aesthetic medicine

Review

Agarose gel - high patient satisfaction of a full-facial volume augmentation

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Abstract

Agarose gel is a new generation of dermal filler. It is a sterile, biodegradable, viscoelastic, isotonic, transparent injectable gel implant, which was already approved and used for more than a decade. It can be used for face reconstruction and face modelling. Facial aging consistently produces increasing prominence of the midface, nasolabial folds, cheeks, jowls, chin and nose.
The aim of this article is to show agarose gel as at least equivalent to those products for full-facial treatment and non-surgical rhinoplasty.
This material provides a non-surgical method for volume augmentation and restoration of the face and structures like the aging nose. Injecting agarose gel is like to inject a liquid implant. Attention must be paid to the injection technique and the post injection treatment. Visible improvements are noted immediately.
Only mild bruising or hematoma are recorded as adverse events. The patients are highly pleased with the results and report that an excellent cosmetic result was obtained. The agarose gel was very well tolerated.
Agarose gel is at least equivalent to other dermal fillers for full-facial treatments and non-surgical rhinoplasty. The utilization of these fillers by trained professionals provides an effective and safe therapy for the management of the aging face.

Keywords

Agarose gel, dermal filler, full-facial, augmentation, restoration, aging face, wrinkles

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Introduction

In recent years there has been a growing interest in non-surgical procedures for facial rejuvenation. Hyaluronic acid (HA) and calciumhydroxyapatite (CHA) are currently the most widely used dermal filler for full facial treatments[1]. These provide a high level of comfort in the treatment (both for the practitioner and for the patient) and a long-lasting effect. In addition, these are safe substances with regard to their compatibility and local resistance[2,3,4].

In addition, the proven safety of Agarose gel has also been a factor in their increased use. Although only rarely complications are reported[5]. Agarose is in principle not a completely new material in medicine. It has been used in the dental field for more than a decade6. The substance class is a neutral polysaccharide, it is completely biocompatible and thus degradable[6].

The aim of this article is to show agarose gel as at least equivalent to those for full-facial treatment.

The following overview describes the possibilities of this treatment method.

General approach

Detailed knowledge of the facial anatomy with the knowledge of changes in the age are necessary to achieve balanced and natural results after the injection. It is also essential to be familiar with the character of the dermal filler to be used. Each face region has its own perfect dermal filler for its purpose. Complete biodegradability, local resistance and good tolerability as well as perfect biocompatibility are indispensable properties of a suitable dermal filler.

The results of the filler injection are extremely technically and material dependent. It is necessary to place a 3-dimensional lattice of injected material below the surface of the skin to add volume, alter surface area and thicken skin or subcutaneous tissue. The degree of correction and the result depends heavily on the injection technique used and the material used hence the required volume[7].

In the past, surgical techniques dominated the field of facial rejuvenation. However, the importance of a three-dimensional volume restoration using dermal fillers has become increasingly recognized in recent years and has increasingly gained precedence over a two-dimensional lift by the scalpel[8].

HA dermal fillers

Hyaluronic acid is very hydrophilic, therefore a change in the treated region after injection is expected. That makes the substance perfect for a more superficial correction. It also hydrates the skin, so that wrinkled skin is better glazed[9]. However, to correct for bone resorption at depth, a substance with less hydrophilic property is needed.

Anatomical changes of the face in old age

No part of the human organism reflects aging like the facial area. The face consists of skin, subcutaneous fat, muscle and bone structure. These individual components age independently, they have their own laws of aging.

In old age, not only changes in the surface of the skin are noted. Aging processes also occur in various deep structures of the human face especially in the area of the maxillary and mandibular; most notably fat loss and bone resorption. Striking is the sinking of soft tissue such as eyebrows and cheeks. Nasal manifestations of the nose result from degradation of the bony and cartilaginous framework. Therefore, the sinking of the tip of the nose and a shortening of the columella arise. Through this downward movement, the nose appears longer and larger. The nose is now larger and the nasolabial angle can be sharpened. In addition, the elderly patient usually has excessively inelastic skin, which makes an injection more difficult.

