

## Dermal Fillers - Role in Post Orthognathic Surgery and Orthodontics – A Review

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### ABSTRACT

**Background:** Patients seeking correction of dental or dentofacial deformities also present with concomitant soft tissue deformities like decreased lip length, increased or decreased lip thickness, inadequate vermilion show etc. Correction of skeletal or dental deformities alone may not achieve appreciable results unless a focus is made on the correction of soft tissue deformities during the treatment planning. Soft tissue deformities that exist with the skeletal or dental deformities may be self-corrected by Orthognathic surgery/Orthodontics or combination of both. But in many situations adjuvant procedures to the perioral structures may need to be performed to get the optimal overall results. This can be accomplished by dermal fillers, Botulinum Toxin A injections or by surgical soft tissues procedures.

**Keywords:** Orthodontics, Orthognathic surgery, Cosmetic surgery.

### INTRODUCTION

Mankind's desire to look best among one's peers has driven the beauty industry by leaps and bounds. There has been renewed interest in the field of Orthodontics/Orthognathic surgery to enhance one's facial features. Correction of the hard tissues can alter the way the adjacent soft tissues look and feel but it may not be sufficient alone to give the perfect desired change. Many times it has to be accompanied by procedures done on the soft



tissues to enhance the final outcome. Sometimes only soft tissue procedures can achieve reasonably good results which are not so demanding on the "fragile" medically

compromised patient.

The basic knowledge of the soft tissue surrounding the perioral structures is essential for a successful outcome. Soft tissue varies according to gender and age. Both play an important role in planning for the patient. Females tend to have finer and delicate features. Men on the other hand rely mostly on masculine aspects of beauty for enhanced features. Age changes include decreased vascular supply, decrease in collagen content of the soft tissue and skin leading to sagging. Solar elastosis, muscle atrophy, volume loss, fat descent, bone and soft tissue changes also lead to alteration in the facial features due to aging<sup>1-4</sup>. Orthognathic surgery/ Orthodontics at an advanced stage or secondary to defects have to address these issues

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and compensate for them during treatment planning. Dermatologist also plays a role in treatment planning and execution. Treatment goals differ from patient to patient and have a lot to do with the aspirations and desires of the patient. Proper counseling can help in clearing unrealistic expectations and guide the patient regarding changes that can be achieved and sustained.

Earliest source of fillers were autologous fat. Human body has reasonably good reserves of fat which can be harvested and implanted into the facial soft tissue. Abdominal fat is a good source of autologous fat<sup>5</sup>. It has been well documented in Oral and Maxillofacial Surgery about the replacement of fat in the temporomandibular joint space after the release of ankylosis and other pathologies. Abdominal fat has been used since the 1890s for cosmetic procedures<sup>6</sup>. There are well documented studies about the use of fat for facial soft tissue augmentation but have varied results among various authors. Longevity may vary from weeks to months. Some prefer 'treating' the harvested fat to prolong the life of the transplant. Though fat grafting has been a part of plastic surgery for decades, the innovative use of stem-cells to enrich the grafts holds the potential to revolutionize this procedure. Stem cells have the unique ability to regenerate themselves and to repair damaged tissues in the body. Because of this characteristic, the cells may also have the power to rejuvenate the skin's tone and texture. Though these benefits have not been proven, stem cells do enhance the survival rate of fat, which can be long-lasting. It is considered a very viable option with less chances of resorption but the longevity of the graft is debatable. Man's desire to fill the void has thrown up many materials which have flooded the market. A proper understanding of the individual properties of the materials is essential before endorsing any product. There is no ideal filler and the search is still on. Fillers can be biodegradable or permanent. They can be classified according to their source and ability to produce antigenicity<sup>7</sup>. Biodegradable are temporary fillers which degrade with time. There have been several attempts to 'treat' them with various chemicals to enhance their life<sup>8</sup>. Non-biodegradable fillers include polyacrylamide fillers, silicone and other synthetic materials. An ideal filler should be non-allergenic, should not degrade in the tissue releasing carcinogens and other potential

harmful chemicals, should have low immunogenicity, be easily retrievable in case it has to be retrieved and should have the approval of an authorizing agency to validate it for human use<sup>7</sup>. Patients' religious sentiments have to be taken into consideration when using fillers derived from bovine, porcine or other species<sup>7</sup>.

