ISSN 2449-8947 MicroMedicine *Research Article*

DOI: http://dx.doi.org/10.5281/zenodo.4272439

Superficial technique for tear trough filling with cohesive polydensified matrix hyaluronic acid

Marisa Gonzaga da Cunha[1], Ana Lúcia Gonzaga da Cunha[1], Meire Gonzaga[1], Fernando Luiz A. Fonseca[2, 3], Glaucia Luciano da Veiga[2]*, Carlos D' Apparecida Machado Filho[1]

[1] Dermatology Discipline, Faculdade de Medicina do ABC, Santo André, São Paulo, Brazil

[2] Clinical Analysis Department, Faculdade de Medicina do ABC, Santo André, São Paulo, Brazil

[3] Pharmaceutical Sciences Department, Universidade Federal de São Paulo, Diadema, São Paulo, Brazil

* Corresponding author: Phone: +5511 4993-5488; E-mail: grlveiga@gmail.com

Received: 17 July 2020; **Revised submission:** 18 September 2020; **Accepted:** 17 October 2020

http://www.journals.tmkarpinski.com/index.php/mmed

ABSTRACT: Introduction: Deep tear troughs create unaesthetic hollows that often worsen the color alteration and aspect of dark undereye circles, thus giving an aged and tired appearance to the eyes, even in younger individuals. The use of dermal fillers for the restoration of volume loss in the area, with a wide variety of products and techniques, has been the most suitable treatment. **Aim:** Description and evaluation of the superficial intradermal injection technique for tear trough filling using cohesive polydensified matrix hyaluronic acid. **Materials and Methods:** 120 patients from Faculdade de Medicina do ABC's Cosmetic Dermatology Sector and a private practice treated between the years 2011 and 2016. **Results:** All the patients rated the treatment result as good or very good. No important or long-lasting adverse effects were reported; the Tyndall effect was not observed either. **Conclusion:** The superficial technique is an easy and safe method to treat the tear trough deformity, with high rates of good aesthetic results.

Keywords: Cosmetic; Treatment; Hyaluronic acid; Intradermal injection; Hirmand's scale.

1. INTRODUCTION

The search for the prevention or correction of aging signs in the facial area has stimulated the development of new surgical techniques and minimally invasive non-surgical treatments [1, 2]. Special attention has been given to the periocular region, in which multifactorial alterations - skin texture, coloration and firmness, bone resorption and displacement of soft parts - result in the emergence of depigmentation, grooves and/or fat pads. According to individual clinical findings, just one therapeutic option may not be sufficient [1, 2].

One of the major complaints regarding the lower eyelid region is the tear trough deformity. It creates unaesthetic hollows that often worsen the color alteration and aspect of dark undereye circles, thus giving an aged and tired appearance to the eyes, even in younger individuals [3, 4]. It is the cutaneous groove that runs obliquely and inferolaterally, from the inner canthus of the eye to approximately the mid-pupillary line, and can continue laterally with the palpebromalar sulcus [3-5]. It can be the result of genetic and anatomical

variations present in young individuals, or the aging process of this region. One of the most important items in beauty of the infrapalpebral region lies is the soft transition between the preseptal and preorbital portions of the orbicular muscle of the eyes, continuing to the malar region without a distinct transition line [2].

The exact anatomical origin of the lacrimal trough is not well clarified, with several conflicting descriptions in the literature [4, 5]. According to several studies, some possible causes are hypothesized:
(1) the prominence of the orbital border resulting from the downward displacement of the malar fat pad,
(2) the fixation of the orbital septum at the level of the inferomedial portion of the arcus marginalis,
(3) the loss of fat in the tear duct or the postseptal fat pad herniation,
(4) the existence of a triangular gap bordered by the orbital portion of the orbicularis oculi, the levator labii superioris and the levator labii superioris alaeque nasi muscle, and
(5) the absence of fat tissue from the central and medial fat pads subjacent to the orbicularis oculi muscle in the area below the groove [2, 5, 6].

Through anatomic dissections, Haddock et al. reported that the tear trough correlates with the junction between the preseptal and orbital portions of the obicularis oculi muscle, with changes in skin texture and underlying fat. In the deep plane, the authors found a separation between the tear trough and the palpebromalar junction [4]. Wong, Hsieh and Mendelson identified a true osteocutaneous ligament, the tear trough ligament, which they defined as the main etiologic factor for the tear trough deformity. This ligament originates from the maxillary bone and it is located between the origins of the palpebral and orbital portions of the orbicularis oculi muscle, from where it firmly inserts itself into the skin region [3].

