occlusal instability, general factors that prevent adequate occlusal stability are contraindicated.

Several studies have shown that treatment time has been the most striking factor in the difference between the two approaches. A study with patients from three different regions showed that the average time of treatment with AFS is 10 months. (Uribe et al., 2015) A study carried out in the United Kingdom showed a mean total treatment time of 27 months in patients undergoing the conventional protocol. (Delgani, Fazeli & Sattarzadeh, 2017) Both studies considered a group of patients with different characteristics of malocclusion.

Kim, J.-Y., et al. (2020), established factors that affect treatment time in 50 class III patients, using three-dimensional computed tomography and scanned dental models of all patients. We selected 22 men and 28 women with a mean age of 22 years. Their results were compared to the control group which consisted of 175 patients who were treated with conventional therapy. All patients were treated with the same surgeon and orthodontist at Yonsei University Dental Hospital between 2011 and 2018. Study group treatments lasted an average of 16 months. The treatments in the control group lasted an average of 23.7 months. At the end of the study, preoperative characteristics that increase treatment time were established, such as: severe crowding (up to 23 months postoperatively), preoperative anterior open bite (up to 19 months postoperatively), need for extraction (Up to 25 months postoperatively). As well as in the postoperative period, features such as: Class III molar brace (Up to 23 months postoperatively), anterior open bite (Up to 18 months postoperatively), midline deviation (Up to 19 months postoperatively), bilateral posteriors without anterior contact (Up to 19 months postoperatively). Some patients showed a longer period of postoperative orthodontics due to their occlusal characteristics, in general, compared to the average duration of treatment in the conventional approach, a difference of approximately 8 months was observed between the approaches.

3.2 Benefits and Limitations

All goals in the preoperative orthodontic period through the traditional protocol of previous orthodontic treatment can be achieved through the surgery-first approach. The conventional protocol will move the teeth in a position that is counter-natural to the masticatory occlusion and initially destabilizes the MIH previously established in the patient. the end of the orthodontic movement procedure and during this period the new tooth position between the arches will bring an aesthetically unfavorable facial modification, moving the soft tissues and attenuating the decompensatory condition that the candidate for surgery is in.

The surgery-first protocol, however, aims precisely at considering the greatest aesthetic-functional benefits that bring greater patient satisfaction, solving their main initial complaint. (Choi & Lee, 2021) Postoperative orthodontic movement, unlike the traditional method, will stabilize the patient's occlusion and will not provoke an intensification of his unsightly situation. Another factor favorable to the choice of this protocol is the fact that studies indicate a faster movement regionally by the phenomenon of regional acceleration (RAP) using corticotomy, which consists of removing the cortical region of the bone which resists tooth movement more strongly and allows the bone to maintain good blood circulation and high potential for bone repair. (Lee et al., 2011; Ko et al., 2013; Lee, 2018; Liou et al., 2011)

Choi and Lee listed the following advantages when the indication is possible, and surgery-first is adopted:

- Post-surgical orthodontic direction: identical with natural compensation
- Possibility of a reduction in the total treatment time
- No need for an aggravated gross appearance during the pre-surgical orthodontic period
- Minimal disruption of the patient's social life
- Guided approach for the patient; early improvement in facial esthetics
- Efficient surgical/orthodontic schedule; enough postoperative time to manage skeletal and facial changes
- Early correction of sleep disorders.

The disadvantages pointed out by the same author regarding surgery-first were all observed from one of the application of a more traditional planning method using plaster models for the study and manufacture of splints and surgical guides, the disadvantages pointed out by the author are :

- Time consuming tooth configuration simulation for surgical occlusion
- More delicate surgical treatment goals and complicated procedures
- Need for accurate and experienced decision making on the possibility of SFA
- Complicated bending of the wire for the surgical arch
- Possible need for a period prolonged intermaxillary fixation
- Incomplete lip and facial profile immediately after surgery
- Chewing difficulties immediately after surgery due to incomplete occlusion.

