

A Narrative Review on Esthetic Surgical Procedures in Orthodontics

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ABSTRACT

Many of the aesthetic facial procedures can be performed simultaneously at the time of initial orthognathic surgery. The incorporation of these procedures is to enhance the final aesthetic result of orthognathic surgery and it is a valuable addition to the orthodontic and orthognathic treatment plan. Correction of any residual deformities after surgery, such as mandibular notching, malar asymmetry, and labiomental crease should be performed as a delayed procedure, when the outcome is more predictable. This paper presents the detailed review about current concepts of various esthetic surgical procedures and soft tissue fillers.

Key words: Esthetic procedures Rhinoplasty Soft tissue Fillers Augmentation Cosmetic procedures

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INTRODUCTION

The face is the most expressive zone of the human body that communicates our feelings and thoughts. In contemporary orthodontic treatment, orthognathic surgeries are performed to correct the functional aspects of dentofacial deformities. Dwelling not merely on the ideal occlusion, the results could be enhanced by analyzing the whole-face to improve the overall treatment outcome. Therefore, it is important for the orthodontist to educate or update more thoroughly in facial growth, facial esthetics and facial surgery. Because, Orthodontists are generally the first professionals who are asked to make judgements and decisions that ultimately result in the final cosmetic facial outcome for our patients and decisions that we make can enhance or diminish their facial appearance for the rest of their lives.

Why would an orthodontist think about recommending soft tissue surgery in orthodontic cases? [1].

When the occlusal goals of orthodontic treatment are attained, but the facial treatment goals are not.

Surgical procedures to improve esthetics when orthognathic surgery is not an option!!

When orthodontic treatment results in undesirable facial changes.

When the cosmetic outcome can be enhanced, either for the immediate benefit or to counter the effects of aging.

Current Concepts in Esthetic Orthognathic Surgery [2].

In many cases, orthognathic surgery alone will improve facial balance and esthetics, while the other cosmetic procedures, like rhinoplasty, malar augmentation, and chin surgery will enhance the final result. Performance of various combinations of orthognathic surgery and simultaneous cosmetic procedures has been facilitated by internal rigid fixation techniques and the use of computer video imaging. Generally, rhinoplasty, malar/midface augmentation and genioplasty (augmentation or reduction) can be performed simultaneously with a high degree of predictability.

Jones and Smith described the sequencing of cosmetic surgery as [3].

Skin Procedures

Laser hair removal

Skin resurfacing

Treatment of red/brown lesions

Upper Face Procedures

Hairline augmentation

Temple augmentation

Forehead augmentation

Midface Procedures

Orbital augmentation

Malar osteotomies/implants

Soft tissue augmentation

Lip augmentation/shortening

Rhinoplasty

Lower Face Procedures

Chin augmentation/reduction

Mandibular angle modification

Submental/jowl lip sculpting

Lower face/neck rhytidectomy

Goals of Cosmetic Maxillofacial Surgery [4]

Enhancement of the patient's self-esteem and quality of life

Achievement of the desired change in bone and/or soft tissue maxillofacial contour

Correction of functional deformities that affect appearance

Stable clinical results

Appropriate understanding and acceptance by patient (and family) of favorable outcomes and known risks and complications

PROCEDURE**Frontal Augmentation [5]**

Some patients have a deficient forward projection of frontal bone, which is considered unattractive and even ugly. In general, the female forehead has no supraorbital bossing and is basically a continuous curve, whereas supraorbital bossing and flatness above the bossing is a characteristic feature of the male forehead. Various surgical procedures have been reported for frontal augmentation which includes autologous fat grafting and alloplastic implants such as hydroxyapatite, expanded polytetrafluoroethylene (ePTFE), silicone, methyl methacrylate and the use of hyaluronic acid have been reported.

Autologous fat is the most biocompatible source for frontal augmentation, but the rate of resorption is not predictable. The consistency of the forehead is somewhat incongruent with autologous fat. Moreover, the formation of periorbital lip granuloma after autologous fat injection has been reported.

Silicone implants are not biocompatible due to the higher risk of capsule formation by surrounding tissues, sometimes resulting in implant movement after surgery. Despite the disadvantages, the greater degree of augmentation, ease of prefabrication, and long-term maintenance of harmonious shape and consistency lead surgeons to use silicone implants [Figure 1].

