MASTER CLINICIAN

Junji Sugawara, DDS, PhD

Associate Editor Peter Sinclair conceived this department devoted to recognizing the Master Clinicians who have made the orthodontic specialty what it is today. In each edition, Dr. Sinclair will delve into the career story and treatment principles of one of these seminal figures. We welcome your nominees for future Master Clinicians.

It is my distinct pleasure to introduce this month's Master Clinician, Dr. Junji Sugawara. Dr. Sugawara is internationally recognized for his pioneering work with the Skeletal Anchorage System (SAS) and the Sendai "surgery first" approach. A dedicated educator and active member of the Edward H. Angle Society, he continues to share his expertise in biomechanics and treatment innovations with clinicians around the world. We are honored to feature his outstanding contributions. NDK

Dr. Sugawara

Dr. Sinclair

Dr. Sugawara is the Director, Junji Sugawara Orthodontic Clinic, 1-10-15 Hachiman Aoba-ku, Sendai 980-0871, Japan; e-mail: j.sugawara@js-ortho.jp.

DR. SINCLAIR What is your background in orthodontics, and who were your mentors?

DR. SUGAWARA I graduated from the Tohoku University School of Dentistry in Japan in 1973 and immediately began my research career at the same university, joining the orthodontics department for my postgraduate education. I was assigned to the surgical-orthodontic treatment team for jaw deformities—which were not common in Japan at the time—and to the clinical team for chin-cap therapy. With regard to research, I was involved in studying the automatic analysis of cephalometric radiographs using image-processing systems, which became my PhD focus and led to

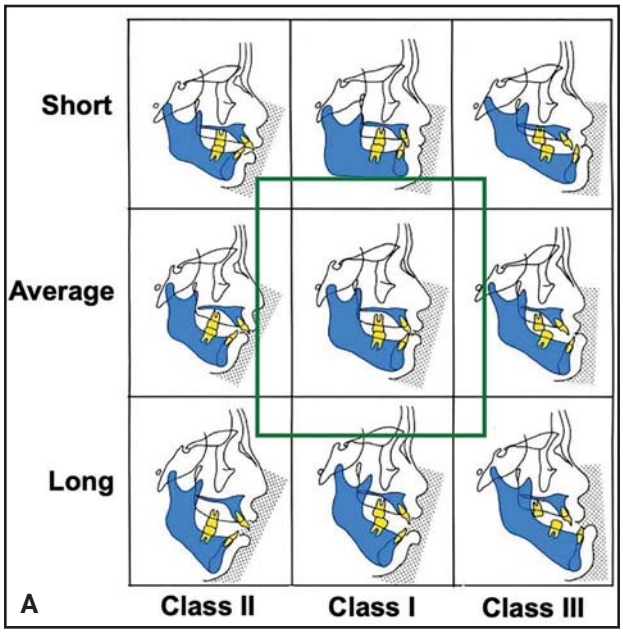
Fig. 1 Prof. Ravindra Nanda and Dr. Junji Sugawara at University of Connecticut in 1982.

the development of the craniofacial drawing standard (CDS) method of cephalometric analysis. I spent the next 33 years at Tohoku University, until my resignation in 2006.

My major areas of research, which I presented at 19 invited lectures for AAO annual conferences and other scientific meetings, included the long-term effects of chin-cap therapy,[1] the development of the Skeletal Anchorage System (SAS),[2-4] and the invention of the "surgery first" method of combined surgical-orthodontic treatment.[5,6] After leaving Tohoku University, I spent 15 years as a practicing orthodontist, then opened my own clinic in 2022, when I turned 74 years old.

In my 52 years of clinical life, I have learned from many people, but I consider three in particular to be my mentors. The first was Prof. Gakuji Ito, a former president of the Japanese Orthodontic Society and my immediate supervisor at Tohoku University. He taught me not only the theory and techniques of orthodontic treatment, but also the appropriate attitude for an orthodontist. The following words are etched into my memory: "When considering a research topic, do not start with a literature search, but first think about what you want to do in your own mind, and then do a literature search to find out if similar research has already been done." In other words, rehashing old work is meaningless; originality is the most important factor in research.

My second mentor was Prof. Hideo Mitani, who was my boss when I was an associate profes-



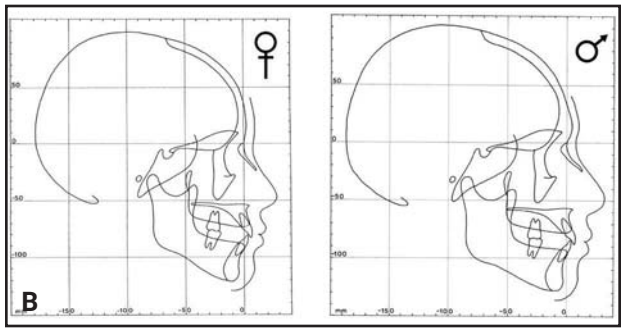


Fig. 2 A. Nine-type facial classification system based on vertical and anteroposterior factors (types outside green box more likely to require orthognathic surgery). B. Craniofacial drawing standards of Japanese individuals with normal occlusion, used to assess facial type.

sor at Tohoku University. He had studied and taught at the University of Illinois under Prof. Allan G. Brodie, so he had a deep knowledge of edgewise techniques. The edgewise methods he taught me still form the basis of my multibracket treatment.