Evaluating the points of discussion regarding the disadvantages of the technique, we observed that currently, when we associate the use of 3D technology with the CAD/CAM system, most of the disadvantages that arise from a more delicate and complex planning and surgical procedure are solved in a much simpler way. The development of surgical guides, cranio-maxillofacial study models and treatment predictability are millimetrically reliable tools for a surgical procedure with increasingly predictable postoperative periods, allowing us to reduce the disadvantages of surgery-first when associated with these technologies. (Hernández-Alfaro, et al., 2014)

Considering the treatment time, a benefit is the increase in the speed of post-surgery orthodontic movements, described by Liou, et al., (2011) whose principle is linked to the increase in osteoclastic activities caused by the osteotomy inherent to the surgery, as well as metabolic changes observed in the alveolus.

Pelo et al., (2017) compared the quality of life between patients who were treated with the surgery-first approach and patients treated with the conventional protocol. A total of 30 patients were evaluated, 15 in each methodology. At the end of the study, patients who were treated with surgery-first had the negative effects of the preoperative period minimized, unlike patients treated with the conventional protocol, they showed a worsening in quality of life in the period of preoperative orthodontics. ¹⁰

Adeni, M. K, et al., (2021), addressed the benefit of SFA in patients with established periodontal problems in a case report. The class II patient had a deep overbite, accentuated curve of Spee and an overjet greater than 10 mm, in addition to

crowding in the lower incisors. A periodontal examination was carried out with a periodontist, where the patient was properly probed, presented gingival recession in 31 teeth, multiple periodontal pockets, grade 1 mobility in all lower incisors, clinical attachment loss of 7 mm in 31 teeth, soon after a radiography was indicated. panoramic view, where alveolar bone loss was observed that was in the middle third of the root of all teeth. The patient was operated on 43 days after the initial evaluation, without any pre-surgical orthodontic treatment, as it could worsen the patient's periodontitis. The treatment involved the extraction of four premolars from the patient during the operation, subapical osteotomy in the mandible with the aim of accelerating orthodontic movement, impaction of 4 mm and 6 mm setback in the maxilla. The treatment lasted 11 months in its entirety, at the end of which a stable occlusion was obtained without worsening the patient's periodontal condition, which in a 1-year follow-up was diagnosed as a healthy periodontium. In one report, the patient declared a significant improvement in her quality of life and self-esteem after AFS.

As much as the surgery-first technique can theoretically be applied to all types of malocclusions, we noticed a higher prevalence in the literature of successful clinical cases in class III malocclusions. This is due to the greater difficulty in obtaining occlusal stability in class II patients, who have greater limitations in relation to stable occlusion after surgery, changing the management of the case and possibly increasing the treatment time. (Oueis et al., 2019)

3.3 Stability after Surgery-First Approach

Several studies have been produced with the aim of comparing the stability of the surgery-first protocol with the conventional technique, the comparison of cephalometric studies and the angles and reference points of groups approached by the different techniques have confirmed the reliability of the surgery-first protocol approach, since the results are similar between the two groups.

In a large-scale study conducted in Korea, Jung et al. (2019) It is confirmed through the comparison of class III patients who underwent the conventional protocol and another group that underwent the surgery-first protocol, that the occlusal stability of these patients in the long term is similar between the results of the techniques in the immediate postoperative period and long-term.

Several other comparative studies of cephalometric measurements have concluded that the instability factors in SFA are a very pronounced overjet, very deep curve of Spee, and a very severe negative overjet. (Kim et al., 2020; Ko et al., 2011; Jeong et al., 2017)

4. Discussion

Of the several disadvantages presented by different authors in the literature, most of them can be alleviated with the application of virtual planning technologies and three-dimensional reconstruction of models and surgical guides. The virtual planning time and the reliability and accuracy it provides allow us to perform the surgery in a simpler and safer way, obtaining results similar to those expected from a digital forecast. There is some divergence in the literature regarding the correct indication of this approach, although most of the literature presents cases of approaches with this protocol in class III patients, other studies provide sufficient clinical evidence for the approach of different more complex cases of decompensation and facial asymmetry, such as class II, diverging from a more conservative ideal already established in the literature.

