

# Upper Eyelid Filling Approach [U.E.F.A.] Technique: State of the Art After 500 Consecutive Patients

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## Abstract

**Background** Lately, it has become evident that eye physical aging is mainly due to depletion of the upper eyelid fat causing laxity and wrinkles of the eyelid skin, and new therapeutic strategies aimed at solving the volume loss have appeared in the literature. The aim of this study is to provide a clear classification of upper eyelid aging after 500 consecutive cases and to present a standardization of the therapeutic approach to be adopted when using hyaluronic acid (HA) as fillers or a surgical approach.

**Methods** The upper eyelid aging process of a total of 500 patients was classified based on the measurement of the pre-tarsal skin show  $m$  and the pre-septal skin show  $N$ . A total of 382 patients were treated exclusively with HA injections in the upper eyelid, 45 patients both with blepharoplasty surgery and HA filling, whereas only 73 patients underwent blepharoplasty only.

**Results** Patient satisfaction and at least 1-year clinical follow-up were used to evaluate the results. Pre-treatment and post-treatment photographic assessment was considered as well. A total of 447 patients were women, whereas 53 were men. The correct ratio between  $m$  and  $N$  was restored in all cases.

**Conclusions** HA filling can be used as either the only volumization procedure or together with blepharoplasty to restore upper eyelid volume loss. The correct strategy has to be selected on the basis of a clear classification. The upper eyelid filling approach is a safe, manageable, lasting

and low-cost technique providing excellent results when the correct procedure is followed.

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**Keywords** Hyaluronic acid filler · Augmentation blepharoplasty · Upper eyelid · Filler oculoplastic surgery · Eyelid hollowing correction

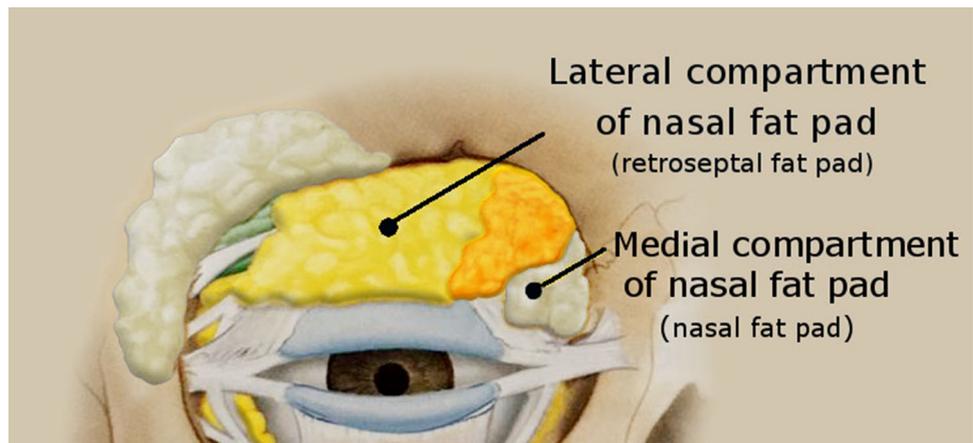
## Introduction

The eyes are often the first part of the face to reveal visible signs of aging, and the upper eyelid is the most important element for a youthful appearance as it determines the shape of the eye. The eyes are a unique part of the face as they age unavoidably, at variance with other areas such as the lips, the malar–zygomatic region, the lower eyelid and the jowls that may preserve a youthful appearance over time. Moreover, there are no aging prevention strategies that are effective for the upper eyelid. The eyelid skin is the thinnest skin on the body, and it undergoes stress due to the constant movement from blinking and to environmental stressors like the sun and wind. Nevertheless, eye physical aging is mainly due to depletion of the upper eyelid fat that causes laxity and wrinkles of the eyelid skin. In particular, depletion of the retroseptal fat pad (Fig. 1) is the main factor responsible for the eye aging process and thin eyelid skin follows this hollowing, forming wrinkles and skin folds. At variance with what was commonly believed in the past, upper eyelid aging is not an issue of excess skin but rather of fat loss. Recently, Korn et al. [1] have found that

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**Fig. 1** The lateral and medial nasal fat pad has a different appearance as they develop from different tissue layers. The medial nasal fat pad is white as it is intraconal, while the lateral fat pad is yellow and it is extraconal. The lateral compartments of the nasal fat pad are more prone to depletion as compared to the medial compartment due to the different nature of these adipose tissues



the nasal fat pad in the medial compartment expresses twice the number of adipose-derived stem cells (ASCs) as compared with that in the lateral compartment. Indeed, the lateral and medial nasal fat pad likely develops from different tissue layers [1]. The medial nasal fat pad is continuous with the intraconal fat, while the lateral fat pad has a more yellow appearance, it is extraconal, and it is presumed to be derived from mesoderm, as are the rest of the other yellow adipose tissues. This finding can be related to the different behavior of the lateral and medial compartments of the nasal fat pad as the former is more prone to depletion as compared to the latter.