Rhinoplasty [6]

In 1931, Joseph was the first to describe what we know today as the cosmetic rhinoplastic procedure. Weir's early description of the classic

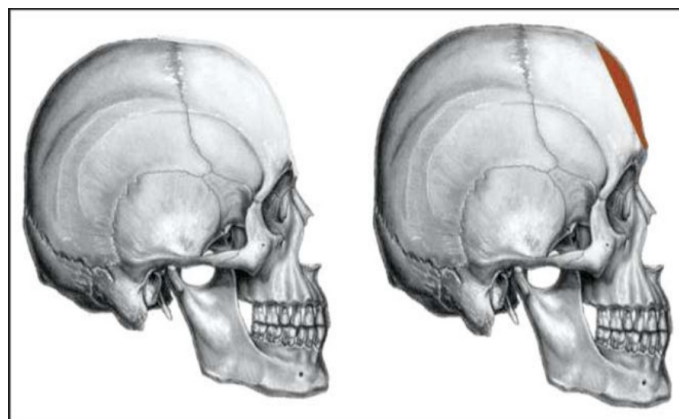


Figure 1: Frontal Augmentation with Implants.

step by step method of rhinoplasty began with dorsal hump removal, lowering the nasal profile, narrowing the nose, tip plasty and finally alar base excision. Not all of these steps of the classic rhinoplastic procedures have to be performed routinely. The individual's nasal malformation is considered and only those procedures indicated are performed.

Rhinoplasty can be performed with an open or a closed approach [Figure 2a and Figure 2b].

In the open approach, an incision is made in the columella and the nose reflected to reveal its entire osseous and cartilage structures. It is reserved for the management of conditions such as secondary revision of cleft lip and nose, crooked asymmetric nose, revision rhinoplasty and in patients with an abnormal morphology of the nasal tip.

In the closed approach, access to the skeletal and cartilage structures of the nose is through an

intranasal incision inside the rim, or nares of the nose. With this approach, septal surgery, hump removal, dorsal osteotomies, tip plasty, and alar base resection can all be performed.

A rhinoplasty can be done in combination with orthognathic surgical procedures. It can be classified as a simultaneous or staged technique on the basis of the timing of the surgery. The oedema, increased surgical time, surgeon fatigue and post-surgical control of bleeding are factors which deter surgeons to undertake a simultaneous approach.

Techniques such as the Alar Cinch are performed by anchoring the fibro areolar tissue through the vestibular incision at the alar-facial junction on both sides and the two free ends of the suture are tightened to reduce alar base width. An alternative to the alar cinch suture technique is the Weir Procedure [Figure 3].

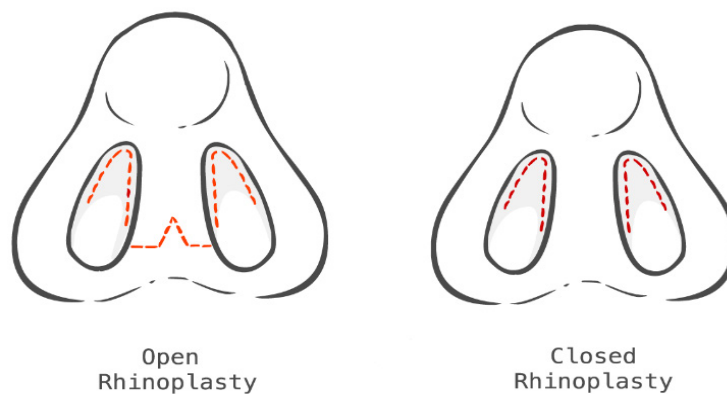


Figure 2a,b: Open Rhinoplasty. (b) Closed Rhinoplasty.

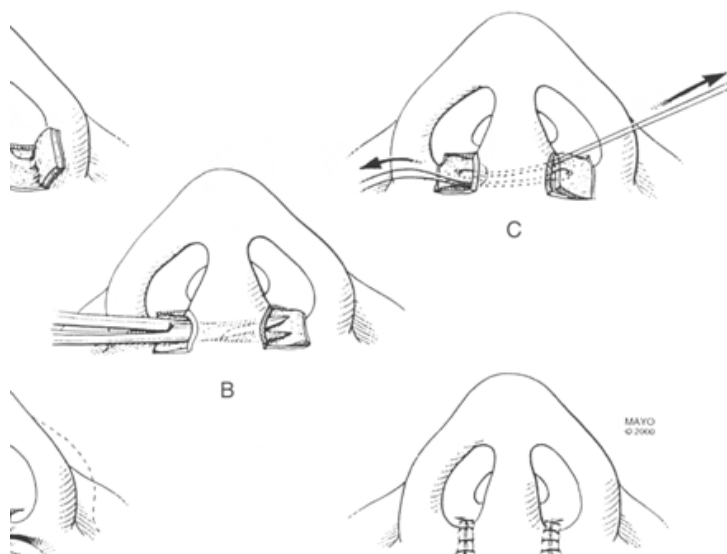


Figure 3: Alar Cinching.

