

The Surgery-First Orthognathic Approach

With discussion of occlusal
plane-altering orthognathic
surgery

Jong-Woo Choi
Jang Yeol Lee



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plane-altering orthognathic surgery

Jong-Woo Choi
Department of Plastic Surgery
Asan Medical Center
Seoul
Korea (Republic of)

Jang Yeol Lee
SmileAgain Orthodontic Center
Seoul
Korea (Republic of)

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Preface

The surgery-first approach (SFA) or the surgery-first orthognathic approach (SFOA) can be defined as an approach based on going directly to orthognathic surgery without presurgical orthodontic treatment, which used to be a pre-requisite for traditional orthognathic surgery. Therefore, SFA is a concept that is not only challenging the status quo but is also a new paradigm in craniomaxillofacial surgery.

In the early 2000s, some Korean orthodontists started the modern concept of surgery-first approach under the name of functional orthognathic surgery which means that postsurgical orthodontic treatment could be more effective and functional compared to presurgical orthodontic treatment. And they had already published the surgery-first concept in *The Korean Journal of Clinical Orthodontics*. This article clearly addressed and described the surgery-first orthognathic approach without presurgical orthodontic treatment, which is the fundamental basic concept underlying our current surgery-first approach.

I have cooperated with this orthodontic group since 2006 for the surgery-first approach and found out the surgery-first approach could work very well in many cases. Now that we could get the clinical results in our practice consistently for the last 15 years and have proved the efficacy and validity based on numerous SCI articles, I, JW Choi, and my partner orthodontist, JY Lee, thought that it is time for writing a book in order to share our clinical experiences and knowledge about our surgery-first approach. This book is the result of our hard work and essence of our collaboration for the last 2 years for completing this book.

Regardless of the specialty, we hope this book will help the surgeon and orthodontist understand the modern surgery-first approach and be able to apply this concept to their clinical practice, which would be not only a very effective tool but also a paradigm shift in orthognathic surgery.

Finally, as a surgeon, I am very grateful that my teachers, BY Park, DH Lew, and YO Kim, who guided me to the world of craniofacial surgery. In addition, I thank YR Chen, Philip Chen, LJ Lou, Sabine Girod, NC Gellrich, and Eduardo Rodriguez who helped me learn the updated techniques in craniofacial and orthognathic surgery. Lastly, I appreciate the consistent support of KS Koh and JP Hong as mentors in my life. Without all of them, I would not be what I am now.

As an orthodontist, I am extending my sincere appreciation in memory of Dr. William R. Proffit's enthusiasm for making the cornerstone of surgical orthodontics. And I would like to express my deep gratitude to Dr. HS Baik,

who has given me the philosophy of treating patients with surgery, and Dr. YC Park, who has played a pioneering role in TADs and taught me. Also, I am grateful to professors of the Department of Orthodontics at Yonsei University and Dr. KJ Kim and Dr. TK Kim.

Seoul, Korea (Republic of)

Seoul, Korea (Republic of)

Jong-Woo Choi

Jang Yeol Lee

Abstract

Traditional orthognathic surgery, which consists of presurgical orthodontics, orthognathic surgery and postsurgical orthodontics, was introduced by Dr. Hugo Obwegeser in the 1960s. Since the early 2000s, we have actively applied a surgery-first orthognathic approach without presurgical orthodontic treatment, based on a novel presurgical simulation process using a dental model up until now. The surgery-first orthognathic approach, which is recently getting popularized worldwide, does not simply involve ‘skipping’ the presurgical orthodontic treatment. We believe it requires the modern diagnostic strategy and the sophisticated simulation methods followed by precise orthognathic surgery and preplanned postsurgical orthodontic treatment. For successful management of the various dentofacial deformities, the integrated consistent strategy throughout the whole process is essential.

According to our 20 years’ experience and research in surgery-first orthognathic approach, it has proved very effective in treating many patients. In addition, the total treatment time was considerably less with the surgery-first orthognathic approach.

Despite evidence that surgery-first approach is effective and has its advantages, the craniomaxillofacial surgeon employing the traditional orthognathic approach may find it difficult to change the methodology. To help the traditional orthognathic surgeon make sense of this new approach, this book addresses our concept, our novel simulation methods, orthognathic surgery itself, postsurgical orthodontic treatment and surgical outcomes based on our 20 years’ experience and investigations including the details.

Now that we are convinced that surgery-first approach could be a paradigm shift, we hope this book could contribute to the advances of modern orthognathic surgery.

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About the Author



Jong-Woo Choi, MD, PhD, MMM Dr. Jong-Woo Choi (J.W. Choi) was born in 1970 and raised in Seoul, South Korea. He earned a MD degree from Yonsei University in 1996. He pursued Plastic and Reconstructive Surgery training at Severance Medical Center/Yonsei College of Medicine in Seoul and completed his residency. He continued on to the Medical College of Ulsan where he earned his PhD degree. He got the Master of Medical Management (MMM) degree in Marshall School of Business, University of Southern California (USC), US. He is a cranio-

maxillofacial surgeon and microsurgeon and professor & chair of plastic & reconstructive surgery in Seoul Asan Medical Center.

