

Preliminary results in using a new dermal filler based on poly-caprolactone

Kostantinos Gritzalas MD

Royal Clinic, Kuwait City

ABSTRACT

Over the last decades, the minimal-invasive aesthetic medicine dramatically increased. Nowadays, patients are looking more often for aesthetic improvements without, or with a very low rate, of complications and days off work. One of the most performed, and required, procedures in aesthetic medicine are dermal fillers. In the last twenty years many permanent, semi-permanent and non permanent fillers have been introduced in this field. The author discusses his experience in using a new dermal filler based on poly-caprolactone.

KEYWORDS: filler, poly-caprolactone, wrinkles

Eur. J. Aesth. Medicine and Dermatology. 2011;1;(1):22-26

INTRODUCTION

Over the last decades, the minimal-invasive aesthetic medicine dramatically increased.

Nowadays, patients are looking more often for aesthetic improvements without, or with a very low rate, of complications and days off work. One of the most performed, and required, procedures in aesthetic medicine are dermal fillers. In the last twenty years many permanent, semi-permanent and non permanent fillers have been introduced in this field.

The current focus of patients and medical doctors who are involved in non invasive aesthetic treatment, is to shift more towards long-lasting results with non permanent devices.

A recent survey performed by the American Academy of Facial and Plastic Reconstructive Surgeons (AAFPRS), and another one performed by the Aesthetic Surgery Education and Research Foundation (ASERF), underlined that non-surgical facial aesthetic treatment plans should be more focused on long-lasting results.

CORRESPONDENCE

Kostantinos Gritzalas MD
Royal Clinic
Aman St Salmiya 5874, Kuwait City
kostas.gritzalas@yahoo.gr

DISCLOSURES

Editorial assistance was provided by Alex Lankhorst PhD of Aqtismedical, The Netherlands. Dr. Gritzalas has consulting relationship and has performed a non-compensated research for Aqtismedical.

Recently, a new dermal filler based on a bio-resorbable polyester, poly-caprolactone (PCL) was introduced. This product, called Ellansé™ dermal filler, is manufactured by AQTIS Medical (Utrecht, The Netherlands) and has received full CE-approval in May 2009 for the The European markets. Four versions of Ellansé™, based on their lasting results, are produced: S-short; M-medium; L-long; E-extra-long.

The product is already available in over 50 countries in Europe, the Middle East, and Asia Pacific.

Aim of this work is to present a preliminary report in using this dermal filler based on PCL.

MATERIAL AND METHOD

Forty patients (32 F and 8 M; mean age 43.8 years old), seeking for non-invasive facial aesthetic treatment were treated with a dermal filler based on PCL (Ellansé™). A follow up of 24 months was performed after each treatment, of which the 15-month data are discussed here.

In this study only 2 versions of this filler were used the S (short) and M (medium)-version. Ten (10) patients were treated with the S version, and thirty (30) with the M version.

Patients were admitted and discharged the same day of the procedure. In the study, anaesthetic procedures were at the discretion of the injecting physician. The author normally uses a bilateral block of the infra-orbital nerves using 1% mepivacaine before the injection of the filler. The product, sold as pre-filled syringes of 1 mL, was injected into target treatment areas in the subdermal layer. The pro-

duct was given using a cross-fanning injection technique; using a 27-gauge 0.75-inch needle, in a retrograde manner. Similar injections were then placed at approximately 90° to the original injections in the treatment areas.

Patients were initially treated sub-optimally, and a further touch-up was performed after 1 month.

Clinical performance was evaluated using the Wrinkle Severity Rating Scale (WSRS), Global Aesthetic Improvement Scale (GAIS), patient satisfaction rating, and patient likelihood return based on a Visual Analogue Scale (VAS).

RESULTS

No serious adverse events were reported in this study. In 12 cases edema was reported (6 in the S-version and 6 in the M-version) and lasted 2 days on average. All cases resolved without therapy.

Ecchymosis occurred in 2 cases for the M-version, and resolved in 7 days on average.

The GAIS showed improvement after treatment, both for patients treated with the S and M version. For the M-version, the volumetric effect lasted for all the 15-months of the follow-up. For the S-version, the volumetric effect lasted for 12 months.

WSRS data were analyzed using a Generalized Estimation Equation (GEE) on the rate of percentage changing in WSRS score of 1 or more. All data analysis points (3, 6, 9, 12, and 15 months post-treatment) were pooled and compared to the results achieved 3 months post treatment, for both linear and quadratic time effects.

For the M-version, the GEE analysis of the 6,

9, 12, and 15 months data showed no significant differences as compared to the 3 months results, suggesting sustained efficacy.

