Scholars Journal of Dental Sciences

OPEN ACCESS

Abbreviated Key Title: Sch J Dent Sci
ISSN 2394-4951 (Print) | ISSN 2394-496X (Online)
Journal homepage: https://saspublishers.com

Paradigm Shift in Orthodontics

Sharath Kumar Shetty[1], Mona[2*], Mahesh Kumar Y[3], Vijayananda K. Madhur[4]

[1]Professor & HOD, Department of Orthodontics and Dentofacial Orthopaedics, K. V. G. Dental College and Hospital, Sullia, Karnataka, India
[2]Post Graduate Student, Department of Orthodontics and Dentofacial Orthopaedics, K. V. G. Dental College and Hospital, Sullia, Karnataka, India
[3]Professor, Department of Orthodontics and Dentofacial Orthopaedics, K. V. G. Dental College and Hospital, Sullia, Karnataka, India
[4]Reader, Department of Orthodontics and Dentofacial Orthopaedics, K. V. G. Dental College and Hospital, Sullia, Karnataka, India

DOI: 10.36347/sjds.2021.v08i01.002 | **Received:** 17.12.2020 | **Accepted:** 31.12.2020 | **Published:** 04.01.2021

***Corresponding author**: Mona

Abstract **Review Article**

New paradigms are continuously developing in orthodontics. Paradigm shift is a fundamental change in the basic concepts and experimental practices of a scientific discipline. New idea generally experience great resistance from practitioners in the field and once the idea is accepted by various practitioners, a new paradigm begins. When this natural dentition state occurs, the face should also be in the perfect harmony and balance and the stomato-gnathic system should function ideally. All these appliances and various other modifications serve the purpose of anchorage but with some limitations like patient compliance especially with extra oral appliances and anchorage loss to some extent.

Keywords: Soft tissue paradigm, Temporary anchorage devices, Surgery first orthognathic approach.

INTRODUCTION

A paradigm shift concept was identified by the American physicist and philosopher Thomas Kuhn (1992-1996). He explained paradigm shift as a fundamental change in the basic concepts and experimental practices of a scientific discipline [1]. According to Ackerman and Proffit, "A universally accepted scientific perspective, the best current explanation of a natural phenomenon, has been termed a paradigm'' [1]. Usually, science advances incrementally by the cumulative effort of investigators, each adding units of knowledge to the currently accepted model or paradigm. A paradigm can be thought of as the foundation upon which a scientific structure is erected, as if laying brick upon brick of new findings and insights. Scientific progress proceeds in this appositional fashion, until a new way of looking at things arises, and a new paradigm is proposed and accepted [2]. As a new paradigm replaces an old one, today's 'truths' become tomorrow's myths. There is generally great resistance on the part of practitioners of a scientific discipline to acceptance of a new paradigm. Nonetheless, once a paradigm shift has occurred, there is variable explosion of new ideas and information, leading to rapid advances in the field.[2] A new paradigm leads to explosion of new ideas and knowledge that leads to various advances in field. Similarly orthodontics has evolved rapidly in the past [1].

Several changes in various aspects have been seen in treatment planning, mechanics, and assessment of orthodontic treatment leading to new paradigms. Major paradigms seen in orthodontics from time of Dr. EH Angle till today are [1].

- Soft tissue paradigm
- Surgery first orthognathic approach
- Temporary anchorage devices

Soft Tissue Paradigm

Orthodontists have a special interest in facial beauty, although, over time, the relative importance of esthetics has waxed and waned in relation to other considerations. In part of his ongoing review of orthodontic history, Wahl wrote, "Now it appears that facial esthetics is again in the forefront as we realize why patients come to us in the first place'' [3]. The evolution of orthodontics during the twentieth century to its level has followed an interesting path, in view of the current emphasis on esthetics. The first prominent orthodontist was Norman Kingsley, a noted artist and sculptor as well as a New York orthodontist. In Kingsley's diagnostic framework, facial esthetics was foremost in determining treatment choices.[4] Edward Harley Angle emerged as the dominant intellectual influence in orthodontics during the twentieth century. The angle paradigm dictated that orthodontists should consider correction of malocclusion first and the face should take care of itself [4]. For 100 years, orthodontic

theory and practice has been largely based on the ANGLE paradigm. This model is predicated on the teleological belief system, which holds that nature intends for all adults to have perfectly aligned dental arches that should mesh in ideal articulation with the teeth in the opposing jaw [2]. when this natural dentitional state occurs, the face should also be in perfect harmony and balance and the stomatognathic system should function ideally [1].

Parameter	Angle paradigm	Soft tissue paradigm
Primary treatment goal	Ideal dental occlusion	Normal soft tissue proportions and adaptations
Secondary goal	Ideal jaw relationships	Ideal soft tissue proportions define ideal hard tissues
Hard / soft tissue relationships	Ideal hard tissue proportions produce ideal soft tissues will be OK	Clinical examination of intra-oral and facial soft tissues
Diagnostic emphasis	Dental casts, cephalometric radiographs	Clinical examination of intra-oral and facial soft tissue
Treatment approach	Obtain ideal dental and skeletal relationships	Plan ideal soft tissues relation-ships and then place teeth and jaws as needed to achieve this
Function emphasis	TM joint in relation to dental occlusion	Soft tissue movement in relation to display of teeth
Stability of result	Related primarily to dental occlusion	Related primarily to soft tissue pressure/equilibrium effects

Fig-1: Comparison between Angle paradigm and Soft tissue paradigm (Mhatre et al., 2012) [1]

A new paradigm is considered to be emerging, namely the soft tissue paradigm. It calls for treatment planning not to be solely focused on the teeth, but also their arrangement to soft tissues. In fact, it suggests that the primary emphasis should be on facial and dental esthetics as a starting point for treatment goals if they are in concert with the patient's concerns and priorities as long as this approach does not compromise function and stability [5].