Indications for Rhinoplasty

Preexisting nasal deformities are one of the primary indications for Rhinoplasty. These deformities include a bulbous or widened nasal tip, widened nasal bridge, and alar base widening. The second indication is postoperative orthognathic surgery nasal changes, which include nasal tip asymmetry, widened alar base, and nasal septal deviation.

Indications for Simultaneous Orthognathic Surgery and Rhinoplasty

Functional nasal septal deviations and widening of the alar base can occur, when maxillary impaction is performed, an equal amount of septum is removed vertically to prevent septal deviation or buckling

Defects in tip morphology can be simultaneously corrected because maxillary surgery will not alter tip form.

The saddle-nose deformity is another problem that may also be made worse in cases of maxillary impaction or advancement.

Contraindications for simultaneous orthognathic surgery and rhinoplasty

Minor correction of tip position: Fine detail and exact tip position are difficult to predict even in isolated rhinoplasty.

Treatment for over projected, over rotated, and ptotic nasal tips are difficult when maxillary movements alter the nasal base.

Disadvantages of Combined Jaw Surgery and Rhinoplasty

The most commonly cited disadvantages of combined jaw surgery and rhinoplasty include potential airway compromise, intraoperative

endotracheal tube management, potential inability to treat subtle nasal problems secondary to intraoperative edema, performing rhinoplasty on an “unstable foundation,” and the patient’s lack of appreciation of nasal deformities. However, 80% of the patients polled after simultaneous rhinoplasty and jaw surgery said that they would never have had the rhinoplasty done as a staged procedure. Therefore, even with the potential disadvantages of the combined procedures, the benefits far outweigh the disadvantages [7].

Midface Augmentation [8]

The midface contour is responsible for the shape of the face prominence and youthful appearance. A zygomatic prominence should be roundish and thick to be considered attractive, whereas a flabby and hypo trophic malar area makes the face flat and uninteresting and gives the impression of aging. Indications for cheek or midface augmentation include poor lateral cheek projection in relation to bigonial and bitemporal widths, midface hypoplasia or congenital deformities, and infraorbital hollowing or increased scleral show. The use of osteotomies and placement of alloplastic and autogenous materials to correct midface hypoplasia has been described in literature.

Alloplastic augmentation of malar deficiency is a relatively recent technique, first reported by Spadafora et al in 1971 and Hinderer in 1975. The Mladick’s reference line [Figure 4] for localization of the malar eminence to achieve proper placement of implant have been used to correct malar deficiency [9].

Many types of alloplastic materials, such as hydroxyapatite, silicone and Proplast have been used for augmentation of the malar eminence. In

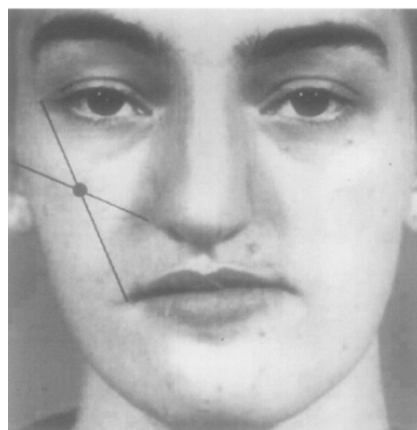


Figure 4: Mladick’s reference line for proper placement of implant.

recent years, more attention has been given to the development of porous implants. The primary advantage of porous materials is that they allow for tissue ingrowth. The Medpor porous polyethylene implant has a unique combination of properties that give it a significant advantage over other available alloplasts. The implant is easy to shape, it can be bent by heating in boiling saline, it is strong yet remarkably stable, and it permits tissue growth into its pores [10].