For the S-version, there is a trend towards a decrease of approximately 55% between 12 and 15 months post treatment, supporting the 12-month performance.

Patients were asked to rate their result using a VAS-score at the end of the follow-up.

Thirty-three percent of the patients treated with the M-version stated that their appearance was improved, 62% Very Much Improved, 5% improved only a bit.

Similar results were observed for the patients treated with the S-version.

DISCUSSION AND CONCLUSION

Ellansé™ is based on the patent-protected STAT-technology (Sustained Performance and Total Bioresorbability). The primary components of this dermal filler are smooth and full spherical PCL microspheres, with particle sizes ranging from 25 – 50 µm, a size that has previously been suggested to be optimal for dermal fillers¹. The microspheres are homogeneously suspended in an aqueous gel-carrier containing carboxymethylcellulose (CMC).

The 4 different versions of the dermal filler available, differs only in the PCL chain-length, and the chain-length is directly correlated to the reabsorption-time of the PCL.

The hydrolytic bioresorption of PCL occurs in two phases.

The first phase is a controlled, predictable, first-order linear bioresorption pattern, where the average length of the polymer chain (with a molecular weight M_0) in the microspheres continuously decreases in time (t) via chain scission according to the kinetic law (with 'k' being the average rate constant for chain scission; Figure 1^{2,3,4,5}).

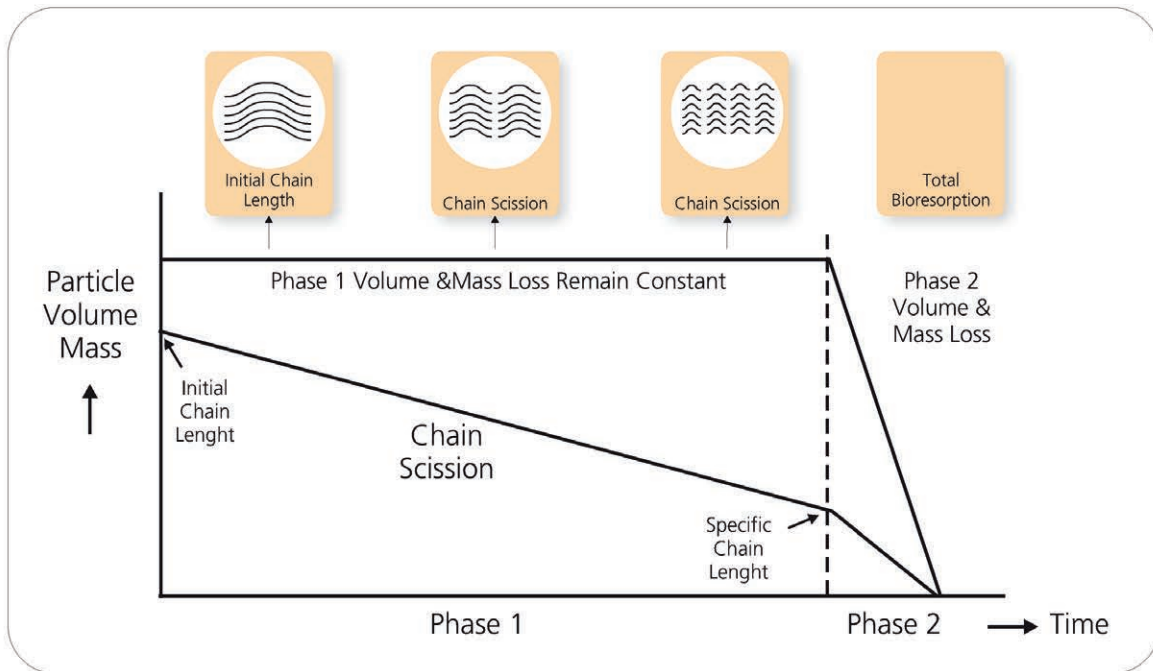
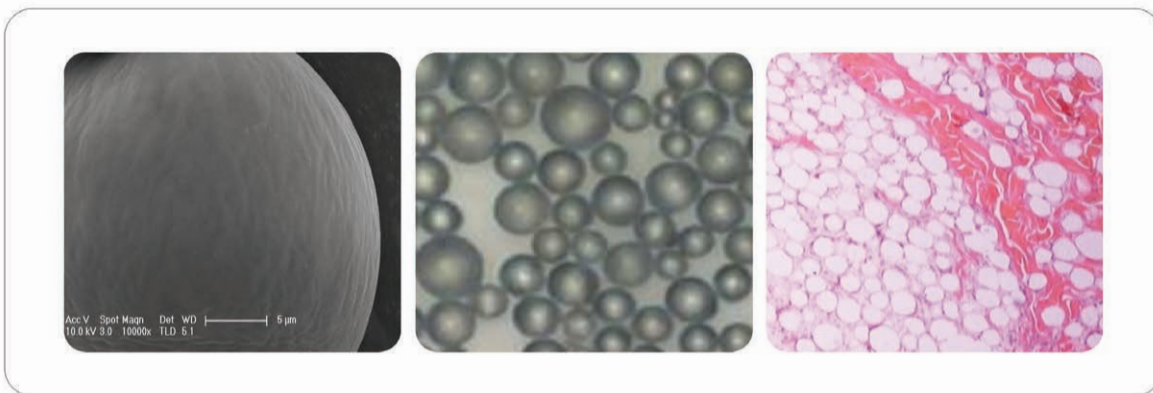
In this first phase, both the mass and volume of the implant remains intact.