His career goal is to contribute to restore the patients' deformities and heal the patients with craniomaxillofacial surgery and microsurgery. To combine the craniofacial surgery and microsurgery has positioned himself to take on the most difficult reconstruction cases. He is recognized among international peers for his pioneering works on orthognathic surgery and craniofacial surgery such as surgery-first orthognathic surgery without presurgical orthodontic treatment, one-piece cranioplasty without Bandeau based on numerous SCI articles. In addition, he has also performed more than 1,200 cases of microsurgical head and neck reconstructions such as dynamic tongue and pharynx reconstruction using various perforator flaps. He also spends a great deal of time in research. His area of research is in bone regeneration using BMP-2, 3D printing scaffold and stem cells including computer simulation and 3D printing technology.

He has participated in writing my books and the chapters including "Asian facial cosmetic surgery" of the new 1st, 2nd Edition Plastic Surgery Textbook authored by Peter Neligan. He has received numerous awards from the Korean Society of Plastic and Reconstructive Surgery (KSPRS). Between 2005 and 2010, he received the best paper awards 5 times from KSPRS. And he was selected as a "Young Plastic Surgeon of the Year" in 2008. He has been participating more than 10 international meetings a year as a lecturer.

He was a international fellow of AOCMFS in Hanover, Germany under N.C. Gellrich and a visiting professor in department of plastic surgery in Stanford university, Shock Trauma Center, University of Maryland and MD

Anderson Medical Center between 2011 and 2012 with Sabine Girod, Eduardo Rodriguez and David Chang.

He played a role as a Secretary General of International Society of Simulation Surgery (ISSIS). He is simultaneously serving and served as directors of scientific committees in 3 major societies of craniomaxillofacial surgery in Korea such as Korean society of Plastic and Reconstructive Sugeons (KSPRS), Korean Cleft palate and Craniofacial Associations (KCPCA) and Korean Society of Simulation Surgery (KSSIS).

He is the current chair of Department of Plastic & Reconstructive surgery, Asan Medical Center, South Korea, which is the biggest hospital in South Korea. In addition, he is the editorial board in Plastic & Reconstructive Surgery, Annals of Plastic Surgery, Journal of Craniofacial surgery and Archives of Aesthetic plastic surgery. He is a current craniofacial section editor of Archives of Plastic Surgery.



Jang Yeol Lee, DDS, MSD, PhD Dr. Lee was born and raised in Seoul, South Korea, and he received his dental degree (DDS) from Yonsei University in Seoul, Korea, in 1995 and earned his master's and PhD degrees in the same school. He completed internship and orthodontic residency at Yonsei University, Seoul, Korea, from 1995 to 1999. He is currently director of the Smileagain Orthodontic Center in Seoul, Korea, and Clinical Professor at the Department of Orthodontics of Yonsei University and Sungkyunkwan University, Seoul, Korea, and Clinical Professor at the Department of Plastic

and Reconstructive Surgery, Seoul Asan Medical Center, Ulsan University, Seoul, Korea.

He was an Associate Fellow of School of Dentistry at the University of Warwick, UK. Dr. Lee is also a visiting scholar in the Department of Orthodontics, School of Dentistry at the University of North Carolina, USA, and University of California at Los Angeles, USA.

Dr. Lee has treated many adult orthodontic patients focusing on aesthetics, and he is one of the pioneer clinicians of surgery-first approach having over 15 years' clinical experience. Dr. Lee has been invited and has given many lectures on various topics about mini-screw orthodontics, surgical orthodontics with surgery-first approach, and lingual orthodontics over the last 15 years over the world. He has also organized clinical courses in many countries such as the USA, the UK, Germany, Japan, Australia, Mexico, Singapore, China, and Morocco. He has participated in writing SCI articles and chapters in textbooks.

Since 2008, he has served as a member of the Board of Trustees of the Korean Association of Orthodontists. He has held a position of Secretary General of the World Implant Orthodontic Association (WIOA), and currently, he is advisory board member of WIOA.

History and Evolution of the Surgery-First Approach

1

Orthodontic and orthognathic surgical treatments are provided to patients who suffer from dentofacial deformities. These deformities not only result in malocclusions but also affect the facial profile. Therefore, surgeons and orthodontists should simultaneously consider both the facial profile and the bite occlusion to achieve the ideal correction. They also must determine the best solution for each individual patient (Fig. 1.1). Although the restoration of bite occlusion should be the fundamental basis of orthognathic surgery and orthodontic treatment, there is also a current focus on the patient's facial profile. Regarding the orthognathic profile, dentofacial deformity could be categorized into concave and convex profile. Then, its growth pattern could be subcategorized into anterior and posterior divergent profile. Based on the individual patient's profile and occlusal status, the best option for the orthognathic surgery should be determined.

The surgery-first approach (SFA) or the surgery-first orthognathic approach (SFOA) is defined as orthognathic surgery without the pre-surgical orthodontic treatment that was, traditionally, a prerequisite to orthognathic surgery. Therefore, SFA is a concept that not only challenges the status quo but also is a new paradigm in craniofacial surgery. Traditionally, to overcome postoperative occlusal instability, presurgical orthodontic treatment was deemed to be essential for achieving successful, long-term orthognathic procedure outcomes [1]. However, since the

original cause of the dentofacial deformity is a skeletal discrepancy, orthognathic surgery should be used for correction. I agree with this expression by Dr. YuRay Chen about the concept of SFA. Thus, why would the skeletal discrepancy, the fundamental etiology of the dentofacial deformity, not be corrected first? Such an approach seems rational and logical. However, a question remains regarding how to overcome the postoperative occlusal instability. Generally, there are three approaches to solving this obstacle.