Basic requirements for assessing dental and facial esthetics (Sarver and Ackerman)

1. A dynamic and static 3-dimensional evaluation of the face derived primarily from the clinical exam of the patient [5].
2. A determination of lip-tooth relationships and anterior tooth display at rest during facial animation [5].
3. An analysis of the dental and skeletal volume of the face and its effects on the soft tissue facial mask [5].

Guidelines for treatment planning depending upon soft tissues (Ackerman, 1997)

Size of nose and chin: If patient has large nose or chin, protraction of incisors is indicated. One should avoid retraction of anteriors in such conditions [6].

Position of upper lip: Upper lip looks unaesthetic if it forms negative angle with true vertical line. So incisors should not be retracted beyond certain limit such that upper lip will make a
negative angle with true vertical line [6].

Mentolabial Sulcus: Protruded lower incisors or lower jaw make the mentolabial Sulcus shallow which is unaesthetic thus proclination of lower incisors should be avoided if mentolabial
Sulcus is shallow [6].

Smile Line: This is the most important feature in orthodontic treatment. Ideally 1-2 mm of gingiva should be visible during smile. More gingival display will lead to unaesthetic smile [18].

Soft Tissue Objectives

There should be soft tissue considerations for orthodontic treatment planning so that specific treatment objectives can be defined before making any treatment decisions [7].

Soft tissue objectives are as follows [7]:

- Retract, maintain, or protract upper and/or lower lip.
- Increase, maintain, or decrease vermilion display (lip thickness).
- Reduce lip strain, mentalis muscle strain, and interlabial gap or maintain lip competence.
- Increase, maintain, or decrease nasolabial angle.
- Increase, maintain, or decrease mentolabial angle.
- Increase or maintain cervicomental angle.
- Reduce, maintain, or increase the gingival display on smiling.
- Improve facial asymmetry.
- Increase, maintain, or decrease width of the alar base.

- Increase, maintain, or decrease the vertical and/or antero-posterior projection of the soft tissue chin.

Soft Tissue Changes with Treatment

Effects of extraction and non extraction therapy

A direct comparison of much of the reported literature is difficult because of the inconsistent use of reference lines in evaluating lip and incisor positions. Some researchers have found a high degree of correlation between incisor retraction and upper and lower lip retraction, while others have found that a definite proportional change in the soft tissue does not necessarily follow changes in the dentition [7]. The inability to formulate constant strong correlations between soft and hard tissues indicates that the change in the perioral soft tissues is a complex phenomenon. Some researchers have found factors that may explain this variability. Oliver stated that lip thickness, postural tone, and body fat may influence the soft tissue's response to incisor retraction. Holdaway described lip taper as the difference in the thickness of the upper lip at a point 3 mm inferior to point A and at the vermilion border. If the difference between these measurements is more than 1 mm, this difference must adjust before lip retraction occurs. Exceptions exist when the tissue near point A is very thick and the lip may not follow the incisors at all, or if the tissue near point A is very thin, the lip may immediately follow the incisor, regardless of lip taper. In adults, even if lip taper is present, the lips will usually follow the teeth immediately, because the lips have accommodated to their position over a long period [7].

Effect of Headgear Versus Functional Appliances

Tulloch et al found that headgear patients had a greater tendency to restricted maxillary forward movement, while functional appliance subjects had more increased mandibular length and improved chin position. There was such wide variation within the groups, however, that much of the differences may in fact be more attributable to differences in growth and clinician proficiency than to a particular treatment approach. They were unable to identify any patient characteristics that could serve as useful predictors of treatment response [7]. Pancherz reported short- and long-term effects of the Herbst appliance on the facial profile. In relation to the E-line, the upper lip became retrusive, while the lower lip remained, on average, unchanged. When excluding the nose, the facial profile convexity was, on average, reduced in the stable group, and it remained unchanged in the relapse group. As a result of posttreatment growth changes, however, the longterm effects of therapy on the facial profile were variable and unpredictable [7]. What is known from the study by Tulloch et al., is that the functional appliance group had, on an average, 3° more proclination of the lower incisors than the control or headgear groups [7]. Therefore, it is concluded that the dentoalveolar compensations that produce the Class II dental corrections vary slightly between these two treatment modalities, because greater lower anchorage loss may be expected with the use of a functional appliance. This phenomenon may be beneficial, for instance, for the Class II patient with a straight or obtuse nasolabial angle and for whom surgical mandibular advancement is not an option [7].

Effects of Maxillary Protraction

Most studies have shown that significant soft tissue profile changes can be expected with maxillary protraction primarily as a result of a decrease in soft tissue facial angle and protrusion of the upper lip area resulting in better lip competence and posture However, individual variations exist in treatment response and subsequent growth changes [7]. Ngan et al., studied the soft tissue profile changes in 20 patients with skeletal Class III malocclusions treated consecutively with maxillary expansion and protraction headgear. They found that a corresponding forward movement of the soft tissue of 50% to 79% accompanied the forward movement of the maxilla. In the mandible, the downward and backward movement of the soft tissues was equivalent to 71% to 81% of the corresponding soft tissues [7].