In the past, standard periorbital rejuvenation procedures involved a surgical approach where part of the underlying muscle and fat were removed [2–6]. By removing skin excess around, a hollow eye is often created and this hollowing worsens over time. As our understanding of eyelid aging continued to evolve, a shift to maintain fullness in the upper eyelid versus hollowing out the eyes has occurred.

Since 2003, fat grafts were used to address periorbital aging and standard rejuvenation procedures were developed [7–17]. This technique has, however, some drawbacks as it is a surgical technique which can give rise to an incomplete or asymmetric result that cannot be easily corrected. Moreover, fat survival is variable, and it is not possible to exclude that infection may occur. Finally, visual loss and cerebrovascular accidents are reported to occur with this technique [18–20].

Since 2009, hyaluronic acid (HA) fillers were used to treat the upper eyelid region for rejuvenation [21–23]. Recently, a standard procedure aimed at reducing upper eyelid volume loss with cross-linked HA fillers has appeared in the literature, and a classification of upper eyelid volume deficiency considering measurement of the pre-tarsal skin has been provided [23]. Use of upper eyelid fillers has been shown to allow satisfactory correction of progressive eyelid hollowing and eyelid aging also for

post-blepharoplasty volume loss. No relevant drawbacks have been shown to occur if the technique is correctly carried out [23]. Serious complications such as arterial or venous occlusions are very rare, and vascular compromise tends to be more commonly reported in the glabellar area, probably due to the lack of good collateral circulation. Vision-threatening complications from embolization of filler material to the central retinal artery have been reported, but they are extremely rare [24–30].

In this article, we show the state of the art of the HA filling approach after 500 consecutive patients in the upper eyelid rejuvenation. A standardization of both the preoperative conditions and the desirable goals is presented, together with a thorough description of the technique.

## Methods

### Classification of the upper eyelid aging

The eye aging process is mainly due to a volume loss in the retroseptal plane where the lateral compartment of nasal fat pad is located. In a young eye, the pre-tarsal skin show is about half of the orbital portion of lid. A variation of this ratio takes place with the aging process, and eventually, an inversion of this proportion may occur. To choose the correct strategy to be used, it is very important to have a clear classification of the upper eyelid volume deficiency.

In a previous work, a classification based on the measurement of the pre-tarsal skin show was presented [23]. Here, a more accurate classification is made based on the experience gained after 500 consecutive upper eyelid augmentation treatments using HA filler sometimes together with a surgical approach. An ideal upper eyelid shape implies an even pre-tarsal skin show  $m$ , with  $2 \text{ mm} < m < 7 \text{ mm}$ , that is half of the orbital portion of lid  $N$  (pre-septal skin) (Fig. 2a). Note that both  $m$  and  $N$  are defined considering the medium pupillary line (white lines in

**Fig. 2** Definition of the pre-septal skin show  $N$  and pre-tarsal skin show  $m$

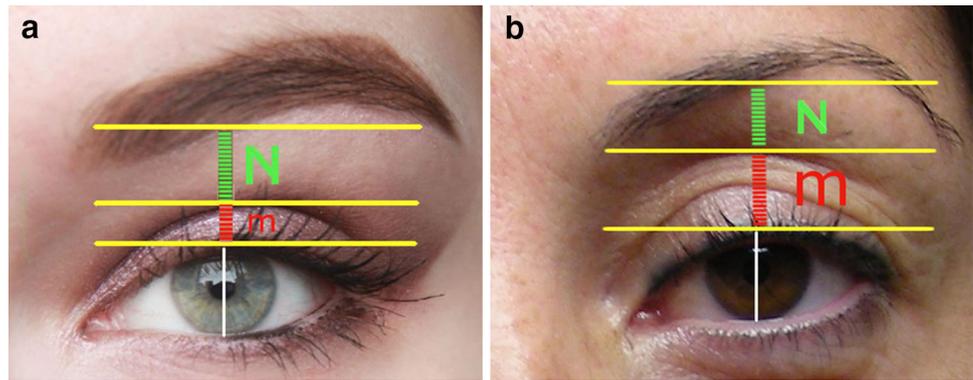
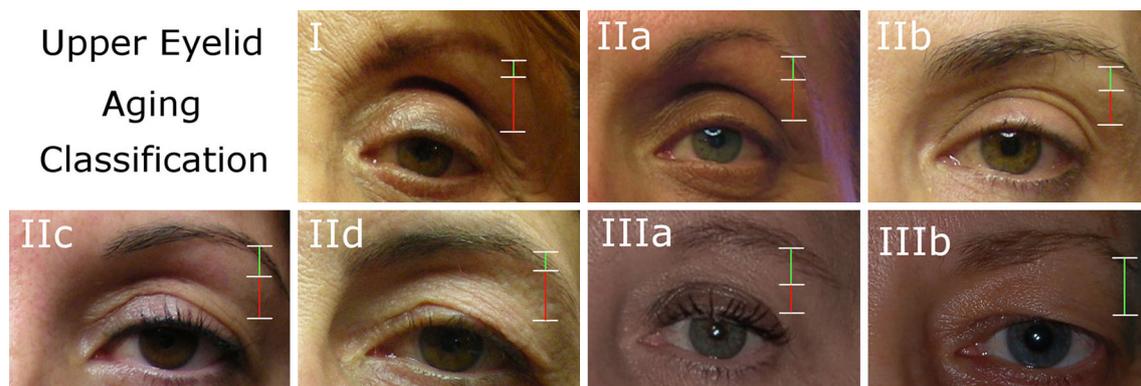