First, South Korean groups often make use of the fact that the SFA direction is the same as the postsurgical orthodontic treatment [2]. Second, some Japanese groups depend on the active use of pre- and postoperative tooth management, including cusp grinding and mini screw use [3]. Third, Taiwanese groups have recommended SFA, based on the regional accelerated phenomenon (RAP), using corticotomies [4]. It seems like that each group developed the surgery first approach with a little different concept.

Although there is some controversy regarding who first suggested the SFA concept, a literature search for the original paper suggests that South Korean authors wrote most of the early papers. In 2002, Korean orthodontists (the "Smile Again Orthodontic Group") published the SFA in a "The Korean journal of clinical orthodontics", calling the procedure "functional orthognathic surgery" (Fig. 1.2). In this article, the authors

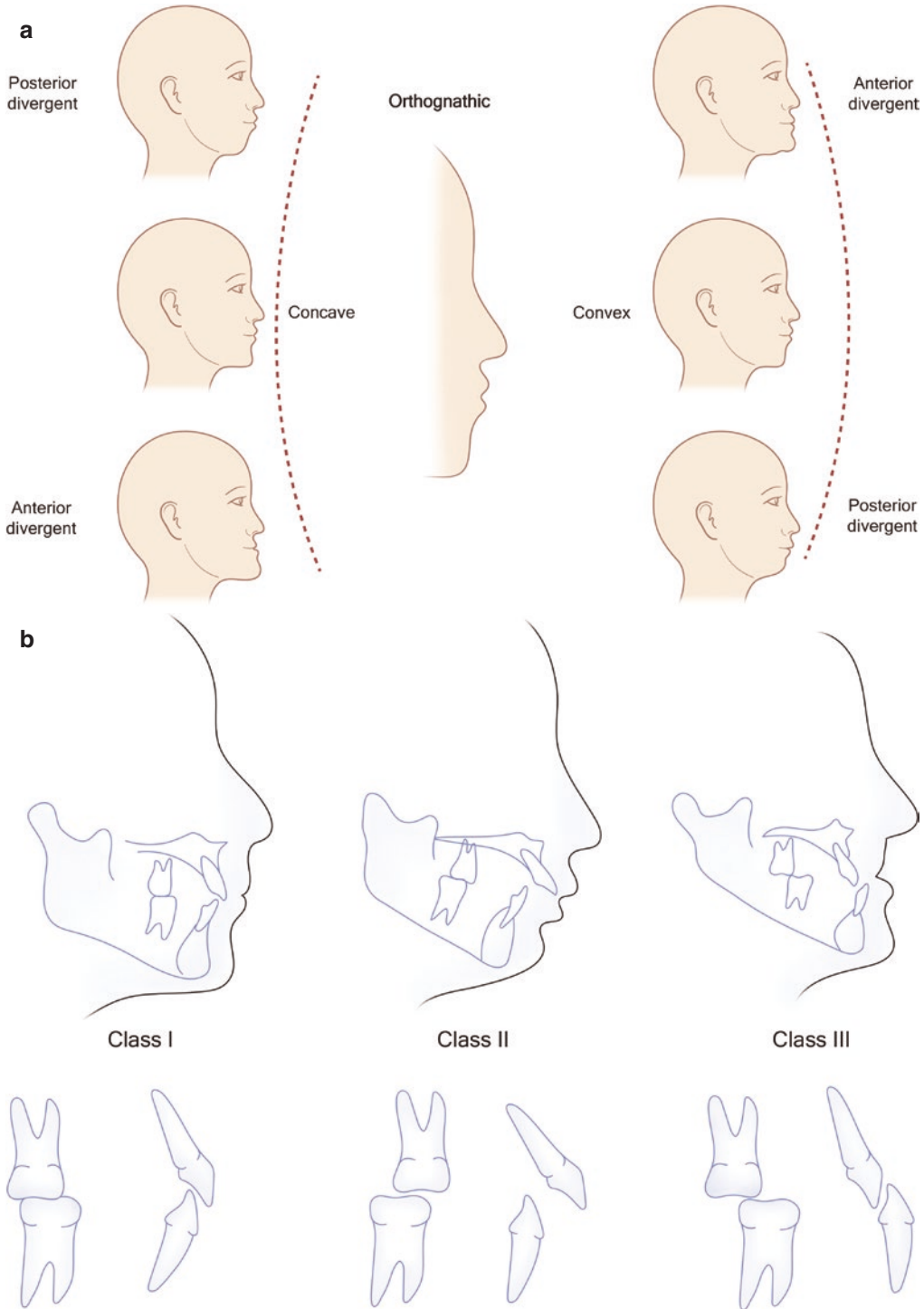


Fig. 1.1 Differential diagnosis of a dentofacial deformity, based on the facial profile as it relates to occlusion and the facial skeleton. **(a)** Not only maxillomandibular relationship but also anterior and posterior facial heights determine the facial divergence. **(b)** Occlusion directly influences facial profile. But, the degree of change in terms of facial profile could be camouflaged with the natu-

ral dental compensation. **(c)** Occlusal plane angle can also change the facial profile enormously while maintaining the same occlusal relationship. Therefore, the surgeon and orthodontist should observe not only the occlusion, but also the facial divergence including the occlusal plane. Each patient requires an individualized treatment planning