However, there are differences, especially depending on race, genetic factors and individual aspects (some earlier, later)[10].

Upper third of the face

The upper third of the face consists mainly of the forehead. Here, dominates the glabella and horizontal folds. These are usually dynamic wrinkles. Here, a treatment with botulinum toxin is recommended.

Middle face third

Therapeutically significant is the midface, especially with respect to the following changes e.g. slackening, sinking of the cheek fat, reduction of hypodermic fat, strengthening nasolabial folds, slackening of the lower eyelids with optical extension.

In addition, there is an aging of the nose (extension of the nose, rarification of the nasal skeleton, loss of hypodermic fat in the nasal area, broadening of the nose and convex nose bridge).

Overall, the midface in old age tends to change to hollow-cheeked, flat, empty, and narrow[10,11].

The aging nose (as part of the middle face)

The nose as the central area in the middle face of the human being is one of the first visible structures for the opposite and the mirror image. It is a complex, three-dimensional, trapezoidal organ protruding from the face. Due to its three-dimensionality, however, the nose causes many people an increased aesthetic distress[12].

While wrinkles are often only perceived as two-dimensional disturbing strokes, the cosmetic problems and desires of the patients with regard to the appearance of the nose are much more complex. Surgical rhinoplasty is therefore one of the most common aesthetic surgical procedures. As with all surgical interventions, there is a certain amount of rhinoplasty

risk of complications with corresponding convalescence time and downtime. In addition, the operation is associated with high costs. Increasingly, therefore, many patients develop the desire to avoid surgical intervention. Still, most have never heard of a nonsurgical nose job[13-15].

Lower third of the face

The lower third of the face extends from the subnasal area to the chin seat. Displacement of the cheek fat caudally. This also applies to the mimic muscles, the zygomatic muscle, major and minor, and the m. risorius. Bone atrophy of the maxilla in anterior-posterior direction and congenital low-grade retrognathia. Due to the sinking cheek fat, the impression of a deepened

nasolabial fold is intensified. By increasing the cheek fat above the nasolabial fold this impression is emphasized.

Agarose gel as dermal filler

The cutaneous and subcutaneous shrinkage of fat or bone resorption can be temporarily compensated by appropriate injections of collagen, autologous fat, hyaluronic acid or even agarose gel[6,16,17].

Agarose is in principle not a completely new material in medicine. It has been used in the dental field for more than ten years[6]. The substance class is a polysaccharide of D-galactose and 3,6-anhydro L-galactose, which are glycosidically linked. Thus it represents a main component of the agar[7]. 100% based on natural polysaccharides, it is completely biocompatible and thus degradable. Agarose gel is a sterile, biodegradable, viscoelastic, isotonic, transparent injectable gel implant[16,18].

Agarose is broken down in the human organism. For this purpose, agarose is first transported by the action of macrophages from the site of application and then degraded enzymatically by means of galactosidase. Agarose is metabolized in the pentose cycle at macrophage, platelet and endothelial reticulum levels[6,16].

Because of its biocompatibility, agarose is widely used in clinical trials. Therefore, the substrate is used in biocompatible tests, for example with regard to cytotoxicity, genotoxicity[19], mutagenesis[20], sensitivity[21], and subcutaneous implants[22].

In addition, the gel is used in biotechnology for three-dimensional tissue growth and as a controlled release substrate for pharmacological substances.

Application of agarose gel

For the preparation of the treatment a superficial anesthesia with a topical anesthetic is recommended. In some cases, a local anesthetic injection should also be considered. Treatment should be as painless as possible. In addition to topical anesthesia, the use of very thin cannulas also serves this purpose. It can also be mixed local anesthetic with the gel. Agarose itself is because of its isotonic properties, as mentioned above, an almost painless injectable. The injection should be done very slowly. Only when stretching out of the tissue does it burn. It is essential to have an extended massage of the injected area to disperse the imported substance with the surrounding tissue. Agarose gel transforms into a hydrocolloid after injection into the tissue. This creates a natural and harmonious look. According to the principle “What you see is what you get”, the result visible immediately after the injection is also the final result. An additional advantage is the use in patients who have demonstrated intolerances to hyaluronic acid or other ingredients in previous treatments.