A lot of considerations go into choosing the filler that is right for the patient. Biodegradable fillers are the right choice for starting off in a patient who has never been exposed to fillers. They provide an opportunity to study the host reaction to fillers.

### Techniques of Injection

*Linear threading technique:* The desired length of the needle corresponding to the length of the wrinkle is inserted and the substance is injected while pulling the needle slowly backwards so that the threads of the gel are placed lengthwise in the wrinkle<sup>9</sup>.

*Serial puncture technique:* Multiple injections are placed serially along the length of wrinkle/fold to be treated. It is made closely together so that it merges into a smooth continuous line which lifts the wrinkle<sup>9</sup>.

*Fan technique:* The needle is inserted at the periphery of the area to be treated as when using the linear threading technique. After injecting one line the direction of the needle is changed and injected as before along a new line<sup>9</sup>.

*Cross hatching technique:* The needle is inserted at the periphery of the area intended to be augmented and injected as while using the linear threading technique. The needle is withdrawn from the skin and inserted 5-10 mm adjacent to the first puncture site and injected in the same way. This procedure can then be repeated at right angles to the original lines<sup>9</sup>.

*Tower technique:* It is a novel technique for the injection of hyaluronic acid fillers. With this technique, the hyaluronic acid is deposited via a perpendicular approach to the deep tissue plane with a gradual tapering of product deposition as the needle is withdrawn. A series of towers or struts are thus created. These towers serve

**Table 1:** Properties of Filler Products.

Product	Composition	Use	Technique	Advantages	Disadvantages
Collagen <sup>7,8</sup>	Bovine Collagen	Reduce wrinkles and scars. Shaping vermilion border and correction of nasolabial folds.	Diluted with phosphate buffered saline. Injected at 45-90° to dermis surface. Comes with preadded Lidocaine	Least expensive, Less bruising.	Needs prior testing as people may be allergic to bovine collagen. Can be managed with steroids, Tacrolimus and Cyclosporine.
	Human collagen-Bioengineered	Facial contour enhancement, including lips, Wrinkles, creases and lines caused by facial expression or aging	Sterile device with 3.5 mg/mL of human-bioengineered collagen distributed in a phosphate-based saline containing 0.3% Lidocaine	No adverse reactions as hypersensitive reactions are rare.	No perceivable adverse reactions. Expensive.
	Porcine collagen	Indicated for the correction of moderate-to-deep facial wrinkles and folds, such as nasolabial folds	Linear threading technique, tunneling technique, serial puncture injections, or combinations have been used to achieve optimal results	Porcine collagen is very close to human collagen	Religious sentiments should be taken into consideration.
	Prominent Glycosaminoglycan of skin	Facial contour enhancement, including lips, wrinkles, creases and lines caused by facial expression or aging	Stabilized hyaluronic acid generated by streptococcal bacteria and suspended in a physiological buffer at a pH of 7.0	Because hyaluronic acid is identical in all species, the risk of allergy is remote	Hyaluronic acid has a heparin like effect, thus resulting in a greater incidence of bruising than is seen with collagen fillers.
	Non resorbable polymethyl methacrylate (PMMA) microspheres	Correction of nasolabial folds. Lip volumizing contraindicated	Most practitioners prefer a threading injection technique	Contains bovine collagen, skin testing must be performed prior to treatment.	In addition to allergy, other adverse effects may include lumpiness, persistent swelling or redness, and increased

