

CHRONOLOGY OF COMPLICATIONS AND POSTOPERATIVE REHABILITATION OF ADULT PATIENTS WITH JAW DEFORMITIES

<https://doi.org/10.5281/zenodo.7699413>



ELSEVIER



A. Abdukadyrov,
F. Sh. Mukhamedieva, U. T. Bakhriev,
F. R. Kurbanov D.A. Abdukadyrov
Center for the Development of Professional Qualifications of Medical Workers in
Tashkent (Uzbekistan)



Abstract: As a result of a chronological analysis of the scientific literature, the development of methods for the elimination of interoperative complications and postoperative rehabilitation of patients with jaw deformities, depending on the development of orthognathic surgery, is conditionally divided into the eras of the formation, formation and flourishing of orthognathic surgery. In the first era of the development of orthognathic surgery, quantities in intraoperative and postoperative complications were 50-80% , in the second era they decreased to 55% -75% and in in the third epoch , they decreased to 35-42%, respectively. The introduction of TRH, MSCT, CBCT, MRI and operations using biologically based incisions led to a decrease in the number of interoperative (35%) and postoperative complications (42%). However, rather high rates of complications indicate the need to create an algorithm for treatment, prevention and rehabilitation measures with the participation of various specialists, which would lead to a decrease in the number of complications of orthognathic operations.

Keywords:

About: FARS Publishers has been established with the aim of spreading quality scientific information to the research community throughout the universe. Open Access process eliminates the barriers associated with the older publication models, thus matching up with the rapidity of the twenty-first century.

Received: 03-03-2023

Accepted: 04-03-2023

Published: 22-03-2023



Abstract: Мақолда жағлар деформацияларини хирургик усул билан түғрилаш давридаги юз берган асоратларни баратарф этиш ва опреациядан сўнгги реабилитация усулларига бағишлаган илмий адабиётлар хронологик тарзда тахлил қилинган бўлиб ва улар шартили равишда ортогнатик хирургиянинг шакилланиш, шакилланган ва гуллаб яшнанга давирларига бўлиниган. Тахлил натижасида биринчи даврда асоратлар сони 50-80% бўлганлиги, иккинчи даврда 55-75%гача ва учинчи даврда 35-42% гача тушганлиги аниқланган. Асоратлар сониниг камайишига замонавий ТРГ, МСКТ, КЛКТ, МРТ ларининг ташхисот жараёнига киритилиши ва операцияларнинг биологик асосланган кесувлар ёрдамида ўтказилиш олиб келган. Аммо лекин асоратлар сонининг ханузгача етрали даражада камаймаганлиги мутахасислар хамжихатлигини талаб қиладиган реабилитация алгоритмининг ишлаб чиқилмаганлигидан далолат беради.

Keywords:

About: FARS Publishers has been established with the aim of spreading quality scientific information to the research community throughout the universe. Open Access process eliminates the barriers associated with the older publication models, thus matching up with the rapidity of the twenty-first century.

Received: 03-03-2023

Accepted: 04-03-2023

Published: 22-03-2023

Basic purpose orthognathic surgery is to achieve an aesthetic balance of the face and occlusion and the elimination of functional disorders with the improvement of the social adaptation of patients with jaw deformities of various origins. However, according to the scientific literature, up to 40% of patients operated on for jaw deformities experience various complications, the majority of which are inter- and postoperative complications (7, 2; 5; 22 ; 23 ;). All this testifies to the insufficient development of therapeutic and prophylactic and postoperative rehabilitation measures with interdisciplinary participation, which would lead to the prevention and reduction of the number of these complications.

Therefore, **the purpose of this scientific report is to present the results of a chronological analysis of scientific papers on the complications of orthognathic treatment of patients with jaw deformities and rehabilitation measures aimed at prevention and treatment leading to a decrease in their number.**

A chronological analysis of available scientific papers has shown that the **history of the development of** rehabilitation measures aimed at preventing and treating complications of orthognathic operations, depending on the methods used for surgical correction of jaw deformities, can be divided into three eras. The first era includes rehabilitation activities in the formative stage, the second one is the period of formed orthognathic surgery and the third one is the heyday of orthognathic surgery.