The third of my mentors was Prof. Ravindra Nanda, whom I met in 1979 when he spent his sabbatical at Tohoku University and who invited me to study with him and Prof. Charles J. Burstone at the University of Connecticut from 1981 to 1982 (Fig. 1). In addition to his academic excellence, he is very caring, and he provided me with a lot of advice and opportunities. Today, he is over 80 years old, but he is still active around the world and remains one of my role models.

DR. SINCLAIR Can you tell us about your diagnostic philosophy?

DR. SUGAWARA While focusing on the surgical-orthodontic treatment of jaw deformities, I was impressed by the long-term dentofacial stability that orthognathic surgery could achieve, due to the ability of the neuromuscular system and surrounding tissues to adapt to the sudden, significant alteration in the patient's skeletal profile. I was also moved by the way surgery helped many patients regain their self-esteem and improved their quality of life. Thanks to this background, I learned early in my clinical life how much our profession can contribute to the lives of patients.

My early experiences also made me recognize the importance of accurately identifying the morphological features of the patient's skeletal profile and setting logical treatment goals based on the orthodontic diagnosis. To this end, I proposed a nine-facial-type classification method that combines Angle's and Sassouni's systems (Fig. 2A). The facial skeletal types are identified using CDS analysis: line drawings of Japanese norms (Fig. 2B) are superimposed on patients' cephalometric tracings to evaluate their individual

Fig. 3 Biomechanics of molar movement with Skeletal Anchorage System (SAS); attachment of miniplates outside basal bone ensures stability and prevents interference with tooth movement.

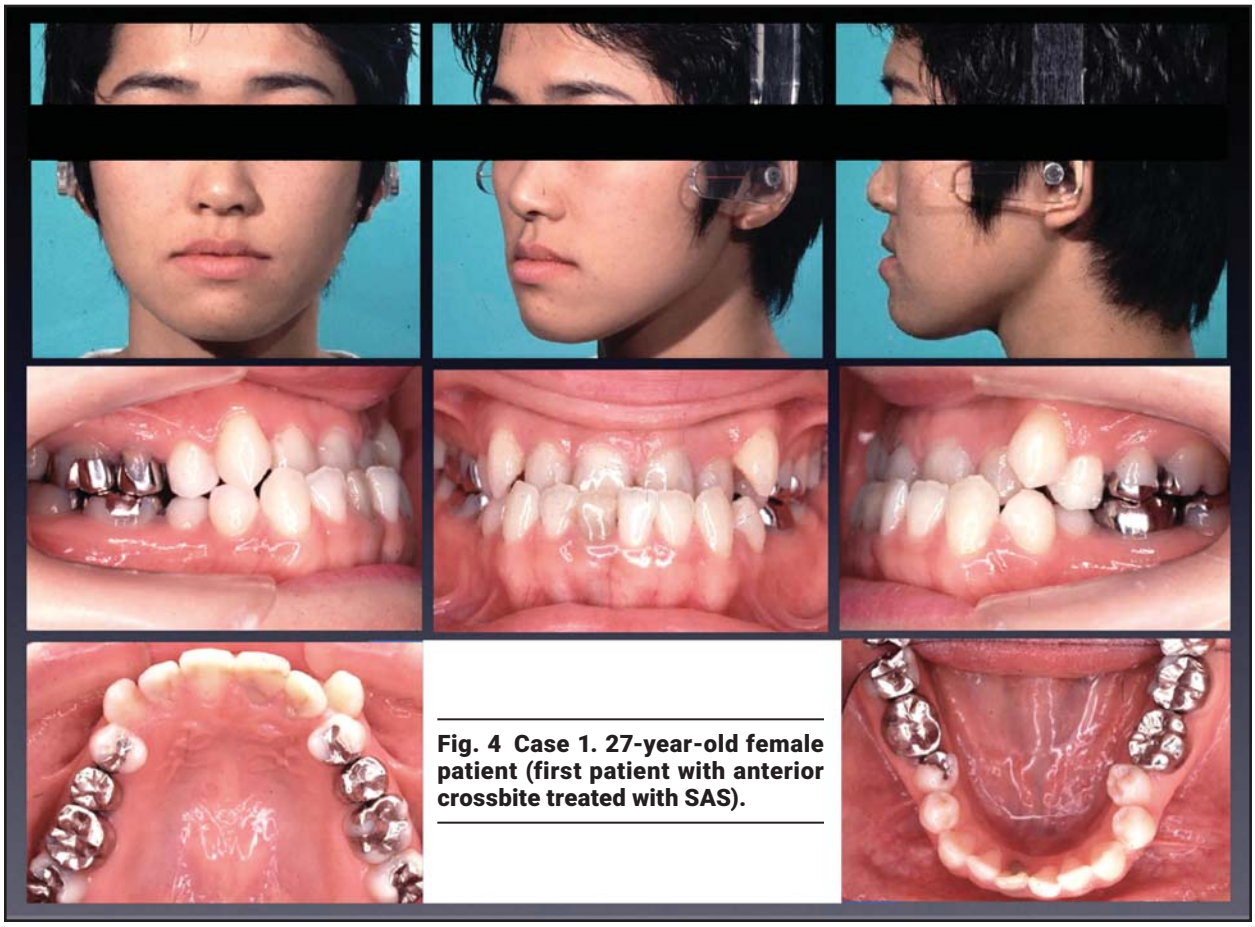


Fig. 4 Case 1. 27-year-old female patient (first patient with anterior crossbite treated with SAS).