Effects of Orthognathic Surgery

In most cases, surgical procedures will have a more dramatic effect on facial soft tissues than changes as a result of orthodontic tooth movement. When there is a major concern in producing detrimental effects to facial esthetics with orthodontic treatment alone, it is appropriate to consider the possibility of orthognathic /cosmetic surgery in addition to orthodontic alignment of the teeth [7]. Computer imaging plays an important role in the contemporary orthodontic practice and is especially useful in the treatment planning of the orthognathic patient. It allows the orthodontist to communicate with the patient and other professionals involved in the treatment about the projected treatment goals and outcomes by being able to visualize the potential facial changes that can be achieved. What is attractive to the orthodontist may not be attractive to the patient, and computer imaging provides a means by which these differences may be recognized before treatment is initiated [7]. Sarver has used computer video imaging technology extensively. Computer simulations are based on predictions of soft tissue changes produced by surgical changes in the hard tissues**.**

Some guidelines for predicting soft tissue change as a result of orthognathic surgery include the following [7]:

1. **Maxillary advancement**: The tip of the nose elevates slightly and follows the advancement of the maxilla by approximately one third, and the base of the nose in a ratio of 4:7. 49. The upper lip moves forward 60% of the upper incisor protraction and shortens 1 to 2 mm.

2. **Maxillary alveolar setback**: The nasolabial angle increases, the upper lip lengthens slightly, and moves back 60% of the upper incisor retraction. The nose is mainly unaffected unless anterior nasal spine is moved, in which case the tip of the nose may move slightly backward or backward and downward.
3. **Maxillary superior repositioning:** The upper lip shortens 1 to 2 mm, and the lower lip rotates 1:1 with the mandible. If the maxilla is advanced as it is being impacted, the width of the alar base can increase significantly The patient's gummy smile was successfully treated with a maxillary impaction. The width of the alar base remains unchanged when the maxilla is set back slightly as it is being repositioned superiorly.
4. **Mandibular advancement:** The soft tissue chin moves 1:1 with the bone, and the lower lip advances 60% to 70% of the lower incisor advancement. The chin-throat angle becomes more acute, total facial height increases, and the mental sulcus has an appearance of deepening.
5. **Mandibular body setback:** The chin follows 1:1, and the lower lip moves back 60% to 80% of the lower incisor retraction. The chin throat angle becomes more obtuse.
6. **Mandibular alveolar setback:** The lower lip sulcus becomes more concave, while the chin point remains unchanged.
7. **Genioplasty:** This varies according to the direction of the genioplasty. If the chin is advanced, the soft tissue follows 60% to 70%; if it is elevated, the soft tissue follows 100%. If the chin is moved back, the soft tissue follows 50%, and if it is moved laterally, the soft tissue follows 60%.

Surgery first orthognathic approach

A combined orthodontic and orthognathic surgery approach is accepted as the standard of care for patients who have a severe skeletal jaw discrepancy with facial asymmetry. It is often considered the only viable treatment option for improving facial appearance and restoring normal occlusal function [8, 9].

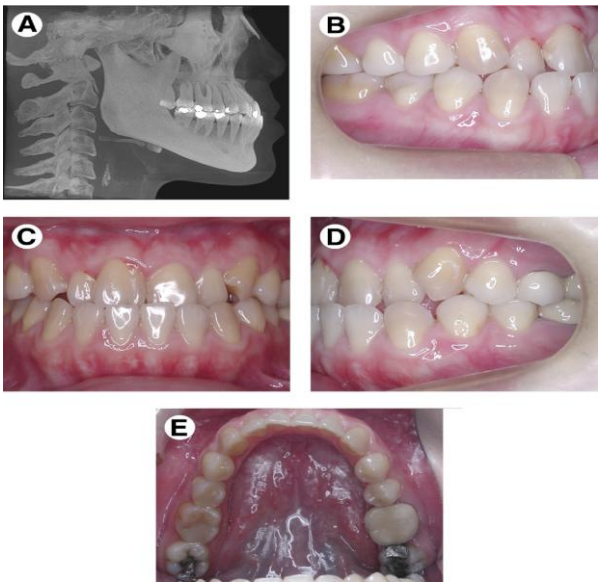
Indications

The criteria that are suggested for Surgery First Approach are:

- Well-aligned to mild crowding.
- Flat to mild curve of Spee.
- Normal to mild proclination/ retroclination of incisors.
- Minimal transverse discrepancy [10].

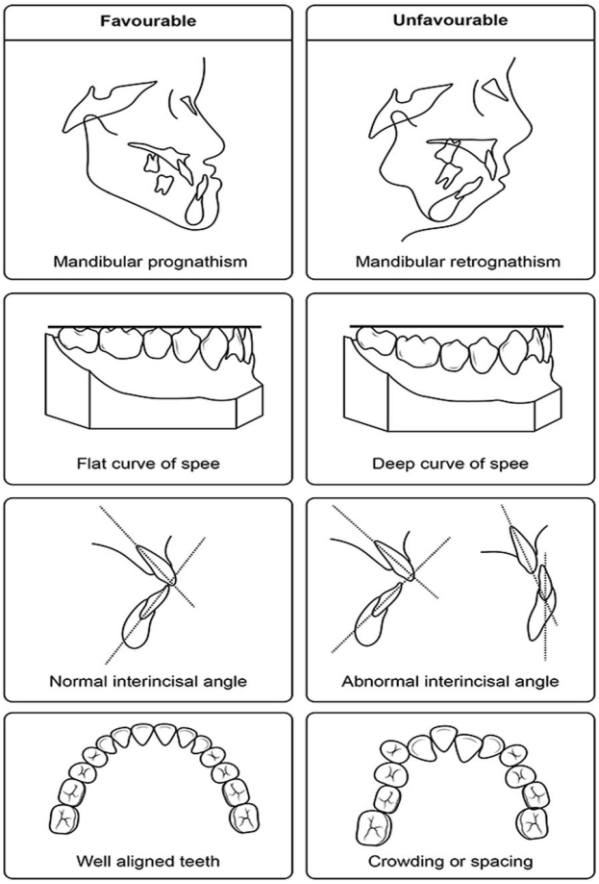
This approach is also indicated in cases in which decompensation is needed[11.] Decompensation is done after positioning the jaw bones properly [10].