Genial Augmentation

The four "esthetic outposts" of the human face are the chin along with the nose and two malar eminences. The defects that can alter the chin are macrogenia, microgenia, micrognathia, pseudomacrognathia, pseudomicrognathia, witch's chin or asymmetries. Genioplasty represents one of the most common ancillary procedures and is often associated at the time of corrective surgery of the skeletal malformations. This type of surgery entails the increase or reduction of the chin sagittal and vertically. It can be performed by surgical osteotomies and/or remodeling by an intraoral vestibular incision. By the same incision, an alternative is the positioning of a sub periosteal graft (silicone or Medpor, Porex) in cases of microgenia. Regarding the choice between advancement osteotomy and autologous or heterologous graft, grafts can sometimes be affected by infection, bone reabsorption in the recipient site, incorrect placement, or subsequent displacement.

Indications for Genial enhancements include [11]

- Hyperactive chin musculature,
- Presence of labial incompetence and lip strain,
- Failure of previous alloplastic implant owing to infection,
- To provide an obstructive sleep apnea functional benefit.

PROCEDURE

The incision is placed along the labial surface on the vestibular depth or near the dentition. The lateral aspects of the incision require special care so that it should not transect the terminal branches of the mental nerves. In order to fully expose the anterior mandible, careful dissection of mentalis muscles done and a full thickness sub

periosteal flap is raised. The midline and paramidline areas are outlined with a pencil until sufficient exposure is reached and markings are made with piezo surgical saw or sagittal saw to leave a permanent guide for the operation. Importantly, in order not to damage the mental nerves, the osteotomy should remain at least 4.5 mm under the mental foramen. The osteotomy is performed with the help of piezo surgical instruments.

Genial augmentation via an advancement osteotomy has been shown to have greater patient satisfaction (93.3%), as well as a 100% soft tissue change predictability. In addition, there is less bony resorption, lower infection rates compared with implants and greater versatility for those with greater facial asymmetry. The versatility of the genioplasty is generally unquestioned; however, there are certain circumstances in which alloplastic augmentation through the use of implants could be considered as the treatment of choice for a genial deficiency. When comparing genioplasty with alloplastic augmentation, genioplasty is more invasive, causes more postoperative swelling, a longer postoperative recovery time, and rarely can result in a fracture of the mandible. Owing to the proximity of the mandibular anterior teeth and mental nerve to the required osteotomy site in a genioplasty, it is possible to experience postoperative paresthesias to the anterior teeth, lip, and chin [12].

The alloplastic chin can be performed simultaneously with orthognathic surgery [Figure 5]. Some of the alloplasts used include: porous polyethylene, silicone, polytetrafluoroethylene, high-density polyethylene. The main indications for the alloplastic chin are very thin patients where a genioplasty procedure poses concerns for notching, and those patients with low mental foramens that may make the osteotomy for a genioplasty difficult [13].

Tenon-mortise genioplasty [14, 15]

Genioglossus advancement was accomplished by executing a tenon mortise type of genioplasty. The purpose of this technique is to achieve volumetric expansion of the hypopharyngeal space through genioglossus muscle advancement [Figure 6a-Figure 6d]. The minimum advancement which was attained with this type of procedure was 10 mm. For patients suffering from mild to moderate obstructive sleep apnea, this form of

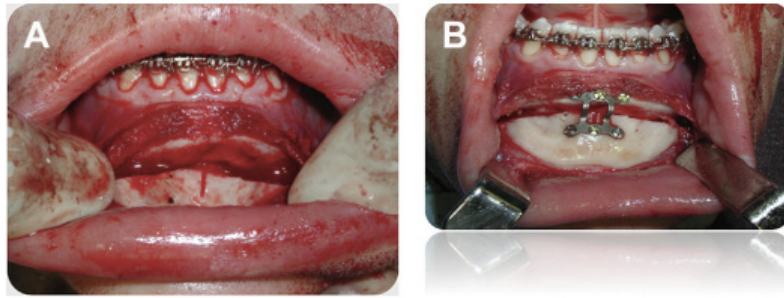


Figure 5: Alloplastic chin placement in cases of deficient chin.

