

Camouflage in orthodontics – review article

Dr.R.Suresh M.D.S.,

Private Practice

No.15, Thiru. Ve. Ka. Street, Thillai Nagar, Villianur, Puducherry-605110.

India

E-mail: sureshortho11@g.mail

Definition (conceal, cover up, hide, mask)

Camouflage in orthodontics is defined as implementation of a less intensive treatment plan option in a patient with a severe problem so as to obtain optimum results within physiologic limits and which may not be addressing the correction of the actually existing problem in the patient.

The goal of dental camouflage is to disguise the unacceptable skeletal relationships by orthodontically repositioning the teeth in the jaws so that there is an acceptable dental occlusion and an esthetic facial appearance.

After the adolescent growth spurt, even though some facial growth continues, too little remains to correct the skeletal problems. The possibilities for treatment, therefore, are either displacement of the teeth relative to their supporting bone, to

compensate for the underlying jaw discrepancy, or surgical repositioning of the jaws. Displacement of the teeth, as in retraction of protruding incisors, is often termed camouflage.

Camouflage implies that repositioning the teeth will have a favorable, or at least not a detrimental, effect on facial esthetics.

Indications for camouflage treatment are ⁹

1. Too old for successful growth modification
2. Mild to moderate skeletal class II or mild skeletal class III
3. Reasonably good alignment of teeth (so that the extraction spaces would be available for controlled anteroposterior displacement and not used to relieve crowding).
4. Good vertical facial proportions, neither extreme short face nor long face.

Contraindications for camouflage treatment are ⁹

1. Severe class II, moderate or severe class III and vertical skeletal discrepancies

2. Patients with severe crowding or protrusion of incisors, in whom space created by extractions will be required to achieve proper alignment of the incisors
3. Adolescents with good growth potential (in whom growth modification should be tried first) or non-growing adults with more than mild discrepancies (in whom orthognathic surgery usually offers better long-term results)
4. Adult patients where life span is less
5. Medically compromised patients
6. Mentally retarded patients
7. Periodontally compromised patients
8. Need for immediate results (patient going abroad, marriage etc.)

Classification of camouflage is:

1. Orthodontic camouflage
 - Class II camouflage
 - Class III camouflage
 - Camouflage of asymmetry
 - Camouflage of skeletal open bite
2. Surgical camouflage
 - Chin surgery
 - Nasal surgery

- Facial soft tissue procedures
- Single jaw surgery in patient with double jaw problems

Computer imaging in the decision for camouflage versus orthognathic surgery⁹

The ultimate judgment as to whether orthodontic treatment alone, to camouflage a skeletal problem, would be an acceptable result, or whether orthognathic surgery to correct the jaw discrepancy would be required, must be made by the patient and parents. The orthodontist's role is to supply the information they need to make the decision and in that context, computer image predictions of the outcome without and with surgery are an important tool to help the patient and parents understand. For the doctor, there are two possible attitudes toward the use of computer predictions; this is dangerous because the predicted outcome may not be obtained, or this is excellent because it improves communication with patients so that they really understand the options that are being offered. Patients appreciate the improved communication that the computer predictions make possible, and compared to those who did not see their predictions are more likely to be satisfied with the outcome of treatment.

Class II camouflage

Dental camouflage of class II skeletal problems done by⁸

- Dental camouflage without extractions
- Dental camouflage with extractions

Class II camouflage can take three forms⁴

Retraction of protruding maxillary incisors

This usually is accomplished by extracting maxillary first premolars and moving the anterior teeth posteriorly into the space they vacated. It is important to protect the anchorage, in closing the space, without allowing the maxillary posterior teeth to come forward.

Displacement of the teeth of both arches moving the upper teeth back and the lower teeth forward.

With fixed appliances, this is accomplished by class II elastics, The typical response to class II elastics, or their equivalent, is modest retraction of the upper arch, major forward displacement of the lower arch, elongation of the upper

incisors and lower molars and rotation of the occlusal plane down in front /up in back.

The two big problems with doing this are that the result is likely to be neither stable nor esthetically acceptable. First, moving the lower arch forward place the incisors in an unstable position, so that either the patient wears retainers forever or there is relapse toward increased overjet and lower incisor crowding as these teeth tip lingually. If a deep bite was corrected with this pattern of tooth movement, it is also likely to recur as the lower incisors erupt after moving back. Second, the tooth movement tends to accentuate the chinless appearance of the patient, because the lower lip goes forward but the soft tissue chin usually goes backward as the mandible rotates downward and backward. Extrusion of the upper incisors increases tooth display and may lead to a gummy smile.

