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Injectable Fillers in Aesthetic Medicine
Editors

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The field of aesthetic medicine has been changing at such a rapid pace it has become hard to keep up with the latest trends and developments. Each decade has introduced new technologies that have made our practices safer, simpler and more efficacious. The 1980’s were the decade of chemical peels; the 1990’s the laser; but the two most innovative changes have come about from the aesthetic use of botulinum toxin in the 1990’s and now the explosion of fillers in this era of the 21st century. From one or two fillers available twenty years ago, we now have a full cabinet of filling materials – both biodegradable and permanent – to meet each of our patient’s needs. In the recent few years, fillers are emerging like spring flowers in a profusion of original devices, copycats and injection materials. It has become increasingly difficult for the clinician to sort through the marketing hype to find the real objective science – if it exists – on the newer agents. This is further complicated by the fact that CE certification does not require efficacy and safety data if comparable filling substances are already on the market. The reality is that most new aesthetic devices come from Europe, and it is difficult for us to evaluate what’s new and what’s good.

“Injectable Fillers in Aesthetic Medicine” provides a well-needed compendium as a complete yet very hands-on practical approach to the practice of fillers at this time. It fulfills an important niche by gathering information from many sources for the updated volume. Both, Dr. Berthold Rzany and Dr. Mauricio de Maio, are highly respected aesthetic researchers and clinicians. They have sorted through the technical data and marketing hype to provide truthful and practical information for you – the aesthetic clinician – for use in your practice.

The volume is divided into usable chapters encompassing materials, patient selection, preparations, anesthesia, regional injections including techniques, combination therapy and complications with treatment. I highly recommend this compendium for both the novice clinician beginning a filler practice as well as those with long experience needing an update on the latest materials and techniques. This is the next best thing to a “hands-on” course from master clinicians.

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Foreword

Gottfried Lemperle, M.D.

“Work’s of art are continuously restored over time – Isn’t a person a work of art, too?”

This reference on injectable dermal fillers is the first comprehensive manual for the practitioner. It is a perfect symbiosis of pragmatism, experience, and wisdom of two well-known scientists and practitioners from both continents Europe and South America. Today, information on aesthetic surgery is not limited to an exclusive group of injectors any more, but finds a broad, multi-disciplinary interest among many medical specialties. Increasingly, many non-traditional specialties such as gynecologists and dentists offer wrinkle treatment, whether in combination with antiaging medicine or rejuvenation of the frontal teeth.

What is the optimal treatment for wrinkles? Many praises have been spread by the manufacturers and distributors regarding their own products – and fewer facts have been presented in courses and published in dermatological and plastic surgery journals. This book discusses which agent is optimally used for which specific indication. It is not only an encyclopedia of available filler substances in Europe and Brazil but also an in-depth approach to their properties and proper practical applications.

The text is both for the novice and the veteran. Indeed, compiling this reference vastly increased my own knowledge in the field of dermal fillers. Organized according target indications, it facilitates the choice of filler for each specific region of the face given the multitude of products in the global market. Of special importance is chapter 6 on treating and resolving complications, which occur with all fillers. Adhering to the “Tips and Tricks” in every chapter will prevent the majority of technical mistakes, however, there may still happen the rare possibility of an unforeseen event.

There is no longer lasting result in plastic surgery than a bad result. If we master the treatment of long lasting redness, superficial ridges and late foreign body granulomas, we will have long-lasting happy patients. Existing misconceptions pertaining to permanent fillers will fade with increasing experience, conservative application and successful treatment of rare complications.

This book will find a widespread acceptance among all interested in anti-aging and aesthetic medicine. I wish this work the great success it deserves.

Professor Gottfried Lemperle
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A book like this would not have been possible without the help of many others. First, we would like to thank our patients, and in particular our teaching patients, without whom we would not be able to teach our colleagues all over the world. We would like to thank those who helped us with their skills and support during the completion of this book. Furthermore, we would like to take this opportunity to thank Mrs. Ellen Blasig from Springer Heidelberg for her guidance and her continuous support, which enabled us to keep the project going.

From the German team, we are grateful to Hendrik Zielke for his help in writing the chapters on the efficacy and safety of the injectable fillers, Mr. Tobias Gottermeyer for the excellent photographs of our teaching patients, Miss Madita von Bargen and Miss Susan Fritz for various tasks including the elaborate graphics, and last but not least Miss Miriam Bollerhoff and Miss Stefanie Rosumeck for formatting the text.

From the Brazilian team, we would like to thank the staff, who are always prompt in providing support with new tasks: Mrs. Liliann Amoroso Ribeiro, Miss Leticia Barros Alves, Miss Gisele Aparecida de Souza, and Dr. Renato Rodrigues Naufal.
Why a book on injectable fillers? Astonishingly, there are few books on this subject. Furthermore, during the last decade we have seen a tremendous increase in the number of filler materials and a parallel increase in our knowledge about them. Treatments have become more subtle and now include more indications. The task of this book is therefore twofold. First, to give an overview on the most common biodegradable and nonbiodegradable fillers and to give parallely some advice about how to approach new fillers, which are often accompanied by marketing myths rather than good scientific data. Second, injecting filler can be tremendously rewarding; based on the perspectives of a dermatologist and a plastic surgeon, this book will give an overview of how to use injectable fillers for the most common indications in aesthetic medicine. It will also offer some insights into more specific aesthetic indications like, for example, remodeling the face, including the nose.

We have tried to use a hands-on approach to be as specific as possible. However, do not hesitate to contact us if you have further questions and we will both try to answer your questions as clearly and quickly as possible.

Berlin and São Paulo, November 2005
Berthold Rzany       Mauricio de Maio
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**Hendrik Zielke**  
Hendrik Zielke is a medical student in his final year at the Charité Universitätsmedizin and works as assistant at the dEBM. Together with Linn Woelber he helped to establish the Berlin Registry for adverse reactions to injectable fillers.
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List of Abbreviations

BoNT-A – Botulinum toxin A
CE – Conformité Européenne
CHP – Calcium hydroxylapatite
FDA – Food and Drug Administration
HEMA – Hydroxyethylmethacrylate
HIV – Human immunodeficiency virus
PMMA – Polymethylmethacrylate
PLA – Polylactic acid
SMAS – Submuscular aponeurotic system
SOOF – Suborbicularis oculi fat
1.1 Introduction

In contrast to the United States, in most countries in Europe and South America a great variety of injectable fillers are available. Therefore, for novices it can sometimes be quite difficult to decide which filler to use for which indications. This chapter will give a brief overview on some of the most commonly used injectable fillers. The selection of products reflects the interest of the authors and might appear quite arbitrary to someone familiar with other fillers.

Injectable fillers may be grouped according to the degree of degradability. In general, fillers can be grouped as biodegradable and nonbiodegradable (permanent) products. Furthermore, combination products exist that include biodegradable as well as nonbiodegradable materials. The advantages and disadvantages of each group will be discussed separately.

1.2 Biodegradable Fillers

Biodegradable fillers are defined as having a limited life span usually ranging from a couple to several months, or even to a couple of years. They usually consist of purified dermal components from human, animal, or bacterial sources and can be divided into the following categories: xenografts (donor and recipient are from different species), autografts (donor and recipient are from the same individual), homografts (donor and recipient are from the same species), and synthetic materials (Table 1.1).
Collagens from various sources and with specific characteristics exist. Therefore, it is important to discuss the different products separately.

**1.2.1 Collagen**

Collagens from various sources and with specific characteristics exist. Therefore, it is important to discuss the different products separately.

**1.2.1.1 Collagen of Bovine Origin**

Prior to the introduction of the hyaluronic acids, collagen was the most widely used filler and was considered the gold standard with which other dermal fillers were compared. The classical bovine enzyme-digested collagen (95% type I, 5% type III) is available in several preparations, which can be distinguished by the collagen content and the addition of glutaraldehyde for stabilization (Homicz and Watson 2004). Glutaraldehyde crosslinks lysine residues within the collagen structure, thereby increasing the stability of the product and its ability to resist in vivo enzymatic degradation.

Depending on the collagen content and the degree of crosslinking, different products should be used for different levels of the dermis. For example, Zyderm 1 and Zyderm 2, which are fillers with noncrosslinked collagen, should be injected superficially into the papillary level of the dermis. Zyplast, a crosslinked form, should be injected more deeply into the reticular layer. All of these products are easy to inject. Furthermore, overcorrection is recommended for Zyderm 1 and Zyderm 2, as these collagen preparations will lose volume over time.

