REVIEW ARTICLE

A Review Of Dermal Fillers: Its Use In Facial Rejuvenation

Umesh K[1], Shoaib N. Parkar[2], Murari washani[3], Amrit P[4], Tanmoy N[5], Azhar K[6]

ABSTRACT

The aim was to evaluate various fillers available for facial rejuvenation. A bibliographic search in Medline, PubMed and the Cochrane Register of controlled clinical trials was performed between 1989 and 2015 by using the terms dermal fillers, facial fillers, and facial augmentation. A total of 163 publications were reviewed. Since last two decades there has been a shift in the way aesthetic surgeons approach facial rejuvenation and more than 80% articles have been published during this period. The field of soft tissue augmentation is in an evolving state due to many products in development as are presently available. By understanding the properties of each filler material treatment can be tailored to the individual patient. In addition to soft tissue augmentation, other modalities such as chemical peels, laser resurfacing, and Botox must also be considered to optimize treatment. With new products such as hyaluronic acid derivatives in markets, soft tissue augmentation will continue to be an important treatment modality at the disposal.

Keywords: Diabetes mellitus, Oral health, Periodontitis

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[1]Professor and HOD, Department of oral & maxillofacial surgery, [2,3,4,5,6] Postgraduate student, Department of oral and maxillofacial surgery, The Oxford Dental College and Hospital, Bangalore, India

Corresponding author: Dr. Umesh K, Professor and HOD, Department of oral and maxillofacial surgery, The Oxford Dental College and Hospital, Bangalore, India

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INTRODUCTION

Soft tissue augmentation has become an even more important tool in aesthetic surgery. Soft tissue fillers have been used for more than a century to improve facial contours, correct wrinkles, fill depressed scars, and enhance areas such as the lips. Although there is still no ideal filler substance, many interesting new products have been developed in recent years.[1]

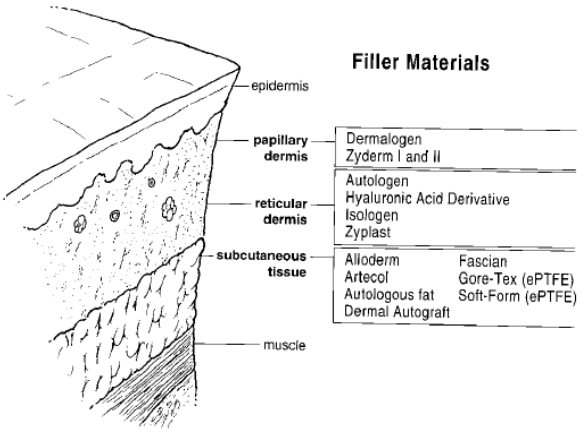
The use of diverse soft-tissue fillers has recently been introduced to cosmetic surgery. The apparent simplicity of filler injection and high patient satisfaction has led to cavalier attitudes towards this treatments.[2]

Neuber was first to report the use of autologous fat for facial rejuvenation in 1893,[3] and since then the use of fillers has increased worldwide. They are used to reduce the signs of ageing by hiding facial lines, creases, and wrinkles, and also to correct deficiencies in volume and facial contours inpatients with facial asymmetry or facial lipodystrophy.[4]

This article will discuss the various materials used in soft tissue augmentation and will help the reader choose the optimal substance for each individual patient.[1]

An ideal filler substance would be an inexpensive, inert, stable substance that is easy to implant, provides a permanent or at least long-lasting natural-looking correction, and has a minimal recovery time. The substance would also have to be free of infectious agents, noncarcinogenic, and easily removed if the patient or physician so desired.[1]

Many autologous, semisynthetic, and synthetic materials have been used to augment soft tissue defects.[5] Autologous materials are harvested from the patient and therefore have no risk of immunologic rejection or nosocomial infection.



AUTOLOGOUS MATERIALS

Autologous Fat Transplantation

Autologous fat transplantation has been a popular technique for soft tissue augmentation for a long time.[3]

In fact, en block transplantation of fat has been successfully performed since the late 19th century.[6] Although success rates were quoted at 50%, this technique required an excision at the donor site and essentially traded one defect for another. Fat tends to survive well when injected into subcutaneoustissue.[7-9] However, as with most filler materials, extremities and very mobile areas tend to hold their correction for a shorter period.[10] Excess harvested fat may bestored in a freezer for use in a touch-up procedure performed 2 to 4 weeks after the initial treatment.

