Minimally Invasive Procedures for Nasal Aesthetics

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Abstract
Nose has an important role in the aesthetics of face. It is easy to understand the reason of the major interest that has revolved around the correction of its imperfections for several centuries, or even from the ancient times. In the last decade, all the surgical or medical minimal-invasive techniques evolved exponentially. The techniques of rejuvenation and corrections of nasal imperfections did not escape this development that is much widespread in the medicine of the third millennium. In many cases, the techniques of surgical correction involve invasive procedure that necessitates, for the majority of cases, hospitalisation. The author, using a different approach, has developed mini-invasive techniques using botulinum toxin A (BTxA) and absorbable fillers for the correction of nasal imperfections. BTxA allows to reduce the imperfections due to hypertension of muscles, while the absorbable fillers allow to correct all the imperfections of the nasal profile from the root to the tip in total safety. The correction is based on the precise rules that allow avoiding the majority of side effects. Results are long lasting and well appreciated by patients.

Abbreviations
Hyaluronic acid (HA), Botulinum Toxin A (BTxA)

Keywords
Botulinum toxin, hyaluronic acid, medical rhinoplasty, aesthetic medicine, nonsurgical procedures

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Introduction

Absorbable fillers have become increasingly popular to reverse signs of aging on the face. Since bovine collagen fillers received Food and Drug Administration approval in 1981, these fillers gained popularity for more than a decade; however, bovine collagen had the potential for allergic reactions and required skin testing before the first treatment. Since then, non-animal-based hyaluronic acid (HA), which had been used for intraarticular joint injection and ophthalmologic procedures for many years with a very good safety profile, was introduced and has become the most commonly used facial filler over the past several years. HA fillers show excellent efficacy not only in correcting wrinkles but also in restoring tissue volume with minimal downtime. These fillers are easy to use, allergy-free, and enzymatically degradable using an injection of hyaluronidase in case of a bad result\(^1\). Botulinum toxin injection for treatment of facial wrinkles is the most frequently performed cosmetic procedure in the Treatment of frown lines and crow’s feet, which are the cosmetic indications approved by the U.S. Food and Drug Administration, and horizontal forehead lines, offers predictable results, has few adverse effects, and is associated with high patient satisfaction. Wrinkles are formed by dermal atrophy and repetitive contraction of underlying facial musculature. Botulinum toxin is a potent neurotoxin that inhibits release of acetylcholine at the neuromuscular junction. Injection of small quantities of botulinum toxin into specific overactive muscles causes localized muscle relaxation that smooths the overlying skin and reduces wrinkles. Botulinum toxin effects take about two weeks to fully develop and last three to four months. Dynamic wrinkles, seen during muscle contraction, yield more dramatic results than static wrinkles, which are visible at rest\(^2\).

Minimally Invasive Procedures for Nasal Aesthetics rests its therapeutic base on two pillars: first, the control of the muscular activity at the base of the nose that provokes the rotation and the dropping of the tip, through the use of botulinum toxin A (BTxA), and second, the improvement of the nasal profile and ageing with the use of absorbable fillers. This article describes the procedure and clinical outcomes and discusses the indications of the treatment and possible mechanisms of the long-lasting effects.

Patients and Methods

The author successfully performed a Minimally Invasive Procedures for Nasal Aesthetics has developed minimvasive techniques using botulinum toxin A (BTxA) and absorbable fillers hyaluronic acid (HA) for the correction of nasal imperfections. 48 carefully selected patients, between September 2017 and October 2018, with an eight- to twelve-months follow-up. Patient ages ranged from 21 to 39 years. All of the patients elected not to undergo any aesthetic nasal surgery but were requesting a slight improvement of their nasal shape. Monophasic Hyaluronic Acid (HA) gel with the presence of two different molecular weights: 1000 kDa and 2000 kDa (Figure 1). This is an advantage both from a biological and mechanical point of view. In fact, different molecular weights allow the physician to act on different HA receptors, putting a number of mechanisms in place that are involved in the regeneration of skin tissue. Furthermore, there is a mechanical advantage; a high molecular weight HA fills larger spaces, while a low molecular weight HA fills smaller spaces, resulting in a complete filling action. Additional important features of product are its safety and manageability. For example, as with most volumising fillers, it is indicated for use at the supraperiosteal layer and deep tissue, but with Monophasic hyaluronic acid (HA) gel no problems arise if it is injected at the mid or deep dermal level (Figure 2). Therefore, it can be used safely throughout the nose area. The smoothness of the gel reduces the possibility of side-effects such as swelling and bruising, as well as the risk of over-correction. Monophasic hyaluronic acid (HA) gel is indicated in all patients who wish to create or redefine facial contour, in those who have lost subcutaneous tissue, and for correcting deficits following injuries\(^3\).
Anatomy
Surface Appearance: the external nose has a pyramidal shape (Figure 3). The nasal root is located superiorly, and is continuous with the forehead. The apex of the nose ends inferiorly in a rounded 'tip'. Spanning between the root and apex is the dorsum of the nose. Located immediately inferiorly to the apex are the nares; piriform openings into the vestibule of the nasal cavity. The nares are bounded medially by the nasal septum, and laterally by the ala nasi (the lateral cartilaginous wings of the nose). Skeletal Structure: the skeleton of the external nose is made of both bony and cartilaginous components: bony component - located superiorly, and is comprised of contributions from the nasal bones, maxillae and frontal bone (Figure 4). Cartilaginous component – located inferiorly, and is comprised of the two lateral cartilages, two alar cartilages and one septal cartilage (Figure 5). There are also some smaller alar cartilages present. Whilst the skin over the bony part of the nose is thin, that overlying the cartilaginous part is thicker with many sebaceous glands. This skin extends into the vestibule of the nose via the nares (Figure 6). Here there are hairs which function to filter air as it enters the respiratory system (Figure 7).
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**Figure 5 - Nasal anatomy muscle structure.**