Zyderm Collagen was cleared for marketing in 1981 by the Food and Drug Administration (FDA) after reviewing clinical data based on a large case series of 9,427 tested and 5,109 treated patients (Cooperman et al. 1985; Matti and Nicolle 1990). In addition to this case series, which focused mainly on safety issues, a recent clinical trial showed that it was effective for at least several months (Cooperman et al. 1985; Matti and Nicolle 1990).

As collagen may elicit hypersensitivity reactions, pretesting is so far mandatory. Pretesting consists of an intradermal injection of Zyderm 1 collagen into the volar aspect of the forearm. A minimum of one skin test should be administered and evaluated after 28 days. Some col-

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**Temporary injectable fillers**

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<thead>
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<th>Origin</th>
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<td>SeS, Juvéderm, Matridur, Restylane, Rofilan</td>
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<td></td>
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<td>Bioinblue</td>
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* Please note that this list is not complete.
leagues even recommend double skin testing. It is important to note that skin testing does not exclude a hypersensitivity reaction.

1.2.1.2 Collagen of Porcine Origin

A few porcine collagen-based fillers have been described in the literature (Saray 2003). However, they have not been widely used. A novel porcine collagen filler, Evolence, was introduced into the European market in 2004. In contrast to other collagens, this product is crosslinked by mimicking the process of collagen glycation using d-ribose as the crosslinking agent. A randomized clinical trial is currently under way with the objective of presenting the superior efficacy of Evolence to bacterial hyaluronic acid for the treatment of nasolabial folds. Data on the efficacy of the implant have not yet been published. The company that produces this collagen filler states a product durability of at least 1 year. In the recent Conformité Européenne (CE) certification of Evolence, pretesting was not considered a prerequisite.

1.2.1.3 Collagen of Human Origin

Collagen of human origin can be of allogenous or autologous nature.

Collagen of Allogenous Nature (from Cadaver)

In addition to bovine or porcine sources, collagen can be derived from human cadavers. Data is available for two products: Dermalogon and Cymetra. Both products derive from pooled human cadaverous tissue from accredited tissue banks. Overcorrection is recommended by the manufacturer. Here again the available data on the efficacy and safety of the product are limited. Cymetra was tested against Zyplast in a randomized controlled trial. A total of 47 patients were treated: 20 received Cymetra and 27 received Zyplast. Various photometric outcome measures were used in this study, which favored the new product over Zyplast (Sclafani et al. 2002a, b).

Collagen of Allogenous Nature (from Culture)

Later-generation noncadaverous collagen products are CosmoDerm and CosmoPlast. They are made from natural human collagen grown under controlled laboratory conditions. There is no need for a pretreatment skin test for these sterile devices, which are composed of highly purified human-based collagen that is dispersed in phosphate-buffered physiological saline containing 0.3% lidocaine. CosmoDerm is a noncrosslinked formulation that is used in the treatment of superficial lines, whereas CosmoPlast is crosslinked and is used primarily in the treatment of more pronounced wrinkles. These products are not available in countries outside of the United States; regulations surrounding products of human origin vary on a country-by-country basis (Bauman 2004). No clinical trials are available because the FDA concluded that since CosmoDerm and CosmoPlast represent a material source change to Zyderm and Zyplast (from bovine- to human-based collagen), they did not require new clinical efficacy studies to be carried out.

Collagen of Autologous Nature

The commercial preparation Autologon consists of dermal extracellular matrix, primarily collagen (types I, III, and VI), that has been harvested from the patient’s own skin. It requires the excision of the patient’s skin and is therefore mostly suitable for those undergoing surgical procedures. Here again, overcorrection is recommended by the manufacturer. The available data on the efficacy and safety of the product are limited (Sclafani et al. 2000).
1.2.2 Hyaluronic Acid

After the bovine collagens, the emergence of different hyaluronic acid preparations has revolutionized the injectable filler market because they require no prior skin test. Hyaluronic acid, which belongs to the family of glycosaminoglycans, consists of repeated disaccharide units. The hydrophilic properties of hyaluronic acid attract water into the extracellular matrix and therefore increase the skin turgor. Hyaluronic acid is gradually degraded. In order to increase the durability of the various hyaluronic acid preparations, stabilization is usually obtained by crosslinking with several substances, such as 1,4-butanediol diglycidyl ether, which is found in Restylane.

Hyaluronic acids can be derived from avian or bacterial sources; each product has its own, specific characteristics. Several preparations adapted for different injection depths are available for most products, which differ based on the concentration of hyaluronic acid and the degree of crosslinking, and thus the rate of degradation.

1.2.2.1 Hyaluronic Acid of Avian Origin

Crosslinked hyaluronic acid of avian origin became the first noncollagen filler to be widely used. The Hylaform product family is based on hyaluronic acid derived from processed rooster combs. Several products with different viscosities allow the treatment of different dermal levels. The Hylaform product family, with an average content of hyaluronic acid of 5.5 mg/ml, is easy to inject due to its superior rheological properties and is less palpable than some products of bacterial origin (Manna et al. 1999).

In 2003, data from a clinical trial comparing Hylaform with Zyplast for the treatment of nasolabial folds was presented to the FDA. A total of 480 patients were included in this study which, to our knowledge, has not yet been published. Based on the data that are available from the FDA, no difference between the products could be established. After 12 weeks the mean (±standard deviation) wrinkle severity score, which ranged from 0 to 5, was 3.3±1.11 for Hylaform and 2.2±1.12 for Zyplast (http://www.fda.gov/).

1.2.2.2 Hyaluronic Acid of Bacterial Origin

Typical examples for bacterial hyaluronic acid products are the Restylane and Juvederm/HydraFill families. The hyaluronic acid used for these products has a lower molecular weight, but is used at a higher concentration than the avian products: 20 mg/ml for Restylane and 24 mg/ml for Juvederm/HydraFill.

The rheology of these products is less than that of avian hyaluronic acid, and therefore increased pressure has to be applied while injecting the material into the dermis. Furthermore, after injection the product is much more palpable. For example, when treating nasolabial folds the product remains palpable as a threadlike structure for days or even months. The material dissolves more gradually, however, and so overcorrection is not necessary.

In contrast to other hyaluronic-acid-based products, clinical trials focusing on safety and durability exist for Hylaform and Restylane. A randomized controlled clinical trial was conducted to compare the efficacy and safety of Restylane and Zyplast. A total of 137 patients were included in the intention-to-treat analysis. After 6 months the authors concluded that Restylane was superior to Zyplast (based on the assessment of the Wrinkle Severity Rating Scale). The superiority of Restylane (i.e., where the investigator felt that Restylane was more effective) was observed in 56.9% of their patients, compared to 9.5% patients in whom the investigator felt that Zyplast was superior (p<0.0001). Those patients in whom there was no difference between these products (33.6%) were not included in the simple univariate statistics (Narins et al. 2003). Although the
authors concluded that Restylane was superior to Zyplast, it was later determined by the FDA that these data were not sufficient to claim the superiority of Restylane compared to Zyplast at the defined study endpoint of 6 months. No such data exist at the moment for any of the other bacterial hyaluronic acid products. However, clinical trials for Juvederm/HydraFill in the United States are underway and are expected to be completed soon.

1.2.3 Combination of Hyaluronic Acid and Dextranes

The combination of hyaluronic acid, hydroxypropylmethylcellulose and dextranes, marketed as Matridex, is thought to be more durable than other products. However, there is as yet no good clinical data on its efficacy and safety.

1.2.4 Polylactic Acid

Polylactid acid (PLA) is a synthetic biodegradable material. It is basically the same substance as that used in suture material. When injected into the deep dermis it gradually stimulates collagen formation. This takes some time and the manufacturer recommends three initial treatment sessions, each approximately 6–8 weeks apart. After the three initial treatments the results are supposed to last for up to 2 years. Therefore, PLA cannot be compared with a standard filler like hyaluronic acid where the effects can be seen immediately and where the results gradually abate after each injection.

This product has to be diluted with sterile water at least 2 h before injection. Although initially the recommended dilution for PLA was 3 ml, the current recommendation is to dilute it in a volume of 5 ml. Some of our colleagues add 1 ml of a local anesthetic to decrease the pain associated with the injection. Only retrograde injection is recommended. Even when administered using the correct injection technique and the higher dilution, in some cases the needle will block during the injection, at which point the needle has to be changed.

Thus far, studies on the efficacy and safety of PLA are based mainly on the treatment of HIV patients with drug-induced lipoatrophy (Moyle et al. 2004; Perry 2004; Valantin et al. 2003). Only case reports and case series exist for the use of PLA for aesthetic indications (Rzany et al. 2004; Woerle et al. 2004). According to the manufacturer, a clinical trial covering aesthetic indications is under way in the United States.