Fig. 2). Due to the aging process,  $m$  becomes progressively wider than  $N$  giving rise either to a hollow or a sunken eye, that is the opposite of a youthful eye (Fig. 2b). Any rejuvenation treatment should aim at restoring the correct ratio between  $m$  and  $N$  (with  $m/N = 1/2$ ) with an optimal  $m$  value of 3–4 mm.

In this study, classification of the upper eyelid aging has been made considering three different groups. Group I is a congenital condition that gives rise to a sunken eye. In this case,  $N$  is very short and  $m$  is always wider than  $N$ . The main feature that characterizes a sunken eye is the presence of a clear separation between the pre-tarsal skin and the orbital portion of lid that originates from low quantity of pre-aponeurotic fat pad that undergoes a progressive depletion associated with thinning of the bone (Fig. 3I). Group II contains hollow eyes, and it comprises the following typologies: (IIa) hollow eye with no skin fold; (IIb) hollow eye with moderate skin fold; (IIc) hollow eye with severe skin fold; (IId) hollow eye with dermatochalasis. In all of these cases,  $m \geq N$  (Fig. 3IIa–d). It is important to outline that Group I and Group IIa are similar, but in the

former case, there is a congenital condition that worsens over time, while in the latter, there is a hollowing of a previously good-looking eye and the separation between the pre-tarsal skin exposition and the orbital portion of lid is absent. Group III comprises the so-called full eye. Two different cases can be found: full eye with moderate skin fold (IIIa) and full eye with dermatochalasis (IIIb) (Fig. 3IIIa,b). For Group IIIa, the ratio between  $m$  and  $N$  is correct but the volume of the orbital portion of lid is not sufficient. In the case of Group IIIb, the volume of the pre-septal skin is correct but the evident dermatochalasis makes  $m < 1$  mm.

HA filling is used for Group I, IIa, IIb, IIc, IIIa as in all of these cases the skin excess either is absent or is due to a volume loss and after recovery of the proper upper eyelid volume with the filler the skin excess is solved. Groups IIb and IIIb have to be treated with blepharoplasty surgery, and only for Group IIb, the surgical treatment has to be followed by HA filling at least 2 months after the blepharoplasty. During the surgical treatment, the skin resection is sometimes associated with resection of the medial nasal fat



**Fig. 3** Classification of upper eyelid aging considering measurements of both the pre-tarsal skin show  $m$  and the pre-septal skin show  $N$ , together with volume deficiency, the presence of eye folds and dermatochalasis. Group I refers to sunken eyes with  $m > 8$ ,  $2 < N < 4$  and  $3/1 < m/N < 6/1$ . Group II includes hollow eyes with  $m > 8$ ,  $4 < N < 6$  and  $m/N = 2/1$ , and it comprises the following

typologies: **IIa** hollow eye with no skin fold; **IIb** hollow eye with moderate skin fold; **IIc** hollow eye with severe skin fold; **IId** hollow eye with dermatochalasis. Group III comprises the so-called full eye. Two different cases can be found: **IIIa** full eye with moderate skin fold with  $3 < m < 7$ ,  $7 < N < 15$  and  $m/N = 1/2$ ; **IIIb** full eye with dermatochalasis with  $m < 1$ ,  $N > 9$  and  $9/1 < m/N < 18/1$

pad and minimal resection of the third lateral of the orbicularis oculi muscle. In the case of Group IId, the nasal fat pad that has been resected from the medial compartment is grafted in the central region of the upper eyelid in the pre-septal (retromuscular) position where hollowing is more evident. In our experience, the retroseptal fat pad is never removed or reduced. It is important to outline that this classification only applies to Caucasian people while different parameters have to be accounted for in other ethnic groups.