First era; According to the description of some authors, orthognathic surgery was formed in the middle of the 19th century and the founders of such a complex section of maxillofacial surgery were Hullen, Langenbeck, Cheever, Billroth, Dufourmentel, Blair; Angel, Harsh, Lvov, Limberg, Babitskaya and others (10; 31; 17;). Most of these renowned clinical scientists were general surgeons who had a second specialty in oral and maxillofacial surgery. This era began in the middle of the 19th century and continued until the 30s of the 20th century. Operations were performed mainly on one lower jaw. The development of inflammatory processes can be judged indirectly by the complications of general surgery, which were observed in 50 to 80% of planned patients with a frequent lethal outcome. The lack of development of the principles of asepsis and antisepsis and the absence of antibiotics in almost all cases led to inflammatory complications and poor wound healing up to the development of osteomyelitis. Due to the insufficient development of an interdisciplinary approach involving orthodontists and other specialists, intermaxillary splints and various home-made orthodontic devices were used to immobilize and prevent relapses, which did not always give the desired result. It can be said that **the postoperative rehabilitation of this era included the fight against inflammatory complications and the preservation of the achieved optimal ratio of the dental arches of the jaws using antiseptics of that time and orthopedic structures.** The second era included from the 30s to the 60s of the 20th century, when orthognathic surgery was already being formed as an independent discipline and the basic principles of asepsis and antisepsis were developed with the widespread use of antibiotics. The formation of orthognathic surgery of this period was greatly contributed by such scientists as Wassmund, Schwartz; Thomas; Kole; Converse, Shapiro, Obwegesser; Dal Pont; Caldwell; Latterman; Katz, Rudko, Arzhantsev, Mukhin; Aleksandrov, **etc.** Orthognathic operations were performed only on the upper or lower jaw and therefore this period can be called **the era of single-jaw operations.** A big step for orthognathic

surgery was the participation of orthodontists and orthopedic dentists in the process of rehabilitation of patients with jaw deformities and the use of radiation methods of examination. Regarding the postoperative rehabilitation of orthognathic patients, many provisions for their management were formulated based on the experience of treating the wounded during the Second World War, which are set out in fundamental scientific works and textbooks on maxillofacial surgery . According to the literature in this period, the most common methods for correcting mandibular deformities were vertical and planar osteotomy of the mandibular branches and their modifications with fixation of fragments mainly with wire sutures (16; 26; 27; 19 ;).

According to the description of clinicians, bleeding from large vessels, irregular fractures of fragments, damage to the sensory and motor nerves of the maxillofacial region were often observed during the operation. Bleeding was stopped by tamponade of wounds with tampons impregnated with procoagulants or by ligation of vessels in the wound, and in difficult cases the external carotid artery was ligated. To compensate for blood loss before surgery, blood and blood substitutes were made, which were transfused during and after surgery. Due to the loss of a large amount of blood and fluid, patients were often weakened, which required long-term inpatient treatment up to a month or more. In case of incorrect fractures, they were fixed in place with wire sutures or removed, which negatively affected the healing of the bone wound. Medical treatment and physiotherapy have been used to treat nerve injuries. In the postoperative period, inflammatory complications, dysfunction of the temporomandibular joints, and recurrences of jaw deformities were observed in 55 to 75% of operated patients (**28;10;**). Local treatment and prevention of inflammatory complications was carried out against the background of intermaxillary immobilization, which grossly violated the hygiene and landscape of the microflora of the oral cavity. Despite the proposed various options for mechanical cleaning and antiseptic treatment of the oral cavity, inflammatory complications were often observed in the periodontal area, the surgical wound, and in neighboring anatomical areas .

For the prevention and treatment of recurrences, proposed retention and orthodontic appliances that were bulky, uncomfortable and painful to wear, as well as violated the hygiene of the cavity mouth, creating conditions for the reproduction of infection. According to some clinicians, most recurrences occur in patients operated on only one lower jaw, resulting in a violation of the masticatory muscle traction vector, which leads to neuromuscular imbalance of the maxillofacial region, narrowing of the oral cavity and pharynx. The desire of the anatomical structures to take their original position after the removal of the splints caused the recurrence of jaw deformities. (4; 10;; 6;) .

Summarizing the results of the analysis of the literary sources of this era, we can say that during this period of development of orthognathic surgery, complex methods for examining, diagnosing, treating patients with various forms of jaw deformities with the participation of orthodontists and other specialists were developed. However, the occurrence of a large number of various complications during and after operations indicates the insufficient development of therapeutic, prophylactic and rehabilitation measures with the participation of related specialists.