Material and Methods

In our practical everyday life we inject a variety of facial areas. The agarose gel used in this study contained 2.5% agarose and 97.5% saline solution for nasolabial fold (*Figure. 1)* and 3,5% agarose and 96,5% saline solution for rhinoplasty and jaw angle (*Figure. 2 & 3*). Patients with acute or chronic skin pathologies or direct involvement in or around the area to be treated were excluded. Pregnancy, lactation and hyaluronic acid treatment less than 3 months earlier were also excluded criteria. After discussing patient in-depth information and written consent, discussing the risks and benefits of the procedure, the risks and benefits of alternatives, and answering all questions, the written consent form outlined possible complications such as bruising, swelling and hematoma or pain. To reduce bruising, patients were asked not to take salicylates in the last 2 weeks before treatment.

In total 27 patients were treated (14 non-surgical nose jobs, four augmentation of jaw angle and nine nasolabial folds). The patients were between 32 and 68 years old. All patients were female. Nobody had a treatment with permanent fillers before. 5 previously had an injection with hyaluronic acid in the area of the nasolabial fold.

For a better comfort, a superficial anesthetic cream was applied. The agarose was mixed with 0.1 mL of lidocaine 0.1% to be as painless as possible during the injection. For the injection of the nose and nasolabial fold 30 gauge needles should be used with a length of 13 mm, for the jaw angle 27 gauge needles. The esthetic evaluation was done after 14 days, and 1, 3 and 6 months after the injection. While a volume of 1.4 mL agarose gel 2.5% was sufficient for the nasolabial fold (*Figure. 1*), 2.8 mL were necessary for the jaw angle of agarose gel 3.5% (*Figure. 2*). However, for the rhinoplasty, only 0.3 mL of 3.5% agarose gel was sufficient (*Figure. 3*). Direct finger compression with cotton gauze and mild cooling were used to reduce bruising and swelling. Further, no special instructions were required and the patients immediately returned to work. The only adverse events described were hematoma, redness, bruising and swelling. All adverse events lasted for a maximum of 4 days.

Patients were asked to re-present 14 days and one month after injection for follow-up and possible reinjection to correct for asymmetry or lack of desired fullness. These repairs were usually made after 14 or 30 days, with 0.1 mL agarose in the area of the nose (by only three patients), 0.2-0.3 mL at the nasolabial folds (six patients), and a maximum of 0.4 mL at the jaw angle area (two patients). Such improvements were not necessary in these three patients (*see below in Figures 1-3*). Therefore, we asked for an additional follow-up after 3 and 6 months. All results remained after 6 months.

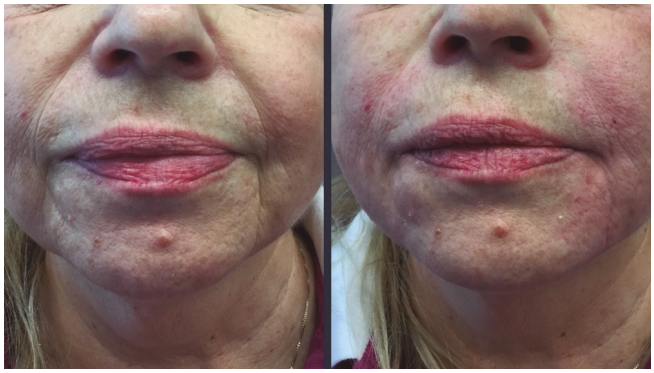

Figure 1 *- Left before Injection. Right immediately after injection with 1.4 ml agarose gel 2,5% nasolabial fold and marionette-fold.*