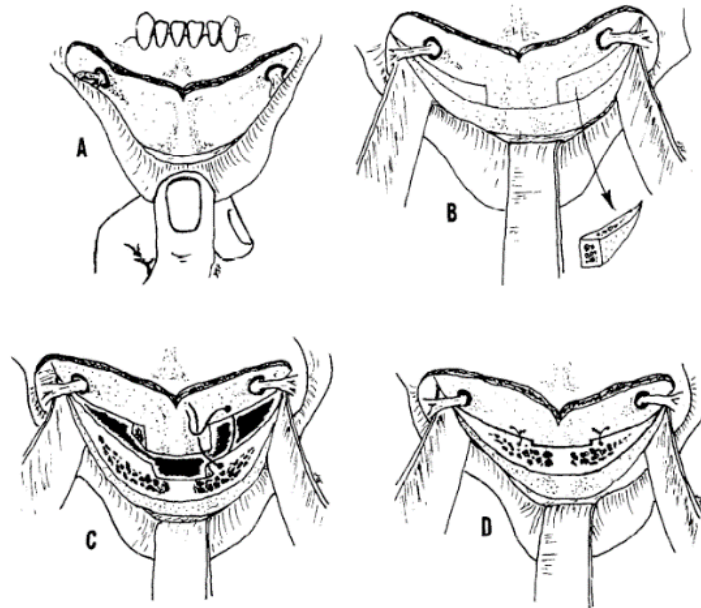


Figure 6a: Exposure of anterior surface of mandible and mental nerves. 6b: Outline of osteotomy-osteotomy cuts.

mortised genioplasty for long-term genioglossus advancement serves as an effective method.

Lip Procedures

Full lips with well-defined borders have often associated with beauty and youth. Lip procedures are frequently advocated along with orthodontic treatment to enhance treatment results. The patients who undergo Lefort I osteotomies have a tendency for flattening of the upper lip and reduction in the vermilion border height. Lip flattening may result from the release and the lateralization of muscle attachments. In these cases, a lip lengthening procedure may help to overcome the side effects [16]. The V-Y procedure can be used to lengthen the lip by converting the horizontal incision into V-Y pattern and suturing both vertical and horizontal arms of the incision [Figure 7a-Figure 7d]. In cases where the patient has a short philtrum, this should be performed with rhinoplasty. This procedure improves the appearance of thin lips by increasing the vermilion display of the upper lip [17].

Lip augmentation could be performed either by the injection of collagen, dermogen, cymetra and fascion or an implant of allodermor synthetic material such as gortex. Reduction cheiloplasty is not a commonly performed procedure, as the current trend is towards thick prominent lips. In reduction cheiloplasty, an incision is made in the oral commissure and the desired amount of lip, including the submucosal gland is excised to obtain a reduced size.

Facial Lip Contouring

Orthognathic surgery can either improve or worsen the submental region and cervicomental angle. However, submental liposuction can be performed simultaneously with orthognathic surgery, only after the changes in skeletal proportions of the submental profile are made. If the procedures are lengthy or complicated, the amount of edema that distorts normal contours and submental liposuction should be delayed. Liposuction serves as an adjunct where orthognathic is limited in aesthetic

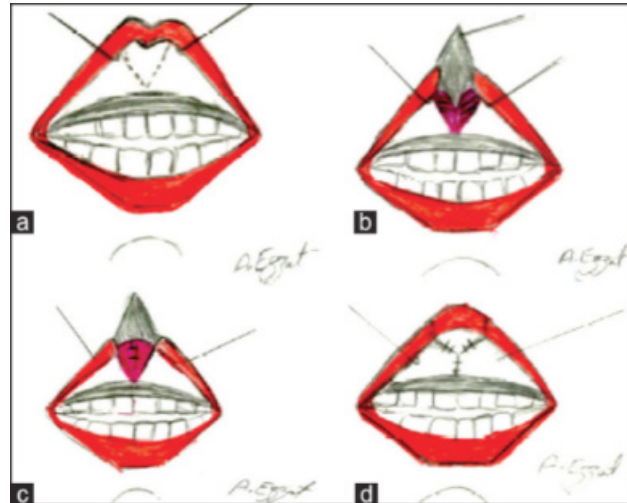


Figure 7a: Intraoperative diagrams showing vertical inverted V incision (with the apex upward) in the mucosal side of the upper lip.

7b: Separation of the two orbicularis oris muscles from each other and the underlying median cleft notch between them.

7c: The orbicularis oris muscle dissected on both sides and united in the midline using horizontal mattress sutures.

7d: The V-shaped mucosal flap sutured into position as Y shaped, giving an additionally mucosal length.

improvement. It removes fat accumulation, permits tissue redraping, and improves overall contour. Submental liposuction has been found to be the most common aesthetic procedure in conjunction with orthognathic surgery, and that 71% of patients reported to be very satisfied with liposuction aesthetic results. Bohluli and colleagues [18] found that any fat suctioned in those with submental lipomatosis can be transferred to other areas of need, such as the lips and paranasal region, instead of discarding it.