Presently, many new techniques are being investigated that may improve autologous fat transplantation in the future. For example, the addition of growth factors to increase the survival of transplanted adipocytes is being studied in animal models.[11]

Dermal Autografts

Dermal grafts have been used for years[12] in lip augmentation, scar revision, and improvement of facial contours, and are now being used under flaps and grafts in reconstructive surgery.

Autologous dermal grafts have many of the properties of an ideal filler substance; they maintain their volume very well for extended periods of time, have no allergic potential provide reasonably natural-appearing correction of deep dermal or subcutaneous defects, and may be easily removed if desired.

Autologous Fibroblasts (Isologen)

A new procedure allows a patient's own fibroblasts to be used in soft tissue augmentation.[13]Early reports on Isologen vary in their assessment of its efficacy. One report demonstrated sustained correction in less than 20% of patients,[14] whereas another showed between 30% and 60% improvement.[13] The drawbacks to Isologen include the initial biopsy procedure required, the relatively small volume provided, the pain on injection, the long wait for results to appear, the less-than-impressive sustained correction, and the fact that patients must be injected the exact day the material arrives or the fibroblasts die.

Autologous Collagen

Another new product, Autologen, is an autologous injectable human tissue matrix made up predominantly ofcollagen.[15] Although there are no large long-term studies at this point, correction with Autologen has been reported to be up to 75% 1 year after 3 treatments.[16] The major drawback to Autologen is the large area of skin required to make the product. For this reason, this product is typically reserved for patients who have excess skin available from a concurrent procedure.

SEMISYNTHETIC XENOGRAFT MATERIALS

Collagen

Bovine collagen is the most commonly used injectable material for soft tissue augmentation in the world. It can be done quickly, offers excellent correction, and has achieved an outstanding safety record in the over 1 million patients it has been used on.[17]

There are presently 3 forms of bovine collagen available for soft tissue augmentation: Zyderm I, Zyderm II, and Zyplast. Zyderm I, the first product to receive FDA approval, has a collagen concentration of 35 mg/mL, comprised of 95% type I collagen and 1% to 5% type III collagen. Zyderm II received FDA approval in 1983 and has a collagen concentration of 65 mg/mL.

At least one skin test should be performed before using collagen for soft tissue augmentation.[18]
Although many patients do not require it, areas to be treated may be anesthetized with topical anesthetic creams (eg, eutectic mixture of local anesthetics [EMLA], Ela-max, Betacaine) before injection. Patients are placed in a near-upright position, slightly side lighted, and the collagen is injected through a 30-gauge needle. Zyplast I and II are injected into the papillary dermis and are used for very superficial rhytides. Zyplast is injected into the reticular dermis and is used for deeper lines, furrows, and scars. Some physicians layer Zyderm over Zyplast for further correction when necessary.

Fibrel
Fibrel is a mixture of porcine-derived lyophilized gelatin powder to which epsilon amino-caproic acid is added. When this is mixed with plasma and then injected into the dermis, it becomes a gelatin matrix, which may stimulate new collagen formation. The product was designed to be mixed with the patient's own centrifuged blood plasma and therefore was somewhat laboratory intensive and required exposure to blood products.
Some authors have stated that the substitution of lidocaine or saline solution in place of the patient's blood plasma significantly improved the ease and safety of use without altering the effectiveness of the product.
Although Fibrel has been approved for treatment of depressed scars and wrinkles, it is primarily used to treat depressed scars. Because Fibrel mixtures are more viscous than Zyderm/Zyplast and must be injected through a 27-gauge needle, the area is usually injected with local anesthesia first. A wide ring block or nerve block is done so as not to distort the treatment site. The scar is first undermined slightly, and the Fibrel mixture is then injected into the dermal pocket created by the undermining.