Five hundred consecutive patients were enrolled in this study, and this allowed us to improve both the classification of upper eyelid aging and the standardization of the upper eyelid filling approach [U.E.F.A.] technique. Group I includes 100 patients, 81 of which were women and the mean age was 45 years (in the range 29–72) whereas 19 were men with a mean age of 52 (in the range 43–70). Group II includes 291 patients belonging to the four categories described above (IIa, IIb, IIc and IId). All 246 patients in Groups IIa–IIc were women with a mean age of 48 (in the range 35–55), whereas Group IId was formed by 39 women (mean age 44, in the range 39–52) and 6 men (mean age 60, in the range 52–63). Group IIIa consists of 36 patients, all women with an average age of 44 years (in the range 35–53). Group IIIb is formed by 73 patients, 45 of which were women (mean age 51, in the range 40–64) and 28 men (mean age 58, in the range 52–64). Exclusion criteria were recent treatment (1 month before) of the periorbital region with fillers, biorevitalization, chemical denervation, suture threads, autoimmune diseases in an active phase, recent trauma or active infections close to the injection area, T.A.O. (oral anticoagulant therapy), N.A.O. (new anticoagulant oral therapy) and A.S.A. (acetyl salicylic acid) use with therapeutic dosage. Temporary exclusion criteria were A.S.A. use with preventive dosage.

Outcome measures and data collection were clinical control, pre- and post-treatment photographic assessment evaluated by measuring the  $m/N$  ratio and patient satisfaction.

### U.E.F.A. Technique

The procedure starts with local infiltration of mepivacaine 2% and adrenalin 1:100,000 beneath the eyebrow tail in the pre-periosteal plane with 0.1 cc of anesthetic. It is important to wait for 15 min to obtain a proper vasoconstriction. For safety reasons, it is mandatory to inject the HA filler using either a 25 G/50 mm or a 27 G/37–40 mm microcannula. To insert the microcannula, a needle puncture is created using a larger gauge needle as compared with the microcannula. When using the needle to create the insertion hole, the microcannula has difficulties in entering the muscle tissue and the fascia beneath the skin. Alternatively,

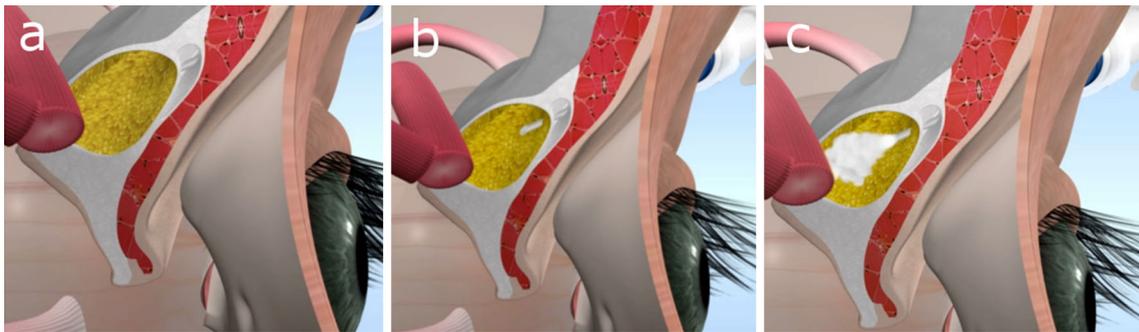
a special device called “easy-guide” can be employed for this maneuver. This is a pilot half needle with a groove that safely and easily enters both the muscle tissue and the fascia so that the correct plane (ROOF, retroorbicularis oculi fat) can be reached also by the microcannula that can be inserted keeping initially the guide in place and removing it when the microcannula is in the ROOF plane. The microcannula is medially advanced in the suborbicularis plane, and passing through the septum (Fig. 4a), it reaches the retroseptal plane where the lateral compartment of the nasal fat pad is located (Fig. 4b). To make sure to be in the right plane, first one has to reach the ROOF, then the microcannula is medially advanced and the orbicularis retaining ligament (ORL) is reached, and when it is overcome, one often feels a clicking in the hand. The septum is behind the ORL and the retroseptal area is located behind the septum itself. The fusion line between the ORL and orbital septum in the superior orbit is indistinguishable. Note that if you are in the right plane, the tip of the microcannula can be seen only if you tilt it because it is in a deep plane. The HA gel with HICE technology with  $\tan \delta$  about 0.28 is then inserted (Fig. 4c), and the microcannula is withdrawn carrying out bolus injections starting from the lateral head of the eyebrow. This region is a critical area where depletion is first observed, it always needs more filling, and its location can be easily seen from Fig. 5. It is important to avoid overcorrection treatments because the filler itself will give rise to a natural remodeling with long-lasting results. In our experience, we usually used a total of 0.7/0.8 cc for both sides and never injected more than 0.5 cc of filler on one side.