**Figure 6 - Nasal anatomy vascular structure.**

**Figure 7 - Nasal anatomy nerve structure.**
The Medical Approach With Botulinum Toxin and Dermal Filler

Correction of the nasal profile and elevation of the tip with Botulinum Toxin

The muscles involved in the rotation of the nasal tip towards the maxillary bone, are the depressor septi nasi and levator labii alaeque nasi. Their treatment with BTxA is easy. The depressor septi nasi muscle can be injected along both its insertion above the columella and in the nasal spine. In this case, we use 4 Units Botulinum Toxin (Botox® Allergan).

If there is hypertonia of the levator labii alaeque nasi muscle with a clear lift of the nasal sides and rotation of the tip downwards, we can give the injection of 4 Units Botulinum Toxin (Botox® Allergan) (Figure 8).

To appreciate the result, it is necessary to wait for 7 to 15 days. We always perform a retouch session after 15 days, both to evaluate the results and for possibly enhancing it with another injection of a few units.

It is important to be careful while treating the levator labii alaeque nasi muscle, since it is possible that the length of the upper lip can increase, getting ptosis. The risk is lower in young women with gummy smile, short lips (less than 1.5 cm) than in older people (over 60 years of age) with long lips. When the distance between the nasal spine and the apex of the Cupid's arch is more than 1.8 cm, the treatment is strictly contraindicated.

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Figure 8 - The depressor septi nasi muscle inject 4 Units Botulinum Toxin. The levator labii alaeque nasi muscle (both side) inject 4 Units Botulinum Toxin (Botox® Allergan).
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Correction of the nasal profile with monophasic hyaluronic acid dermal filler

Normally use average cross-linked hyaluronic acids, and in particular: Aliaxin® EV. The safety of materials is fundamental to obtain good results, and so the advice is to use well-known materials with a very high safety profile. We always start with topical anaesthesia with an anaesthetic lotion for at least 30 min. Before the procedure, the midline and the most prominent spot of the nasal domes were marked. A cannula guide needle was used through the nose tip to create the entry point (center of domes tip defining point) (Figure 9)⁹.

First Step: with the columella angle needs to be enlarged by moving the columella through the entry point and placing the Aliaxin® EV dermal filler into the nasal septal cartilage. The cannula is not removed at all during the procedure. Forward and backward maneuvering places the Aliaxin® EV dermal filler into the columella⁹.

Second Step: it is necessary to move along the nasal dorsum from the entrance point and to put the Aliaxin® EV dermal filler over the nasal periosteum and proceed to the glabella to lift the nasal bridge. The cannula is not removed at all during the procedure. Forward and backward maneuvering places the Aliaxin® EV dermal filler into the nasal dorsum⁹. The amount injected is variable depending on the imperfection to correct. If the Nasolabial angle is also reduced (less than 90º), we proceed with an injection at the level of the nasal spine to open this angle that should be possibly more that 90º. This injection opens the Nasofrontal angle, so it is obvious that the best indication remains the one with a reduced angle, less than 115º. It is better not to exaggerate with the injection and reach the optimum result, We use fan technique and, again the best results are obtained step by step. References: (Figures 10 and 11)¹⁰


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AliAxin® EV Dermal Filler: 1 ml or 2 ml Total
Injection Technique: Fan Technique
Injection Device: 23G x 50 mm Cannula
Target Area: Subcutaneous Layer
Attention: Avoid Columellar Artery and Lateral Nasal Artery

Figure 9 - Center of domes tip defining point for cannula inject the dermal filler⁹.