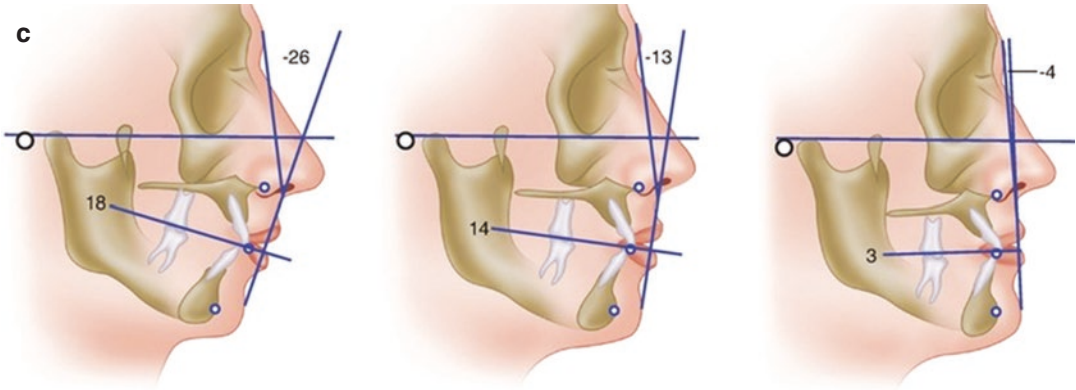


Fig. 1.1 (continued)

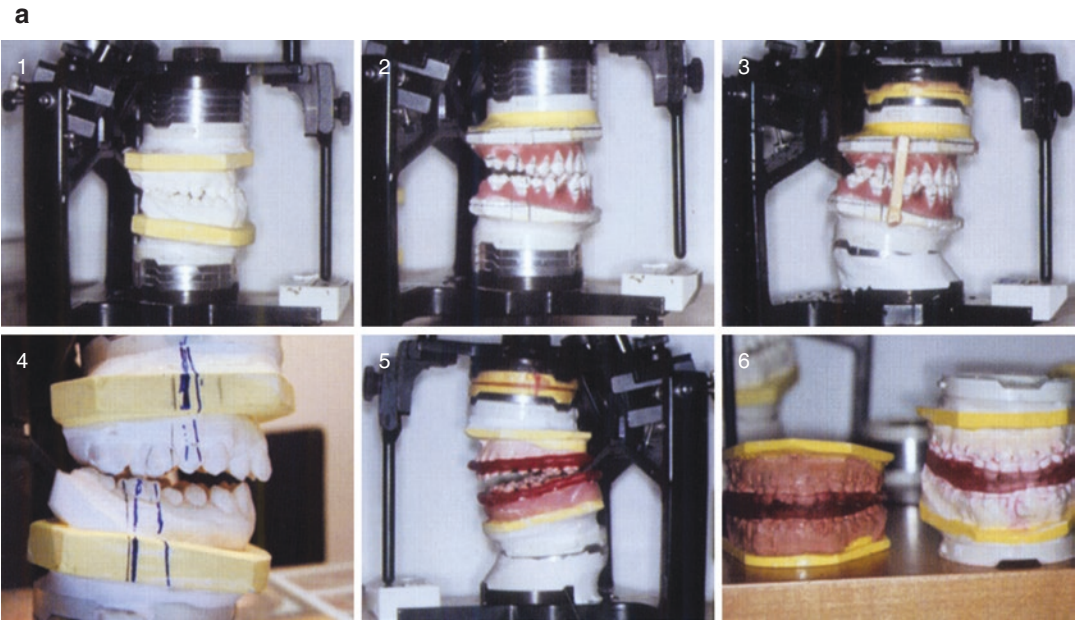


Fig. 1.2 A depiction of the fundamental concept behind the surgery-first orthognathic approach. This dental model shows the surgery-first concept, involving the separation of the teeth to mimic presurgical orthodontic treatment. The

dental model describes the surgery-first orthognathic approach without presurgical orthodontic treatment. CO Oh, HB Son. Functional Orthognathic Surgery (1). The Korean Journal of Clinical Orthodontics. 2002;1(1):32–39