characteristics and particular challenges.[7] Because this is a qualitative system, involving no numerical values, it allows patients to identify their own skeletal facial types. It also serves as a communication tool in interdisciplinary treatment with specialists who are unfamiliar with cephalometric analysis. Furthermore, the method enables instant visualization of two-dimensional treatment goals, so it is useful for deciding between surgical and nonsurgical treatment.

DR. SINCLAIR What mechanical principles do you employ?

DR. SUGAWARA The basic principle of orthodontic treatment can be summed up as follows: "Move the teeth you want to move to the exact desired positions, and keep the teeth you don't want to move in their present positions." In other words, anchorage is key, as it has been for the entire history of orthodontics. In particular, various extraoral and intraoral appliances have been used for anchorage while distalizing the maxillary molars. In the 1990s, we developed the SAS,[4] a method of moving the molars in three dimensions, using a titanium miniplate and a multibracket appliance as anchorage (Fig. 3). This method could be used for adult patients and made it possible to distalize not only the maxillary molars, but also the mandibular molars. This was revolutionary in Japan, where Class III malocclusion is common.

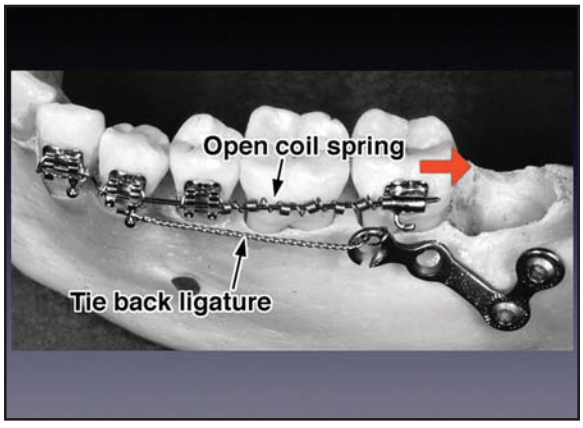


Fig. 5 Case 1. Mechanics used for distal movement of mandibular molars (group molar distalization used in all cases today).

Case 1 shows the first time we used the SAS for camouflage treatment of an anterior crossbite. This 27-year-old female had maxillary anterior crowding and an asymmetrical mandibular dentition, in addition to the crossbite (Fig. 4). Because she did not wish to undergo orthognathic surgery, I aimed to solve her problems nonsurgically, through proclination of the upper incisors and asymmetrical distalization of the mandibular teeth. Treatment progressed as planned (Fig. 5), and the treatment goals were achieved predictably (Fig. 6). I was impressed, because such treatment would have been impossible using conventional mechanics. At the 20-year follow-up examination, I found an extremely stable occlusion, with almost no change in the positions of the lower molars (Fig. 7).

