Original Contribution

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A randomized, prospective, blinded, split-face, single-center study comparing polycaprolactone to hyaluronic acid for treatment of nasolabial folds

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Summary

Background Dermal fillers have continuingly been under development to increase safety, efficacy, and longevity. Biostimulatory dermal fillers, such as calcium hydroxylapatite fillers, have already been shown to be superior in efficacy compared to nonanimal stabilized hyaluronic acid (NASHA)-based fillers.
Aims In this randomized split-face study, we compared a novel biostimulatory polycaprolactone (PCL)-based dermal filler with a NASHA-based dermal filler, for safety, efficacy, and duration of cosmetic correction for the treatment of nasolabial folds (NLFs).
Patients/Methods Forty subjects received a PCL-based dermal filler in one of their NLFs, and a NASHA-based dermal filler on the contralateral side. Efficacy was evaluated based on the Wrinkle Severity Rating Scale and Global Aesthetic Improvement Scale.
Results After 6, 9, and 12 months post-treatment, NLFs treated with the PCL-based dermal filler showed statistically significant improvements on the Wrinkle Severity Rating Scale and greater improvements on the GAIS compared to NLFs treated with the NASHA-based dermal filler. Both products were found to be equally safe and well tolerated.
Conclusion Our results suggest that PCL-based dermal fillers offer longer-lasting performance over NASHA-based dermal fillers in NLFs treatment.

Keywords: facial filler, hyaluronic acid, nasolabial folds, polycaprolactone

Introduction

Tissue augmentation by dermal filler injection has been used for over 20 years and still continues to grow in popularity. There are several types of dermal fillers available such as fillers based on nonanimal stabilized hyaluronic acid (NASHA), calcium hydroxylapatite (CaHA), and poly-L-lactic acid (PLLA), all with their own efficacy and longevity profile.[1] Currently, the demands in the noninvasive esthetic treatments are shifting to more safer and long-lasting results with nonpermanent devices.[2]

A polycaprolactone (PCL)-based dermal filler has been introduced to the esthetic market in 2009, representing a new class of biostimulatory dermal fillers. Biostimulatory fillers such as the CaHa fillers have already been shown to be superior to NASHA-based fillers in the treatment of nasolabial folds (NLFs).[3] PCL is a bioresorbable, nontoxic medical polymer that is attractive for the

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use in medical devices because of its controlled and safe bioresorption profile.[4,5] The PCL microspheres (25–50 μm) are suspended in an aqueous carboxymethylcellulose (CMC) gel carrier. Both PCL and CMC individually have an excellent and proven biocompatibility profile and have been used successfully in numerous CE-marked and FDA-approved medical devices such as oral and maxillofacial surgery, wound dressing, and controlled drug delivery systems.[6–12] In a recent study, the excellent biocompatibility profile of PCL has been extended by showing its use as a bioresorbable tracheal splint for the treatment of tracheobronchomalacia, an airway disease.[13] Furthermore, PCL microspheres are totally smooth and spherical-shaped, which has been shown to be optimal for dermal fillers.[14,15]

The PCL microspheres bioresorb into nontoxic bioresorption products and are excreted through normal metabolic pathways into CO_2 and H_2O.[4,5,16–18] With ^{3}H-labeled PCL and C^{14}-labeled PCL implantation studies, it has been shown that PCL is completely excreted from the body.[4,5]

The CMC gel carrier is gradually resorbed by macrophages over a period of several weeks. In contrast, PCL microspheres are not phagocytosed because of their size and surface characteristics. Instead, the totally smooth and spherical-shaped PCL microspheres use the body's natural response to stimulate neocollagenesis and replace the volume of the resorbed CMC carrier by deposition of newly formed collagen around the microspheres.[19] Recently, in a clinical trial for the correction of NLFs, it was found that a PCL-based dermal filler is safe and well tolerated for facial treatment.[20] Furthermore, in a pilot study, it was shown that a PCL-based dermal filler is safe, well tolerated, and effective for hand rejuvenation.[21]

This study was designed to compare the efficacy and safety of a biostimulatory PCL-based dermal filler (Ellansé-S™; AQTIS Medical, Utrecht, the Netherlands) to a NASHA-based dermal filler Perlane (Q-Med; a Galderma division, Lausanne, Switzerland) for the correction of NLFs. Perlane is a large-gel particle hyaluronic acid which has a median gel particle size of between 750 and 1000 μm and has been shown to be safe and effective in the correction of moderate to severe facial wrinkles.[1]

Materials and methods

Patient population

The study enrolled 40 patients between the ages of 31 and 60 years (mean age 46 years). All patients had moderate to severe NLFs as determined by a Wrinkle Severity Rating Scale (WSRS) score of 3 or 4 in both folds.

Study design

The study was a single-center, prospective, randomized, split-face, controlled trial. The study protocol conformed to the guidelines of the 1975 Declaration of Helsinki. The protocol and study design were approved by the College of Medicine and Health Sciences' and Tawam Hospital's institutional review board (IRB) prior to commencement.

The study inclusion criteria were as follows: Subjects were 18 years of age or older with moderate to severe NLFs as determined by the WSRS score at the pretreatment evaluation; subjects were willing to abstain from other facial cosmetic procedures through the 12-month follow-up visit which could interfere with treatment outcomes and able to comply with study follow-up procedures; and all subjects provided written informed consent for their participation in the study.

Subjects who received previous permanent implants in the nasolabial area at any time or who had any esthetic facial procedure performed in the nasolabial area within 6 months prior to enrollment that could interfere with the treatment outcome were excluded from the study. Also, patients with a history of autoimmune disorder or taking systemic corticosteroids were also excluded.

Pretreatment

Prior to treatment, all patients had a general examination including medical history and survey of current medications. Pretreatment photographs of the NLFs were taken for each patient to determine their WSRS ratings. Prior to participation in the study, all subjects received patient information and signed and dated the study consent form, which was approved for this study by the hospitals ethics committee. The original signed documents were kept with the subject's file, and copies were provided to the subjects.

Treatment

At the initial visit, each subject was randomly treated with PCL to correct one NLF and NASHA to correct the contralateral fold. In addition to the choice of filler, the facial side treated was also randomly chosen. Injections were administered into the mid-deep dermis using a 27-G needle inserted at an approximate angle of 30°