1.2.5 Calcium Hydroxylapatite

Calcium hydroxylapatite (CHP) is another comparatively new product that is made from synthetically formed calcium phosphate pearls, a procedure that is classified as bioceramics and involves the ionic bonding of calcium and phosphate ions. When injected they form a foundation within a matrix that allows the local cellular infiltration of fibroblasts. The complex is available as a gel to allow easier application.

Again, as for the majority of injectable fillers, there are 40 clinical trials that show equivalence or even superiority to standard products (Comite et al. 2004; Sklar and White 2004; Tzikas 2004). Based on information from the manufacturer, the effects of this product should last longer than for other biodegradable products.

In contrast to the other fillers, CHP is visible on x-rays; patients should be informed of this so that they can tell their doctors should they require an x-ray of the face.

1.2.6 Polyvinyl Alcohol

Polyvinyl alcohol is a comparatively newer biodegradable filler material. It consists of polyvinyl alcohol (8 %) and water (92 %). No good clinical
trials or larger case series involving this product have been published so far.

### 1.3 Nonbiodegradable Fillers

Several nonbiodegradable fillers are available (Table 1.2). As well as being expensive, frequent injections can be quite tiresome for both the patient and the physician, and so the application of a nonbiodegradable or permanent filler holds a certain attraction. Conversely, there are certain disadvantages that should be taken into account. First, patients of all ages can be treated in aesthetic medicine. It may therefore be quite uncertain how a permanent depot will appear after 3 or even 4 decades, by which time age and solar-induced elastosis has reduced the dermal and epidermal layers. Second, there is always a possibility of adverse reactions to fillers. The most common subacute or late reaction to permanent fillers is the development of a granuloma. Treatment of an adverse reaction to a filler material is much more difficult when the filler is nonbiodegradable because it will provide a permanent stimulus for the surrounding tissue.

**Table 1.2 Nonbiodegradable fillers**

<table>
<thead>
<tr>
<th>Material</th>
<th>Origin</th>
<th>Products*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silicone</td>
<td>–</td>
<td>ADATO SIL-ol 5000, Bioplastique, Biopolimero, Dermagen, SILIKON 1000 Silicex</td>
</tr>
<tr>
<td>Polyacrylamide</td>
<td>–</td>
<td>Amazingel, Aquamid, Argiform, Bioformacryl, Evolution, Outline</td>
</tr>
<tr>
<td>Polyalkylamide</td>
<td>–</td>
<td>Bio-Alcamid</td>
</tr>
</tbody>
</table>

* Please note that this list is not complete.

In order to ensure patient satisfaction, they should be thoroughly advised about the pros and cons of the suggested treatment with a nonbiodegradable product. We would not generally recommend the use of nonbiodegradable fillers at the first visit for patients who have never been treated before with a filler. Patients who are interested in being treated with a nonbiodegradable filler should first be preinjected with saline or a biodegradable filler to ensure that they are satisfied with the correction result.

#### 1.3.1 Silicone

Injectable silicone is one of the oldest injectable filler materials used. Medical-grade silicon is a clear, oily, colorless liquid composed of long chains of polymerized dimethylsiloxane. There are several methods of injection for this product. One of the recommended techniques is the microparticle technique (Orentreich 2000; Webster et al. 1986). Fluid silicone is injected into the dermis as 0.01 ml microdroplets. Each microdroplet is separated by 1 mm. Undercorrection is recommended as the main side effect is a foreign body (fibrotic) reaction. In fact, as a result of severe adverse reactions, the FDA declared the use of injectable silicone illegal in 1991. Nevertheless, silicone oil is still widely used in other countries.

#### 1.3.2 Polyacrylamide

Polyacrylamide (trade name Aquamid) is composed of 97.5 % water and 2.5 % crosslinked polyacrylamide. It is recommended for folds, skin sculpturing, and facial atrophy. It is not effective for fine wrinkles. Aquamid should be injected deeply using the subcutaneous tunneling technique (Breiting et al. 2004; De Cassia Novaes and Berg 2003).

#### 1.3.3 Polyalkylamide

Polyalkylamide is available as Bio-alcamid. It consists of alkyl-imide group networks (approximately 4 %) and water (approximately 96 %). The
Overview of Injectable Fillers

Chapter 1

Some fillers are a combination of nonbiodegradable (permanent) and biodegradable (temporary) materials. The purpose of the biodegradable material is to act as a carrier and to ensure an immediate effect until the fibrotic foreign body reaction induced by the nonbiodegradable filler leads to visible effects (Table 1.3).

Table 1.3 Combinations of permanent and temporary materials

<table>
<thead>
<tr>
<th>Temporary</th>
<th>Permanent</th>
<th>Products*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collagen (bovine)</td>
<td>Polymethylmethacrylate</td>
<td>Artecoll/Artefill</td>
</tr>
<tr>
<td>Hyaluronic acid (from cell cultures)</td>
<td>Hydroxyethylmethacrylate</td>
<td>DermaLive, DermaDeep</td>
</tr>
</tbody>
</table>

* Please note that this list is not complete.

1.4.1 Polymethylmethacrylate and Collagen

The combination of polymethylmethacrylate (PMMA) and collagen (Artecoll) was introduced at the end of the 1980s and is the oldest available combination preparation. PMMA beads are suspended in a solution of 3.5% bovine collagen (as a carrier) and 0.3% lidocaine (for pain relief). While the collagen resorbs over a period of 2–3 months, the PMMA spheres become encapsulated by fibrotic material. Artecoll has been used for a variety of aesthetic indications.

Artecoll should be injected into the lower third of the dermis with a 26- to 27-gauge needle using the tunneling technique. The material should not be injected too superficially; the needle should never be visible through the skin. Careful massage with a fingertip after application helps to distribute the material more evenly. Overcorrection is not advisable; however, a second implantation may be necessary after 3 months (Lemperle et al. 2003). Although the preparation contains collagen, in Europe a skin test is not mandatory (personal communication Rofil Medical International).

1.4.2 Hydroxyethylmethacrylate and Hyaluronic Acid

Hydroxyethylmethacrylate (HEMA) and ethylmethacrylate microspheres suspended in hyaluronic acid have been available in Europe as DermaLive since the end of the 1990s. This product consists of 40% bacterial hyaluronic acid and 60% acrylic hydrogel particles (diameter of 45–65 μm). A similar formulation with larger-sized particles (about 85–110 μm) and a somewhat higher hyaluronic acid content is marketed as DermaDeep and is intended to be injected deeper.

DermaLive should only be injected with a 27.5-gauge needle into the deeper layers of the dermis, at the junction between the dermis and the hypodermis, with the tunneling technique, while DermaDeep is supposed to be injected with a slightly bigger needle (26.5-gauge) deeper into the subperiosteal layer or the hypodermis. Overcorrection must be avoided. In addition, it is recommended that a period of at least 3 months should be left between two injection sessions (Bergeret-Galley et al. 2001).
1.4.3 Other Combinations

Nonbiodegradable and biodegradable products may be combined by the injector in one area, but should this be done? This question raises some controversy. For example, with PLA, where the onset of efficacy may be delayed, combination with another biodegradable filler such as hyaluronic acid might improve the patient’s satisfaction. On the other hand, if an adverse event occurs the culprit filler might be much more difficult to identify. Nevertheless, the combination of different fillers in one area does not necessarily increase the risk. Only 8.9% of patients with adverse reactions to injectable fillers from the Berlin registry reported an individual combination therapy. Nevertheless, since good epidemiological data is lacking, we would recommend using extreme caution when combining fillers of different origin for the same indication.

Table 1.4 Questions to ask when treating with new products

<table>
<thead>
<tr>
<th>Question</th>
<th>What you have to look for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Where does the data on efficacy – durability come from?</td>
<td>A randomized, double-blind controlled clinical trial compared to the gold standard (either collagen or hyaluronic acid)</td>
</tr>
<tr>
<td>Where does the safety data come from?</td>
<td>A clinical trial (this is good for short-term safety)</td>
</tr>
<tr>
<td></td>
<td>A post-marketing registry (this is good for long term safety)</td>
</tr>
<tr>
<td>How do you know it is a good trial?</td>
<td>Some basic criteria have to be met: the trial should comprise at least 50 patients, the trial should be randomized and double blind, there should be no or only a very few drop outs, meaningful outcome criteria should be used, the statistical analysis should be properly done (i.e., an intention to treat analysis including all randomized patients should be performed)*</td>
</tr>
</tbody>
</table>

* For further information about how to critically appraise a trial please see Williams et al. (2003)

1.5 General Approach to New Fillers

At the moment new injectable fillers are popping up like daisies. CE certification is the official way to introduce a new product onto the European market, but data from clinical trials are not required for a new filler if comparable filler sub-

stances are already on the market. As such, no clinical data on efficacy and safety exist for most of the new injectable fillers. Users should thus be cautious in embracing new products. Marketing approaches tend to include claims of durability and safety for biodegradable and nonbiodegradable products that may not stand the scrutiny of a clinical trial or postmarketing safety studies. Good data on efficacy and safety should be requested by every user (Table 1.4) to prevent patients being used as guinea pigs for companies that are reluctant to invest in clinical trials.