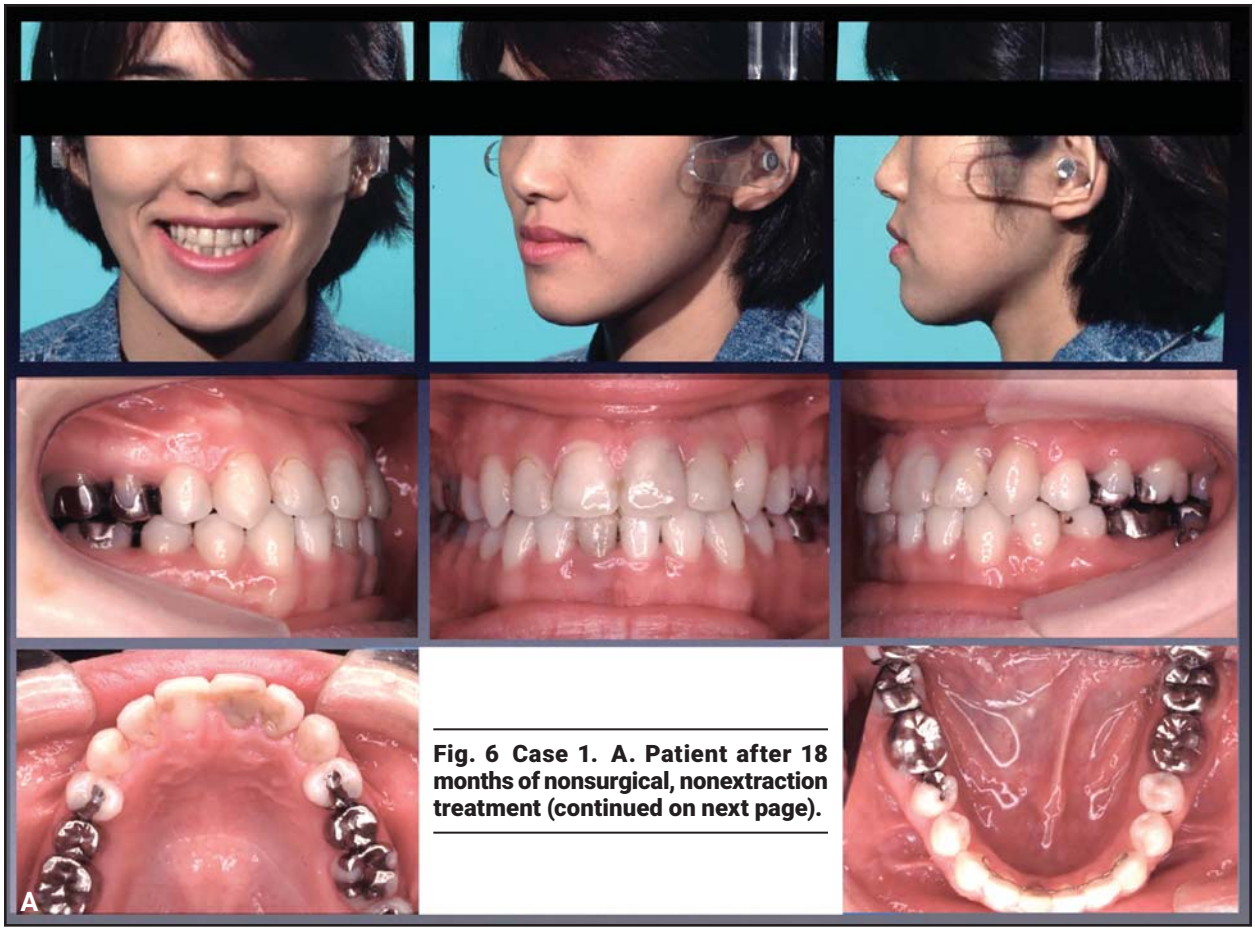


Fig. 6 Case 1. A. Patient after 18 months of nonsurgical, nonextraction treatment (continued on next page).

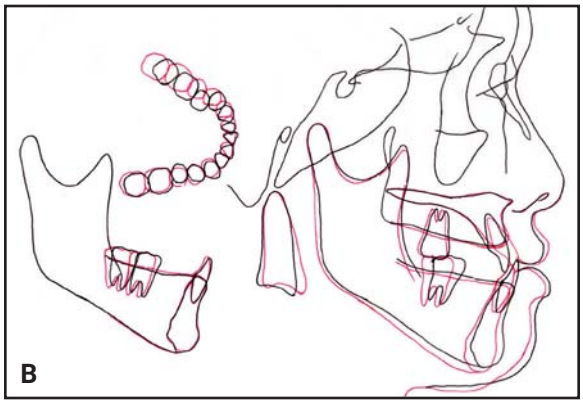


Fig. 6 (cont.) B. Pretreatment (black) and post-treatment (red) cephalometric superimposition and mandibular occlusogram; note improvement in asymmetrical mandibular dentition after distalization of lower left molars.

In the 30 years since I started using the SAS, I have applied it to a wide variety of malocclusions. It enables 3D movement of the molars without dependence on patient cooperation, leading to dramatic reductions in treatment time, significant improvements in predictability, and an increase in the number of cases we can treat nonextraction. The method is also effective for retreatment, and I still use it on a daily basis.

DR. SINCLAIR What orthodontic problem have you found hardest to correct?

DR. SUGAWARA The most difficult to treat orthodontically is a skeletal open bite in an adult patient. Nonsurgical correction of excessive lower facial height and the associated large interlabial