	Synthetic, biodegradable, biocompatible, immunologically inert peptide polymer	Intended for restoration and/or correction of the signs of facial fat loss (lipoatrophy) in people with HIV infection	To be injected into the deep dermis or subcutaneous layer	Injected dermally, subcutaneously or neocollagenesis occurs, thus it is a dermal stimulating agent, not a true dermal filling agent.	sub dermal	sensitivity at the injection site
Calcium Hydroxylapatite <sup>7,8</sup>	Composed of 30% calcium hydroxyl apatite and 70% carrier gel.	Most commonly used for the correction of nasolabial folds, atrophic cheeks, and temporal wasting.	Injected dermally at the dermal-subcutaneous junction	No skin test is required prior to treatment, and the product is stored at room temperature.	sub dermal	Dermal nodules have been reported after treatment and often take 7 months or much longer to develop. Injection into the dermis may result in nodule formation and should be avoided. Avoid treating the lips.
Autologous cell therapy <sup>7,8</sup>	Cultured fibroblast cells obtained autologously	Indicated to improve the appearance of moderate to severe nasolabial fold wrinkles	Injected in Nasolabial fold and wrinkles.	Patients own fibroblasts are cultured decreasing chance of rejection.	own	Virtually no adverse reactions.

as support structures for the overlying soft tissue, thereby restoring the face to a more youthful appearance. The anatomic areas most amenable to this technique include the lateral brow, the nasolabial folds, the marionette lines, the prejowl sulcus and the mental region<sup>10</sup>.

*Intraoral approach:* The skin overlying the treatment area is cleansed with a topical antiseptic. With the patient in an upright position, the procedure area is marked. The areas are marked using the Hinderers technique<sup>11</sup>. The volume augmentation site is identified by two lines intersecting each other. One line runs from the tragus to the alar cartilage of the nose and the other from the outer canthus of the eye to the labial commissure. The implant is placed in the upper outer quadrant of the crisscross lines.

The oral cavity is cleaned with Betadine™ mouth gargle or a chlorhexidine-based mouth wash, and a local anaesthetic infiltration of xylocaine 2% with adrenaline (1:2,00,000) is given at the mucosal puncture sites in the upper gingival fornix at the

second incisor and canine junction level. After the lips are retracted by an assistant, a small stab or puncture wound is made in the mucosa using a scalpel blade No. 11. A blunt 18 gauge cannula is introduced through this site superficial to the bone, always using the other hand to guide the cannula. The guiding hand is kept at the infraorbital margin to prevent placing of the product in the orbital fossa. Multiple tracts are made with the cannula and the filler is placed in retrograde technique till the desired volume is reached. A fresh cannula is used for the other side of the face. An antibiotic prophylaxis is used to combat the risk of infection<sup>12</sup>.

### Combination Approach

1. *Sandwich procedure:* Here a layering technique, where one product is injected above the other in different planes for a better esthetic effect, is followed<sup>9</sup>.

2. *Botulinum toxin:* Injecting botulinum toxin 1 week prior to soft tissue augmentation in the areas to be

treated results in a synergistic effect. It reduces the amount of product required for correction and also helps to increase the longevity of the filler in the treated area<sup>9</sup>.

Botulinum Toxin A is obtained from the bacterium *Clostridium Botulinum*. It acts at the neuromuscular junction paralyzing the muscle. It finds application in treating patients with excessive gingival exposure; gummy smile<sup>13-16</sup>. By weakening the lip elevators, the amount of movement decreases and the patient shows less gingiva on smiling<sup>13</sup>. Mentalis hyperactivity can be managed by injection of Botox into the muscle. The procedure has to be repeated as the effects do not last more than 3-6 months. Surgical options for correction of soft tissue defects are debulking, augmentation, liposuction and face lifts<sup>17,18</sup>.

## CONCLUSION

The ultimate goal in a comprehensive plan is to provide the most viable options to the patient and have a treatment plan individualized for the patient. Any experienced professional in the field of Maxillofacial Surgery would vouch that many times just Orthognathic Surgery/Orthodontics or a combination of both are just not enough to achieve the best results but one should be willing to incorporate adjuvant procedures to achieve the best results.

## CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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