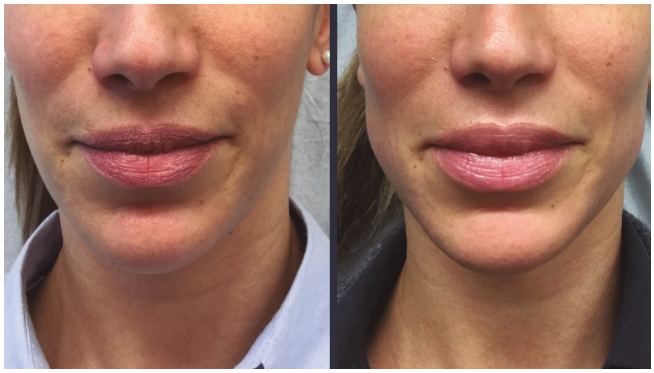

Figure 2 *- Left before Injection. Right after injection with 2.8 mL agarose gel 3,5% jaw angle.*

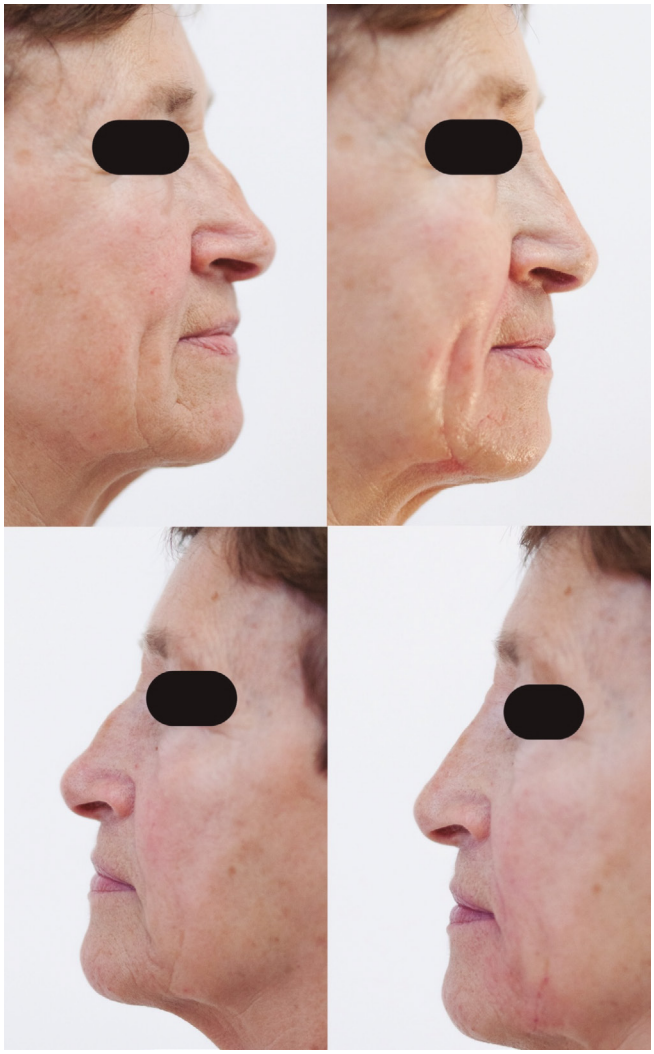

Figure 3 *- Left before Injection. Right immediately after injection with 0.3 mL agarose gel 3,5% non-surgical rhinoplasty.*

Conclusion

The agarose-based filler is a great new option for modeling and aesthetic correction in nonsurgical rhinoplasty and complete face treatment.
Especially for patients who want to avoid surgery. But even for the practitioner, it offers a low-complication possibility of a nose correction with relatively little effort compared to an operative procedure. So far we have had several very good substances (such as hyaluron and calcium hydroxyapatite) available. Now, with agarose gel, another substance enriches the dermal filler range with an interesting option. This popularity of a substance such as agarose will continue to increase in the future as the aging population seeks viable options to correct the signs of aging without surgery. The utilization of these fillers by trained professionals provides an effective and safe therapy for the management of the aging face.

Disclosure

The authors declare that they have no conflicts of interest and have not received any contributions for this publication.

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