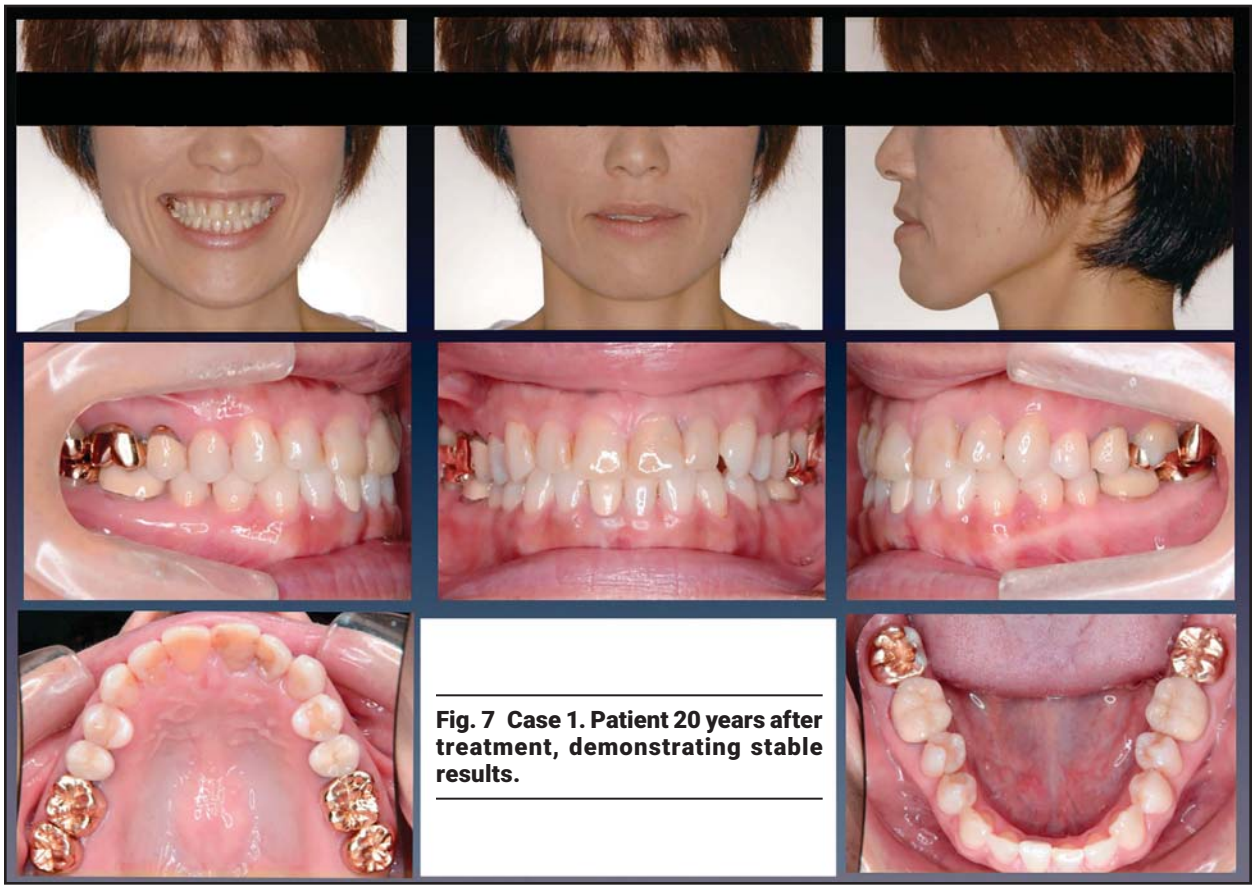


Fig. 7 Case 1. Patient 20 years after treatment, demonstrating stable results.

Fig. 8 Case 2. 27-year-old female patient with anterior open bite before treatment.

gap is challenging, which is why a skeletal open bite is often regarded as an indication for orthognathic surgery. Even with surgery, however, it is not always easy to achieve the treatment goals, and the condition is prone to relapse.

The SAS enables nonsurgical correction of an anterior open bite and large interlabial gap through molar intrusion to promote counterclockwise rotation of the mandible, in turn reducing lower facial height. While we have had success with this method, the results have not always been stable. In our experience, patients with a long history of open bite, mamelons on the teeth, and adverse myofunctional habits—even if control measures are taken—are prone to proclination of the mandibular incisors over the long term, leading to relapse. Case 2 is a typical example (Fig. 8). While the patient's open bite was corrected successfully with SAS biomechanics (Fig. 9), the mandibular incisors proclined gradually over the next 14 years of follow-up, eventually leading to recurrence of the open bite (Fig. 10). Although I attempted retreatment with clear aligners, I did not see any fundamental improvement. This case represents an orthodontic challenge I have been unable to overcome at the moment.

DR. SINCLAIR What are the indications and contraindications for your "surgery first" approach?

DR. SUGAWARA About 20 years ago, we developed the "surgery first" protocol, which eliminates the preoperative orthodontic stage of orthognathic-orthodontic treatment. There are two different versions of this approach. The first is the orthodontics-driven style, in which skeletal problems are corrected surgically and dental problems orthodontically.[8] In this approach, molar intrusion and distalization are used to reduce the invasiveness of surgery. The second version is the surgery-driven style, in which orthognathic surgery is used to resolve as many skeletal and dental problems as possible.[9,10] This second method uses two-jaw surgery, in combination with segmentation and corticotomy, to simplify postoperative orthodontic treatment.

While both styles can reduce treatment time

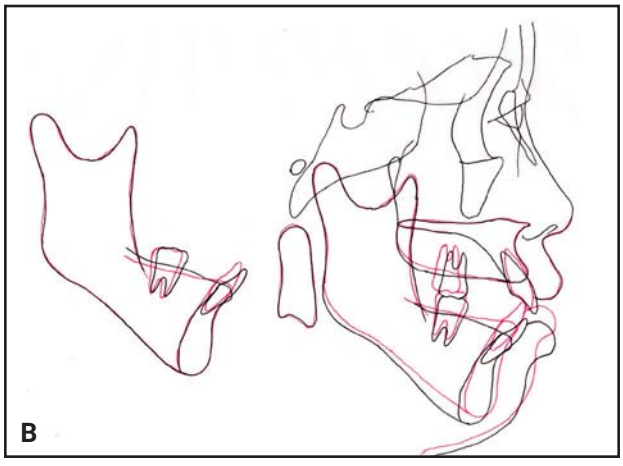


Fig. 9 Case 2. A. Patient after treatment with combination of multibracket appliance and four orthodontic miniplates. B. Superimposition of pretreatment (black) and post-treatment (red) cephalometric tracings.

dramatically, we prefer the first approach. A distinguishing feature of our method is its wide applicability: it can be used for about 90% of patients eligible for surgical-orthodontic treatment. In all "surgery first" cases, orthodontic miniplates for SAS treatment are implanted during the surgical procedure to be used for postoperative orthodontics, even if the immediate postoperative occlusion presents complex challenges.