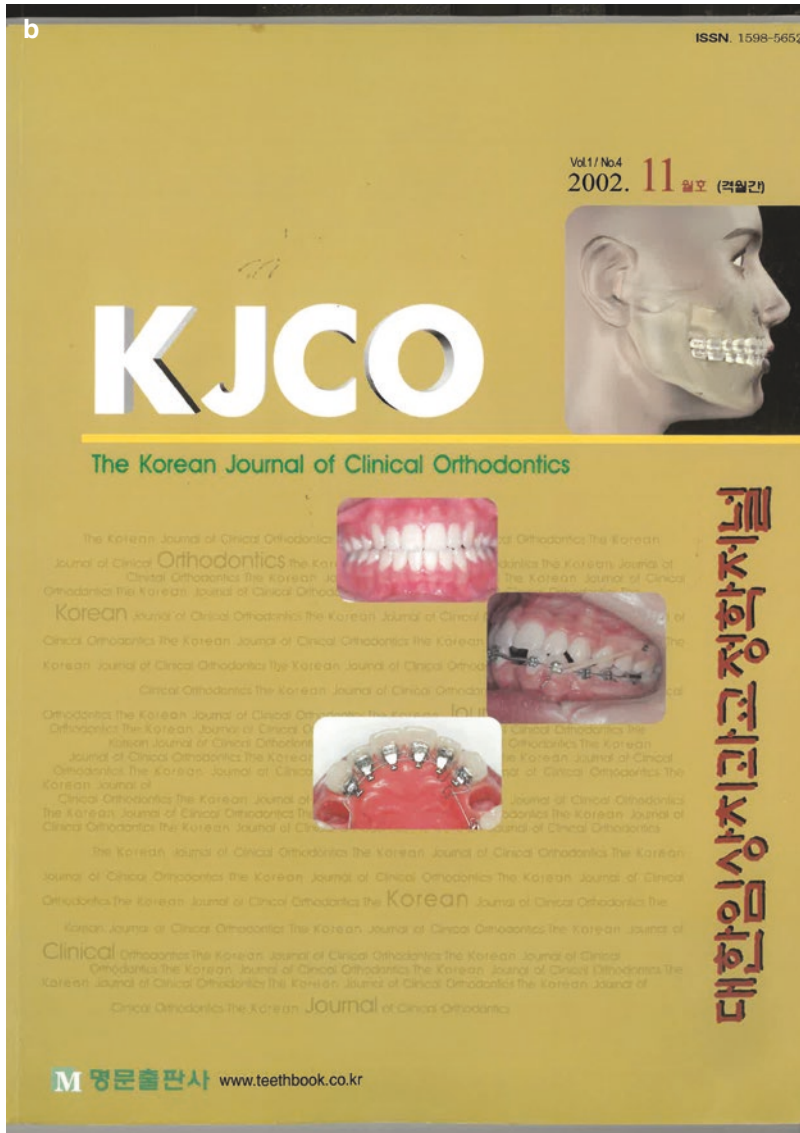


Fig. 1.2 (continued)

c

FOS (Functional Orthognathic Surgery) (1)

Functional Orthognathic Surgery란



그림 4. FOS 의 수술후 교합

수술 전 교정 없이 바로 수술한 골격성 III 급 부정 교합 환자의 수술 후 2주 모습으로, 교합의 안정성이 없는 불안정하게 보이는 모습을 보인다. 그러나 자세히 살펴보면 surgical wafer를 끼고 있는 2주 기간 동안에, 새로운 골격 환경에 대한 치아의 적응으로 구치부 교합 관계가 개선 되고 있음을 볼 수 있다.

그러나 현재 임상에서 얻을 수 있는 3차원 자료인 석고 모형과 악골의 운동을 재현할 수 있는 교합기, 그리고 기존의 치료 경험과 모든 진단 자료를 이용하고, 악 교정 수술 및 수술전 교정을 미리 가상으로 치아 모형의 set up을 통하여 simulation한 후,

현재 환자의 상 하악골 모형과 교환 하여, 수술 후 치료가 완료된 시점의 악골의 위치를 찾을 수 있을은 물론이고, 그 악골의 위치에서 치료 받지않은 교합의 위치, 즉 수술을 위한 교합 관계(surgical occlusion)를 얻을 수 있게 되었다.



치료 전 환자의 구강내 사진



그림 5. FOS, 모의 교정 및 수술을 통해 얻은 수술을 위한 교합관계
기존에 먼저 수술을 하거나 수술 전 교정 중에 수술 할 경우와 비교 했을 때 일반적으로 생각 하기 쉬운, 전치 부 overbite 의 양이나 구치부 교합 관계와는 다른 느낌을 받게된다.

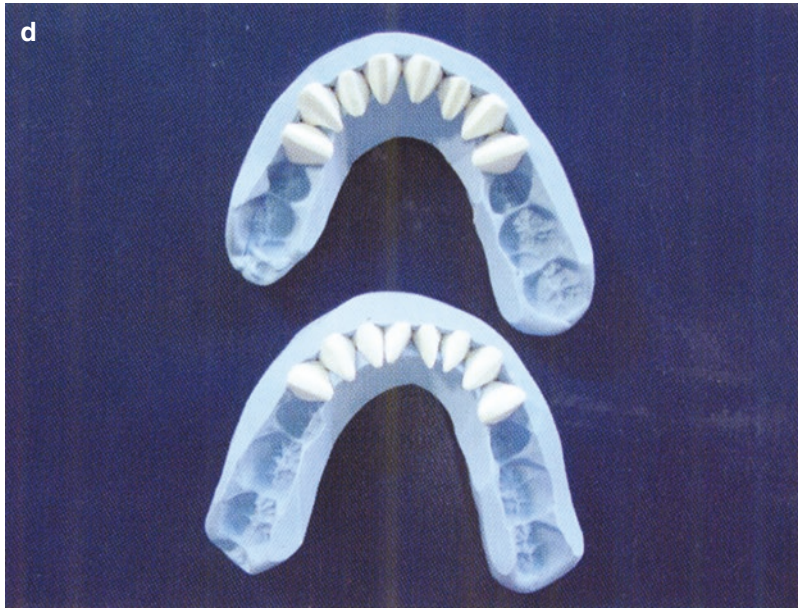


Fig. 1.2 (continued)

clearly addressed and described SFA, without presurgical orthodontic treatment; this would be the fundamental concept behind modern SFA from my understanding.

The authors of the 2002 study insisted that SFOA, without presurgical orthodontic treatment, was possible, based on the novel, mock dental surgery that included mimicking the presurgical orthodontic treatment process for separating the teeth. The article already showed several very successful surgical clinical outcomes using the SFA concept. Korean orthodontic groups, such as the Smile Again Orthodontic Center, started using SFA in 2001, and our institution, cooperating with the Smile Again Orthodontic Group, started using SFA in 2007. Our group has suggested SFA concepts and demonstrated clinical SFA outcomes, based on feasibility testing with mock SFA dental surgeries, in multiple publications.

This balance of this chapter will address the current SFA concept, discuss the controversial issues found in the current literature, and describe our 15 years of clinical experience with SFA.