In the second phase, the bioresorption of the microspheres starts, and the product is excreted through the normal metabolic pathways as carbon dioxide and water (Figure 2^{6,2,3}). The total bioresorption has been determined and confirmed by ³H- and ¹⁴C-labelled studies^{2,3}.

The PCL microspheres trigger a natural response of the human body, and stimulate a natural wound-healing response through neocollagenesis. This response has been already

FIGURE 1. Kinetic law

$$M_n = M_{n,o} \times e^{-kt}$$

FIGURE 2. Bi-phasic break-down of PCL**FIGURE 3.** Showing a Scanning Electron Microscopy picture of a smooth PCL microspheres, light microscopy of microspheres, and microspheres embedded in dermal tissue.

shown previously with other particle-based dermal fillers such as calcium hydroxylapatite^{7,11}.

After the injection, the folds or wrinkles treated, are immediately corrected thanks to the viscosity of the gel-carrier. Then, the gel-car-

rier is gradually resorbed by macrophages. However, the aesthetical correction seems to be maintained, probably because the volume of the resorbed gel-carrier is replaced by the newly formed collagen. The PCL particles can't be phagocytosed, due to their size and

smooth surface. Instead, the surface is covered by a monolayer of macrophages and a scaffold of the newly formed collagen^{8,9,1,10}.

From the outcomes of this preliminary report, the author believe that this novel dermal filler Ellansé seems to be a promising new device. However, larger volume studies with longer follow-up must be performed to confirm these results.

REFERENCES

1. Morhenn VB, Lemperle G, Gallo RL. Phagocytosis of different particulate dermal filler substances by human macrophages and skin cells. *Dermatol Surg* 2002; 28(6):484-490.
2. Pitt CG, Gratzl MM, Kimmel GL. Aliphatic polyesters I The degradation of poly caprolactone) in vivo. *J. Appl. Polym. Sci.*,1981, 26, 3779-3787
3. Pitt CG. Poly caprolactone and its copolymers. In: Chassin M, Langer R, editors. Biodegradable polymers as drug delivery systems. *New York: Dekker*: 1990. p. 71-119
4. Woodward SC, Brewer PS, Moatamed F, Schindler A, Pitt CG, The intracellular degradation of poly caprolactone. *J. Biomed. Mater. Res*, 1985, 19, 437-444
5. Chen DR, Bei JZ, Wang SG. Polycaprolactone microparticles and their biodegradation. *Polymer Degradation and Stability*, 2000, 67, 455-459
6. Taylor MS, Daniels AU, Andriano KP, Heller J, Six biodegradable polymers: in vitro acute toxicity of accumulated degradation products., *J. Appl. Biomat.*, 1994, 5, 151-157
7. Marmur ES, Phelps R, Goldberg DJ. Clinical, histological and electron microscopic findings after injection of a calcium hydroxylapatite filler. *J Cosmet Laser Ther* 2004; 6:223-226.
8. Anderson JM, Mechanism of inflammation and infection with implanted devices. *Cardiovasc. Pathol.*, 1993, 2, 33S-41S
9. Laeschke K. Biocompatibility of microparticles into soft tissue fillers, *Sem. Cut. Med. Surg.*, 2004, 23, 214-217
10. Nicolau PJ, Long-lasting and permanent fillers: Biomaterials influence over host response, *Plast. Reconstr. Surg.*,2007, 119, 2271-2286
11. Berlin A, Hussain M, Goldberg DJ. Calcium hydroxylapatite filler for facial rejuvenation: a histologic and immunohistochemical analysis. *Dermatol Surg* 2008; 34:S64-S67.