Case 3 is a classic example. In addition to pronounced mandibular prognathism, this patient had significant dental compensations and severe lower anterior crowding (Fig. 11). The surgery-driven style would normally be contraindicated in such a case, but it was suitable for our method. Two-jaw surgery was used to achieve maxillary advancement and mandibular setback, and one year of orthodontic treatment with the SAS was

Fig. 10 Case 2. Patient 14 years after treatment, showing recurrence of anterior open bite.

performed (Fig. 12), resulting in an ideal profile and occlusion (Fig. 13) that remained stable over the long term. In general, extended follow-up indicates that a short treatment period does not result in relapse or an unstable occlusion.[11,12]

The remaining 10% of cases for which our method is contraindicated include a Class II, division 2 malocclusion with a small mandible or a severe facial asymmetry with excessive canting of the occlusal plane caused, for example, by hyperplasia of the mandibular condyle.[13]

DR. SINCLAIR What are the latest developments in the SAS?

DR. SUGAWARA The initial use of the SAS was for nonsurgical treatment of skeletal Class III malocclusion and open bite. It was later applied to interdisciplinary dentofacial therapy for occlusal collapse, validating its effectiveness, and then used in the "surgery first" protocol.

A more recent advance—not in the design itself but in its application—is the use of the SAS in nonsurgical treatment of a gummy smile with an excessive interlabial gap and vertical maxillary excess. Traditionally, orthognathic surgery would be used, because treatment requires intrusion of not only the maxillary incisors, but the entire maxillary dentition. With a combination of the SAS and miniscrews, however, it is now possible to treat this malocclusion nonsurgically, with results comparable to those of orthognathic surgery.

Case 4 is one such case. A 32-year-old female presented with the chief complaint of a gummy smile (Fig. 14). She had undergone multibracket treatment and extraction of all first premolars at another clinic, but was referred to me for retreatment after her gummy smile became more prominent. The overbite was normal, and she had no significant occlusal difficulty, but the large interlabial gap, excessive maxillary and mandibular alveolar height, and gummy smile required intrusion of the entire dentition without changes to the occlusion. Moreover, because this would lead the mandible to rotate counterclockwise and become anteriorly positioned, the entire lower dentition had

Fig. 11 Case 3. 20-year-old female patient with mandibular prognathism before surgical-orthodontic treatment.

Fig. 12 Case 3. Progress of postsurgical orthodontic treatment with SAS and multibracket appliance.

Fig. 13 Case 3. A. Patient after 12 months of orthodontic treatment, showing improvement in profile and occlusion. B. Superimposition of pretreatment (black) and post-treatment (red) cephalometric tracings.

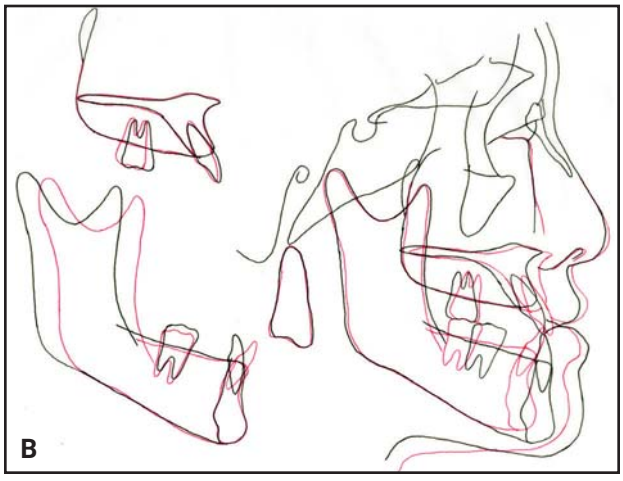


Fig. 14 Case 4. 32-year-old female patient with gummy smile before treatment.

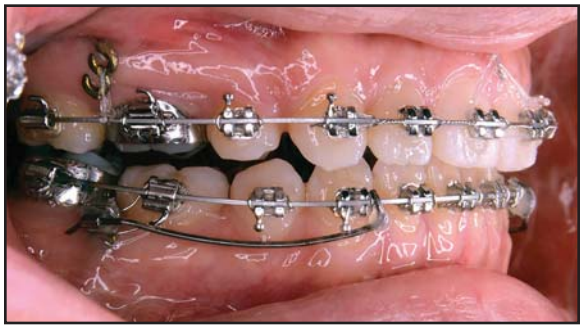


Fig. 15 Case 4. Mechanics for intrusion of entire maxillary and mandibular dentition: SAS for upper and lower molar intrusion, miniscrew anchorage for upper incisor intrusion, and cantilevers for lower incisor intrusion.

to be distalized. These daunting challenges required a combination of four miniplates to support molar intrusion, a miniscrew for upper incisor intrusion, and SAS intrusion cantilevers for the lower anterior teeth (Fig. 15). The final outcome (Fig. 16) shows that even in challenging cases such as this one, the combination of miniplates and a miniscrew can resolve the issues nonsurgically.