A standardization of the U.E.F.A. technique has been achieved based on the classification described above. In particular, the quantity of HA filler that has to be used depends on each group and a quantitative estimate is provided in Table 1 for each group.

The first check is scheduled at 3–4 weeks post-filling, and additional treatments should be avoided. In the case of sunken eye (Group I) after 2 or 3 months, additional injections may be necessary. In our experience, only 10% of patients needed correction that was carried out with a small amount of filler (0.05–0.1 cc). This treatment usually lasts more than 1 year, and the results appear stable.

### Results

Of the 500 patients in our study that underwent upper eyelid rejuvenation treatment, 421 had at least 12 months of follow-up data available. To gain a good result, there are three main conditions that have to be fulfilled:  $m < N$  with an optimal  $m/N$  ratio of 1/2; the volume of the pre-septal area has to be restored, and the pre-tarsal skin has to have a



**Fig. 4** The microcannula is laterally advanced in the suborbicularis plane, and passing through the septum, it reaches the retroseptal plane where the lateral compartment of nasal fat pad is located. The HA gel

is then inserted, and the microcannula is withdrawn carrying out bolus injections starting from the lateral head of the eyebrow



**Fig. 5** The correct plane where HA filler has to be injected is evident from open surgery

regular exposition with  $m$  in the range 2–7 mm (3–4 mm is the optimal value). We collected the results by measuring the  $m$  and  $N$  values for each eye of the patients pre- and post-treatment for a total of 998 values as in two cases from Group IIb and Group IIIa only one eye needed to be

treated. Asymmetry is often present in the preoperative conditions, and it is characterized by a difference in the  $m$  or  $N$  values greater than 1 mm between the two eyes. More than 70% of patients belonging to Group IIb, IIc and IId presented asymmetry, Group I has a very low percentage of asymmetric eyes (less than 5%), whereas in the other groups, asymmetry was observed in about 20% of the cases. Twenty-two patients of Group I (4.4% of the totality of patients enrolled in this study) had sunken eye as the result of a previous surgical treatment with resection of both the skin and the lateral nasal fat pad that had to be restored. Sixteen patients belonging to Group IIb (3.2% of the totality of patients enrolled in this study) had previous treatments with piezoelectric devices. The outcomes of our study on 500 consecutive patients are summarized in Table 1, where the pre- and post-treatment data ( $m$ ,  $N$  and  $m/N$  ratio) are listed.

Figure 6 shows results for a 43-year-old man with sunken eye with no skin excess and a slight asymmetry (Group I). He remained very pleased by the results at

**Table 1** Patient distribution,  $m$ ,  $N$  and  $m/N$  ratio before (initial) and after (final) treatment and HA filler quantity injected for each eye

	Number of patients	Initial $m$ (cc)	Initial $N$ (cc)	Initial $m/N$ (cc)	HA quantity (cc)	Final $m$ (cc)	Final $N$ (cc)	Final $m/N$ (cc)
Group I	100	8–15	2–4	3/1–6/1	0.4–0.5	5–7	7–15	1/2
Group IIa	73	8–12	4–6	2/1	0.1–0.3	4–6	8–14	1/2
Group IIb <sup>a</sup>	64	8–12	4–6	2/1	0.2–0.4	3–5	8–12	1/2
Group IIc <sup>b</sup>	109	8–12	4–6	2/1	0.3–0.4	2–4	7–14	1/2
Group IId <sup>c</sup>	45	8–12	4–6	2/1	0.1–0.3	2–5	8–14	1/2
Group IIIa <sup>d</sup>	36	3–7	7–15	1/2	0.1–0.2	3–7	7–15	1/2
Group IIIb <sup>e</sup>	73	0–1	9–18	9/1–18/1	–	2–4	7–12	1/2

<sup>a</sup>With moderate skin folds

<sup>b</sup>With severe skin folds

<sup>c</sup>With dermatochalasis

<sup>d</sup>The proportion is already correct, but we reach a better eyelid volume

<sup>e</sup>No HA filler is used

12-month follow-up as a youthful appearance has been achieved and the small asymmetry has been corrected.

Figure 7 demonstrates results for a 37-year-old woman with hollow eyes and no skin excess (Group IIa). The hollowing in the intermediate compartment makes the eyes look older, and injection of 0.25 cc of HA in each eye definitely improved the eye appearance.

Figure 8 shows results for a 49-year-old woman with hollow eyes and moderate skin fold (Group IIb). The patient presented asymmetric eyes with an irregular exposition of the pre-tarsal skin. Fullness in the upper eyelid has been recreated, the skin folds have been eliminated, and the asymmetry has been solved. The patient was very pleased with the result.

Figure 9 shows a 58-year-old woman with hollow eyes, severe skin folds (Group IIc) and asymmetry between the left and right eye. The skin excess has been corrected, and a good final result has been achieved.