1.1 Definition and Evolution of SFA

SFA is an orthognathic approach that consists of orthognathic surgery and postsurgical orthodontic treatment, in the absence of presurgical orthodontic treatment [5]. This procedure is regarded as a paradigm shift from the traditional orthognathic approach. In the past, some orthognathic surgeries were performed without proper presurgical orthodontic treatment (Fig. 1.3). This occurred before the establishment of the traditional protocol that involves 12–18 months of



Fig. 1.3 The traditional orthognathic approach requires presurgical orthodontic treatment, such as leveling, decompensation, and arch coordination, as shown in the top series of panels. Unlike in the traditional approach, decompensation of the lower and upper teeth is not performed, preoperatively, in the surgery-first approach (SFA). Thus, SFA inevitably leads to a predesigned

malocclusion status that is corrected during the postsurgical orthodontic treatment. The direction of the natural dental compensation is the same as that in the postsurgical orthodontic treatment. The evolution of the use in the miniscrew plays an important role in the rapid and effective correction of the postoperative occlusal instability

presurgical orthodontic treatment, followed by the orthognathic surgery and 6–12 months of postsurgical orthodontic treatment [6]. However, this approach cannot be regarded as SFA in keeping with the modern SFA concept. Despite some controversies, the first paper describing SFA was published, in 2002, in the *Korean*

Journal of Clinical Orthodontics (1(1): 32–39, 2002). This article addressed the modern concept of SFA, referred to as “functional orthognathic surgery.” The procedure was described as consisting of orthognathic surgery followed by postsurgical orthodontic treatment, without any presurgical orthodontic treatment; the procedure

was based on novel laboratory work. When it comes to our concept of SFA, the laboratory work of ours does not mean the simple estimation of the occlusion with presurgical orthodontics, but includes the novel process where the each teeth, separated from the dental model, were simulated. The clinical cases included in the article involved separation of the teeth, using a dental model to simulate the immediate postsurgical occlusal status, without presurgical orthodontic treatment. The model simulation of the teeth allows the surgeon or orthodontist to recreate the surgery-first status and skip the traditional presurgical orthodontic treatment. This approach remains the fundamental basis of clinical SFA applications in our practice.

1.2 Benefits and Drawbacks of SFA (Fig. 1.5 and Fig. 1.6)

The starting point of the concept of surgery-first approach is the concept of correcting the skeletal abnormality that provides the cause first, and then correcting the positional abnormality of the tooth, which is a symptom of the skeletal abnormality. Therefore, the tooth movement after surgery is a fast and natural in the forward direction by adapting the teeth to the surrounding muscles or functions and the new corrected skeletal position. In addition, from the patient's point of view, there is a great advantage in that it is possible to quickly return to social life by improving facial appearance earlier. However, since this technique requires a completely different preparation and process from the way we have been doing for a long time, additional efforts are required from the perspective of doctors. The advantage and disadvantage of surgery-first approach can be summarized as follows.

1. Advantages

1. Direction of the postsurgical orthodontics is the same as the natural compensation.
2. Possibility of reduced total treatment time.

3. No need for aggravated gross appearance during presurgical orthodontic period.
4. Minimal disturbance of patient's social life.
5. Patient-oriented approach; early improvement of facial esthetics.
6. Efficient surgical-orthodontic timetable; sufficient postoperative time to manage skeletal and facial changes.
7. Early correction of sleep disorders.

The goals of preoperative orthodontics for orthognathic surgery patients are:

- Elimination or reduction of dental compensation due to skeletal discrepancies.
- Horizontal and vertical positioning of the anterior teeth, canine, and posterior teeth.
- Establishment of an arch form coordinating with each jaw.
- Alignment for irregularities of the teeth.

Tooth movements during preoperative orthodontics occur in a direction opposite to the functional compensation and result in adverse effects to the surrounding soft tissue during decompensation; it can also prolong the period of preoperative orthodontic treatment. For the patient, the movement can worsen facial esthetics, increase patient discomfort, and worsen the functional disturbance, limiting dental compensation (Fig. 1.4). Conversely, during SFA, the direction of the postoperative dental decompensation is the same as in the dental and muscle adaptation to the new, surrounding skeletal structures.

This is one of the main reasons for shortening the total SFA treatment time. Another factor affecting treatment time is the regional accelerated phenomenon (RAP), which can be maximized after surgery. This phenomenon might be controversial after a certain postoperative period; however, tooth movement can be accelerated during the early

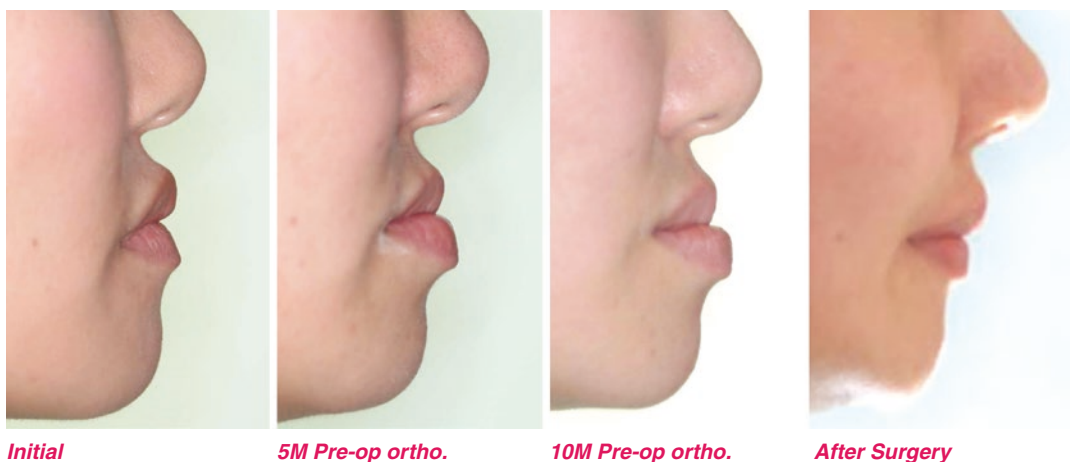


Fig. 1.4 Changes in the facial profile of a patient with a Class III dentofacial deformity during traditional orthognathic surgery (presurgical orthodontic treatment, orthognathic surgery, and postsurgical orthodontic treatment). During the traditional approach, the patient inevitably suf-