Postoperative stability is similar in both patients treated by the conventional method as with the surgery-first method, however in cases that present possible contraindications due to post-surgical occlusal instability, it is up to the surgeon to balance the risk-benefit when adopting the technique, since it can even in more complex cases present itself as the best prognosis for the patient in several aspects. Another topic that presents itself as a discussion throughout the literature is about the reduced treatment

time, which is very discrepant in several articles, since it is not an exact science and different organisms react in different ways, even so most of them of the cases present a considerable reduction in the total treatment time, evidencing this benefit. (Hernández-Alfaro, et al., 2014)

5. Conclusion

The Early Benefit or Surgery-first Approach (SFA) protocol without preoperative orthodontic treatment proved to be a positive approach when related to treatment time, patient quality of life, time of post-surgical orthodontics and occlusal stability. Overall, the SFA achieved optimal results comparable to the conventional protocol regarding treatment success. Therefore, using surgery-first approach is safe and of great value to the patient and professionals when well indicated and correctly approached based on its benefits and indications reported in this article.

Future studies need to be carried out in order to systematically compare and in the long term to evaluate the quantitative and qualitative results, with the use of digital flow and CAD/CAM systems that make room for more precise and predictable surgeries, in order to evaluate and standardize the protocols. for each case reaching higher percentages of success in measurable and subjective parameters

References

- Adeni, M. K., Sanjana, M., Khan, N., Vijayalakshmi, D., Parameswaran, R., & Parameswaran, A. (2021). Surgery-First Approach: A Boon for Periodontally Compromised Patients - A Case Report. *Annals of maxillofacial surgery*, 11(2), 344–348. https://doi.org/10.4103/ams.ams_436_20
- Bell, W. H., & Creekmore, T. D. (1973). Surgical-orthodontic correction of mandibular prognathism. *American journal of orthodontics*, 63(3), 256–270. [https://doi.org/10.1016/0002-9416\(73\)90351-5](https://doi.org/10.1016/0002-9416(73)90351-5)
- Choi, J. W., & Lee, J. Y. (2021). Current concept of the surgery-first orthognathic approach. *Archives of plastic surgery*, 48(2), 199–207. <https://doi.org/10.5999/aps.2020.01305>
- Dehghani, M., Fazeli, F., & Sattarzadeh, A. P. (2017). Efficiency and Duration of Orthodontic/Orthognathic Surgery Treatment. *The Journal of craniofacial surgery*, 28(8), 1997–2000. <https://doi.org/10.1097/SCS.000000000000416511>.
- Hernández-Alfaro, F., Guijarro-Martínez, R., & Peiró-Guijarro, M. A. (2014). Surgery first in orthognathic surgery: what have we learned? A comprehensive workflow based on 45 consecutive cases. *Journal of oral and maxillofacial surgery : official journal of the American Association of Oral and Maxillofacial Surgeons*, 72(2), 376–390. <https://doi.org/10.1016/j.joms.2013.08.01319>.
- Jeong, W. S., Lee, J. Y., & Choi, J. W. (2017). Large-Scale Study of Long-Term Anteroposterior Stability in a Surgery-First Orthognathic Approach Without Presurgical Orthodontic Treatment. *The Journal of craniofacial surgery*, 28(8), 2016–2020. <https://doi.org/10.1097/SCS.00000000000003853>
- Kim, J. Y., Park, J. H., Jung, H. D., & Jung, Y. S. (2020). Factors Affecting Total Treatment Time in Patients Treated with Orthognathic Surgery Using the Surgery-First Approach: Multivariable Analysis Using 3D CT and Scanned Dental Casts. *Journal of clinical medicine*, 9(3), 641. <https://doi.org/10.3390/jcm9030641>
- Ko, E. W., Hsu, S. S., Hsieh, H. Y., Wang, Y. C., Huang, C. S., & Chen, Y. R. (2011). Comparison of progressive cephalometric changes and postsurgical stability of skeletal Class III correction with and without presurgical orthodontic treatment. *Journal of oral and maxillofacial surgery : official journal of the American Association of Oral and Maxillofacial Surgeons*, 69(5), 1469–1477. <https://doi.org/10.1016/j.joms.2010.07.022>
- Ko, E. W., Lin, S. C., Chen, Y. R., & Huang, C. S. (2013). Skeletal and dental variables related to the stability of orthognathic surgery in skeletal Class III malocclusion with a surgery-first approach. *Journal of oral and maxillofacial surgery : official journal of the American Association of Oral and Maxillofacial Surgeons*, 71(5), e215–e223. <https://doi.org/10.1016/j.joms.2012.12.025>
- Lee W. (2018). Corticotomy for orthodontic tooth movement. *Journal of the Korean Association of Oral and Maxillofacial Surgeons*, 44(6), 251–258. <https://doi.org/10.5125/jkaoms.2018.44.6.251>
- Liou, E. J., Chen, P. H., Wang, Y. C., Yu, C. C., Huang, C. S., & Chen, Y. R. (2011). Surgery-first accelerated orthognathic surgery: orthodontic guidelines and setup for model surgery. *Journal of oral and maxillofacial surgery : official journal of the American Association of Oral and Maxillofacial Surgeons*, 69(3), 771–780. <https://doi.org/10.1016/j.joms.2010.11.011>
- Liou, E. J., Chen, P. H., Wang, Y. C., Yu, C. C., Huang, C. S., & Chen, Y. R. (2011). Surgery-first accelerated orthognathic surgery: postoperative rapid orthodontic tooth movement. *Journal of oral and maxillofacial surgery : official journal of the American Association of Oral and Maxillofacial Surgeons*, 69(3), 781–785. <https://doi.org/10.1016/j.joms.2010.10.035>
- Oueis, R., Waite, P. D., Wang, J., & Kau, C. H. (2020). Orthodontic-Orthognathic Management of a patient with skeletal class II with bimaxillary protrusion, complicated by vertical maxillary excess: A multi-faceted case report of difficult treatment management issues. *International orthodontics*, 18(1), 178–190.

