Semipermanent and Permanent Injectable Fillers

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KEYWORDS

- Semipermanent and permanent fillers
- Hyaluronic acid • Calcium hyaluronic polylactic acid
- Polymethyl methacrylate

Soft-tissue augmentation dates back more than 100 years ago, when autologous fat grafts were used to restore facial volume defects.[1] Paraffin was used for some time but fell out of favor because of a high incidence of foreign-body reactions. In the early 1950s, liquid silicone was first injected for soft-tissue augmentation. It was used widely until 1982, when the US Food and Drug Administration (FDA) temporarily banned its use over concerns of possible toxicity. Following the ban on liquid silicone, injectable bovine collagen became available in the United States in the 1980s and quickly became the gold standard of treatment to which many new dermal fillers are still compared. Although some may question the duration of effect of collagen, human collagen remains an agent of comparison in many pivotal trials.

Today, an impressive array of injectable dermal fillers for facial soft-tissue augmentation is available in the United States. These agents, most of which were introduced in the last half decade, represent a variety of semipermanent and permanent fillers across several categories. Physicians can choose between semipermanent fillers, such as hyaluronic acid derivatives (HA), calcium hydroxylapatite (CaHA), and poly-L-lactic acid (PLA), and longer-lasting, so-called "permanent fillers," such as polymethyl methacrylate microspheres (PMMA), highly purified forms of liquid silicone, and hydrogel polymers.

While these fillers are generally safe, effectiveness is related to areas of injection and physician expertise. Each has its own specific properties and longevity that makes it more suitable for certain uses than for others. Semipermanent fillers must be repeated at regular intervals, although with certain products the filler is replaced by the patients' own collagen over the course of several treatments. Permanent fillers require minimal touch-ups and have long-lasting effects of 5 years and longer.

SEMIPERMANENT FILLERS

Calcium Hydroxylapatite

CaHA is a normal component of human bone and teeth and has been used as implant or coating material in dentistry and other therapeutic areas for more than 20 years. The filler is composed of CaHA microspheres (25–45 microns) suspended in an aqueous carboxymethylcellulose gel carrier. Radiesse (BioForm Medical, San Mateo, California) is the dermal filler containing CaHA. Skin testing is not required.

Mechanism of action

The mechanical filling and volume enhancement occurs following injection, when the gel carrier and CaHA microspheres displace surrounding soft tissue. As the gel is phagocytized, the process of neocollagenesis begins in and around the microspheres, stimulating the gradual growth of the patients' own collagen (**Fig. 1**).[2] The spherical CaHA particles are gradually broken down and degraded by way of normal metabolic processes and eliminated as calcium and phosphate ions through the urinary system. The proliferation of collagen along with the slow breakdown of the CaHA is understood to account for the prolonged effects.[3]

Indications

CaHA is indicated for subdermal implantation for the correction of moderate to severe facial wrinkles

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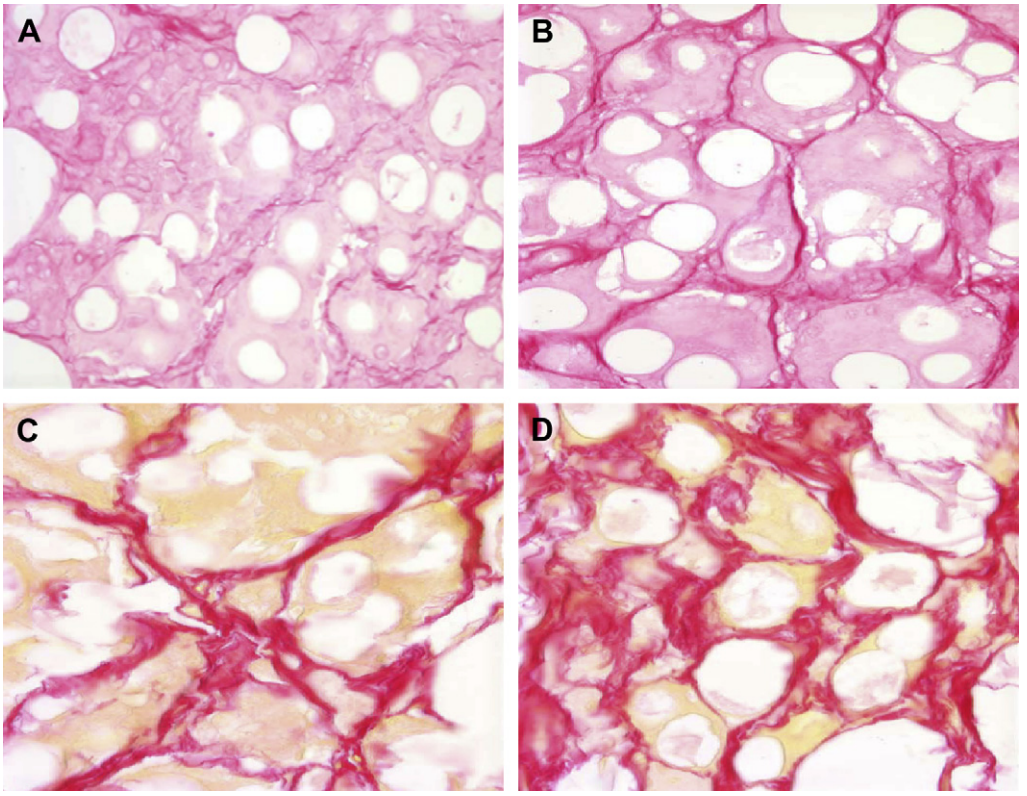