Fortunately there is a tendency for improvement, although at the moment most studies are being carried out in the United States. In general it is advisable to not conduct studies in only one country, but to place clinical trials in Europe or South America, for example, to acknowledge cultural differences and provide a broader and better base for regulatory decisions.
References

2.1 Introduction

Technical ability is fundamental for good medical practice, but the correct selection of patients is mandatory. Physicians who would like to successfully practice aesthetic medicine must understand that the vast majority of patients are unaware of what they really need. They know what they want, however it is the physician who understands the anatomical basis and aging process and who has to find a compromise between the expectations of the patient and what is possible. Patients are prone to ask for procedures that they have heard or read about in lay magazines. For example, it is quite common for patients request treatment of nasolabial folds with botulinum toxin A (BoNT-A), only because this product is widely advertised. In most cases, however injection of BoNT-A into the nasolabial fold would result in an unhappy patient because this would have little effect on the depth of the fold.

Patients with multiple needs and requesting immediate results are legendary. The first consultation is very important, as it gives the physician the opportunity to establish the kind of patient he will be treating. Uncompromising patients, for example, are best avoided. Dissatisfaction with prior aesthetic procedures is one of the most important points to be evaluated. It is therefore mandatory to conduct a thorough examination of their past history, which should include any prior cosmetic procedure, and how the result was perceived by the patient. Depending on the answer, the practitioner can evaluate the patient’s perception. Unrealistic expectations are
another important factor to be analyzed before
starting with any treatment. Experience shows
that sometimes it is preferable not to treat a spe-
cific patient, because whatever is done, dissatis-
faction will invariably result.

2.2 General Rules

As mentioned before, the first consultation is
very important for both the patient and the phy-
sician. Before the advent of the digital camera,
the physician would make an effort to make the
patient understand the limits of treatments and,
in particular, the limits of a specific treatment for
a specific patient. The lack of knowledge of the
vast majority of patients would often make it dif-
ficult for them to truly understand what the phy-
sician is telling them. Showing some before and
after pictures could be useful in some cases but
disastrous in others. Only the best cases would
be shown and patients may gain an unreasonably
positive impression of the results, since these re-
results may not be achievable in their case.

I will briefly describe how the first consulta-
tion is conducted and how the type of proce-
dures available and their limitations are made
clear to patients.

Without the digital camera it was particularly
hard to make patients understand the physical
limitations of certain procedures. Patients often
do not look at themselves in the mirror in the
proper way. Patients unconsciously correct any
defects by smiling or changing the angle when
facing the mirror. It is quite difficult for human
beings to face differences in beauty and accept
the aging process. If a woman was quite beauti-
ful when she was young, it is even harder to ac-
cept that she cannot become that beautiful again,
even after an invasive cosmetic procedure.

2.3 The First Consultation

When patients come into the office, they initially
complete the consultation form in which they are
asked what they would like to be treated. A com-
plete past history should be obtained and pic-
tures taken in several positions (frontal, oblique,
profile), and from the static and dynamic points
of view. Before the consultation, the photographs
are downloaded onto a computer and the physi-
cian and the patient go through the consultation
form. The patient is then taken to another room
to analyze the pictures. It is important to tell
the patients before the pictures are shown that
nobody likes this phase of the consultation but
that it is the most effective way of getting straight
to the point, and that it will be helpful to make
them understand their needs. By doing this the
consultation becomes more objective and time
is not wasted. It is impressive how difficult it is
for patients to see themselves exposed in this
way, particularly when it is the body that is being
analyzed, and as such the practitioner should be
very sensitive toward them.

It is interesting that it is usually the patient
him or herself who points out what treatment is
required, rather than the practitioner. It is also
at this point that some patients quickly change
their mind about what they want to treat, and
discrepancies that arise with regard to what was
noted on the consultation form can be pointed
out. This is the best opportunity to enlist the pa-
tient’s trust, and when we can begin to point out
what we can do to help the patient improve.

2.4 The Facial Thirds

To ensure that patients understand their prob-
lems, the face is divided didactically into the clas-
sical three thirds: superior, medial, and inferior.
The patient will be told that now all of the positive
and less positive aspects of their face will be dis-
cussed (it is recommended that physicians avoid
the use of any negative word during the consultation). Any possible negative aspect should be reinforced with some positive aspect in the face. The physician should point out what must be treated and whether it is a surgical or nonsurgical procedure that should be performed. In general, saggy skin is treated with surgery, dynamic wrinkles with BoNT-A, and folds with fillers. Patients start to realize what can be treated with these three types of procedure, and even when everything is needed to promote a real improvement. Some patients cannot be subjected to all procedures due to either social or economical reasons. Depending on their circumstances, the procedure is indicated and its limitations pointed out. It is very important to tell patients directly about the benefits and limitations of each procedure that they will be subjected to.

2.5 The Ideal Patient

The ideal patient is happy to listen to what the physician has to say. It is with this kind of patient that the physician may learn to distinguish between good or bad candidates for cosmetic procedures. This patient is able to point out what is bothering them and is willing to understand what steps must be taken in order to reach the aesthetic improvement. The ideal patient is able to balance the positive and negative outcomes, and therefore is able to make the most suitable choice. It is clear to them that even minimum invasive procedures must be handled by experienced physicians. The ideal patient discusses the type of product to be injected and is concerned about side effects. When it comes to the duration of the fillers, the ideal patient can understand perfectly differences in degrees of permanence when informed about the internal and external factors that may influence filler duration. The ideal patient is willing to learn what can be done to maintain good results and what should be avoided. It is perfectly understandable to them that the aging process is a continuing process and that there will be a need to return for other procedures to maintain the aesthetic result.

2.6 The Aging Patient

The aging process happens to all people who reach an old age. This does not mean, however, that all of us are prepared for that. Women, in general, are more likely to feel depressed by age-related changes to their body. Saggy skin, deep folds, wrinkles, and aging spots are some of the major signs that develop during this phase. It is hard to look at the mirror and at previous photographs and realize that time has passed. It is important to explain to patients that the aging process is complex and it results from various factors. If that is understood, patients may admit that a single procedure is not enough to solve all of the disturbances that accompany the aging process. It is easier if it is explained to the patients that the aging process derives from intrinsic and extrinsic reasons. Extrinsic aging results from environmental influences such as, for example, sun exposure, smoking, and climate. Intrinsic aging is influenced mainly by genetics. Asking the patients what their parents look like makes them aware of the fact that what is happening to them is natural. The most important information that patients must be given is that nothing can stop the aging process, but that something can always be done to smooth the signs of aging. The better they are, the better they can get. The sooner they start, the less invasive the procedure will be. It happens very often with fillers. The deeper the fold, the greater number of injections must be given. When I am asked about duration, I advise patients that they are starting a recovery process and that they should not let the wrinkles or folds get that deep again. Patients must be told that when they are starting a new procedure that they will have to come more frequently during the 1st year and that it is possible that the inter-
vals between visits will increase if they are to be properly treated. They must be told that there is no permanent miracle. The aging process is dynamic, and so, therefore, must be the procedures.

### 2.7 The Patient with Facial Imperfections

We are all quite asymmetric, and yet beauty is defined by balance and symmetry. The vast majority of patients that search for cosmetic improvement may be neither symmetric nor balanced. Before initiating the consultation, it is important to define as objectively as possible the evaluation of the patient’s physical attributes. The patient should be examined in the anterior, posterior, oblique, and profile positions. Static and dynamic analyses are also important. A patient’s imperfections may only be observed during dynamic analysis. It is usually quite impolite for the practitioner to start pointing out all the imperfections that patients present. Here, a digital camera may play a fundamental role in protecting the physician against being unkind to the patient. As it is often said, a picture says more than 1000 words. It is the patient who, when looking at the picture, will see and describe what he or she sees. This may be a very difficult time for patients and the physician again should be gentle and lead them to understand what can be done to improve their facial imperfections. It is not uncommon that patients become depressed when they look at their pictures.