Figure 10 demonstrates results for a 50-year-old woman with dermatochalasis and strong asymmetry of the upper eyelids (Group IIId). Blepharoplasty surgery was carried out followed by HA filler injections 3 months postoperatively. After surgery (Fig. 10b), the dermatochalasis was solved but asymmetric hollow eyes were still present despite that the resected medial fat pad was grafted in the pre-septal plane of the central eyelid region. Injection of 0.3 cc of HA filler in both eyes gave a very nice result, and the patient was very pleased with the results at 2-month follow-up



**Fig. 6** This 43-year-old man with sunken eyes with no skin excess and slight asymmetry (Group I) underwent upper eyelid filling with HA gel to improve the look. Before treatment,  $m$  was  $> 10$  mm and  $N < 2$  mm. **a** Preoperative, **b** immediately after filling with 0.5 cc for each eye (the microcannula insertion points are evident) **c** 2-month postoperative:  $m$  is 5 mm for both upper eyelids, and the sunken eye has been corrected with  $m/N = 1/2$ . The asymmetry is solved



**Fig. 7** This 37-year-old woman with hollow eye with no skin fold and good symmetry (Group IIa) underwent upper eyelid filling with HA to improve the look. Before treatment,  $m$  was  $> 10$  mm and  $N = 5$  mm. The pre-tarsal skin has an irregular exposition (medially wider than laterally). **a** Preoperative, **b** 2-month postoperative after injecting 0.25 cc of HA in both upper eyelids:  $m$  is 5 mm for both eyes, and the hollow eyes have been corrected gaining a pre-tarsal skin regular exposition with  $m/N = 1/2$



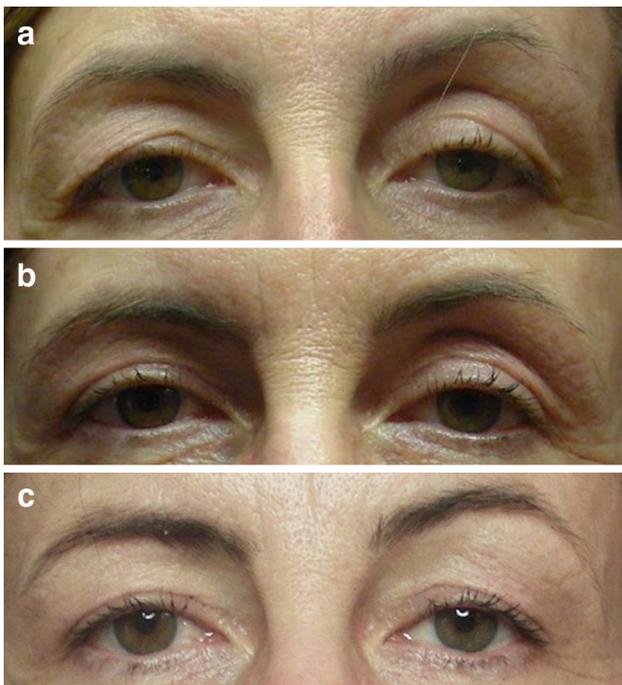
**Fig. 8** This 49-year-old woman showing hollowing with moderate skin fold (Group IIb) underwent upper eyelid filling with HA filler to improve asymmetry of the eyes and appearance. An irregular exposition of the pre-tarsal skin (medially wider than laterally) is evident. Before treatment,  $m$  was 9 mm for the right eye and 6 mm for the left eye. **a** Preoperative, **b** 9-month postoperative after injecting 0.25 cc and 0.30 cc of HA in the left and right upper eyelid, respectively:  $m$  is 2 mm for both upper eyelids after treatment with  $m/N = 1/2$ , and the asymmetry has been corrected

(Fig. 10c) even if asymmetry between the two eyes is still present due to a different height and shape of the eyebrows.

Figure 11 shows the results for a 41-year-old woman with full eye with moderate skin folds (Group IIIa). In this case, the ratio between  $m$  and  $N$  is correct and the pre-tarsal skin had a regular exposition before treatment. Injection of 0.15 cc of HA in each eye improved the fullness of the upper eyelid.



**Fig. 9** This 58-year-old woman with hollow eye and severe skin folds (Group IIc) presents an irregular exposition of the pre-tarsal skin (medially wider than laterally) and pseudoptosis. Before treatment,  $m$  was 8 mm for both eyes. **a** Preoperative, **b** 9-month post-treatment after injecting 0.4 cc of HA into both eyelids:  $m$  is 4 mm for both upper eyelids after treatment, and the asymmetry has been corrected with  $m/N = 1/2$



**Fig. 10** This 50-year-old woman shows dermatochalasis with asymmetry and upper eyelid hollowing without pre-tarsal skin show (Group IIId). Before treatment,  $m$  was 0 mm for both upper eyelids. **a** Preoperative, **b** 2-month after blepharoplasty with both skin resection (lateral and middle for the right eye while only lateral for the left eye) and minimal muscle resection (lateral only) a more constant pre-tarsal skin show has been obtained but a hollow eye with major skin fold is still present. **c** Two months after 0.3 cc of HA filler was injected into both eyelids: fullness in the upper eyelid has been recreated with  $m/N = 1/2$

Figure 12a shows a 56-year-old man with evident dermatochalasis in the central and lateral region of the upper eyelid with no volume depletion (Group IIIb).