DR. SINCLAIR What is your best clinical tip?

DR. SUGAWARA "Custom is second nature" is an ancient proverb that means repeating an action

*Apple, Inc., Cupertino, CA; www.apple.com.

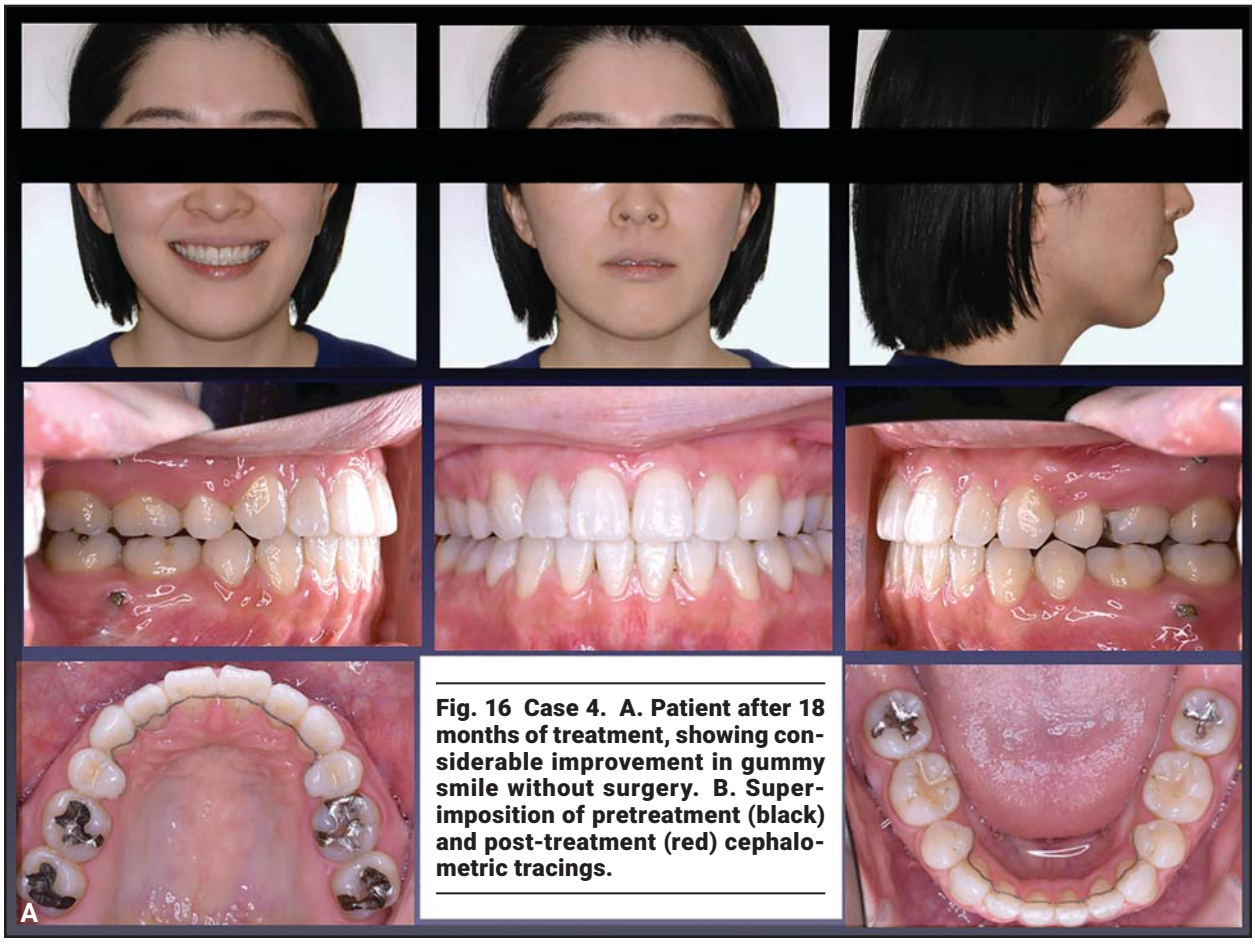


Fig. 16 Case 4. A. Patient after 18 months of treatment, showing considerable improvement in gummy smile without surgery. B. Superimposition of pretreatment (black) and post-treatment (red) cephalometric tracings.