Surgical correction of the lacrimal trough deformity is considered as difficult [2]. The objective of the traditional blepharoplasty is the removal of tissues and fixation of the orbital septum. However, the most recent studies about facial aging have highlighted the correction of the local volume losses and not only the removal of tissues. That way, the idea of infraorbital groove filling for the restoration of the lost volume has emerged.

Therefore, procedures using fillers to restore the lost volume in the infraorbital region have been increasingly performed. The first works on the use of fillers in the nasojugal groove were reported by Michel Kane in 2003. Hyaluronic acid was more superficially applied, but the technique was prone to the Tyndall effect [6]. In 2004, Robert Alan Goldberg described the technique of hyaluronic acid filling below the orbicular muscle of the eyes using a 30G needle [7]. Today, a great number of application techniques with needles or cannulas are described, and the most frequent complications reported are the malar edema, the Tyndall effect and contour irregularities [2, 8, 9].

The aim of this study is to describe the safety and efficacy of the intradermal for the tear trough filling treatment with cohesive polydensified matrix hyaluronic acid (Belotero Soft® and Belotero Balance® - Merz Pharmaceuticals).

2. MATERIALS AND METHODS

This is a retrospective study of patients treated by the authors at private clinics and at the Cosmetic Dermatology Sector at FMABC between the years 2011 and 2016 and was approved by the Ethics and Research Committee of Faculdade de Medicina do ABC (nº 2.611.929). A total of 120 patients, aged between 18 and 50 years (mean age of 27.6 years), with classe I (50 patients) and classe II (70 patients) of lacrimal trough according to the Hirmand's scale [5], who had tear trough deformity without bulging orbital fat or excess of the lower eyelid skin, were treated (Table 1). Cohesive polydensified matrix hyaluronic acid

(Belotero Soft® and Belotero Balance®) was used, which is indicated to increase skin tissue volume with subepidermal injections.

The technique applied was the intradermal retroinjection, which allows the visualization of the material, with a 30G 1/2" (0.3 X 13mm) needle forming "sticks" in the groove line and subsequent molding of the injected material until the complete filling of the tear trough (Figure 1). The choice for the most suitable product depended on the groove classification: Belotero Soft® for class I and and Belotero Balance® for classes II. The product amount varied between 0.3 and 0,5 ml on each side, according to the depth and extension of the groove.

Table 1. Example of Hirmand's scale [5].

CLASS	CLINICAL DESCRIPTION
I	Patients have loss of volume, limited medially to the tear trough. These patients can also have mild flattening extending to the central cheek.
II	Patients exhibit loss of volume in the lateral orbital area in addition to the medial orbit, and they may have moderate deficiency of volume in the medial cheek and flattening of the central upper cheek.
III	Patients presente with a full depression circumferenctially along the orbital rim, medial to lateral

Note: Adapted by the authors.

Figure 1. Superficial injection of hyaluronic acid in the tear trough and posterior molding.

Cold compresses were applied before and after the procedure to prevent edema and formation of hematoma. Patients were photographed and analyzed under standardized conditions before, immediately and 30 days after the treatment.

3. RESULTS

The evaluation was performed with photographic comparison by the applicator physician and with questionnaires answered by the patients .The results presented herein were observed after a single application and were based on Hirmand's scale [5], having been considered as excellent by the patients and by the applicator physician when there was a total disappearance of the groove (54 patients); very good when the groove passed from class 2 to class 1 (54 patients); and good when the groove passed from class 2 to class 1, but maintaining the difference of color (12 patients) (Figures 2 to 7). There were no cases of absence of improvement or dissatisfaction by the patient or applicator physician.

Figure 2. Results after 30 days of the treatment: without improve (0%), good improve (12 patients - 10%), very improve (54 patients - 45%) and excellent improve (54 patients - 45%).

Figure 3. Before and right after the procedure with Belotero® Soft. Observe the discrete erythematous reaction.

Figure 4. Before and right after the procedure with Belotero® Soft. Observe the discrete erythematous reaction.

Figure 5. Before and 30 days after the procedure with Belotero® Soft.