Hyaluronic Acid Derivatives
Hyaluronic acid is a polysaccharide found in the dermis that binds water and provides skin turgor. Unlike collagen, hyaluronic acid is identical across all species. Because these products do not elicit antibody formation, no skin testing is necessary.[19] They are injected into the mid derm-is with a 30-gauge needle
The hyaluronic acid derivative products are composed of cross-linked hyaluronan molecules with very high molecular weights that may persist in the dermis for an extended period of time.[20]
Hyalaform gel, or Hylan B gel, is a hyaluronic acid derivative derived from the rooster comb of domestic fowl, and has also been used in Europe for some time.[21] One study showed that 60% of wrinkles demonstrated some degree of correction 18 months after 2 treatments.[22]

ALLOGRAFT MATERIAL

Dermalogen
Dermalogen is an injectable allograft material of human tissue collagen matrix. Autologen is used to harvest intact collagen fibrils from the dermal layer of human cadaveric skin. The material is supplied in syringes and is injected into the high dermis with a 30-gauge needle. There is some evidence of neovascularization and host collagen deposition in sites injected with Dermalogen.

Alloderm
Alloderm (LifeCell Corp, The Woodlands, Tex) is an acellular solid dermal transplant allograft material harvested from cadaver tissue. The tissue is processed in such a way as to remove the epidermis as well as all cellular components. The Alloderm matrix serves as a template for ingrowth of the recipient's fibroblasts and vessels. The material is used in full-thickness burns, under grafts to improve contour and decrease contraction, for septal reconstruction, to improve facial fold contours, and for lip augmentation.[23] Because this is implanted below the dermis, it is not the best choice for fine rhytides.
Fascian is an injectable allograft material of particulate human cadaveric human fascia lata.The material is harvested from cadaver tissue, processed, and supplied in 3-mL syringes in a dehydrated form. Fascian is injected into the superficial subcutaneous fat through a 16-gauge (for the 2.0 mm size) or 18-gauge (for the <0.5 mm size) needle. Some investigators recommend creating a pocket with needle dissection before injection. Histology of areas treated with Fascian show replacement with host collagen over several

months.[24]

Human Collagen

Animal studies have been done investigating the use of gamma-irradiated human placental amniotic collagen for soft tissue augmentation.[25,26]

Placental collagen could be prepared as either an injectable allograft or banked as an autograft material for the patient to use at a later time.

It is soft, pliable, non-allergenic has minimal tissue reactivity, may be removed, and has an excellent safety record in 3 decades of use in cardiac and vascular surgical applications.

An incision must be made to implant the material, so local anesthesia is required and patients must be made aware of the tiny scar associated with the implantation incision. The material is typically implanted in a pretunneled space in the high subcutaneous fat just under the dermis.

Artecol

Artecol is a suspension of small (20 to 40 μg) beads of Plexiglas (polymethyl-methacryate or PMMA) in abovine collagen solution. Artecol is injected with a 27-gauge needle into the dermal/subcutaneous junction. Injections tend to be painful, and erythema and swelling is common. The materialmay be molded into shape with fingertip pressure and is then reportedly encapsulated by the tissue approximately 2 to 4 weeks after injection.

Some authors suggest that particles must be greater than 60 μm in size to not be phagocytized and thus remain in place permanently.[11]

Although Artecol injection can result in a beaded appearance if placed too superficially, one study showed 64% of patients reported striking and lasting improvement up to the 2-year follow-up visit.[27]

DISCUSSION

Rejuvenation of the aging face has always been an integral part of facial plastic surgery. The aging face is characterized by macroscopic and microscopic changes. Some of the macroscopic changes include the formation of jowls, melolabial folds, and tear-trough deformities. Other changes in facial appearance include bone and soft-tissue volume depletion, changes in skin quality, and the downward gravitational pull of facial musculature and soft tissue. Large macroscopic changes can be counteracted by surgery, such as facelifts and midface lifts. Filler agents have a specific role in combating facial aging changes to augment surgical results and offer real benefits in patients with lesser degrees of aging not yet conducive to invasive procedures.[28]

CONCLUSION

The field of soft tissue augmentation is in an evolving state due to many products in development as are presently available. By understanding the properties of each filler material treatment can be tailored to the individual patient.

The risks and benefits of the various materials may be weighed by the patient, and the proper decision for that patient may be made. Some patients may prefer to sacrifice permanence for a more natural feel, or vice versa.

In addition to soft tissue augmentation, other modalities such as chemical peels, laser resurfacing, and Botox must also be considered to optimize treatment. With new products such as hyaluronic acid derivatives in markets, soft tissue augmentation will continue to be an important treatment modality at the disposal.

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