The heyday of orthognathic surgery begins in the mid-60s of the last century and continues to this day, and is called the era of bimaxellar operations. Operations began to be carried out on the two jaws and other parts of the facial skeleton using new medical technologies and biologically based tissue incisions. A technique was developed for rigid fixation of bone fragments using plates and screws, which led to a reduction in the time of intermaxillary immobilization (4; 14; 15;).

Chronologically, the first recommendations on **the next** postoperative rehabilitation measures for maxillofacial patients are given in the works of M. V. Mukhin (1974). According to the scientist, after surgery, carried out under general anesthesia, the patient is transported on a gurney to the postoperative ward, where he is followed by medical and nursing control and care for 2-3 days. Local and general treatment is prescribed , which includes hygienic care of the oral cavity and pharynx, cold on the wound area, humidified oxygen supply, antibiotics, sulfonamides, anti-inflammatory and symptomatic therapy. In the postoperative period, various types of physiotherapeutic procedures and myogymnastics are also recommended, which lead to an improvement in microcirculation in the wound with optimization of reparative processes.

However, according to the data of clinicians of a later period, various complications often began to be observed during and after combined osteotomies of the jaws (24;25;17;4;) . , which reached from 800 to 2200 ml. It occurs when the tubercles of the upper jaw are separated from the pterygoid processes and when the mucosa of the bottom of the nasal cavity is ruptured. Special curved osteotomes have been proposed that do not damage the vessels and venous plexuses. As a prevention of bleeding during surgery, a clear organization of the operational process is proposed, i.e. work of the surgeon, operating nurses and anesthesiologist. When such complications occurred, they performed a complete pharyngeal tamponade, anterior and posterior tamponade of the nasal cavity, ligation of the external carotid artery as indicated, and transfusion of blood and blood substitutes. According to the description of the same authors, damage to the branches of the trigeminal and facial nerves and incorrect fractures of jaw

fragments can occur during the operation. In rare cases, damage to the base of the skull has been observed, with a fatal outcome.

The widespread introduction of MSCT, CBCT, MRI in the later period of TRG, the emergence of methods of general anesthesia using artificial hypotension led to a decrease in the number of complications of orthognathic operations. The accumulated experience of monitoring the complications of osteotomies of the jaws and their elimination led to the creation of their classifications, the main criterion of which was the time and severity of operations, divided into classes (29;23; 22; 11;) . However, the analysis of recent literature sources shows that the frequency of bleeding during surgery (9-15%) and in the early postoperative period (16.8%) is a serious problem that needs to be addressed. In case of incorrect fractures of osteotomized fragments, which occur on average in 15.8% of patients, it is proposed to fix them additionally with plates with screws. The most common complication of the surgical period is damage to the branches of the trigeminal and facial nerves, which occurs in 13.5 to 76% of cases. They are often damaged during planar or vertical osteotomy of the branches and Le Fort-1 osteotomy of the maxilla. The most serious complication of these injuries is the development of neuropathy, which is accompanied by pain and movement disorders in the face. Currently, when the nerve trunk is damaged during operations, their ends are sutured using microsurgical techniques, followed by drug treatment and physiotherapy, which in most cases are effective. But up to 5% of patients, the violation of the sensitivity of the regions of the first and second branches of the trigeminal nerve remains for many years, which causes physiological and social discomfort. Despite the great success of orthognathic surgery, today intraoperative complications of jaw osteotomies remain at the level of 49.2%, which indicates the archaicity of this issue (7;11; 22 ;23:).

As can be seen from the above results of the analysis of the available scientific literature, the incidence of complications during orthognathic operations remains at a high level and this may contribute to the development of other complications in the postoperative period, which requires further study of their causes and development of preventive measures.