fers an aggravated facial appearance during the presurgical orthodontic treatment that requires dental decompensation, such as a labial version of the lower incisor and a lingual version of the upper incisor

postoperative period. SFA also avoids aggravating the patient's gross appearance during presurgical orthodontic treatment. Thus, this procedure can fulfill patient demands for early improvements in facial esthetics and can minimize social life disturbances. For orthodontist, the time to observe postoperative bone healing and bone segment changes are increased, providing more latitude for handling possible postoperative skeletal relapses.

2. Disadvantages

1. Simulation of postsurgical occlusion is time consuming.
2. More delicate and complicated short-term orthodontic procedures.
3. Requires accurate and experienced decisions.
4. Complicated bending of the surgical arch wires.
5. No opportunity to extract third molars, preoperatively.
6. Needs possible extended intermaxillary bony fixation period.
7. Incomplete lip and facial profile immediately after surgery.
8. Chewing difficulties, immediately after surgery, due to incomplete occlusion.

Establishing of the surgical occlusion in surgery-first approach will be mentioned in the following chapters, but this requires a more detailed and elaborate process than the conventional surgico-orthodontic process. Therefore, these are tasks that take time before we get used to it. In addition, the process of predicting and reproducing possible tooth movement after surgery requires some skill and experience. In addition, bended surgical wires need to be manufactured, and the postoperative care process may take a little longer due to incomplete occlusion after surgery. Although there is a great advantage that the patient's facial aesthetics improves immediately, the facial profile after these surgery is not perfect until dental decompensation is finished, and this should be sufficiently informed to the patient before surgery. The paradigm shift at this point is the beginning, not the completion. There is no doubt that future experiences, research and technological advances will make the surgery-first approach process more comfortable and accurate.

1.3 SFA Controversies

1. Stability

In general, good stability in both the horizontal and vertical planes has been observed, in our experi-

ence, with the mandible position showing the highest associated relapse rate. Horizontally, Ko et al. reported a mean B-point relapse of 1.44 mm (12.46%) at the one-year follow-up [4]. When comparing SFA with the traditional treatment, Kim et al. found average anterior relapses of 1.6 mm in patients undergoing traditional treatment and 2.4 mm in the patients undergoing SFA; Liao et al. reported mild horizontal relapses in both groups [7, 8]. According to our studies, vertical and skeletal stabilities are generally maintained, and dental movement in patients undergoing SFA surpassed that in patients undergoing traditional treatment [9–11].

2. Total treatment time

Some authors insist that RAP could play a role in accelerating tooth movement during the post-surgical period because osteoblasts and osteocytes are activated for several months, postoperatively [11]. Therefore, some surgeons perform a multiple corticotomies on the maxillary and mandibular bones to induce RAP. However, in our experience, we also observed dramatically shortened treatment times, despite not performing corticotomies [6]. Thus, in our opinion, the fact that the direction of the postsurgical orthodontic movement corresponds with natural tooth compensational movements plays a much more important role in reducing the overall treatment time than does RAP. Because we overcame the temporary, postoperative occlusal instability, postsurgical orthodontic treatment should be much more effective than presurgical orthodontic treatment for directing tooth movement. In addition, our analysis of the factors influencing total treatment time showed that tooth extraction is the most influential. This analysis also indicated that, regardless of the orthognathic approach, if the orthodontist extracts a tooth, tooth mobilization might occur for some time. Therefore, to obtain the maximal reduction in total treatment duration associated with SFA, avoiding tooth extraction is the preferred treatment choice, if possible [12].

Despite the heterogeneity of extant SFA publications, a treatment time that is shorter than that associated with the traditional approach seems to be a consistent finding. Overall, the mean treat-

ment time for SFA is 14.2 months (range, 10.2–19.4 months) and that for the traditional approach is 20.16 months (range, 15.7–22.5 months) [13]. This may be due to a synergistic effect between the postoperative orthodontic force and the newly established adaptive force from the lip and the tongue in the direction of tooth movement, decreasing the time to full compensation. The temporary (a few weeks) decrease in postoperative muscle activity, bite force, and occlusal pressure may also be a facilitating factor [14]. The orthodontic treatment associated with the traditional approach has been reported to last 15–24 months, preoperatively, and 7–12 months, postoperatively, with the orthodontist being the key arbiter of the treatment duration [15]. Similarly, we have reported much shorter total treatment times for SFA than for the traditional orthodontic treatment approaches reported in the literature, especially for patients not requiring tooth extractions.

3. Indications and contraindications

(a) SFA indications

If the desired surgical occlusion, following SFA, has been modeled to simulate postoperative orthodontic movement, all surgical cases can be theoretically treated using SFA.