**Fig. 11** This 41-year-old woman with full eye with moderate skin fold (Group IIIa) with a regular exposition of the pre-tarsal skin. Before treatment, the  $m/N$  ratio was correct and there was only a volume loss. **a** Preoperative, **b** 12 months post-treatment after 0.15 cc of HA was injected into both upper eyelids: skin folds are no more present

Blepharoplasty with lateral and middle skin resection and minimal muscle resection in the lateral region was carried out (Fig. 12b). No filling with HA was necessary. The patient was very pleased with the natural result at the 12-month follow-up.

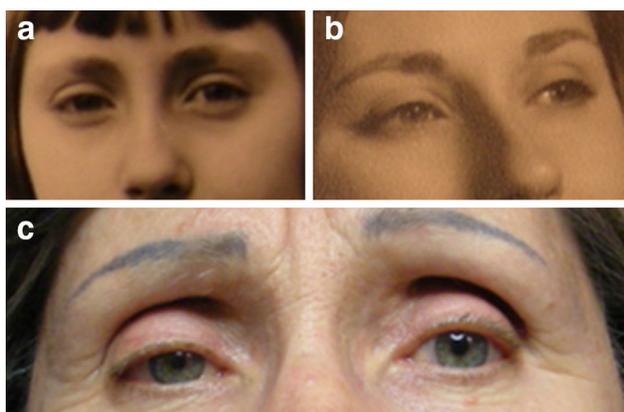
## Discussion

In the last few years, our understanding of eyelid aging witnessed an evolution and it is nowadays clear that the aging process is associated with a volume loss rather than to the formation of skin excess. For this reason, volume restoration either with fat grafts [7, 9, 13–17, 31–33] or with HA filling procedures [21–23] has been recently used to create a more youthful eye appearance. The eyelid volume loss can be a congenital condition that gives rise to a sunken eye or it can be due to the aging process that produces hollow eyes with the presence of skin folds of different relevance that can evolve into dermatochalasis. Only few studies have previously attempted to classify the sunken eyes considering the depth of depression and skin redundancy [14, 22, 31, 32]. However, these classification criteria seem heterogeneous and lack a numerical evaluation that can allow clear application to the wide spectrum of possible clinical cases.



**Fig. 12** This 56-year-old man presents dermatochalasis evident in the central and lateral part of upper eyelids with a proper volume (Group IIIb). Before treatment,  $m$  was  $< 0$  for both upper eyelids. **a** Preoperative, **b** 3 months after blepharoplasty with skin resection (lateral and middle) and minimal muscle resection (lateral only): a constant pre-tarsal skin show has been obtained with  $m = 3$  mm for both eyelids. No filling with HA was necessary

Sunken eyes can be observed already in young people, and this condition unavoidably worsens over time. Figure 13 shows the evolution of a patient with sunken eyes over time. Figure 13c shows a 71-year-old woman with sunken eyes where fat pad depletion is very evident in all the upper eyelid. The fat pad is only present in the medial compartment that is less prone to undergo a hollow process, and it might become hypertrophic as it has been



**Fig. 13** The same patient is shown at the age of 10 (**a**), 20 (**b**) and 71 (**c**) years. The evolution of a sunken eye (Group I) is exemplified: the pre-tarsal skin exposition increases with an inversion of the ratio between  $m$  and  $N$ . The aging process finally gives rise to a skeletal appearance of the upper eyelid. This condition cannot be fully recovered if the HA filling is performed too late

recently shown [1]. Figure 13a and b shows the same patient at the age of 10 and 20 years. It can be noted that the presence of a dark line between the pre-tarsal and pre-septal skin is a clear indication that the upper eyelid will evolve giving rise to a sunken eye. The condition at 20 years of age (Fig. 13b) further clarifies the evolution of a sunken eye as the pre-tarsal skin exposition did uniformly increase with an inversion of the ratio between  $m$  and  $N$ . The aging process finally gives rise to a skeletal appearance of the upper eyelid (Fig. 13c). This condition cannot be fully recovered if the HA filling is performed too late.