Even though, the surgery- first technique can be applied to Class II as well as Class III malocclusions, the majority of cases treated using this approach have been cases with Class III malocclusion meeting the above criteria [12].”



The surgery-first accelerated orthognathic surgery is best indicated in cases with well-aligned to mildly crowded anterior teeth, a flat to mild curve of Spee, and normal to mildly proclined/ retroclined incisor inclination [10].

Favourable and unfavourable cases for SFOA



Favorable case and unfavorable case for the surgery-first approach. Some unfavorable cases may be considered for the surgery-first approach. However, much more sophisticated treatment plan is required for unfavorable cases [13].

Different approaches in SFOA

- Orthodontically driven style
  Sendai approach
- Chang Gung approach

Surgically driven style.

Surgically driven style: When the surgical treatment is utilized not only for correction of skeletal problem but also for the dental problem, it can be named as "surgery-driven style" SFA [14].

Orthodontically driven style: corrects the jaw deformity by surgery and the dental deformity via Orthodontics [15, 16, 17-20].

Orthodontically driven style	**Surgically driven style**
To solve skeletal problems with OGS and dental problems using SAS	To solve both skeletal and dental problems using OGS
Most jaw deformities are indications except for a few specific types of cases.	Indications 1) Crowding: no~mild 2) Curve of Spee: no~mild 3) U1 and L1: normal~mild 4) Asymmetry: no~mild [16].
Occlusion after OGS should be setup to reveal the true extent of decompensation based on ceph prediction.[15]	Occlusion after OGS should be setup for "a treatable Class I malocclusion" with tripod occlusal contact [21].
The use of the skeletal anchorage system using miniplates or miniscrews is indispensable in the postsurgical orthodontics [15].	Since skeletal and dental problems are solved surgically, the application of TADs are not necessarily required.

Differences between the TRADITIONAL ORTHODONTICS- FIRST And SURGERY- FIRST ORTHOGNATHIC APPROACHES

Differences between the traditional orthodontics-first and surgery-first orthognathic approaches; these differences only occur in the pre-surgical period. A simulation of pre-surgical orthodontic treatment using model mounting and setup can replace pre-surgical orthodontic treatment (STO, surgical treatment objective [22].

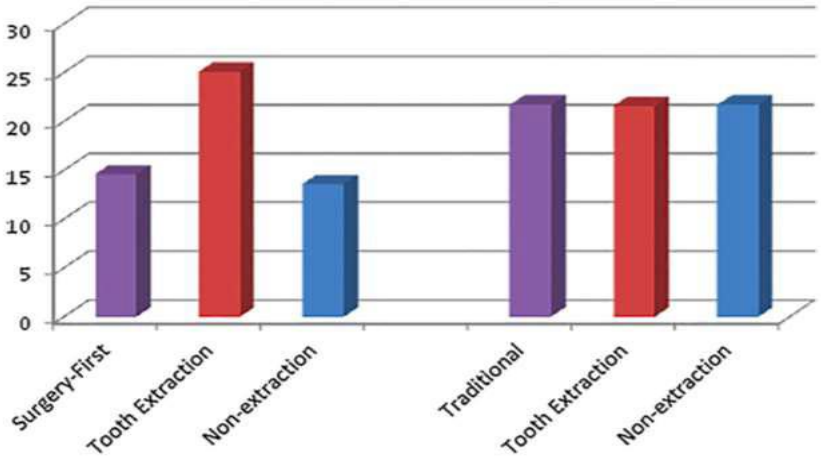
Table comparing salient features of 'SFOA' and 'conventional jaw surgery [23]

Salient features	**Surgery First Orthognathic Approach**	**Conventional jaw surgery**
Pre-surgery orthodontic treatment	1–4 weeks	12–18 months
Stages involved	Three stages • Pre-surgery orthodontics • Jaw surgery • Post-surgery orthodontics	Two stages • Jaw surgery • Post-surgery orthodontics
Post-surgery orthodontic treatment time	12–18 months	6–12 months
Impact on facial profile	Immediate improvement	Potential aggravation led by worsening of profile before surgery
Post-surgical stability	Yet to be evaluated in Detail	No immediate post-surgical instability
Quality of life: self-esteem, body image, level of satisfaction	Significant benefits with the surgery-first approach	Negative impact on the perception of patients' quality of life
Early elimination of soft and hard tissue hindrances	Possible to eliminate imbalances in the beginning of treatment due to establishment of proper maxilla-mandibular relationship, thereby allowing efficient dental correction	Not possible; in fact, Worsens due to ensued decompensation mechanism
Patient satisfaction rate	High patient satisfaction rate isassociated with improved cooperation during postoperative orthodontics	Patients cannot appreciate The mmediate corrections due to pre-surgical orthodontics phase
Surgery option	Surgery can be opted Based according to patients' will	Surgery timing can't be chosen as the patient has to wait until pre-surgical decompensation is completed
Overall treatment time	1–1.5 years	3–4 years
Patient selection criteria	Critical for the success of treatment as the baseline dental relation is unable to guide the post-surgery occlusion. The orthodontist experience in assessing and predicting accurate post-surgery tooth movement plays a vital role	Non-critical, complex cases can be managed with appropriate pre-surgical decompensation stage

Advantages of SFOA over the conventional approach

1. Early correction of soft tissue problems.
2. Minimize serious psychosocial difficulties encountered by patients.
3. Entire treatment period is shortened to 1 to 1.5 years or less.
4. Phenomenon of RAP reduces the difficulty and treatment time of orthodontic management.
5. Compensation of surgical error or skeletal relapse is possible later [31].
6. Earlier resolution of temporomandibular disorders and sleep disordered breathing [45].