For these reasons, giving the dentition a class II elastics trip is almost never satisfactory. Not only is the result unstable, it fails the test of concealing the underlying deformity and can make the deformity more obvious. The implementation of a genioplasty to move the chin forward sometimes can make treatment of this type esthetically acceptable.

Repositioning of the chin and /or nose

Genioplasty and rhinoplasty can be viewed as a form of camouflage, since neither surgical procedure changes the underlying jaw relationships. One way to improve the balance between the lower incisors and the chin is to move the chin forward. Sometimes augmenting the chin by itself can solve the esthetic problems of a mandibular deficiency, but this facial rather than dentofacial correction tends to be unsatisfactory just as dental treatment, that ignores the face, rarely produces a satisfactory outcome. In theory, reducing the size of the nose is a treatment option for a maxillary protrusion. As noted previously, sometimes this might make retraction of the upper incisors more esthetically acceptable to the patient, but rarely is rhinoplasty by itself a realistic possibility for surgical treatment of class II problems.

The surgical /non-surgical decision in class II treatment

The soft tissue cephalometric analysis or stca has been advocated by arnett et al. As an aid for orthodontists and surgeons in treatment planning. It recommends analysis using a true vertical line through subnasle, with natural head posture. It may also be used to quantify a favorable or an unfavorable change in the profile after overjet reduction and, hence, has an important potential role in post treatment analysis and in research.

PIP components in class II treatment⁴

For each case, it is necessary to set a PIP as a treatment goal, which will result in the upper incisors having correct A/P and vertical positioning, with appropriate torque.

The anteroposterior component of PIP in class II treatment

Traditionally in orthodontics the upper incisor A/P position has been related to the apo line with a conventional cephalometric value of +6 mm. The Arnett analysis relates upper incisor position to a true vertical line and uses the term mxi tvl, which are the linear measurements from the tip of the upper incisor to the tvl. The male upper central incisor tip is ideally -12 mm to the line and the female is at -9 mm.

The torque component of PIP in class II treatment

Traditionally, in orthodontics, upper incisor torque has been related to the maxillary plane, with a cephalometric value of 110 to 115 being a typical goal. The Arnett analysis relates upper incisor torque to the maxillary occlusal plane, and lower incisor torque to the mandibular occlusal plane, with the male upper central incisor torque being ideally 58 and the female 57.

The vertical component of PIP in class II treatment

The Arnett analysis quantifies the vertical positioning of upper incisors and requires an overbite of 3 mm with upper incisor exposure being 4 mm below the relaxed upper lip in males and 5 mm in females.

Two other factors to consider in the decision for orthodontics vs. surgery are the possible role of augmentation genioplasty as an adjunct to class II camouflage and the risk of root resorption with camouflage treatment. A limiting factor in orthodontic class II treatment is the extent to which the lower teeth can be moved forward relative to the mandible. Moving the lower incisors forward more than 2 mm is highly unstable unless they were severely tipped lingually, but this is likely to occur during camouflage treatment when class II elastics are used unless lower premolars were extracted. Often, it is undesirable, esthetically, to retract the upper incisors to the extent that would be necessary if the lower incisors were not advanced significantly. If orthodontic treatment would otherwise move the lower incisors too far forward for reasonable esthetics or stability, a lower border osteotomy to reposition the chin can both improve facial balance and decrease lip pressure against the lower incisors, improving the stability. The lower border osteotomy is no more extensive a surgical procedure than premolar extraction would be. It can be done as an outpatient or same day surgery at much less cost than mandibular advancement, If it is done prior to age 19, remodeling of the lingual cortex is better than at an older age.

Class III camouflage

Class III camouflage is more difficult than its class II counterpart, not because the tooth movement is more difficult but because it is more difficult to obtain acceptable esthetics. The problem is that most class III patients already have some dental compensation that developed during growth. Typically, the upper incisors are at least somewhat proclined and protrusive relative to the maxilla, whereas the lower incisors are upright and retrusive relative to the chin. Class III camouflage logically would be the reverse of class II camouflage, based on retracting the lower incisors, advancing the upper incisors, and surgically reducing the prominence of the chin, in addition, rotating the mandible downward and backward, when the chin is prominent, can be considered a form of camouflage.

In order to correct an anterior crossbite, with orthodontics alone, further protraction of the upper incisors and retraction of the lower incisors would be necessary. As upper incisors are tipped forward, their inclination becomes an esthetic problem, but torquing the roots forward is difficult and stresses the anchorage. For all practical purposes, labial root torque to the upper incisors

means that more retraction of the lower incisors is necessary. That compounds the biggest problems with orthodontic camouflage; retracting the lower incisors tends to accentuate the prominence of the chin, not camouflage it. Unless the lower incisors are protrusive to start with, little if any retraction is acceptable esthetically.

