

Case Study

**PEGylated hyaluronic acid as tissue expander on a surgical compromised nose.
A case study.**

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Our nose is a very important and sometimes an essential element of facial beauty. The nose, located in the centre of the face, should be in harmony with the other features of the face. Rhinoplasty is one of the most frequently performed aesthetic operations today. Below, we present the case of a 29-year-old patient with a complication after surgical rhinoplasty. The patient underwent surgical rhinoplasty twice - the first time (2011) with terrible results and the second time (2017) only with gentle improvements.

Twelve years after the first surgery, the patient was still looking for a way to improve the outcome of her nose; we proposed the treatment plan with the use of novel PEG-cross-linked hyaluronic acid to improve the appearance of the nose area, with significant visual effect and no side effects.

INTRODUCTION

The nose is a very important and maybe sometimes a key element of facial beauty. The nose, located in the centre of the face, should be in harmony with the other features of the face. A nose that is somehow incompatible with other facial features can negatively affect the overall aesthetics of the face. Over recent years, rhinoplasty has gained increasing popularity (1); rhinoplasty is a popular surgery performed by facial plastic surgeons with both functional and aesthetic indications. However, rhinoplasty is considered one of the most challenging procedures nowadays (2). Although many complications of rhinoplasty are preventable with good surgical planning and technique, the competent surgeon must be prepared to deal with the range of complications that can result from this complex procedure (3). The complexity lies in the ability to have a consistent and predictable aesthetic result. The unpredictability is mainly attributable to the interplay between manipulated internal structures and wound healing dynamics (4); this can lead to the existence of many sutures, grafts, and alloplastic materials. Granulation tissues can fill dead spaces. Scar and fibrosis can hide or exaggerate existing grafts (5). As a result, a growing demand for secondary correction has also emerged. Revision rhinoplasty is more complex than primary cases and often requires extra nasal grafting material and sometimes flaps and tissue expanders (1, 6, 7). Among others, this issue has led to an increase in the popularity of rhinoplasty using fillers. A filler is any material that can augment volume when injected into the body and is usually an injectable material (8). However, this study will present the first case reported in the literature of using hyaluronic acid as a tissue expander.

CASE REPORT

We present the case of a healthy 29-year-old woman with no medical conditions presented to the author's private practice, looking for any improvement she could aspire to her nose. The patient underwent surgical rhinoplasty twice - the first time (2011) with terrible results and the second time (2017) only with gentle improvements. Upon examination, she had the architecture of the nose destroyed, asymmetry of the nostrils, drooping of the nasal tip, depression and no support of the nasal crus, areas of skin firmly attached to the cartilage layer below, and fibrosis due to the last two problems. Some areas around the nasal tip were very ischemic, and worst on the left side of the nose tip that, because of the significant loss of support, is a depression hole-like shape (Fig. 1, 2). An uneven curve dorsal aesthetic line on the frontal profile is highly recognisable (Fig. 3).



Fig. 1, 2. *Condition before treatment: the architecture of the nose was destroyed, drooping of the nasal tip, depression and no support of the nasal crus, areas of skin firmly attached to the cartilage layer below, and fibrosis.*

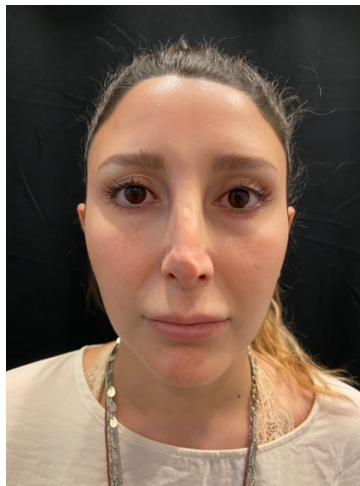


Fig. 3. *Frontal profile with visible uneven curve of nasal dorsal line and overlap of the right nasal cartilage to the left.*

Twelve years after the first surgery, the patient was still looking for a way to improve her nose's visual and functional outcome. She was rejected several times by plastic surgeons, maxillofacial surgeons and oral surgeons, mainly because of the lack of skin available to perform another surgery, so she came to our Clinic. However, the problem presented by the patient was very complex and challenging to deal with; the correction procedures of a previously operated nose with hyaluronic acid injectables are much more dangerous than injecting a "normal" one.

Our idea for the treatment plan came from the problem itself, "the lack of skin to perform surgery". We chose hyaluronic acid filler to expand the skin and detach it from the cartilage tissue below.

The treatment plan consisted of one session per month, 3 months in a row, 2 month break, 3 months of treatment, 2 month break, and then a control/follow-up visit.

