

Dermal Fillers

Karthik R^{1,*}, Mohan N²

¹Reader, ²Professor & HOD, Dept. of Oral Medicine & Radiology, Vinayaka Missions Sankarachariyar Dental College, Salem

***Corresponding Author:**

Email: drkarthik17@gmail.com

Abstract

In the modern era of medicine, Dermal fillers are used for aesthetic reasons, the choice of the Dermal filler depends on several factors such as the defect to be corrected, desired longevity and material used. The adjunct use of Dermal fillers with other procedures such as the use of laser, chemical peels, Botulinum toxin, radiofrequency and aesthetic plastic surgery helped in improving the fine corrections of facial defects.

Keywords: Dermal fillers, Injectable implant, Marionette lines, Dual Plane technique.

Introduction

A Dermal filler also called injectable implants is a natural or synthetic collagen used for injection in the dermis for the augmentation of soft tissues. Dermal fillers are now frequently used for aesthetic indications like wrinkles and creases due to aging.

Optimal characteristics of Dermal Fillers

1. Biodegradable (in case of temporary and semipermanent dermal fillers).
2. Long duration/Persistence.
3. Nontoxic
4. Noninflammatory
5. Noncarcinogenic.
6. Non-Animal origin.
7. Easy to inject
8. Minimal side effects.

Classification of Dermal Fillers

1. Based on the origin: Natural /Synthetic.
2. Based on the source: Autograft/ Allograft/ Heterograft.
3. Content: Collagen/ fat/ hyaluronic acid/ silicone/ Peptides.
4. Duration of effect: Temporary /Permanent.

Table 1: Classification of Dermal Fillers

Dermal fillers	Examples
Based on origin	
Natural	Zyderm, Fibrel, Restylane.
Synthetic	Expanded Poly Tetra Fluoro ethylene(EPTFE), Silikon 1000.SIL skin, Bioplastique, Pro fill
Source	
Autograft	Fat, Dermal graft
Allograft	Fascian (cadaver), Allo Derm
Xenograft	Fibroquel (Bovine)
Based on content	
Collagen	Zyderm, Zyplast, Fibroquel
Fat	Autologous Fat, Frozen Fat, Lipocytic Dermal Augmentation
Hyaluronic acid	Hylaform gel, Hylan, Restylane
Silicone	silikon 1000, Biocell ultra vital, Bio plastique
Peptides	Fibrel
Based on duration of effect	
Temporary	Zyderm, Fibrel, Alloderm, Cymetra, Endoplast-50, Plasmagel, Restylane, Autologous fat, Frozen fat, Lipocytic Dermal augmentation
Permanent	Expanded Poly Tetra Fluoro ethylene(EPTFE), Adatosil 5000, Silikon 1000, Biocell Ultra Vital

Table 2: Classification of Dermal Fillers based on longevity

Temporary (Biodegradable) < 1 Year	Semi-Permanent (Biodegradable) 1-2 Years	Permanent (Non-Biodegradable) >2Years
Collagen	CaHA, Calcium Hydroxyapatite	PMMA, Polymethylmethacrylate
Collagen-Human	DEAE-Sephadex(Dextran)	PAAG, Polyacrylamide Gel
Collagen-Porcine	PLLA Poly-L-Lactic acid	Polyalkylimide
Hyaluronic acid-avian	PVA Poly Vinyl Alcohol	LIS-Silicon (Polydimethylsiloxane oil)
Hyaluronic acid-Bacterial	Chitosan HEMA Hydroxyethylmethacrylate Cultured Human fibroblasts	

Table 3: FDA Approved Dermal Fillers

Material	Site of Placement	Longevity	Injection Techniques
Artefill	Reticular Dermis	2 Years	Layered, Tunneling technique
Zyderm I X II Zyplast	Dermis	2-4 Months	Serial Puncture, Threading
Hyaluronic acid			
Restylane	Mid Dermis	6-8 Months	Threading
Perlane	Deep Dermis	6-8 Months	Threading and Serial Puncture
Hylaform/ Hylaform Plus	Mid Dermis	4 Months	Serial Puncture, Threading
Captique	Mid Dermis	4 Months	Serial Puncture, Threading
Autografts			
Autologous Fat	subcutis	>1 year	Serial Puncture, Cross Hatching
Autologous Collagen	Mid Dermis Upper Dermis	>18 Months	Threading
Synthetic Materials			
Polytetrafluoroethylene	Subcutis	Permanent	Threading
Silicone	Deep Dermis and Subcutis	Permanent	Threading
Sculptra	Deep Dermis	1-2 Years	Threading

Absorbable (Temporary) Dermal Fillers

Collagen: Collagen is a type of protein that is a major part of skin and other tissues in the body. Sources of purified collagen used in soft tissue fillers can be from cow (bovine) or human cells. The effects of collagen fillers generally last for 3-4 months. They are the shortest lasting of injectable filler materials.

Hyaluronic acid: Restylane (Medicis, Scottsdale, AZ) was the first to receive approval by the FDA (in December 2003) for the correction of moderate to severe facial wrinkles and folds, such as nasolabial folds. The effect of this filling material lasts for approximately 6-12 months.

Calcium hydroxylapatite: Calcium hydroxylapatite is a type of mineral that is commonly found in human teeth and bones. For wrinkle filling in the face, calcium hydroxylapatite particles are suspended in a gel-like solution and then injected into the wrinkle in the face.