In the literature of that time, complications of the postoperative period can be found, which occurred in 35-40% of patients. Most of all they arose during the period of intermaxillary immobilization. In the event of purulent inflammatory complications, surgical interventions and drug treatment were often performed, where preference was given to local antiseptics and broad-spectrum antibiotics. The use of broad-spectrum antibiotics and local antiseptics led to a decrease in inflammatory complications. (25; 17; 4 ; 5 ;,). However, an analysis of the scientific literature of recent years shows a slight decrease in inflammatory complications to

11.7-20.4%, which is explained by poor mechanical cleaning of the oral cavity, the emergence of resistance of pathogenic microbes to traditional antibiotics, antiseptics, and insufficient infection control. (12;, 3; 7; 22; 23;). According to V.N. Tsareva et al. (2003) used traditional local antiseptics are not deposited in sufficient concentration in the oral mucosa due to the lack of adhesiveness. Therefore, without providing a full antibacterial effect, they are washed off with saliva. For adequate treatment of inflammatory processes in the oral cavity and periodontium, it was recommended to use antiseptics with a wide antibacterial spectrum of action, which do not induce microbial resistance and create a depot in the area of their action. According to the author himself, the use of the eludril-elgydium-parodium complex for the treatment of generalized periodontitis showed its high efficiency compared to metrogildenta. There are no works devoted to the use of such a complex for the treatment of inflammatory processes in the oral cavity after orthognathic operations. As can be seen from the above facts, the development of methods that eliminate all pathogenic microbes of the oral cavity as a result of the use of long-acting antiseptics remains an unsolved problem of orthognathic surgery to this day.

A complication of orthognathic operations in the postoperative period is the mobility of osteotomized fragments as a result of a slowdown in reparative regeneration, which can lead to secondary deformity or relapses. Among the many drugs used in clinical practice, osteogenon stands out with positive results. It affects the mass and quality of the cortical bone, which resists mechanical stress and provides stability during osteosynthesis. However, there are no scientific works on the use of the drug osteogenon to improve reparative regeneration of bone tissue after osteotomies of the jaws.

Meanwhile, the introduction of combined osteotomies of the jaws did not lead to the complete elimination of complications from the temporomandibular joints. According to V. A. Sukachev et al. (1984), the variants of planar and vertical osteotomy of the mandibular branches often lead to a change in the direction of the traction of the masticatory muscles and a change in the position of the articular head, which leads to a violation of the neuromuscular balance, which negatively affects the function of the temporomandibular joints. According to the authors of the late period, they remain on average at a level of 12.16% to 22.35% and occur with poor positioning of the articular heads, which leads to pathological displacement of the articular disc with its crushing. The formation of intra-articular hematoma, hypermobility of the articular head can lead to the formation of fibrous adhesions, ankylosis or resorption of the head of the condylar process. Rigid bicortical fixation of bone fragments also leads to changes in the position of the joints, which leads to unsatisfactory changes in occlusion. As a result of the use of

postoperative rehabilitation measures, most complications are compensated. However, some of them require repeated surgical intervention with drug treatment (5; 11; 7;) . **According to some authors, in order to reduce complications from the temporomandibular joints, it is necessary to choose osteotomy methods that minimally disrupt the direction of the masticatory muscle thrust vector. (10; 1;)**

In the long-term after operations, the most frequent complications were recurrences of jaw deformities. According to **V. M. Bezrukov (1981)** , after planar osteotomy according to Obwegeiser and its modifications, relapses of inferior prognathia were observed in 27 to 50% of patients. In addition, after various options for total osteotomy of the upper jaw, the recurrence rates were also quite high, from 8.5% to 35% of the operated patients (25;, 20; 4;).

According to V. M. Bezrukov and V. I. Gunko (1987), the reason for such a high percentage of recurrences is the planning and performance of operations without taking into account the morphofunctional state of the nasal cavity, pharynx, oral cavity, tongue size and masticatory muscle function. To prevent recurrence, it is proposed to carry out the following activities; correct diagnosis, careful planning of the operation, the introduction of bone grafts between the tubercles of the upper jaw and the pterygoid processes of the sphenoid bone, fixation of bone fragments, intermaxillary traction, hypercorrection of the dental arches with good fissure-tubercular contacts. According to another group of clinicians, well-organized treatment according to the protocol "orthodontics-orthognathia-orthodontics" is the main condition for success. According to some clinicians, the frequency of recurrence of jaw deformities is currently up to 22.5%, which indicates the need to study their causes and develop more advanced methods of prevention (11; 22 ;). The state of orthognathic surgery of that time can be ended with a quote from the monograph by A.S. Shcherbakov (1986) "Surgical treatment of malocclusion in adults has not yet become widespread, which can be explained by a rather significant recurrence rate after it and the lack of close contact between dental surgeons and orthodontists" , which confirms the relevance of this issue.