<https://doi.org/10.1016/j.ortho.2019.09.002>

Pelo, S., Gasparini, G., Garagiola, U., Cordaro, M., Di Nardo, F., Staderini, E., Patini, R., de Angelis, P., D'Amato, G., Saponaro, G., & Moro, A. (2017). Surgery-first orthognathic approach vs traditional orthognathic approach: Oral health-related quality of life assessed with 2 questionnaires. *American journal of orthodontics and dentofacial orthopedics : official publication of the American Association of Orthodontists, its constituent societies, and the American Board of Orthodontics*, 152(2), 250–254. <https://doi.org/10.1016/j.ajodo.2016.12.022>

Shah, Y. A., Deshmukh, S. V., & Patil, A. S. (2017). Surgery-first Approach. *World J Dent* 8 (4):343-350. <https://10.5005/jp-journals-10015-1462>

Sharma, V. K., Yadav, K., & Tandon, P. (2015). An overview of surgery-first approach: Recent advances in orthognathic surgery. *Journal of orthodontic science*, 4(1), 9–12. <https://doi.org/10.4103/2278-0203.149609>

Trauner, R., & Obwegeser, H. (1957). The surgical correction of mandibular prognathism and retrognathia with consideration of genioplasty. I. Surgical procedures to correct mandibular prognathism and reshaping of the chin. *Oral surgery, oral medicine, and oral pathology*. 10(7), 677-689. [https://doi.org/10.1016/s0030-4220\(57\)80063-2](https://doi.org/10.1016/s0030-4220(57)80063-2)

Uribe, F., Adabi, S., Janakiraman, N., Allareddy, V., Steinbacher, D., Shafer, D., & Villegas, C. (2015). Treatment duration and factors associated with the surgery-first approach: a two-center study. *Progress in orthodontics*, 16, 29. <https://doi.org/10.1186/s40510-015-0101-1>

Uribe, F. A., & Farrell, B. (2020). Surgery-First Approach in the Orthognathic Patient. *Oral and maxillofacial surgery clinics of North America*, 32(1), 89–103. <https://doi.org/10.1016/j.coms.2019.08.009>

Worms, F. W., Isaacson, R. J., & Speidel, T. M. (1976). Surgical orthodontic treatment planning: profile analysis and mandibular surgery. *The Angle orthodontist*, 46(1), 1–25. [https://doi.org/10.1043/0003-3219\(1976\)046<0001:SOTPPA>2.0.CO;2](https://doi.org/10.1043/0003-3219(1976)046<0001:SOTPPA>2.0.CO;2)