The dialogue starts and the patient’s wishes and expectations are evaluated. Patients with imperfections may say they want everything changed, they feel themselves distorted, old, and imperfect. Dividing the face into the aforementioned three thirds is useful for the physician to focus on specific areas and ask the patient questions such as: What do you see in your forehead? Is there anything that bothers you there? Questions like these help the physician to indicate either surgical or nonsurgical methods. It is also important to determine whether or not the patient is open to surgery. Depending on the patient’s answer, the physician may explain what result is achievable by surgical or nonsurgical methods. A patient’s dissatisfaction arises mainly from promises made by the physician that remain unfulfilled after the procedure.

Patients should be told that there are imperfections that arise from the bone and that it is hard to treat these with noninvasive methods. The practitioner should be experienced enough to establish whether the imperfections are from soft or hard tissues, or from skin, fat, or muscle. The combination of BoNT-A and fillers may solve many imperfections in the skin, fat, and muscle. It is advisable for the patient to treat the imperfections step by step to perceive the gradual improvement. The physician may, based on experience, start with the procedures that will produce the most benefit for the patient. The patient’s confidence grows and so will continue to allow other procedures. It is important to point out that balancing both the static and dynamic aspects of the face involves more than simply filling a wrinkle or fold. It is very rewarding for a physician to realize that the patients with unusual cosmetic imperfections that they have treated feel much better after the procedure.

### 2.8 The Patient You Do Not Want to Treat

Bad candidates for cosmetic procedures may come from different economic, social, and ethnic backgrounds. The physician must be able to read the red signs some patients present even at the first consultation. At this time the physician must evaluate whether it is worth doing the procedure or not. Patients with unrealistic expectations will invariably be dissatisfied with the results of cosmetic procedures. Extreme expectations may
Selection of Patients

lead to poor results. For the cosmetic practitioner, some results may be considered excellent, but the patient may consider them extremely poor. Patients may believe that a cosmetic procedure will solve their personal problems, such as the expectation of looking 30 years younger, getting a new job, and improving their love life. Patients who have suffered any acute extreme psychological stress should also be avoided until they recover from it. Cosmetic procedures should not be considered as a compensation for life’s disappointments. Both the physician and the patient must agree with the expected final result; if not, it is advisable to avoid the procedure.

Patients are sometimes reluctant to hear what they are being told; they are considered poor listeners. Patients with deficient communication skills are also undesirable candidates. The understanding of possible adverse events and complications is very important. Poor listeners do not tend to hear topics like these. They must be encouraged to repeat what the likely result is and the risks of any procedure. Care should also be taken with manipulative, indecisive, impulsive, and hysterical patients. Other patients to be avoided are those who are obsessively concerned with their appearance, they may be dysmorphic.

they consider to be a poor candidate, telling them objectively, but in a compassionate way, that the result they are looking for cannot be obtained by him.

2.9 The Dysmorphic Patient

Patients with dysmorphism are those obsessively preoccupied with real or imaginary defects. They may even take the mirror to point out a defect that has not been noted by the physician. In general, those defects are minor but are perceived by them to be disfiguring. The inability to deal with unavoidable scars is also a warning that dissatisfaction may arise after the cosmetic procedure. Some patients do have a real psychiatric or emotional disorder. Patients with borderline personality, obsessive-compulsive, and narcissistic disorders should be avoided.

The physician should decline any patient that

References

3.1 General Requirements

3.1.1 Introduction

To ensure a safe and efficient procedure, several requirements have to be met. The following list is not intended to give a complete overview, but to give some tips on preparations that might be helpful.

3.1.2 Documentation

A thorough documentation of all treatment-related data is highly recommended.

This is not only advisable for legal and billing reasons, but will help to improve one’s own performance, and consequently the patient’s satisfaction.

3.1.3 Charts

In addition to the patient's identification data, their age and history of relevant concomitant diseases, present relevant drug intake (e.g., the intake of acetylsalicylic acid!), and previous aesthetic procedures should be documented. In particular, all previous injections of nonbiodegradable and biodegradable fillers need to be thoroughly assessed. Furthermore, the procedure itself has to be documented. This can be done either as text or as text supported by pictures of the areas to be treated. The injected filler substance, the injection areas, the depth of injections, and...
the injected volumes should be logged. Special attention should be given to the „lot” number of the filler used because this identifies the production batch and, in the event of adverse effects manifesting themselves, might allow the manufacturer to trace an entire batch.

3.1.4 Photographs

It is advisable to document the status of the patient before treatment. If possible the photographs should be standardized. Standardization requires some effort, such as using a fixed setting or following standard procedures (Fig. 3.1). In addition to being useful as legal documentation, these photographs will help to improve our communication with the patient (see Chap. 2).

3.1.5 Consent

The consent of each patient should be thoroughly documented. Patients should date and sign a consent form for each new filler substance. The consent form should be accompanied by a patient information brochure that includes all of the necessary information on the estimated efficacy and possible adverse events.

3.1.6 Treatment Plan

When using biodegradable fillers, a treatment plan is highly recommended. Patients should be made aware of the fact that repeated sessions are necessary to achieve constant results. For example, hyaluronic acid preparations may require three sessions over 6 months (weeks 0, 4, and 24).

3.1.7 Staff

Staff have to be trained in marketing, quality control, and assistance. They should be aware of the aesthetic procedures offered and should be able to provide some information about the fillers used. They are responsible for monitoring the patient’s chart and for ensuring that all necessary documents are available and signed by the patient. And finally, the staff may help to apply topical anesthesia, massage the area after the injection of the filler, or add cooling before or after the injection to reduce pain and swelling.

3.2 Technical Requirements

3.2.1 Room

The procedure room should be brightly lit. No shadows should decrease the visibility of the area to be treated.

3.2.2 Chair

For most procedures patients should have a relaxed upright position to ensure that optimal correction of the facial lines or volume deficits can be achieved. However, a more reclined position might be helpful when treating areas such as the upper lip.

3.2.3 Mirror

Like the patient’s baseline digital photography, a mirror should be provided to ensure that patient–doctor communication is optimal from the start. The doctor should use the mirror to ensure that patient and doctor are discussing exactly the same areas to be treated and the grade of correction that is desired.
Fig. 3.1 Standardized documentation of the glabellar area (photographs from the German GLADYS study) (Rzany et al. 2005)
### 3.2.4 Small Things

A standard setting can prove useful to ensure that all tools required are available. All required tools, listed below, should all be within reach.
- Patient information and consent forms
- Documentation material for source data (electronic or conventional charts)
- Handheld mirror
- Camera (conventional or digital) for photographic documentation
- Topical local anesthetic or syringe, needles with appropriate local anesthesia
- Topical disinfectant
- Nonsterile compresses
- The injectable filler, appropriate syringes, and needles
- Cool packs or precooled saline to soak the compresses
- Emergency kit (in case of an anaphylactic reaction towards the local anesthetic)

### 3.2.5 First-Aid Kit

Most injectable fillers have a zero risk for systemic reactions. However, local anesthesia might cause (fortunately rarely) anaphylactic reactions, and it is possible for patients to collapse due to circulatory imbalance, for example when treating the upper lip area with insufficient local anesthesia.

### 3.2.6 Tips and Tricks

Most complaints from unsatisfied patients can be attributable to insufficient communication between the doctor and the patient. This also applies to the cost related to these procedures! Patients should know from the start how much they have to pay.

### 3.3 The 13 General Rules

#### 3.3.1 Introduction

Working with injectable fillers can be extremely rewarding for both the patient and the treating physician if some simple rules are followed. These rules will be discussed more deeply in other chapters of this book.

#### 3.3.2 Rule 1: Listen to the Patient

Patients and doctors are prone to the same verbal misunderstandings as everybody else. In aesthetic medicine a disaster might result if the doctor misunderstands the patient’s meaning. It is therefore very important to listen to the patient, to try to understand what the patient really wants. If possible, use a digital photograph of the patient as the basis for your discussions.

#### 3.3.3 Rule 2: Fillers are Only One Tool

Even when you are very enthusiastic about fillers, do not forget that fillers are only one tool in aesthetic medicine. Do not treat with fillers indications that might be better treated with another method. For example, BoNT-A is the first-line treatment for wrinkles of the glabella; biodegradable injectable fillers should come as a second step in this area.

#### 3.3.4 Rule 3: Talk About Money

The patient should have a clear picture about what he will have to pay for which treatment. If you use biodegradable fillers, make it clear that in most patients one treatment will not be enough
and that subsequent treatments will be necessary to ensure a good result. It might be helpful to include the subsequent treatments in the first cost estimation for the patient. Tell the patient, for example „If you start with this procedure (and you like it), you will need to have at least two to three treatments over the following 12 months, which will cost you approximately this amount of money per month”.