Figure 10 - The aesthetic triangle of Nose.

Figure 11 - The ideal Tip Angle of Nose for Female and Male.
Results
Between September 2017 and October 2018, 48 carefully selected patients, with an eight - to twelve - months follow-up. Patient ages ranged from 21 to 39 years. The results were satisfactory in all but 42 of the 48 cases based on patient feedback (Table 1). Six patients found the results inadequate and those patients underwent normal rhinoplasty afterward. The operation duration was under 30 minutes in all of the cases. Our longest follow-up was 12 months, during which we observed that the final outcome appeared after the third month and did not undergo any change afterward. No complication related to the AliAxin® EV dermal filler and Botulinum Toxin (Botox® Allergan) (Figures 12, 13, 14, 15, 16, 17 and 18).

<table>
<thead>
<tr>
<th>Satisfied Patients</th>
<th>Inadequate (Rhinoplasty Afterwards)</th>
<th>Total Patients</th>
</tr>
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<tbody>
<tr>
<td>42</td>
<td>6</td>
<td>48</td>
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Table 1 - The results were satisfactory in all but 42 of the 48 cases based on patient feedback.

Clinical Cases

AliAxin® EV Dermal Filler: 1 ml Total
Injection Technique: Fan Technique
Injection Device: 23G x 50 mm Cannula
Target Area: Subcutaneous Layer
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Figure 15 - Female patient 30 years old, front view. The depressor septi nasi muscle injected 4 Units Botulinum Toxin. The levator labii alaeque nasi muscle (both side) injected 4 Units Botulinum Toxin (Botox® Allergan).

AliAxin® EV Dermal Filler: 1.5 ml Total
Injection Technique: Fan Technique
Injection Device: 23G x 50 mm Cannula
Target Area: Subcutaneous Layer

Figure 16 - Female patient 30 years old, front view. The depressor septi nasi muscle injected 4 Units Botulinum Toxin. The levator labii alaeque nasi muscle (both side) injected 4 Units Botulinum Toxin (Botox® Allergan).

Figure 17 - Female patient 40 years old, Lateral view. The depressor septi nasi muscle injected 4 Units Botulinum Toxin. The levator labii alaeque nasi muscle (both side) injected 4 Units Botulinum Toxin (Botox® Allergan).

AliAxin® EV Dermal Filler: 2 ml Total
Injection Technique: Fan Technique
Injection Device: 23G x 50 mm Cannula
Target Area: Subcutaneous Layer

Figure 18 - Female patient 40 years old, Lateral view.
Discussion

Facial rejuvenation involves a spectrum of interventions, ranging from topical cosmetic products to surgical tissue manipulation. Botulinum toxin and Dermal filler injections fall somewhere in the middle of this spectrum. Used alone or in conjunction with other modalities, botulinum toxin and dermal filler products play an important role in achieving a youthful, aesthetically pleasing facial appearance. As demonstrated throughout this article, nonsurgical approaches to facial rejuvenation have become enormously popular among both patients and practitioners in recent years. Facial rejuvenation is comprised of a spectrum of interventions ranging from topical cosmetics to surgical restoration. Injectable products fall somewhere in the middle of the spectrum, offering dramatic aesthetic results for a moderate cost and require minimal posttreatment recovery time. The present article serves as a general conceptual outline regarding the use of injectable products to achieve facial rejuvenation. Certainly, every patient warrants treatment approaches tailored to their specific situation, and when questions arise, specific recommendations should be sought from one’s more experienced colleagues in their author’s experience, injection of HA gel is a valuable tool for minimally invasive nasal reshaping. Experienced plastic surgeons can use HA injection as an alternative/complement to many indications for rhinoplasty because of its versatility.

In the author’s opinion, this is infrequently considered by many surgeons. Benefits with HA injection include a quick and noninvasive method to change nasal features without need for general anesthesia. The procedure is associated with no/minimal downtime and with lower cost per treatment compared with rhinoplasty. Minor and sometimes time-consuming and risky secondary surgical procedures can sometimes be avoided with HA injection. In addition, HA gel injections are useful for preserving the height of the nose, which can be challenging with a surgical reshaping rhinoplasty. The nonpermanent nature of HA and reversibility with hyaluronidase are also favorable properties. Limitations include a relatively short duration of effect in some cases and thus need for retreatment. Although use of HA in aesthetic facial treatments is well established for treatment of wrinkles and folds, most patients are unaware of nasal indications. As a nonsurgical minimally invasive alternative to rhinoplasty, it would likely appeal to many patients who wish to modify the appearance of their nose, HA treatment may also serve as a door opener to surgery for patients who are reluctant to undergo rhinoplasty.