Mandibular Angle Definition and Ramus Augmentation

Mandibular angle and ramus augmentation is more frequently requested by men to gain a more masculine face. It is also used to improve facial asymmetries and to improve facial proportions, such as the bigonial dimension. Silicone, porous polyethylene materials, and allograft are all examples of materials used to perform these augmentations. Angle and ramus augmentations can also be performed simultaneously at the time of orthognathic surgery.

Neck Contouring Procedures

A smooth neckline gives a grace to the personality and gives a sense of refinement that aids in enhancing an individual's overall appearance. Neck contouring surgery helps patients of any age to accomplish a naturally attractive neckline. If submental skin laxity is the only problem, the skin removed during the rhytidectomy may be sufficient for an improvement in the neck

appearance. A variety of techniques are available to address the neck, including liposuction, midline platysmaplasty and chin augmentation. During liposuction 1 or 2 tiny incisions are made that are concealed beneath the chin or behind the ears. A cosmetic surgeon inserts a small liposuction cannula, removing excess fat and sculpting a natural contour to the chin and neck. Suction-assisted lipectomy is commonly performed with emphasis on medial excision in the central subplatysmal fat region.

The advantages include the reduction or elimination of a "turkey neck" by removing excess, sagging skin, smoothening out wrinkles and creases throughout the neck and improvement in the appearance of vertical neck bands. The potential complications from liposuction are dimpling or puckering of skin, asymmetry, nerve damage or an undesirable result. Platysmaplasty involves tightening and removing skin from the human neck. It has taken many forms, including lateral plication, sectioning and flap rotation, simple midline suturing, progressively tensioned midline sutures and many others.

SOFT TISSUE FILLERS

SOFT TISSUE FILLER INJECTABLE - Hyaluronic acid

It has become the new gold standard in the last few years. This is mostly due to the fact that it is non-immunogenic. There are 2 main categories: animal derived (Hylaform, and no longer on the market) and bacteria derived (Restylane and Juvederm). It consists of 30% calcium

hydroxyapatite aqueous gel and stimulates cutaneous cells to induce neocollagenesis by fibroblast activation. The substance is radiopaque with a slow rate of degradation, similar to human bone. These soft tissue filler injectable can be used for adjunctive procedures, such as chin augmentation and nonsurgical rhinoplasty.

SOFT TISSUE FILLER INJECTABLE – Botulinum Toxin

Botulinum toxin is a polypeptide produced by the gram positive anaerobic bacterium *Clostridium botulinum*. The muscle paralyzing feature of botulinum toxin has proven to be useful in more than 50 pathological conditions, including cosmetic applications. This can be used for procedures such as the temporal brow lift, levator-labii superioris, nasal flare, mental crease, facial asymmetry, upper lip wrinkling, hypermobile upper lip, gummy smile, Crow's feet, facial palsy and in aging of the neck.

Injection Site for Gummy Smile

BTX should be injected in small, carefully titrated doses to limit muscular over-contraction of the upper lip, thus reducing exposure of the upper gums when smiling. Hwang et al., at Yonsei University College of Dentistry, Seoul, Korea have proposed an injection point for BTX and named it as Yonsei point. It is basically a point located at the center of the triangle formed by levator labii superior, levator labii superioris alaeque nasi, and zygomaticus minor. A dose of 3 U is recommended at each injection site. If applied in small, carefully titrated doses, these muscles can be proportionately weakened with Botox, which will reduce exposure of the upper gums when smiling. Complications that have been reported include nausea, fatigue, malaise, flulike symptoms, and rashes at sites distant from the injections. Percutaneous injections may cause pain, oedema, erythema, ecchymosis, headache, bruising, and weakness of adjacent muscles, ptosis, delayed eyelid closure, decreased blink response, excessive tearing, and asymmetry of the face, antibody development, and necrotizing fasciitis. The only disadvantage is that treatment with Botox is not a permanent option, unlike other surgical alternatives. The effect of this treatment is for short-term usually for 6 months, and the patient has to get it redone after that. It is important to note that injection of Botox should not be given prematurely before the effect of

earlier treatment has worn off completely as this can result in buildup of antibodies to Botox that will dilute the effect of further treatments. Moreover, the treatment might sometimes produce asymmetrical results due to injection at wrong site or by an inexperienced clinician, and the cost is also high for such a treatment.

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