3.3.5 Rule 4: 
Talk About Possible Adverse Events

Adverse events can occur for all fillers. Make sure that patients understand what might occur without frightened them.

3.3.6 Rule 5: 
Avoid Disturbed Patients

Dysmorphia exaggerates the negative implications of certain bodily features for a patient. The patient shown in Fig. 3.2, for example, felt her lips to be particularly small, which made her afraid of never being able to find a decent partner. Patients with a dysmorphic disorder can make a physician’s life miserable. Therefore listen to your gut. If you have doubts, talk the patient out of the procedure or your office (see Chap. 2).

3.3.7 Rule 6: 
Anesthesia – Numb the Patient!

You do not want a patient with tears running down their cheeks. Anesthesia is mandatory, especially when treating sensitive areas such as the lips.

3.3.8 Rule 7: 
Position – Keep the Patient Upright

You might treat the patient in a supine position. However, when gravity is likely to influence the depth of the wrinkles, for example in the case of nasolabial folds, the patient should be seated in the upright position. If not, the wrinkles will be undercorrected.

3.3.9 Rule 8: 
Use the Mirror

Using a mirror will help your communication with the patient, to plan the procedure appropriately, to increase the patient’s understanding of the nature and the possibilities of the procedure, and to ensure that the final effect is what the patient wants. Although most patients do not want to watch the procedure itself, they are usually very interested in taking a look at the preliminary results. Showing the patient the half-treated status will ensure that they acknowledge the difference. Sentences like: “I do not see any difference” will thus be avoided.

Fig. 3.2 Dysmorphic patient. The patient perceived her lips as too small and requested a touch up. Please note the small excoriations on the patient’s cheek, which are consistent with the features of acne excoriée, a neurotic skin disease
3.3.10 Rule 9: Start With a Biodegradable Filler First

If you have a patient who comes for a nonbiodegradable filler, start with a biodegradable filler first. Injecting a nonbiodegradable filler at the first visit can lead to very unhappy patients.

3.3.11 Rule 10: Quantity of Filler – Do Not Inject Insufficient Amounts

Injection of insufficient filler will leave you with an unhappy patient. Make sure that the patient understands that if he wants an optimal result he has to invest for this accordingly.

3.3.12 Rule 11: Quantity of Filler – Do Not Inject Too Much

Too much filler is not a good idea either. You do not want a patient with large lumps of an injectable filler that can be seen or felt over weeks or even months.

3.3.13 Rule 12: Injection Techniques – Do Not Increase the Visibility of Fillers

When dealing with furrows that are exacerbated by gravity it is advisable to inject medially to the fold. If you inject laterally, the fold will become deeper.

3.3.14 Rule 13: If Something Goes Wrong

If something goes wrong, for example the patient is overcorrected or the patient has an adverse reaction to the injectable filler, be accessible and understanding. Most lawsuits arise when the doctor/patient relationship is dysfunctional.

References

1. Rzany B et al. for the GLADYS-study group (2005) Efficacy and safety of 3 x 10 (30) units and 5 x 10 (50) units of botulinum toxin A (Dysport®) for the treatment of wrinkles in the glabella and forehead region. Accepted Arch Dermatol.
4.1 Introduction

Pain is one of the most fearful experiences for human beings. Topical anesthetics, infiltration, and nerve blocking have been found helpful in making cosmetic procedures more pleasant and tolerable for the patient (White 1986). However, for a variety of reasons, the vast majority of dermal filler injections are undertaken under insufficient topical or no anesthesia at all. Since one reason may be the lack of familiarity with these procedures, this chapter will describe the most common forms of local anesthesia. In addition to taking time to explain the procedure to novice patients and answering any questions they may have, local anesthesia is one of the most important factors that help to decrease or even avoid anxiety.

4.2 Preoperative Evaluation

The preoperative evaluation determines the type of anesthetic procedure to be used as well as the need for any drug for pain relief after the treatment. Simple procedures rarely require the use of adjunctive agents, except in very anxious patients. Be aware that a medical history must be taken and a physical examination performed prior to the use of any medication (Snow 1982). Preexisting medical conditions such as hypertension and heart diseases may influence the use of anesthetics in combination with epinephrine. A history of alcohol consumption, use of sedatives, and problems with anesthetics dur-
ing dental procedures may indicate that extra care should be taken with these patients. The potential of drug-drug interaction with some of the anesthetic agents should be evaluated before any prescription of analgesics. It is important to ask the patients if they have had any undesirable experience with topical, infiltrative, or blocking procedures. Patients should also be asked about the use of any illegal drugs before the administration of any anesthetic medication.

4.3 Local Anesthesia

Local anesthetics decrease or completely block sensory, autonomic, and motor functions. They act by blocking sodium channels at the cell membrane and interrupting the excitation-conduction process (Carvalho and Mathias 1997). The systemic absorption of the local anesthetics depends upon the vascular flow at the injection site, the chemical and physical characteristics of the agents, and the adjunctive use of vasoconstrictors such as epinephrine. Vasoconstrictors will decrease the absorption and enhance the availability of the local anesthetic to the nerve cells, thus prolonging the duration of action and decreasing possible systemic effects. Care should be taken not to inject local anesthetics into areas of terminal circulation due to an increased risk of necrosis.

4.4 Topical Anesthesia

In most cases, the level of anesthesia achieved with a topical anesthetic will be sufficient to alleviate discomfort during the injection of dermal fillers. There are basically two groups of topical agents: the ester group (cocaine, tetracaine, and benzocaine), and the amide group (lidocaine and prilocaine).

The stratum corneum is a strong barrier to the absorption of drugs through the skin. The skin should be cleaned with antiseptics before applying the topical anesthetic cream; this will allow better permeation of the topical agents. The effect might also be enhanced by rubbing a dry gauze on the surface to remove dead cells and grease. The vasodilatation that results from this rubbing of the skin may also increase the permeation of the drug. Although effective, tape stripping of the skin to remove the outer layer of dead cells and enhance penetration of the topical anesthetic is often impractical (Monash 1957).

One of the most common topical anesthetics is a eutectic mixture of 2.5% lidocaine and 2.5% prilocaine, which is marketed as EMLA cream. It is a nontoxic mixture whose use results in very low plasma levels. The usual dose is 1 g for each 10 cm² of intact epidermis. The cream should be in contact with the skin for approximately 45 min to 1 h with occlusive dressing (Hallen and Uppfeldt 1982).

Cryohanesthesia is another method of inducing topical anesthesia. The simple application of ice bags may enhance the anesthetic effect. In fact, for some patients the use of ice bags alone will provide enough anesthesia. Other topical freezing agents include ethyl chloride or dichlorotetrafluoroethane sprays, but these are unlikely to be used when the treatment involves dermal fillers.

4.5 Infiltrative Anesthesia

Direct inhibition of nerve ending excitation may be achieved by infiltrative anesthesia. The drug of choice is generally 1% lidocaine, which is injected intradermally or subcutaneously. Intradermal injection results in a rapid onset and longer duration of anesthesia, but it has the disadvantage of itself being painful and causing tissue distortion. Subcutaneous injection is less painful but has a shorter-lasting effect (Arndt et al. 1983). During infiltrative anesthesia, patients usually feel a prick when the needle pierces the skin and a burning sensation with infusion of the anesthetic itself. Pain results from rapid tissue
distention, and so the use of smaller volumes is advised to avoid this discomfort. The combination of freshly prepared solutions with epinephrine or bicarbonate can greatly reduce the pain during infiltration (McKay et al. 1987). For very anxious patients it may be useful to apply topical anesthetics before administering the infiltrative anesthesia.

### 4.6 Nerve Block

Nerve block anesthesia is effected by an injection of a small amount of local anesthetic around a nerve, resulting in anesthesia within the area supplied by that nerve. The volume of anesthetic used in these procedures is small and so there is a low risk of systemic toxicity. In contrast to the infiltrative method, there is almost no imbalance with nerve blocks and it is associated with less discomfort. However, this method requires good technical and anatomical knowledge to obtain optimal results with few injections and to avoid adverse events. There is the possibility of inadvertent laceration of the nerve and blood vessel injuries. Long-lasting dysesthesia and hematoma or ecchymosis may occur in a few patients, which may be quite distressing (Laskin 1984).