Total Treatment Period



The total treatment period: surgery-first orthognathic surgery compared with the traditional orthodontics-first method; tooth extraction group (red) and non-extraction group (blue)

Can a surgery-first orthognathic approach reduce the total treatment time? Jeong et al. (Int. J. Oral Maxillofac. Surg. 2017; 46: 473–482).

The surgery-first approach for orthognathic surgery can accelerate orthodontic treatment and reduce the total duration of treatment needed to correct dentofacial deformities when tooth extraction is not needed. The surgery-first approach is also extremely beneficial in decreasing the total management time [22].

Performing orthognathic surgery before orthodontic treatment has multiple advantages including but not limited to shortened treatment time, increased patient acceptance, and the utilization of the regional acceleratory phenomenon. If the cases are selected carefully, the orthodontist and the surgeon are experienced enough to predict the final occlusion beforehand, and the level of cooperation between the clinicians is high, the results are very promising. However, even the slightest error during the treatment planning, surgical, and post-surgical orthodontic steps can be very difficult to correct. By utilizing the principles of surgery first technique, the pre-surgical orthodontics period can be shortened even if it is not eliminated. As with any other surgical procedure, the patient's well-being and chief complaint should always be the first priority. The future of orthognathic surgery is geared towards minimizing the overall treatment time without compromising the final results. The scope of this approach has been expanding with advances in 3-dimensional (3D) imaging technology and 3D virtual surgical simulation, the use of skeletal anchorage systems, and better understanding of the biologic response after surgery.

Temporary Anchorage Devices

Device that is temporarily fixed to bone for the purpose of enhancing orthodontic anchorage either by supporting the teeth of the reactive unit or by obviating the need for the reactive unit altogether, and which is subsequently removed after use [26].

	Traditional orthodontic treatment	**Treatment with implants**
Anchorage source	Teeth and extra oral bony structures	implants
Stability of anchorage	Anchor teeth not stable	stable
no: of anchor teeth	Sufficient anchorage include maximum teeth	Direct anchorage :teeth are not necessary Indirect anchorage: minimal teeth required
Treatment efficiency	Applying force on teeth, part of it is wasted due to periodontal amortization	More efficient as force is transmitted directly to the implants

Indications
Three dimensional stable anchorage is needed.
Maximum anchorage case
Several missing teeth making it difficult to engage posterior units
Intrude/extrude teeth
Close edentulous spaces
Treat partial edentulism
Retraction of anterior teeth (class II divI)
To treat borderline cases with non extraction method
Patient is not willing to undergo orthognathic surgery.
Reposition of malposed tooth
Eruption of impacted tooth
Uprighting of molars
Mesiodistal tooth movement
Open bite correction
Molar mesialization
Distalization of molars
Orthopedic use-on plants can be used for expansion and maxilla protraction.
Correct undesirable occlusion

Absolute contra-indications
Recent myocardial infarction
Valvular prosthesis
Severe renal disorder
Treatment-resistant diabetics:
Generalized secondary osteoporosis
Chronic or severe alcoholism
Treatment-resistant osteomalacia
Radiotherapy in progress
Severe hormone deficiency
Drug addiction
Heavy smoking habits (more than 20 cigarettes per day):

Relative Contraindications
1. AIDS and other seropositive diseases
2. Prolonged use of corticosteroids
3. Disorders of phosphocalcic metabolism
4. Hernatopoietic disorder
5. Buccopharyngeal tumors
6. Chemotherapy in progress
7. Mild renal disorder
8. Hepatopancreatic disorder
9. Multiple endocrine disorder
10. Psychologic disorders, psychoses
11. Lack of understanding and motivation
12. Unrealistic treatment plan

Implant site selection [27]
Indication and required mechanics.
Attached gingiva placement, clear of frenulum.
Sufficient interradicular distance.
Avoid other anatomical structures.
Adequate cortical bone thickness

Maxillary Microimplants sites
- Infrazygomatic crest area
- Maxillary tuberosity area
- Between the first and second molar buccally
- Between the first molar and second premolar buccally
- Between the lateral incisors and canine labially
- Between the maxillary incisors facially
- Between maxillary second premolar and first molar and between first and second molar palatally
- Midpalatal area

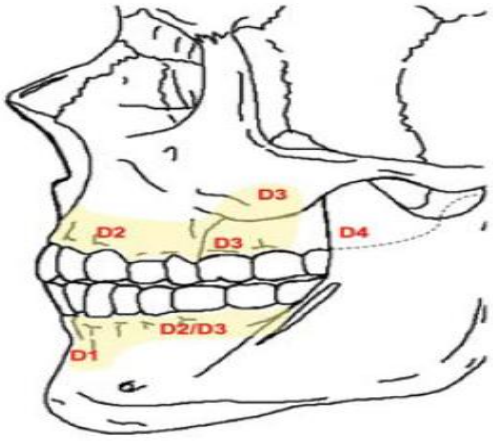
Mandibular Microimplants sites
1. Retromolar area
2. Between mandibular first and second molar buccally
3. Between mandibular first molar and second premolar buccally
4. Between mandibular canine and premolar buccally
5. Mandibular symphysis facially
6. Edentulous area
7. Other areas