The effects of this material last approximately 18 months.

Poly-L Lactic acid (PLLA): The poly-L-lactic acid Sculptra (PLLA; Sanofi-Aventis, Bridgewater NJ) provides a semipermanent correction and was approved by the FDA in 2004 for use in HIV facial lipoatrophy. The 40 to 63 µm PLLA particles are suspended in a sodium oxymethylcellulose carrier.

PLLA is a biodegradable, biocompatible synthetic polymer. PLLA is a long lasting filler material that is given in a series of injections over a period of several months. The effects of PLLA generally become increasingly apparent over time (over a period of several weeks) and its effects may last up to 2 years.

Non-absorbable (Permanent) Dermal Fillers: Polymethylmethacrylate beads (PMMA microspheres): PMMA is a non-biodegradable, biocompatible, synthetic polymer. PMMA beads are tiny, round, smooth particles that are not absorbed by the body.

When used as a soft tissue filler, PMMA beads are suspended in a gel-like solution that contains cow (bovine) collagen and injected into the face.

Techniques of Injecting Dermal fillers

Linear Threading Technique: It consists in inserting the needle along the length of the skin depression then depositing regularly the product while removing the needle. This technique is best for treating Vermilion Border of Lip.

Multi Puncture Technique: This technique can be performed using a needle or an injection gun. This consists of administering multiple very superficial injections of small amounts of dermal filler. The injection sites are very close together and evenly distributed over the surface to be treated or forming a line along the length of the wrinkle.

Fan Technique: It involves inserting the needle and depositing the product while slowly but not fully withdrawing the needle, and then repositioning the needle again until the entire zone is filled. Using a single injection point, this method makes it possible to change the direction of the needle and precisely inject the product into the whole depression zone.

Nappage Technique: This technique involves multiples threading injections, in grid pattern, in vertical and horizontal directions.

Dual Plane technique: It is a technique based on restoring first the deep volumes and there after the superficial volumes.

The Mean volume of Dermal fillers used in the facial region is as follows Glabellar wrinkles in the forehead 0.5 ml, Nasolabial folds and Lips (0.5- 1 ml each side), Nose 0.5-1 ml, Infraorbital area 1.0-2.0 ml each side.

Indications of Dermal fillers

1. Depressed scars such as following surgery or trauma scars.
2. Wrinkles on the face and Marionette Lines (Increased Nasolabial fold lines) due to aging.
3. Lip augmentation.
4. Dermal atrophy due to various causes e.g. Morphea.
5. AIDS Lipoatrophy.

Contraindications of Dermal fillers

Collagen based fillers are contraindicated in Patients with Systemic Lupus erythematosus.⁵ hyaluronic acid-based fillers derived from Streptococcus species in patients with any previous streptococcal disease.

Advantages of Dermal Fillers

1. Easy Procedure.
2. Immediate Results.
3. Shortest recovery time.
4. Minimum risk.

Disadvantages of Dermal Fillers

1. Expensive.
2. Temporary results, needs repetition once in a year.

3. Adverse reactions may occur such as secondary bacterial infection, cyst or abscess formation, Local tissue necrosis due to vascular occlusion, Reactivation of Herpes infection, Anaphylactic reactions.

Adjunct therapies with dermal fillers

Dermal fillers and Lasers: As the chromophore for lasers used for skin rejuvenation is water, there is a theoretical risk of dissolution of hyaluronic acid-based fillers, when such lasers are administered to treated areas. Goldman *et al.*, administered 1320-nm Nd:YAG laser, 1450-nm diode laser, monopolar radiofrequency and/or intense pulsed light immediately after injecting hyaluronic acid-based dermal fillers (Restylane™) into the nasolabial groove.⁽⁴⁾

De Maio suggests that laser resurfacing should be done first and then the filler procedure, once the process of collagen remodelling has been completed. He has also mentioned that nasolabial grooves become shallower due to overall tightening of skin. However, aggressive resurfacing with laser has risk of dyspigmentation in darker skin types.⁽³⁾

Dermal fillers and chemical peels: All chemical peels elicit some amount of inflammation and this inflammation has a theoretical risk of degradation of the filler. De Maio and Rzyany opine that as the inflammation elicited by superficial chemical peels is not significant, superficial peels can be done immediately after filler administration. They advise to defer medium-depth peels, namely trichloroacetic acid till the post-peel erythema fades or till collagen remodelling is completed (probably in 1-2 weeks).⁽⁶⁾

Dermal Fillers and Botulinum toxin: Combining fillers with botulinum toxin is a new rejuvenation paradigm. Since the hyperactive or hypertonic muscles play a prominent role in producing wrinkles, it is better to relax the muscles first with the botulinum toxin, and later administer fillers after 2 weeks. However, for the nasolabial groove, fillers are injected first and then the botulinum toxin is injected.⁽⁷⁾

Dermal fillers and Radiofrequency: Radiofrequency is one of the common modalities employed for non-ablative skin rejuvenation. The efficacy of a filler (both hyaluronic acid- and non-hyaluronic acid-based fillers) was found unaltered when non-ablative radiofrequency was performed over areas treated with the filler.⁽⁸⁾

Dermal Fillers and Plastic surgery: Plastic surgery for facial contouring and other aesthetic indications can be supplemented by fillers. Fillers have the advantage of achieving finer corrections.

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