Clinically, however, in several situations surgical correction involving SFA is inappropriate. Hence, understanding the contraindications for SFA is necessary to understand its indications.

(b) SFA contraindications

(i) Severe crowding of the upper anterior teeth

A blocked upper lateral incisor, on the palatal side, may significantly interfere with surgical occlusion.

(ii) Severely compensated, flared upper incisors

In such cases, obtaining satisfactory esthetics, immediately after surgery, may be difficult due to excessive overjet.

(iii) Excessively extruded upper second molars

Severe mandibular prognathism causes excessive overeruption of the maxillary second molars because the maxillary and mandibular second molars do not occlude at all. If the amount of extrusion is excessive, interference with posterior surgical occlusion may compromise postoperative stability.

(iv) Disharmony between the upper and lower intercanine widths

Often mandibular prognathism results in functional displacement of the tongue; when

the tongue's position falls, spacing occurs between the lower incisors. This may cause discordant upper and lower intercanine widths in the surgical occlusion, resulting in postoperative interference and bone instability.

(v) Postoperative anterior crossbite

In cases of class II or III skeletal surgeries, partial anterior crossbite occurs. As a result, the postoperative functional adaptation of the incisors may be hindered, making postoperative orthodontic treatment very difficult.

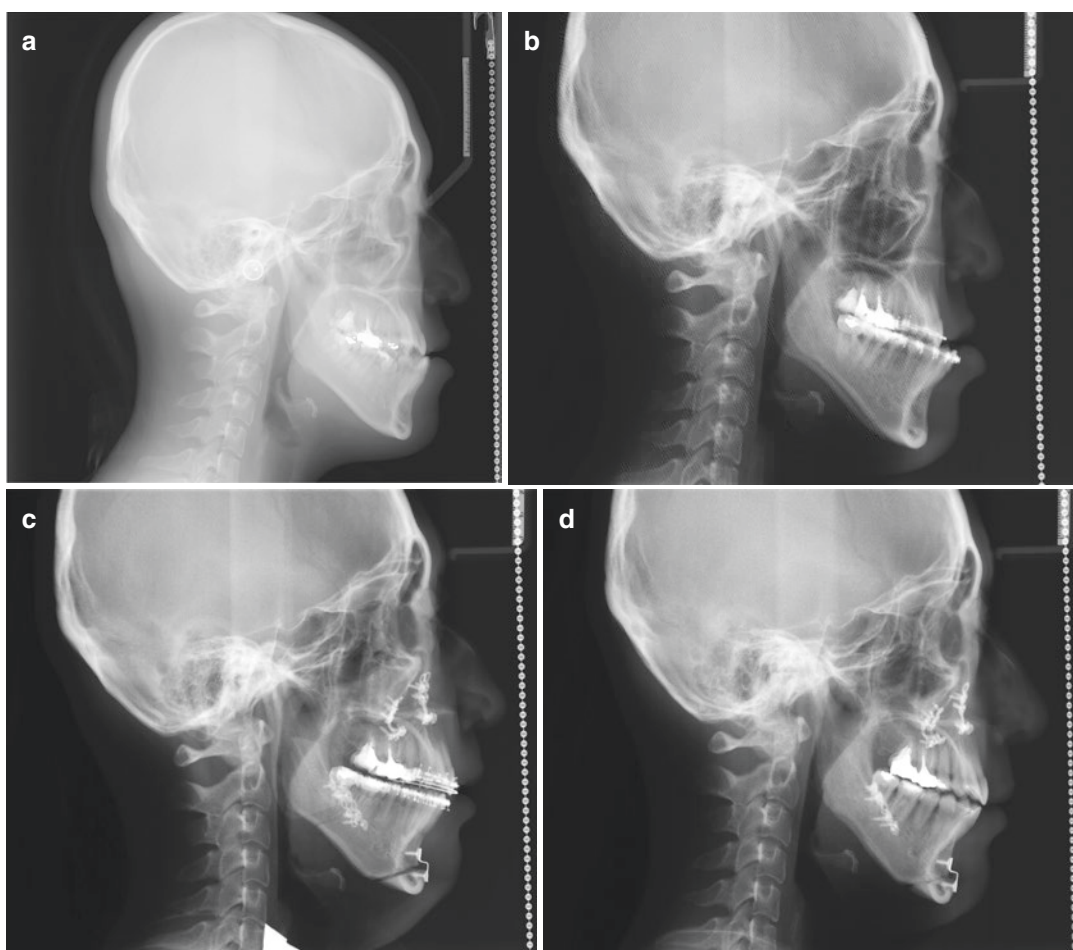


Fig. 1.5 Traditional orthognathic approach with presurgical orthodontic treatment. Traditional approach could provide us with the stable surgical outcomes. But, the total treatment time ranges from 18 month to 30 months. In

addition, the patient should endure the aggravated facial appearance during the presurgical orthodontic treatment period owing to the dental decompensation based on uncorrected skeletal locations



Fig. 1.5 (continued)



Fig. 1.5 (continued)



Fig. 1.5 (continued)



Fig. 1.6 Surgery first orthognathic approach without pre-surgical orthodontic treatment. My experiences for last15 years revealed that SFA turned out to be similar in terms of skeletal stability. In addition, the total treatment time decreased dramatically especially in non tooth extraction

cases. It could be regarded as a functional orthognathic surgery given the fact that the direction of the postsurgical orthodontic treatment is identical with that of the natural dental compensation



Fig. 1.6 (continued)



Fig. 1.6 (continued)