The sensitivity and motion of the face are dependent on the fifth pair of cranial nerves (Fig. 4.1). The main trigeminal branches have independent exits from the skull. The ophthalmic branch is more superior and passes inside the orbit, forming the frontal branch, which bifurcates into the supraorbital and supratrochlear nerves. The other two branches are the maxillary nerve, which produces the infraorbital nerve, and the mandibular nerve, which is the largest and the only one to contain motor fibers, and which produces the mental nerve. Nerve block is usually achieved with 1 or 2% lidocaine. A combination of epinephrine and lidocaine is preferable when a quicker and longer-lasting anesthetic response is required. Care should be taken not to inadvertently inject this into the blood vessels. Epinephrine should also be avoided in patients with hypertension or cardiovascular diseases.

Pain results from tissue expansion during the injection and as a result of irritation from the anesthetic itself. Gentle injections are preferable and provide a quite tolerable nerve block.

---

**Fig. 4.1** The areas supplied by the main facial nerves (de Maio 2004)
4.6.1 The Supraorbital Nerve

4.6.1.1 Anatomy and Territory

The supraorbital nerve exits the skull through the supraorbital foramen, which lies along the supraorbital ridge in the midpupillary line. It supplies the forehead.

4.6.1.2 Technique

Inject 0.5–1 ml lidocaine right into the depression in the internal third of the eyebrows (supraorbital notch) with the needle pointed toward the forehead (Figs. 4.2 and 4.3).

4.6.2 The Supratrochlear Nerve

4.6.2.1 Anatomy and Territory

The supratrochlear nerve exits the skull along the medial corner of the orbit. It supplies the medial portion of the forehead.

4.6.2.2 Technique

Inject 0.5–1 ml lidocaine at the junction of the root of the nose and the upper rim of the orbit, just below the medial portion of the eyebrow (Fig. 4.4).

4.6.3 The Infraorbital Nerve

4.6.3.1 Anatomy and Territory

The infraorbital nerve exits the infraorbital foramen in the midpupillary line about 1 cm inferior to the infraorbital ridge. It supplies the lower eyelid, nasolabial fold, upper lip, and part of the medial cheek and nose.

Fig. 4.2 Anatomy and blocking of the supraorbital nerve. 1=external branch of the frontal nerve; 2 and 3=internal branch of the frontal nerve (de Maio 2004)

Fig. 4.3 Blocking of the supraorbital nerve

Fig. 4.4 Blocking of the supratrochlear nerve
4.6.3.2 Technique

The infraorbital foramen can usually be palpated. There are two ways of blocking it: by a cutaneous or a mucosal approach. For cutaneous injections, the needle should be placed 1 cm below the inferior orbital rim in the midpupillary line and 0.5 ml lidocaine injected around but not into the canal. The needle should be advanced through the mucosa then through the superior labial sulcus, aiming at the iris at the canine level. A total of 1 ml lidocaine should be injected using a retrograde technique. Control of the needle is undertaken externally with palpation (Figs. 4.5 and 4.6).

4.6.4 The Mental Nerve

4.6.4.1 Anatomy and Territory

The mental nerve exits the mental foramen approximately 2.5 cm from the midline of the face in the midpupillary line. It supplies the lower lip and chin.

4.6.4.3 Technique

Inject 1 ml of lidocaine through the inferior labial sulcus, inserting the needle between the sec-
ond and third inferior premolars aiming at the foramen mentalis (Fig. 4.7).

4.7 Adverse Events

Adverse events can result from the anesthetic itself, but are usually more common when epinephrine is used concomitantly. Short-term systemic reactions to epinephrine include tremor, tachycardia, restlessness, palpitations, headache, increased blood pressure, and chest pain (Grekin and Auletta 1988). Systemic reactions to local anesthetics can occur when toxic levels are reached. The use of larger volumes than recommended and inadvertent intravascular injection are the most common causes of toxicity.

Systemic toxicity of local anesthetics is characterized by central nervous and cardiovascular impairment. Signs and symptoms of toxicity depend on the velocity of injection and plasma concentration of the drug. The diagnosis of severe toxicity is mandatory: lip and tongue paresthesia, blurred vision, motor fasciculations, tinnitus, seizures, unconsciousness, coma, and respiratory and cardiovascular depression (Mather and Cousins 1979). Local anesthetics block sodium channels, causing myocardial depolarization and a reduction in nerve conduction velocity. Aesthetic treatment involving local anesthetics should therefore be carried out in conjunction with support measurements such as ventilation, oxygenation, and cardiovascular optimization.

Allergic reactions to anesthetics are rare, but have been known to occur with ester preparations (Brown et al. 1981).

4.8 Disadvantages of Local Anesthetics

The eutectic mixture of 2.5% lidocaine and 2.5% prilocaine may decrease the visibility of fine wrinkles, thus making it impractical for treatments involving very fine fillers such as colla-
gen and some hyaluronic acid products. Nerve blocking might change considerably the shape of, for example, the nasolabial fold and the upper lip and may therefore encourage under- or overcorrection.

4.9 Tips and Tricks

Never let the patients feel pain during aesthetic procedures. Any negative experience may mean that patients will refuse to continue with facial improvement. Anesthesia should be seen as one of the most important steps during aesthetic treatment with fillers.

References

# Chapter 5

## The Most Common Indications

M. de Maio and B. Rzany

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5.1 Forehead and Glabella

5.1.1 Introduction

BoNT-A is the treatment of choice for forehead and glabellar folds. However, with very deep lines, BoNT-A alone might not be sufficient to improve the patient’s overall appearance. Here, the best possible effect might be gained using fillers (Figs. 5.1–5.4).

5.1.2 Anatomy

The forehead and glabellar areas are characterized by extensive mimic movements of three main muscles: occipitofrontal, corrugators, and procerus. Horizontal forehead lines appear when the occipitofrontal muscle is activated. The vertical glabellar folds are the product of the continuous contraction of both corrugator muscles. The horizontal lines in the glabellar area are due to pronounced procerus muscle activity.

5.1.3 Patient Evaluation and Selection

Patients should be critically appraised for possible pretreatment with BoNT-A; additional filler therapy in these areas often turns out to be unnecessary after pretreatment with BoNT-A. Patients presenting deep forehead and glabellar folds will require a filler that can be injected more deeply (in the deep dermis) to increase volume. Patients presenting with superficial forehead and glabellar folds or lines might benefit from a fine or very fine filler that needs to be injected more superficially. Examples might...
be a fine collagen or a very fine hyaluronic acid preparation. A slight overcorrection has to be used for collagen. Please be aware of the fact that too much overcorrection with hyaluronic acid or a too superficial injection might lead to whitish or bluish lines. For deep and superficial forehead and glabellar folds, the appropriate fillers should be combined.

### 5.1.4 Techniques

Anesthesia is not usually necessary. Most of my colleagues use the retrograde tunnel technique (i.e., the filler is injected while withdrawing the needle), as it allows a faster application. However, the multiple injection site technique can also be used. This technique will help to blend the filler better in the surrounding area. Deep and superficial forehead and/or glabellar lines might require multilevel injections. The injection should not be deep. An injection below the fascia might encourage migration of the filler (for example from the glabella to the perinasal area). Furthermore, nonbiodegradable products or products with a large particle size should be injected very carefully in the glabellar area as necrosis due to the occlusion of arteries has been reported.

### 5.1.5 Touch Up

Deep glabellar folds might need a touch up after 2–4 weeks when a biodegradable filler is used.

### 5.1.6 Tips and Tricks

Before injecting a filler for forehead and glabellar folds it is recommendable to pretreat this area with BoNT-A. The combination of BoNT-A and an injectable filler usually leads to a better overall result. BoNT-A should be injected 2 weeks after the injection of hyaluronic acid.
before the filler, although both procedures can be performed at the same time for this area.

Any remaining superficial lines above the eyebrow after treatment of the upper third with BoNT-A can easily be corrected with a fine biodegradable filler. Correction with BoNT-A is also possible, however this would carry a small risk of brow ptosis.

5.2 Eyebrow

5.2.1 Introduction

One of the most important aspects of beauty concerns the position of the eyebrows. It has been established that “well-demarcated eyebrows should arch slightly at the junction of the medial two-thirds and lateral one-third of the face”. Variations of color and texture of the hair contribute significantly to the overall perception of the image. However, it is the volume and mass at this level that determine the uniqueness of beauty. Eyebrow dimensions vary widely on an individual and ethnic basis.Eyebrow hair in the medial one-third is full and tends to sweep upward and laterally. In the middle one-third, hair direction is more horizontal and lateral; it points downward. It should be noted that normal eyebrow position differs from men to women and this has to be taken into account when proper correction of undesired aspects of the eyebrows is considered.