Bone density and MISCH classification

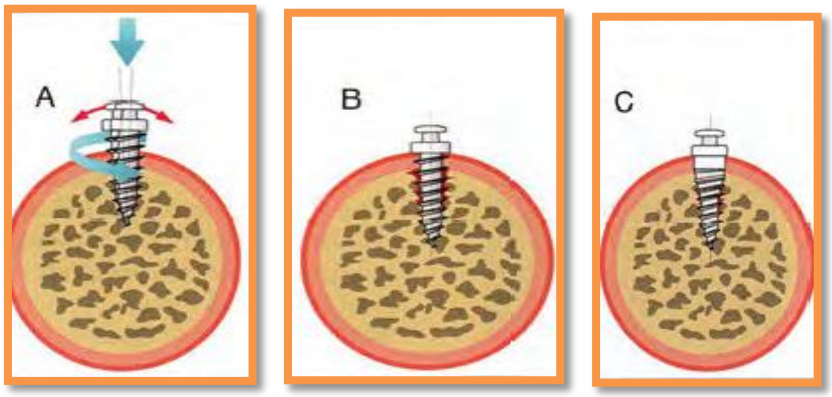
Bone density (quality) is classified into 4 groups by Lekholm and Zarb, and Misch related bone density to the clinical hardness of the bone as perceived during drilling prior to implant placement [28].

i. Dl - is dense cortical bone primarily found in the anterior mandible and the maxillary midpalatal area. (Dl bone is "oak or maple-like").
ii. D2 - is thick (2mm) porous cortical bone with coarse trabeculae primarily found in the anterior maxilla and the posterior mandible. (D2 is similar to "spruce or white pine wood")
iii. D3-is thin (1mm) porous cortical bone with fine trabeculae primarily found in the posterior maxillae with some in the posterior mandible. (D3 is like "balsa wood')
iv. D4-is fine trabecular bone primarily found in the posterior maxilla and the tuberosity region. (D4 is similar to "Styrofoam").

Dl to D3 bone are optimal for self-drilling miniscrews. Placement of screws in Dl and D2 bone might provide greater stationary anchorage under the orthodontic loading. Placement of the miniscrew in D4 bone is not recommended due to the reported high failure rate.



Miniscrew Shape: Tapering



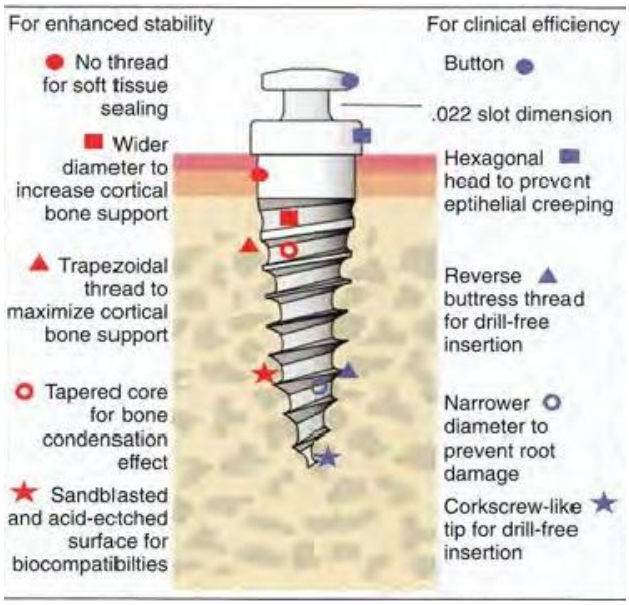
Reduced diameter at apical region can minimize possible root injury. Large collar increases the surface area and helps in distribution of stress on cortical bone [26].

Implant angulation

Maxillary micro implants: The micro-implants sites need a 30^0-40^0 angulation to the long axes of the teeth, either buccally or lingually [29]. For, miniscrews placed in pnematized, edentulous regions of the maxilla, or placed higher in the posterior maxilla when intrusive forces are required, the clinician should consider angulating the screw perpendicular to the alveolar ridge to avoid damage to the maxillary sinus [30].

Mandibular micro-implants: Most of the mandibular arch is made up of thicker cortical bone (Dl and D2). Micro-implants in these thicker cortical regions require only 10^0-20^0 of angulation to the long axes of the teeth, i.e., almost parallel to the tooth roots so that most of the inserted portion of the implant will lie in the cortical bone [29].

Composition of miniscrew



Growing Patients Considerations

The success rates in individuals younger than 15 yrs of age is relatively low.

To prevent injury to successor tooth buds, areas in which permanent teeth have not yet erupted should be avoided.

Predrilling through cortical bone is recommended to minimize surgical trauma.

Use of light continuous forces is preferable to the use of heavy intermittent force. (150g)

Parasagittal area may be considered.

Post operative instructions

There may be some amount of Pain.

Ulceration may occur because of mechanical irritation.

Any kind of mechanical irritation can cause loosening of an implant.

Brushing of the implant is also necessary, brush as gently as possible.

Never touch implant with finger or with the tongue.

When eating a meal, hard food may cause mechanical irritation.

Loading protocols

Loading protocols for screws involve immediate loading or a waiting period of 2 weeks to apply orthodontic forces.

Removal

Deep anesthesia is generally unnecessary

Topical anesthesia or infiltration anesthesia may be administered.