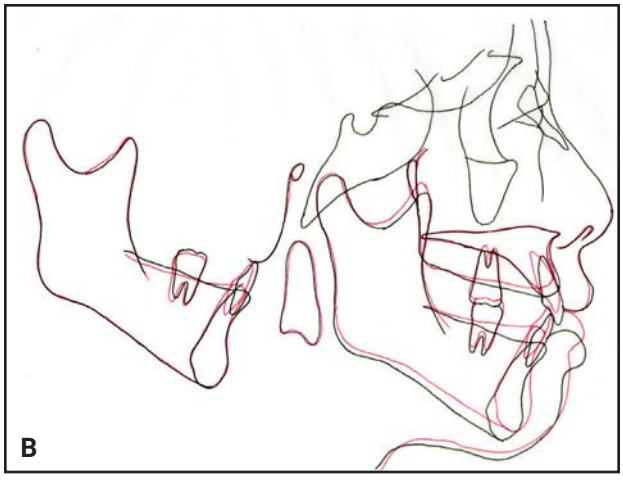


Fig. 17 Keynote* presentation software used to document diagnosis, treatment, and long-term outcomes of all cases to case-report standards.

frequently enough will make it feel innate. This holds true for orthodontic practice. One custom I have followed for more than 20 years is to use Keynote* presentation software to document the diagnosis, treatment, and outcome of each case to case-report specifications (Fig. 17). I then share the presentation files with the patient and make them easily accessible. While this process might seem crazy to other orthodontists, given the considerable effort it requires, it has become a normal daily task for me and my staff. Advantages include building trust with patients, preventing loss of patient records, improving treatment quality and reducing the risk of failure, and providing an educational archive for training young orthodontists. This process might be difficult to implement in a business-oriented practice, but it can greatly improve job satisfaction. In short, my best clinical tip is to make good habits second nature.

*Apple, Inc., Cupertino, CA; www.apple.com.

DR. SINCLAIR Dr. Sugawara, thank you for sharing your clinical experiences and orthodontic philosophy with our readers.

REFERENCES

1. Sugawara, J.; Asano, T.; Endo, N.; and Mitani, H.: Long-term effects of chincap therapy on skeletal profile in mandibular prognathism, Am. J. Orthod. 98:127-133, 1990.
2. Sugawara, J.; Umemori, M.; Mitani, H.; Nagasaka, H.; and Kawamura, H: Orthodontic treatment system for Class III malocclusion using a titanium miniplate as an anchorage, Orthod. Waves 57:25-35, 1998.
3. Umemori, M.; Sugawara, J.; Mitani, H.; Nagasaka, H.; and Kawamura, H.: Skeletal anchorage system for open-bite correction, Am. J. Orthod. 115:166-174, 1999.
4. Sugawara, J. and White, L.W.: JCO Interviews Dr. Junji Sugawara on the Skeletal Anchorage System, J. Clin. Orthod. 33:689-696, 2000.
5. Nagasaka, H.; Sugawara, J.; Kawamura, H.; and Nanda, R.: "Surgery first" skeletal Class III correction using the Skeletal Anchorage System, J. Clin. Orthod. 43:97-105, 2009.
6. Sugawara, J.; Aymach, Z.; Nagasaka, H.; Kawamura, H.; and Nanda, R.: "Surgery first" orthognathics to correct a skeletal Class II malocclusion with an impinging bite, J. Clin. Orthod. 44:429-438, 2010.
7. Sugawara, J.; Soya, T.; Kawamura, H.; and Kanamori, Y.: Analysis of craniofacial morphology using craniofacial drawing standards (CDS): Application for orthognathic surgery [in Japanese], Nihon Kyosei Shika Gakkai Zasshi 47:394-408, 1988.
8. Sugawara, J.; Aymach, Z.; Yamada, S.; Nagasaka, H.; Kawamura, H.; and Nanda, R.: Surgery first: The protocol of innovative surgical orthodontics, in *Biomechanics and Esthetic Strategies in Clinical Orthodontics,* 2nd ed., ed. R. Nanda, W.B. Saunders Co., St. Louis, 2015, pp. 442-473.
9. Liou, E.J. W.; Chen, P.H.; Wang, Y.C.; Yu, C.C.; Huang, C.S.; and Chen, Y.R.: Surgery-first accelerated orthognathic surgery: Orthodontic guidelines and setup for model surgery, J. Oral Maxillofac. Surg. 69:771-780, 2010.
10. Hernández-Alfaro, F.; Guijarro-Martínez, R.; and Peiró-Guijarro, M.A.: Surgery first in orthognathic surgery: What have we learned? A comprehensive workflow based on 45 consecutive cases, J. Oral Maxillofac. Surg. 72:376-390, 2013.
11. Sugawara, J.; Nagasaka, H.; Yamada, S.; Yokota, S.; Takahashi, T.; and Nanda, R.: The application of orthodontic miniplates to Sendai surgery first, Semin. Orthod. 24:17-36, 2018.
12. Sugawara, J.; Nagasaka, H.; Abe, Y.; Chiba, M.; and Takahashi, T.: Recent protocol of the Sendai surgery-first (SSF) approach: Clinical and scientific perspectives, Semin. Orthod. 28:258-288, 2022.
13. Suzuki, H.; Nogami, S.; Otake, Y.; Takeda, Y; Sugawara, J.; Takahashi, T.; and Yamauchi, K.: Surgery-early approach combined with condylectomy for correction of severe facial asymmetry with mandibular condylar hyperplasia: A case report, J. Kor. Assoc. Oral Maxillofac. Surg. 50:227-234, 2024.