Fig. 1. (*A–D*) Histology studies demonstrate increased collagen deposition around CaHA microspheres over 4 to 78 weeks. Collagen fibers are represented by the darker areas. (*From* Coleman KM, Voights R, DeVore DP, et al. Neocollagenesis after injection of calcium hydroxylapatite composition in a canine model. Dermatol Surg 2008;34:S53–5; with permission.)

and folds, including nasolabial folds (Fig. 2), and for the correction of HIV-associated facial lipoatrophy (Fig. 3). It is also indicated for vocal cord insufficiency, oral/maxillofacial defects, and radiographic tissue marking. Off-label facial uses also include correction of marionette lines and oral commissures, prejowl sulcus, cheek-volume loss, and dorsal nasal deformities. In its present formulation, CaHA is not appropriate for use in the lips.

Efficacy and safety

CaHA was compared with a human-collagen product in a United States pivotal trial of 117 subjects with moderate to severe nasolabial folds. These subjects were randomized to receive CaHA on one side of the face and an existing human collagen (HC) product (Cosmoplast, Inamed, Santa Barbara, California) on the other. CaHA provided significantly longer correction than HC,

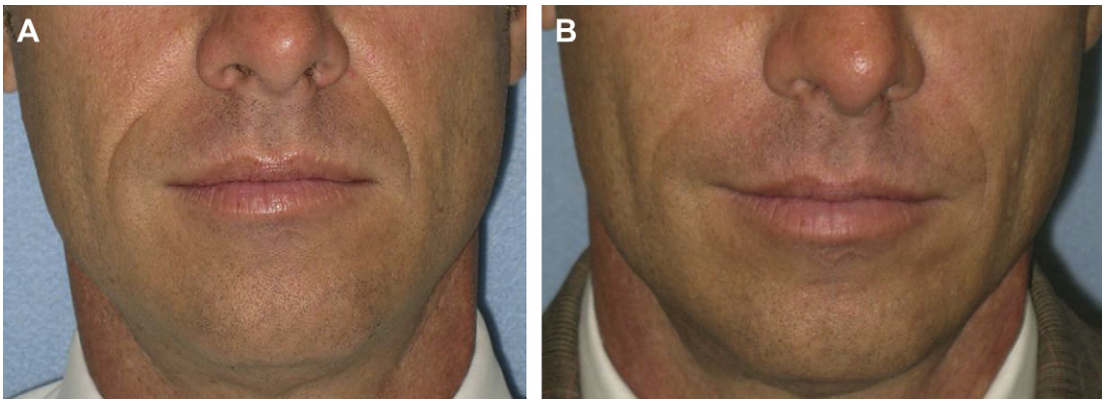

Fig. 2. (*A*, *B*) Pretreatment and posttreatment photographs of injection with Radiesse for nasolabial folds. Total volume injected into nasolabial folds was 1.3 mL. (*Courtesy of* D. Jones, MD, Los Angeles, CA.)