In recent years , reports have appeared in scientific publications in which patients do not complete the treatment they have begun, associated with the duration and inefficiency of orthodontic treatment, deterioration in oral hygiene, the appearance of pain in the jaws and the development of inflammatory processes in the periodontium up to the loss of teeth. All these complications of orthodontic constructions have led scientists to find alternative methods to the used protocol "orthodontics-orthognathia-orthodontics". In 2009, Nagasaki proposed a new protocol, " Surgery - first ", which included orthognathic surgery as the first stage and orthodontic treatment after surgery, i.e., the second stage. The results of a

comparative analysis of two protocols carried out by clinicians showed the advantage of the new protocol, which reduced the treatment time from 26 to 15 months (21 ; 31) aesthetic and functional results of surgical treatment (8;) . A. Abdukadyrov (2007) depending on the sequence of restoration of vital body functions, the time of occurrence of complications and adaptation of the patient's maxillofacial region to new morphofunctional and aesthetic changes in the face. The sequence of rehabilitation activities with the participation of various specialists is divided into three periods. The first period includes the first 1-3 days after the operation and is called the period of restoration of vital body functions. During this period, general and local rehabilitation measures are carried out by an anesthesiologist and an orthopedic surgeon. The second period is called the period of intermaxillary immobilization and lasts from 2 weeks to 2 months. In this period, the participation of an orthognathic surgeon, an oral surgeon, an orthodontist, an orthopedic dentist and other specialists as indicated is required. The third period - the time after removing the splints up to a year is called the period of restoration of the function of the maxillofacial region and the patient's adaptation to new social conditions. In this period, the participation of an orthognathic surgeon, an oral surgeon, an orthodontist, an orthopedic dentist, a psychologist and other specialists is required. However, the author's work does not specifically indicate the number of complications that arose in chronological order and the results of the treatment and preventive care provided.

As a result of the analysis of the available scientific literature on rehabilitation measures after orthognathic operations, we came to the following conclusions;

A) in the era of the formation of orthognathic surgery, information about complications during operations is very scarce, and rehabilitation measures were aimed at eliminating inflammatory complications and maintaining the achieved ratio of the dental arches of the jaws using primitive orthodontic structures.

B) in the era of formed orthognathic surgery, the main provisions for the elimination of intraoperative complications and postoperative rehabilitation were developed based on the experience of the Second World War. The participation of the surgeon, orthodontist, orthopedist and other specialists as indicated led to a slight decrease in the number of complications.

C) in the heyday of orthognathic surgery, the use of modern methods of diagnosis and treatment did not lead to a significant decrease in interoperative and postoperative complications, which indicates the need to create an algorithm for rehabilitation measures involving various specialists, which leads to the prevention or reduction of their number in adult patients with jaw deformities.

LITERATURE:

1. A. Abdukadyrov Improvement of reconstructive surgeries in adult patients with concomitant jaw deformities Dis... Doctor of Medicine Tashkent-2007; 236 C.
- 2.A.Abdukadyrov, F.Sh. Mukhamediev, F. R. Kurbanov. Algorithm for outpatient preparation of adult patients for orthognathic operations Journal of Stomatologiya No. 1-2 p. 46-51,. 2020 Tashkent
3. Andreishchev A.R. Combined dentofacial anomalies and deformities: a guide for physicians. - M.: GEOTAR-Media, 2008. - 456 p. 4 . 4. Bezrukov V.M. Clinic, diagnosis and treatment of congenital deformities of the facial skeleton: Dis. ... Dr. med. Nauk.-M., 1981.-329 p.
5. Gunko V.I. Belova O. M. Analysis of errors and complications in the surgical treatment of patients with deformities Bulletin of the Peoples' Friendship University of Russia series medicine No. 1 pp. 69-73. Moscow 2010
6. Gunko V.I. Clinic, diagnosis and treatment of patients with combined jaw deformities: Dis. ... Doctor of Medical Sciences - M., 1987.-525 p.
7. Drobyshev A.Yu. Complications in orthognathic surgery // Mat. scientific conf. "Fundamentals of Orthognathic Surgery". - St. Petersburg. 2016. - P.175.
8. Dybov A.M. Interdisciplinary rehabilitation of patients with congenital and acquired maxillofacial deformities based on the protocol of three-dimensional computer planning diss . doctor of medical sciences 338str. VAK RF 14.01.14, 20
- 9.Mukhin M.V. Clinical operative maxillofacial surgery Book. Leningrad: Medicine, 1974. - 456 p.
10. Sukachev V. A. Atlas of reconstructive operations on the jaws M. 1984.
11. Sorvin V.A., et al. Complications of surgical treatment of patients with congenital jaw anomalies: clinical characteristics and prevention. Plastic surgery and aesthetic medicine. 2020;(2):21 -32.
12. Tsarev V. N. et al. Clinical and microbiological evaluation of the effectiveness of the use of "Eludril", "Parodium", and "Elgidium" in the complex treatment of periodontitis J. Periodontology No. 1 (26) p. 54-61 2003 29..
13. Shcherbakov A.S. Bite anomalies in adults. -M.: Medicine. - 1987. 191 p.
14. Bell WH, Profitt WR, White RP Surgical Correction of dentofacial deformities.-WB Saunders Company, Philadelphia, London, Toronto, 1985.-Vol. 1-2.-P.1785.
15. Bell WH, Profitt WR, White RP Surgical Correction of dentofacial deformities.-WB Saunders Company, Philadelphia, London, Toronto, 1985.-Vol. 3.-P. 783. J/oral Surg., 1971, v.29.p.549-553.
16. Caldvell, Latterman G. S, Vertical osteotomy in the mandibular raml for correction of prognathism J Oral Surg (Chic) . 1954 Jul;12(3):185-202.