Rhinoplasty is one of the most common cosmetic procedures performed by plastic surgeons. However, non-surgical nose jobs with a dermal filler are becoming increasingly popular in the world. Filler rhinoplasty has become an advantageous choice for patients that are afraid of surgery or general anesthesia. It is a fast, safe, simple, and effective method when compared with surgical rhinoplasty. On the other hand, HA filler rhinoplasty can be completely reversed with hyaluronidase when needed. Signorini et al. recommended an injection of 10 to 20 U hyaluronidase for areas less than 2.5 mm and two to four injections of 10 to 20 U hyaluronidase for areas greater than 2.5 mm.

In some patients, the use of BOTOX increases the distance between the columellar base and the vermillion border, creating the appearance of a fuller and voluminous lip. It can also correct the gingival smile. If the toxin diffuses laterally in the base of the columella, it can affect the levator labii superioris and the orbicularis oris, provoking an unaesthetic elongation of the superior lip, filtrum flattening, and labial sphincter incompetence when talking and drinking.

The use of high doses in the nasal tip can produce an exaggerated opening of the nostrils and a strong elevation of the tip, leaving an unattractive appearance in the frontal view. The clinical effect in this area usually lasts for a shorter time than other parts of the face. The first days after the injection, the patient can experience pain in the nasal tip. Nasal aesthetic problems are one of the few fields in which we are not able to offer our patients an acceptable, minimally invasive alternative. Furthermore, we have patients who are incapable of arranging their daily programs to accommodate the required recovery period or who do not wish to undergo such a significant operation because of their associated health problems or anxiety over an irreversible change in their facial characteristics.

The main objective of the technique we describe is to provide patients with a simple method for nose reshaping, which can be performed in the office under topical anesthesia in less than 30 minutes and is therefore with Botulinum toxin or Fillers in the patient’s mind. For selected patients, however, our method can be proposed as a simple, office-based procedure that can be performed under topical anesthesia in a matter of minutes with virtually no downtime.

At the end of the session, we normally use a camphor cream to disinfect and reduce the oedema which is usually modest. The patient can immediately resume his or her daily activities. The main indication of these procedures is in all minor defects of appearance of the nose, particularly for the plunging tip. A second important indication is the flat nose, frequently seen in black/brown and yellow skin people. In these cases it is also possible to achieve a reduction of enlarged nasal wings. Another useful indication is the correction of many post-surgical imperfections, which will be difficult to treat otherwise. Corrective surgery is not always so easy to perform.

The training of doctors, who want to engage with this easy technique that gives extraordinary results, is always necessary and essential. Rules, written long time ago and well documented, remain the best way to achieve good results and reduce to the minimum the incidence of side effects.

Adverse Effects

Potential major complications of injection rhinoplasty include infection, ischaemic necrosis from arterial embolism, pressure necrosis from overinjection of nasal tip and osteophyte from periosteal injection. These risks may be reduced, with effective nasal analysis, meticulous injection technique, and a good understanding of nasal cartilaginous and vascular anatomy. Radix and...
upper nasal third injections should be medially placed to avoid the dorsal and lateral nasal arteries. Pre-injection palpation may aid identification, and aspiration before injection is mandatory. Intravascular filler injection can lead to arterial embolisation and subsequent skin necrosis or retinopathy. Visual impairment following middle facial third filler injection mandates urgent ophthalmological review to exclude retinal embolism. Prompt anticoagulation and hyaluronidase injection may be a useful adjunct should complications arise.

**Conclusion**
Injection of HA gel is a valuable tool for plastic surgeons to consider for nasal reshaping. Small corrective refinements offered to patients may help achieve higher patient satisfaction and have in many cases had a surprisingly long duration of effect. The clinical experience gained with HA gel injections for nasal treatments over 15 years has also shown that HA gel can be used for correction of minor postrhinoplasty defects in appropriate patients. Minimally invasive procedures for nasal aesthetics described herein is one of very few minimally invasive alternatives for aesthetic nasal surgery. For selected patients, our method can be used as a simple, office-based procedure that can be performed under topical anesthesia without any significant morbidity, a very high patient satisfaction, and a recovery period of only two to three days. The reversibility of the result, at least for a short period of time, is also appealing to patients who are uncertain about the outcome of nasal surgery. Injection rhinoplasty is not a substitution for surgical rhinoplasty. There are many indications where it will be insufficient to achieve the desired aesthetic outcome. Noses that are significantly overprojected, or overrotated, have a shallow radix, and tension noses are better suited to surgical correction. It is however a useful postoperative adjunct to surgery or in those patients contemplating rhinoplasty. The non-permanence and minimal morbidity of associated with degradable fillers is especially beneficial to those patients who seek cosmetic rhinoplasty but are discouraged by the risks and convalescence of surgery.

**Conflicts of Interest**
The author declare no conflict of interest.

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