There is no serious difficulty in bleeding control.

Removal is done by turning in opposite direction of placement.

If covered by soft tissue the head of the microimplant will need to be incised and reflected to expose the head of implant.

Apply slight and gentle force until the interface between microimplant and bone breaks**.**

If removal torque reaches fracture torque, the clinician should wait 1-2 weeks, when the microimplant can be removed with lesser force.

Micro-implants (miniscrews) introduced as skeletal orthodontic anchorage have overcome the shortcomings of conventional means to some extent, reduced considerable treatment duration with simpler biomechanics, minimised patient co-operation while offering maximum treatment outcome and efficiency. Despite their small size they provide stable anchorage for various types of tooth movements, including intrusion, protraction, extrusion of impacted canines, correction of canted occlusal planes. Miniscrew application, clearly demonstrates the versatility, technical advantages of the skeletal orthodontic anchorage system. The orthodontic treatment using miniscrew anchorage system is not only more effective, but offers a variety of treatment alternatives in complex and challenging cases where traditional mechanics cannot be used

REFERENCES

1. Paradigm shift in orthodontics-review international Journal of Current Research. 2018 July, 10(7):71800-71803.
2. Mejia-Maidl M, Evans CA. Soft tissue facial considerations andorthodontic treatment. In Seminars in Orthodontics 2000 Mar 1 (Vol. 6, No. 1, pp. 3-20). WB Saunders.
3. Naini FB, Moss JP, Gill DS. The enigma of facial beauty: esthetics, proportions, deformity, and controversy. American Journal of Orthodontics and Dentofacial Orthopedics. 2006 Sep 1; 130(3):277-8
4. Sarver DM. The face as the determinant of treatment choice. Craniofacial Growth Series. 2001;38:19-54
5. Parekh SM. The perception of selected aspects of smile esthetics-smile arcs and buccal corridors (Doctoral dissertation, The Ohio State University). 2005.
6. Ackerman JL, Proffit WR. Soft tissue limitations in orthodontics: treatment planning guidelines. The Angle Orthodontist. 1997 Oct 1; 67(5):327-36.
7. Hwang HS, Oh MH, Oh HK, Oh H. Surgery-first approach in correcting skeletal Class III malocclusion with mandibular asymmetry. American Journal of Orthodontics and Dentofacial Orthopedics. 2017 Aug 1;152(2):255-67.
8. Hwang HS, Oh MH, Oh HK, Oh H. Surgery-first approach in correcting skeletal Class III malocclusion with mandibular asymmetry. American Journal of Orthodontics and Dentofacial Orthopedics. 2017 Aug 1;152(2):255-67.
9. Bell WH, Creekmore TD. Surgical-orthodontic correction of mandibular prognathism. Am J Orthod. 1973; 63:256-70.
10. Liou EJ, Chen PH, Wang YC, Yu CC, Huang CS, Chen YR. Surgery‐first accelerated orthognathic surgery: Orthodontic guidelines and setup for model surgery. J Oral Maxillofac Surg. 2011;69:771‐80
11. 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. 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. 2017 Aug 1;152(2):250-4.
12. Kim JH, Mahdavie NN, Evans CA. Guidelines for 'surgery first' orthodontic treatment. In: Bourzgui F, editor. Orthodontics-basic aspects and clinical considerations. Rijeka: In Tech; 2012. Available from: http://www.intechopen.com/books/orthodontics-basicaspects-and-clinical-considerations/orthodontic-guidelines-for-the-surgery-first-treatment-of severe malocclusions.
13. Choi DS, Garagiola U, Kim SG. Current status of the surgery-first approach (part I): concepts and orthodontic protocols. Maxillofacial plastic and reconstructive surgery. 2019 Dec 1;41(1):10.
14. Kim JY, Jung HD, Kim SY, Park HS, Jung YS. Postoperative stability for surgery-first approach using intraoral vertical ramus osteotomy: 12 month follow-up. Br J Oral Maxillofac Surg. 2014 July; 52(6):539-44.
15. Nagasaka H, Sugawara J, Kawamura H, Nanda R. "Surgery first" skeletal Class III correction using the skeletal anchorage system. J Clin Orthod. 2009; 43:97-105.
16. Sugawara J, Aymach Z, Nagasaka DH, Kawamura H, Nanda R. "Surgery first" orthognathics to correct a skeletal Class II malocclusion with an impinging bite. J Clin Orthod. 2010; 44: 429-38.
17. Baek SH, Ahn HW, Kwon YH, Choi JY. Surgery-first approach in skeletal class III malocclusion treated with 2-jaw surgery: evaluation of surgical movement and postoperative orthodontic treatment. J Craniofac Surg. 2010; 21:332–8.
18. Hernández-Alfaro F, Guijarro-Martínez R, Molina-Coral A, Badía-Escriche C. "Surgery first" in bimaxillary orthognathic surgery. J Oral Maxillofac Surg. 2011; 69:201–7.
19. Hernández-Alfaro F, Guijarro-Martínez R, Peiró-Guijarro MA. Surgery first in orthognathic surgery: what have we learned? A comprehensive workflow