Figure 14 shows a 70-year-old man with sunken eyes with no skin excess that underwent upper eyelid filling with HA. Even if a clear improvement of the eye appearance has been obtained, the separation between the pre-tarsal skin and the orbital portion of the lid is still present while the orbital ROOF has been lowered. Conversely, when the same procedure is carried out on a young patient, a very good result with proper restoration of the upper eyelid volume is obtained (Fig. 6c).

According to our experience in most cases, the upper eyelid aging process can be solved with HA filling, the need of a surgical treatment is very limited, and it has to be carried out only when dermatochalasis is present. In our new classification, only patients belonging to Group II and Group IIIb are candidates for blepharoplasty but a different approach as compared to the old standards is beneficial. To avoid deformities in the region where eyelid hollowing starts, the skin resection has to be performed only where the skin excess is evident aiming at obtaining an even exposition of the pre-tarsal skin (Fig. 15). Moreover, the fat pad has to be treated in a different way



**Fig. 14** This 70-year-old man with sunken eyes with no skin excess (Group I) underwent upper eyelid filling with HA filler. Before treatment,  $m$  was 11 and 12 mm for the right and left upper eyelid, respectively, with pseudoptosis. **a** Preoperative, **b** 9 months postoperative after 0.5 cc of HA was injected in both upper eyelids: even if the sunken eye is not completely solved, a much better appearance of the look has been obtained



**Fig. 15** This 56-year-old man presents dermatochalasis more evident in the lateral part of upper eyelid with proper volume (Group IIIb). Before treatment,  $m$  was  $< 0$  mm for both upper eyelids laterally, while centrally and medially  $m$  was 3 mm. **a** Preoperative, **b** 4 months after blepharoplasty: skin resection was carried out only laterally starting from the green point with minimal muscle resection (laterally only). A constant pre-tarsal skin show has been obtained with  $m = 3$  mm for both eyelids. No filling with HA was necessary

depending on its location. In particular, most of the time the medial nasal fat pad is resected and it is grafted in patients belonging to Group IId. We prefer to resect and graft it in the central region of the upper eyelid instead of carrying out a dislocation with tubulization to avoid volume excess in the medial compartment. The transitional fat pad is dislocated in the central region of the upper eyelid, and it is partially resected if it exceeds the needed quantity. Conversely, the retroseptal fat pad is never resected, and we usually avoid opening the septum. We prefer to inject HA filler after surgery only when a stable result has been obtained, and for this reason, we treat the patient at least 2 months after blepharoplasty. Upper eyelid filling with HA can be used also to improve post-blepharoplasty volume loss and asymmetric eyes in young people [12, 21, 22].

The U.E.F.A. technique is fast, versatile, effective, relatively easy to perform and low cost. As such, it is a valid alternative to fat transplantation that is an invasive procedure associated with long downtime, and hence poor patient acceptance.

Based on our long experience, the longevity of HA filling is quite remarkable as compared to other facial regions. The longest follow-up period has been 4 years, with the patient still maintaining the initial volume.

Only two complications occurred in our experience (0.4%), and in both cases, a concomitant treatment in the periorbital region was carried out. In the former case, a volumization of the temporal region with HA filler was performed 1 h after the upper eyelid treatment and a bilateral edema appeared 24 h after HA injection. In the latter case, a unilateral complication occurred after HA

filling that was carried out 2 h after lifting of the eyebrow with suture threads. Minimal edema and blurry vision appeared 9 days after treatment. An ocular CT scan was carried out, and no displacement of the HA filler was detected. Both cases were resolved 72 h after occurrence by cortisone therapy with deflazacort. No severe complications such as vascular obstruction, infections, tissue necrosis or hematoma were observed in our experience. However, visual impairment due to embolism is a specific concern in periocular filler treatment [20], and specific care has to be taken during HA injection. A topographic study has revealed that the vascular arcade that can be the main responsible for visual loss is mainly located in the superficial subcutaneous layer [34]. Therefore, slow injections in the deep pre-periosteal retroseptal plane have to be performed, and the use of a microcannula no thinner than 27 G is mandatory to reduce the risk of severe complications.

## Conclusions

In this study, we have provided a new classification of upper eyelid volume deficiency considering measurements of both the pre-tarsal skin show  $m$  and pre-septal skin  $N$  together with an evaluation of skin folds and dermatochalasis. This classification allowed us to provide a standardization (U.E.F.A. technique) of the approach that has to be followed for upper eyelid rejuvenation based on the preoperative conditions. After performing upper eyelid rejuvenation in 500 consecutive patients, a standardization of both the preoperative conditions and the desirable goals has been conceived and a thorough description of the technique that has to be used is provided. The author believes that the U.E.F.A. technique could become the method of choice for upper eyelid rejuvenation.

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## Compliance with Ethical Standards

**Conflict of interest** The author declared no potential conflicts of interest with respect to the research, authorship and publication of this article.

**Ethical Approval** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

**Informed Consent** All patients enrolled in the study provide informed consents.

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