Malocclusions with a mild mandibular prognathism and a moderate overbite can be corrected by dentoalveolar movements. Class III elastics, with or without extraction of teeth, have been used to camouflage the skeletal discrepancy, resulting in an acceptable facial profile. Class III cases with mild mandibular prognathism and crowding can be treated by various extraction schemes including four premolars (maxillary second premolars and mandibular first premolars), two lower premolars (mandibular second or first premolars) or a mandibular incisor⁹.

If this corrects the dental occlusion but does not camouflage the facial deformity, there are two possibilities for additional surgical camouflage; onlay grafts to the anterior maxilla and reduction genioplasty.

If there is a mandibular displacement between cr and co, this needs to be identified and accurately recorded at the record taking appointment.

Displacements can be a major factor in determining a surgical versus a non-surgical decision for some patients⁴.

There are several methods of conventional cephalometric analyses to assess A/P skeletal discrepancy. The Arnett analysis uses a true vertical line as a facial reference and it is recommended as a more sophisticated and accurate method of deciding the needs of the case.

Borderline surgical cases

In some cases with mandibular excess, the diagnosis will suggest that mandibular surgery may be needed. It is helpful to delay orthodontic treatment for such cases. If possible, this will allow assessment of growth patterns, using regular cephalometric radiographs, so that a more informed surgical /non-surgical decision can be reached.

Class III surgical cases

Some cases are clearly class III surgical cases from the outset, and should not be treated until all growth has ceased. Timing will be agreed with the surgeon, and may be beyond the age of 20 years in males and a little earlier in females.

If a decision is made to treat the malocclusion with orthodontics alone, every patient should be informed of the unpredictable nature of class III growth, and of the implications of any unfavorable growth which may occur in the retention period. Unfavorable growth can be difficult to manage for the post-orthodontic patient, and, therefore, care should be taken to identify those cases, which should be managed surgically from the outset. In, particular, irreversible extraction decisions should not be made too early.

Camouflage of asymmetry

When facial asymmetry exists, even if the asymmetry is largely in the mandible, the nose is likely to tilt in the same direction as the chin, and dental compensation usually brings the dental midlines closer together than the skeletal midlines.

With camouflage treatment, it may not be possible to totally correct the dental midlines (jaw surgery would be required to do that). In that case, the emphasis must be on correcting the maxillary dental midline, because it is obvious and an important point of dental esthetics the mandibular dental midline, in contrast is seen only under close observation. The skeletal midlines are important, however. Moving the chin laterally via a lower border osteotomy is minimal surgery compared with bilateral mandibular ramus procedures or a lefort I osteotomy, can be quite effective in concealing the underlying jaw asymmetry. Correcting only

the lower face and leaving the nose alone tends to make its asymmetry more obvious, so nasal asymmetry must be addressed at the treatment planning stage. Deferring rhinoplasty until everything else is completed is acceptable if the patient understands what is happening – taking the patient by surprise with that seems to be a newly crooked nose is not ¹⁰.

Camouflage of skeletal open bite

There are also a number of recommended techniques for orthodontic treatment of the patient with skeletal open bite. Most of these procedures are designed to intrude posterior teeth or at least prevent molar eruption or extrusion in an attempt to reduce or control anterior facial height. The following are treatment principles that have been proposed for the patient with a skeletal open bite:

1. Prevent extrusion of upper posterior teeth
2. Prevent eruption of the lower molars.
3. Maintain or create a curve or spee
4. Avoid both class II and class III elastics as both encourage posterior extrusion
5. Anterior vertical elastics are usually not indicated because the incisors are often already over-erupted to compensate for excessive anterior facial height
6. If extractions are indicated, the more posterior the better

7. Banding of second molars should be avoided because they tend to extrude when engaged on the arch wire. If second molars are banded, they should be banded or bonded with the molar tubes in the occlusal third of the clinical crown or the arch wire should be stepped gingivally to avoid extrusion of the terminal molar on the appliance.

It has been postulated that 1 mm of intrusive vertical movement of the molars results in approximately 3 mm of bite closure by mandibular counterclockwise rotation.

Implants

When the objective is to increase the overbite as in a skeletal open-bite correction, it would be ideal to close the bite by intruding posterior teeth. An intrusive force on the molars can only occur when an extrusive force is placed elsewhere. Undesirable movements of anchorage units, such as extrusion, can cause downward and backward rotation of the mandible, resulting in poor treatment outcomes. Implants offer a possibility of achieving a source of stationary anchorage in skeletal open bite cases. Osseointegrated implants have been successfully used with intrusion mechanics in open-bite malocclusions to prevent the extrusion of posterior teeth.