based on 45 consecutive cases. J Oral Maxillofac Surg. 2014; 72:376–90.
20. Yu CC, Chen PH, Liou E, Huang CS, Chen YR. A surgery-first approach in surgical orthodontic treatment of mandibular prognathism—a case report. Chang Gung Med J. 2010; 33:699–705.
21. Liou EJ, Chen PH, Wang YC, Yu CC, Huang CS, Chen YR. Surgery‐first accelerated orthognathic surgery: Postoperative rapid orthodontic tooth movement. J Oral Maxillofac Surg. 2011; 69:781‐5.
22. Jeong WS, Choi JW, Lee JY, Kwon SM. Can a surgery-first orthognathic approach reduce the total treatment time?. International journal of oral and maxillofacial surgery. 2017 Apr 1;46(4):473-82.
23. Chai KC, Narayan HG, Eric JWL. Surgery-First Orthodontic Management, A Clinical Guide to a New Treatment Approach.1st edition. Springer Nature Switzerland AG. 2019/
24. Zingler S, Hakim E, Finke D, Brunner M, Saure D, Hoffmann J, Lux CJ, Erber R, Seeberger R. Surgery-first approach in orthognathic surgery: Psychological and biological aspects–A prospective cohort study. Journal of Cranio-Maxillofacial Surgery. 2017 Aug 1;45(8):1293-301.
25. Park KR, Kim SY, Park HS, Jung YS. Surgery-first approach on patients with temporomandibular joint disease by intraoral vertical ramus osteotomy. Oral Surg Oral Med Oral Pathol Oral Radiol. 2013 Dec; 116(6):e429-e436.
26. Temporary Anchorage Device-Ravindra Nanda.
27. Lee JS, Kim JK, Park YC, Vanarsdall RL. Applications of orthodontic mini-implants. Chicago, Ill: Quintessence Publishing Company; 2007.
28. Shahlaie M, Gantes B, Schulz E, Riggs M, Crigger M. Bone density assessments of dental implant sites: Quantitative Computed Tomography. J Oral Maxillofac Implants. 2003;18:224-231.
29. Wehrbein H, Diedrich P. Endosseous titanium implants during and after orthodontic load- an experimental study in the dog. Clinical Oral Implants Research. 1993 Jun;4(2):76-82.
30. Brite, M. Mini implants: where are we? 3 Clin Orthod. 2005; 39:539-547.
31. Mah SJ, Won PJ, Nam JH, Kim EC, Kang YG. Uprighting mesially impacted mandibular molars with 2 miniscrews. American Journal of Orthodontics and Dentofacial Orthopedics. 2015 Nov 1;148(5):849-61.
32. Nishimura M, Sannohe M, Nagasaka H, Igarashi K, Sugawara J. Nonextraction treatment with temporary skeletal anchorage devices to correct a Class II Division 2 malocclusion with excessive gingival display. American Journal of Orthodontics and Dentofacial Orthopedics. 2014 Jan 1;145(1):85-94.
33. Cope JB. Temporary anchorage devices in orthodontics: a paradigm shift. InSeminars in orthodontics 2005 Mar 1 (Vol. 11, No. 1, pp. 3-9). WB Saunders.
34. Cornelis MA, Scheffler NR, De Clerck HJ, Tulloch JC, Behets CN. Systematic review of the experimental use of temporary skeletal anchorage devices in orthodontics. American Journal of Orthodontics and Dentofacial Orthopedics. 2007 Apr 1;131(4):S52-8.
35. Minibone plate. The skeletal anchorage device system. Semin orthod. 2005; 11:47-56.
36. The Spider Screw for Skeletal Anchorage: JCO. 2003 February (37):90-7.
37. Miniscrew implants: IMTEC Mini Ortho Implants Semin Orthod. 2005:11:32-39.
38. Leo M, Cerroni L, Pasquantonio G, Condò SG, Condò R. Temporary anchorage devices (TADs) in orthodontics: review of the factors that influence the clinical success rate of the mini-implants. Clin Ter. 2016 Jan 1;167(3):e70-77.
39. Nishimura M, Sannohe M, Nagasaka H, Igarashi K, Sugawara J. Nonextraction treatment with temporary skeletal anchorage devices to correct a Class II Division 2 malocclusion with excessive gingival display. American Journal of Orthodontics and Dentofacial Orthopedics. 2014 Jan 1; 145(1):85-94. .
40. Antoszewska-Smith J, Sarul M, Łyczek J, Konopka T, Kawala B. Effectiveness of orthodontic miniscrew implants in anchorage reinforcement during en-masse retraction: A systematic review and meta-analysis. American Journal of Orthodontics and Dentofacial Orthopedics. 2017 Mar 1;151(3):440-55.
41. Watanabe T, Miyazawa K, Fujiwara T, Kawaguchi M, Tabuchi M, Goto S. Insertion torque and Periotest values are important factors predicting outcome after orthodontic miniscrew placement. American Journal of Orthodontics and Dentofacial Orthopedics. 2017 Oct 1;152(4):483-8.
42. Lee KJ, Kim SJ. Advanced biomechanics for total arch movement and non-surgical treatment for hyperdivergent faces. InSeminars in Orthodontics 2018 Mar 1 (Vol. 24, No. 1, pp. 83-94). WB Saunders.
43. Sung EH, Kim SJ, Chun YS, Park YC, Yu HS, Lee KJ. Distalization pattern of whole maxillary dentition according to force application points. The Korean Journal of Orthodontics. 2015 Jan 1;45(1):20-8.
44. Chung KR, Choo H, Kim SH, Ngan P. Timely relocation of mini-implants for uninterrupted full-arch distalization. American journal of orthodontics and dentofacial orthopedics. 2010 Dec 1;138(6):839-49.
45. Ghosh A. Infra-Zygomatic Crest and Buccal Shelf-Orthodontic Bone Screws: A Leap Ahead of Micro-Implants–Clinical Perspectives. Journal of Indian Orthodontic Society. 2018 Dec;52(4_suppl2):127-41.