The treatment was based on using hyaluronic acid dermal filler with high viscosity and cohesivity, cross-linked with PEG - Neauvia Intense (Matexlab, Switzerland). Due to the properties selected for this case, working with a 27G or 25G needle would be too traumatic, the same as trying to use a cannula; that is why we used a 30G 4 mm long needle, a much more precise and less traumatic to work on this fibrous and attached skin. The application was via a needle with the bevel up, reaching between the skin and the cartilage, doing a

fan movement to make space for the HA, aspirate and after that, injecting the HA in small boluses, almost unmeasurable small, just until the tissue gains a little volume, repeating the technique in all the areas affected. During the first session, 0,06 ml of Neauvia Intense was used. In the second session, a month later, 0.08 ml of the HA filler was used, and in the third session, 0,08 ml as well. Following the session, we could observe mild morphological changes in the nose shape. After two months of break, without treatments, our first observation was that the quality of the skin improved; the skin looked brighter and less attached to the layers below. The most impressive finding was the capillary refilling of the area; after doing a compression test with two fingers on the tip area of the nose until it gets very ischemic, after releasing it, the perfusion returned immediately; that was a very impressive and unexpected finding.

It was visible that the tissue was more able to receive HA, and hence, the changes in the shape are much more significant, losing the destroyed appearance from the first session. During the second treatment (3 sessions one month apart), we injected 0,1 ml, 0,12 ml and 0,14 ml; after finishing the last session, we observed significant changes in the nose shape (Fig. 4-6), the quality of the skin, the colour due the increase of the blood perfusion, that also tells us about the subcutaneous space we gain over the tight, fibrous and attached skin she had at the beginning (Fig. 7).



Fig. 4-6. *Condition after finishing the last session.*



Fig. 7. *Before and after treatment frontal pictures.*

DISCUSSION

Revision rates in the literature vary widely but are most frequently cited at 0% to 10% (9). In patients who have had frequent operations, the complex architecture of the nose can be wholly disrupted in many places (3). The patient in this report had a first rhinoplasty with catastrophic results on the nose shape and architecture, leading the patient to not only be disappointed about the outcome but also generate an enormous feeling of discomfort, lack of self-esteem and mild depression. Considering all of this, after six years, the patient had a revision surgery that was supposed to improve the results, but again, the outcomes were very poor; this caused the patient to feel not only frustrated but also insecure.

The emotional states of these patients also differ from those undergoing primary and secondary rhinoplasties. Multiple failures and an unpleasant appearance can lead to an unstable psychological condition (5).

Complications reported in the literature can be divided into early, late and technical complications, some associated with the cartilage graft, soft tissue complication, and unfavourable scarring (3). In our case, the most complex problems were the scarring, the attachments of the skin layer to the layer below, especially over the cartilage, and the asymmetry of the nostrils and the dorsum. All of this together left her nose with insufficient skin to perform another surgery (according to several specialists), so we decided to work on the skin quality and quantity with the use of hyaluronic acid as a tissue expander. There are no previous reports of hyaluronic acid fillers used as a tissue expander, so we are talking about a new technique, outcomes and possibilities, especially in some delicate cases.

CONCLUSION

Injectable hyaluronic acid gel as a soft-tissue filler for facial rejuvenation has become a standard treatment procedure for aesthetic clinicians worldwide. In order to be used, this hydrogel needs special properties given by the cross-linking technology, such as elastic modulus (G'), viscosity (G''), cohesivity, and plasticity, among others (10). Concerning the choice of the correct product, we made sure it had the suitable properties to accomplish what we were looking for: the expansion of the skin and the detachment of the skin to the cartilage; the problem was high “fragility” most of the HA dermal fillers have, this is why we decided to use a HA cross-linked with polyethene glycol (PEG).

PEG is a polymer well known in medicine and has been used in different areas for many years, such as pharmacology, vaccine or tissue scaffolds (11). Hyaluronic acid hydrogel cross-linked with polyethene glycol (PEG) has been recently introduced on the Market, but several features of these materials have already been investigated; namely, the properties directly involved in the safe use as dermal fillers (degradation by hyaluronidase and biosafety) (12). Safety is one of the most important characteristics that is looked for. The PEGylated HA can guarantee both the safety and efficacy of the treatment, having the perfect properties we were looking for in this case: a high G' that is going to have the strength to expand the tissue, the high cohesivity, that is going to maintain the product united and ensure the no migration, also a great biointegration, that is going to allow us to apply the product and leave it to expand the tissue, improve the quality and the degrade, so we do not have to perform a second procedure to remove it.

The choice of hyaluronic acid fillers cross-linked with polyethene glycol should be considered justified and safe in the case described above; it may also be a milestone for new applications of PEGylated hyaluronic acid, especially in delicate cases where surgical operations cannot be the treatment of choice. This promising observation should be extended. We suggest more studies and clinical case comparisons with other procedures based on hyaluronic acid fillers to ensure the best results and optimise the technique.

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