In addition to single tooth implants, a skeletal anchorage system using a titanium miniplate temporarily implanted in the maxilla or mandible has been reported to provide a source of immobile anchorage. Titanium miniplates implanted in the

buccal cortical bone in the apical regions of the first and second molars have been shown to produce as much as 3 to 5 mm of molar intrusion. Counterclockwise rotation of the occlusal plane is achieved.

Surgical camouflage

Surgical camouflage has the same goal as orthodontic camouflage to remove the appearance of jaw deformity without correcting the underlying problem. This type of treatment includes chin surgery, nasal surgery and other facial soft tissue procedures, including onlay grafts to improve soft tissue contours.

Chin surgery

The position of the chin can be changed in two ways: by adding some extraneous material to it (eg, bone, cartilage or any of several alloplastic materials) or by using an inferior border osteotomy to free it so that it can be repositioned. The inferior border osteotomy is preferred when this surgery is possible.

The chin can be repositioned in all three planes of space with an inferior border osteotomy. Any asymmetry can be corrected by sliding the chin sideways and /or repositioning it vertically; a deficiency by moving in forward or downward (which

may require an interpositional graft); and an excess by moving it backward or upward (which is done best by removing a wedge of bone above the chin)

Nasal surgery

Nasal surgery to correct nasal distortions is an adjunct to orthodontic camouflage or to orthognathic surgery. If a deformity of the nose exists in the presence of normal dental and other facial relationships, of course rhinoplasty is the primary treatment procedure, but the focus here is on its use in combination with the other dentofacial treatment methods. The variations in normal nasal anatomy among racial and ethnic groups must be kept in mind when nasal deformity is diagnosed.

Augmentation of deficient facial surfaces

Midface and paranasal deficiency

A deficiency of the midface and paranasal area is difficult to describe quantitatively but often affects facial esthetics. If severe, it affects the appearance of the eyes, because the lower eyelid tends to droop downward when it is not adequately supported. The lower third of the iris of the eye, ideally, should be covered by the lower eyelid, which is supported by the bone of the lower orbit and midface. This area can be augmented by a high lefort I osteotomy, but if a lefort osteotomy is not indicated, augmentation of the midface offers a

reasonable alternative. Onlay bone grafting on the flat anterior surface of the maxilla is unpredictable in how it remodels. Cartilage or alloplastic materials may be used.

Other indications for onlay grafting

Other indications for onlay grafting include mandibular asymmetry subsequent to hemimandibular hypertrophy, traumatic injury, nasal bone deficiency in cleft patients, and deficient areas in osteotomy sites that require camouflage.

Soft tissue procedures

Esthetic lip surgery

Lengthening of the short philtrum

A short philtrum can contribute to excessive incisor display, and lengthening it is one possible solution to this problem. Correction of the short philtrum in the adult may be accomplished through the use a V – Y cheiloplasty performed as an isolated procedure or in combination with Lefort I osteotomy, rhinoplasty or both. The V – Y procedure itself may gain philtrum length. But, when combined with a

rhinoplasty, the amount of tissue available for lip lengthening appears to increase dramatically¹⁰.

References:

1. David .L.Turpin, Camouflage might not mean compromise,AJO:2003:123,241
2. Douglass Squire et al, Determining the limits of orthodontic treatment of overbite, overjet, and transverse discrepancy, a pilot study , AJO 2006:129,804-808
3. Graber TM, Vanarsdall RL.Orthodontic :Current Principles and Technique ,3rd edition, Saint Louis, Mosby,2000
4. Mclaughlin, Bennett &Trevisi, Systemized orthodontic treatment mechanics, Mosby, 2001,162-183&219-234
5. Nanda, Biomechanics in clinical orthodontics, W.B. Saunders company, 1997,29-36,134-136
6. Orthodontic treatment planning software, Hassan Noroozi, AJO 2006:129:834-837
7. Ravindra nanda, Biomechanics &Esthetics strategies in clinical orthodontics, Elsevier saunders, 2005,165-169,287-293,295-309
8. Samir E.Bishara, Textbook of orthodontics, W.B.Saunders company, 2001,354-361

9. William R.Proffit, Henry W.Fields, David M.Sarver, Contemporary orthodontics, 4th edition, Mosby, 2007, 302-311,674-681,691-693,704-707
- 10.William R.Proffit, Raymond P.White Jr, David M. Sarver, contemporary treatment of dentofacial deformity , Mosby, 2003, 394-415,433-439,470-480 and 522- 527