17. J. Converse, D. Telsey, E. Smoll, The tripartite in the medface for orbital expansion and correction of the deformity in craniostenosis.-Brit.J. plast surg., 1971, v.24. p. 365-374.

18. RS Conley, Orthognathic surgery past, present, and future (Review Article) Clinical and Investigative Orthodontics Volume 81, 2022 - Issue 4 Pages 179-186 | Received 21 Jul 2022 Accepted 14 Sep 2022 Published online: 27 Sep 2022

19. Dal Pont G. Retromolar osteotomy for correction of prognathism // J. Oral Surg.-1961.-Vol. 19, No. 1.-P.-42-47. .

20. Frehofer HP Surgical treatment of the short face Syndrome // J. Oral Surg.-1981.-Vol.39.-P.907-911.

21. Heon-Mook Park, Yang-Ku Lee, Jin-Young Choi, Seung-Hak Baek Maxillary incisor inclination of skeletal Class III patients treated with extraction of the upper first premolars and two-jaw surgery: conventional orthognathic surgery vs surgery-first approach Angle Orthod . 2014 Jul;84(4):720-9.

22. Jędrzejewski M, Smektała T, Sporniak-Tutak K, Olszewski R. Preoperative, intraoperative, and postoperative complications in orthognathic surgery: a systematic review. Clin Oral Investig. 2015;19:969-977.

23. Kim JH, Kim SG, Oh JS. Complications related to orthognathic surgery. J Korean Assoc Maxillofac Plast Reconstr Surg. 2010;32:416-421.

24. Kufner J. A method of craniofacial suspension // J. Oral Surg.-1970.-Vol. 28, No. 4.-P.260-262.

25. Kufner J. Experience with a modified procedure for correction of open bite // Transactions of the Third International Conference of oral surgery.-London: ES Livingstone, 1970.

26. Obwegesser HL Der operation's technic bei der Progenia und anderen Kiferanomalien // Dtsch. Zahn. Mund, Kiefer-helkund.-1955.-Bd.23, N 1.-S.1-8.

27. Obwegesser HL Eingriffe am Oberkiefer zur Korrektur des pogenen Zustandsbildes // Schweiz. MShr. Zahnheilk.-1965.-Bd.75, no. 4.-S.365-374.

28. E. Reichenbach Scaffolding implantations for prosthetic purposes Dtsch Zahnarztl Z . 1955 Mar 1;10(5):447-50.

29. Satava RM. Identification and reduction of surgical error using simulation. Minimally Invasive Therapy and Allied Technologies. 2005;14:257-261. PMID: 16754172. <https://doi.org/10.1080/13645700500274112>

30. Steinhauser EW. Historical development of orthognathic surgery. J Craniomaxillofac Surg. 1996 Aug; 24(4):195-204. doi: 10.1016/s1010-5182(96)80002-3. PMID: 8880445.

31. Young-Wook Park¹, Kwang-Jun Kwon², Yei-Jin Kang², In-San Jang³ Surgery-first approach reduces the overall treatment time without damaging long-term stability in the skeletal class III correction: a preliminary study Maxillofac