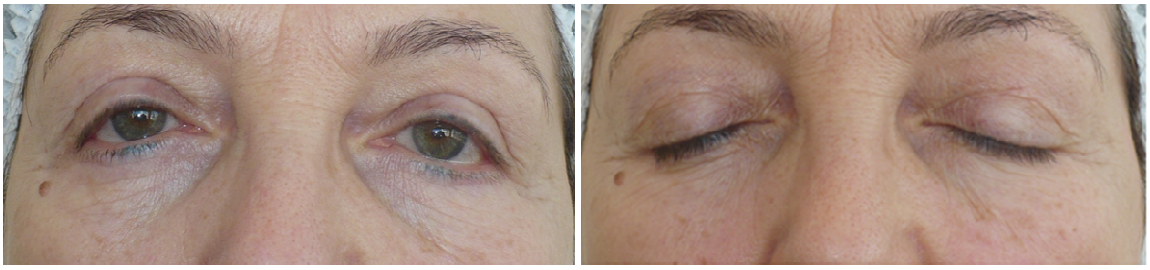

Figure 6. Before and 30 days after the procedure with Belotero® Balance.

Figure 7. A) Before treatment with Belotero Soft®. B) Immediate post first treatment. C) After 30 months of the treatment. D) Immediate post second treatment. Observe the residual effect 30 months after the first treatment.

Local edema is a frequent side effect right after the procedure; however, it disappears in a few hours, as well as the local erythema, which is more frequently observed in skin phototype I and II patients. Hematomas of short duration were also observed after the application, and they could be easily concealed with makeup.

4. DISCUSSION

The skin of the palpebral region is the thinnest on the human body (<1 mm), with the epidermis consisting of a very thin stratified epithelium (0.4 mm) and extremely thin dermis composed of loose

connective tissue and virtually absent in the pre-tarsal skin and eyelid medial and lateral ligaments, where it adheres to the fibrous underlying tissue. The tear trough deformity is the cutaneous groove that runs obliquely and inferolaterally, from the inner canthus of the eye to approximately the mid-pupillary line, and it can continue laterally with the palpebromalar sulcus or inferiorly with the malar sulcus [2-4].

There are many techniques for correction of the tear trough deformity described in the literature [7, 9-11]. Among the recommended dermal fillers for treatment reported in many studies, hyaluronic acid is highlighted due to its simplicity of application, low allergenic potential and more homogeneous texture. It provides better aesthetic results with theoretical lower risk of adverse effects [6]. Nevertheless, many complications have been described in the treatment of the periorbital region, especially permanent edema, which is most probably related to fibrosis or impaired lymphatic drainage whenever the procedure is performed below the orbicular muscle of the eye [10, 12].

Superficial intradermal injections of cohesive polydensified matrix hyaluronic acid, product with a great integration to dermal tissue and isoecogenicity, [13] indicated for more superficial applications promoting uniform volume increase at the site of application, make tear trough correction safer with lower risk of contour irregularities and color alterations. The formation of hematomas, which is prone to happen with any applied method, is a minor complication since the technique here described does not pose any risk of compression of any noble structure. The use of cold compresses on the area before and immediately after the application minimizes such occurrences. Moreover, with this technique there is no risk of arterial obstruction or migration of the product. The most frequent complication observed was overcorrection, which was minimized with the slow application of the material and the use of a lower-density filler, resulting in a better moldability.

The longer duration of effect observed in about 30% of the patients in the current study (40 weeks or more) (Figure 6) may be related to the hyaluronic acid replacement, which improves hydration in the skin with a resultant increase in its thickness as well as the enhancement of its turgor, elasticity and firmness, thus stimulating the production of new collagen [12, 14, 15].

It is important to point out that in cases of severe sagging skin or bulging fat pouches, the traditional blepharoplasty procedure is previously indicated for excess tissue removal and correction of the orbital septum. The use of a filler is then a complementary procedure indicated for the restoration of local volume loss.

5. CONCLUSION

The superficial technique for tear trough filling here described is safe and easily applied. Moreover, it poses low risk of complications and provides a high degree of satisfaction to patients. It is specially indicated for those with no skin sagging, or as a complementary treatment after a blepharoplasty procedure in patients with tear trough deformity and loose tissue.

Authors **Contributions**: MGC, ALGC, MG and CDMF: Conceptualization; Data curation; Formal analysis; Project administration; Supervision. GLV, FLAF: Investigation; Methodology; Resources; MGC, GLV and FLAF: Validation; Visualization; Roles/Writing - original draft; Writing - review & editing. All authors read and approved the final manuscript.

Conflict of Interest: The author declares no conflicts of interest.

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