The eyebrows not only frame the upward arc of the orbit but are expressive of emotions such as anger, frustration, and uncertainty. Any negative aspect concerning the eyebrow symmetry, position, and fullness influences the overall aesthetic balance of the face. Eyebrow position will change with age, as gravity and loss of soft-tissue support result in ptosis, thereby creating a tired and sad look. Eyebrow ptosis leads to lateral hooping of eyelids and the resulting skin excess influences the crow’s feet lines. Hyperactivity of the frontalis muscle is an attempt to correct malposition of the eyebrow and results in transverse lines in the forehead.

Rejuvenation of the upper face may be accomplished using surgical and nonsurgical techniques. Nonsurgical techniques include ablative methods, BoNT-A, and fillers. The surgical approach includes the temporal lift, the endoscopic browlift, and the coronal lift. Some of the surgical techniques targeting upper-third rejuvenation present certain limitations. Depending on the chosen technique, there may be no effect on glabellar and forehead lines or those in the middle and medium part of the eyebrow. Therefore, other methods, such as fillers and BoNT-A are mandatory for a complete improvement.

5.2.2 Anatomy

The aesthetic forehead unit comprises the upper one-third of the classical “facial thirds”. It extends vertically from the supraorbital rim to the anterior hairline. The skin in the forehead is generally thicker than in the lower face, and five layers are encountered at this level: skin, subcutaneous tissue, galea aponeurotica, a part of the submuscular aponeurotic system (SMAS), the loose subaponeurotic areolar layer, and the periosteum.

The forehead and eyebrow positions are dependent on the frontal bone, the supraorbital rims, and the zygoma. The action of the frontalis, corrugator, and procerus muscles also influence their position. The underlying bone structure, rather than the soft tissues can be responsible for aesthetic problems. The contour of the orbital bone and its prominence, which can be targeted by fillers, is very important for eyebrow position. The eyebrow is an important demarcation line dividing the upper and mid-thirds of the face.

Understanding the eyebrow shape and its position with respect to the supraorbital rim is essential for promoting good results. The eyebrows should be 5–6 cm below the hairline. The medial portion of the eyebrow should lie on a perpen-
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The lateral eyebrow ends at an oblique line drawn from the alar base through the lateral canthus. The medial and lateral ends of the eyebrow lie at the same horizontal level. In women, the eyebrow should lie above the supraorbital rim and in an arch shape with its highest point at the level of the lateral limbus of the eye at approximately the junction of the medial two-thirds and the lateral third of the eyebrow. In men, the arch must be smaller and lie slightly lower at the supraorbital rim than in women. It also tends to be heavier in men than in women (Fig. 5.5).

The soft tissue at this level comprises the balance of four muscles that act on this area: three depressors (orbicularis, procerus, and corrugators) and one elevator (frontalis). The frontalis arises from the anterior aspect of the galea and inserts into the skin, superficial fascia, upper fibers of the orbicularis oculi, and corrugators (Williams et al. 1989). When activated it will allow a good elevation of the eyebrows.

The fascia superficialis is known as the temporoparietal fascia and the galea in the temporal area and forehead, respectively. There is a fat pad called the galea fat pad in the glabella and over the eyebrows. The superficial fat is sparse in the forehead, glabella, temporal, and orbital areas. It is dense due to fibrotic septa in the forehead region. Deep fat is dense in the temporal and periorcular areas and it is at this level where the temporal extension of the deep fat pad of Bi-chat may be found. In the upper face, the SMAS is denominated the galea aponeurotica, which envelops the frontalis, the occipitalis, and the procerus. The frontalis forms the frontal belly of the occipitofrontal muscle and is inserted into the galea aponeurotica. The galea connects the frontalis and the occipital muscles. In the central forehead, the frontalis muscles are paired and united by the superficial fascia. This raises the eyebrows and produces the forehead hyperkinetic lines. The frontalis antagonists are the corrugators, procerus, and orbicularis oculi.

The corrugators arise from the inner and anterior portions of the superior medial orbital rim above the nose and insert into the frontalis and the skin at the level of the eyebrow (Larabee and Makielski 1993). Their action pulls the eyebrows together and downward, producing the glabellar lines. The procerus arises from the nasal bone in the glabella and inserts into the forehead skin. Its action pulls down the medial part of the eyebrows and may cause transverse lines. The orbicularis oculi muscle arises from the medial palpebral ligament and is divided into two parts: the palpebral and the orbital. It is responsible for eye closure and blinking. The lateral part of the orbicularis oculi depresses the eyebrow.

The supraorbital artery is a terminal branch of the ophthalmic artery from the internal carotid artery. The superficial temporal artery is the terminal branch of the external carotid artery and divides into two major branches. The carotid

Fig. 5.5 Examples of different eyebrow shapes
veins accompany these arteries. The frontal branch of the facial nerve may be found within the temporoparietal fascia, from the midportion of the zygomatic arch up to its entrance to the frontalis muscle. It provides motor innervation to the frontalis, corrugator, and procerus muscles. It also innervates the cephalic portion of the orbicularis oculi (Pitanguy and Ramos 1966). The supratrochlear nerve exits the orbit between the periosteum and the orbital septum at the medial supraorbital rim. It runs along the caudal aspect and within the corrugator muscle and then superiorly on the inner surface of the frontalis fascia to supply sensation to the medial and central forehead. The supraorbital nerve exits between the medial and central thirds of the superior orbital rim and runs superiorly and laterally on the inner surface of the frontalis fascia and galea. It is responsible for sensation in the anterior lateral forehead and scalp. The temporal branch of the facial nerve passes posterior to the middle aspect of the zygomatic arch, where it lies quite superficially beneath the subcutaneous fat.

### 5.2.3 Patient Evaluation and Selection

The initial consultation should include a physical evaluation and provision of education about the benefits that fillers may bring to brow reshaping. Patients should understand that it is not a surgical procedure and that what fillers may promote is basically a mild volumetric augmentation of the lateral orbital roof and a millimetric elevation of the eyebrows. Other aspects of the upper third such as hyperkinetic forehead and glabellar lines and the desire to have a major lifting of the eyebrows should be treated with BoNT-A or with selective endoscopic muscle transection. The pa-
The patient should be evaluated for eyebrow position and mobility, eyelid function, and the presence of skin excess and eye bags. Pretreatment planning should include photographic documentation and a clear explanation of the final result.

Some clinical situations make treatment with fillers difficult or contraindicated. Severe or moderate ptosis of the eyebrows cannot be improved with fillers because of the inherent limitations of the procedure. The best results are those with symmetric mild ptosis of the eyebrows and thin skin. In these cases, the skin tends to have more mobility for both expansion and elevation. Mild upper eyelid skin excess can be improved in selected cases.

Eyebrow position is one of the common areas of asymmetry. It is quite difficult to find someone with eyebrows that are the same shape and in the same position. Therefore any asymmetry, which is quite common in middle-aged women, must be thoroughly documented before injection.

5.2.4 Technique

Eyebrow elevation does usually do not require local infiltration or nerve blocking prior to the injection of the filler. Only topical or no anesthetic at all is usually required for this procedure. With the proper technique, this procedure may be considered quite painless.

After examining the patient, the requirement for medial, central, or lateral elevation must be evaluated. Before starting the injection, it is advisable to stretch up the eyebrow with the finger to verify the mobility of the medial, central, and lateral part of the eyebrow. When major expansion is desired, the entire eyebrow should be injected. If only lateral elevation is desired, a small quantity of product (0.2 ml) is needed on the lateral part of the eyebrow (Fig. 5.6). Mild differences in position may be achieved by varying the quantity of product injected.

Although the vast majority of fillers are designed for intradermal injections, biodegradable products can be injected into all layers beneath the eyebrow for a better performance of the filler. The filler should be injected onto the periosteum, into the muscle, and subdermally. The injection must be soft, and touching the periosteum (which would cause pain) should be avoided. While injecting, it is advisable to stretch up the eyebrow and place the thumb on the upper eyelid to avoid migration of the product down to this area (Fig. 5.7).

After injecting the entire eyebrow or into a specific area, it is advisable to compress the eyebrow for a few seconds to avoid bleeding and keep the product at the proper site. Bleeding is generally light and only minor edema usually occurs. Ice bags are put in place immediately after the procedure. Microtapes are usually placed onto the site for 2 days to help maintain the eyebrow shape and to reduce edema and migration of the product down to the upper eyelid. Post-treatment pain is usually minimal and the use of any medication is rare.

Patient satisfaction is usually good if the limitations of the results are understood. Fillers are also helpful when enlargement of the orbital area is desired (Fig. 5.8). The most common indication is the lifting of the upper lateral part of the eyebrow (Fig. 5.9). When fillers are combined with BoNT-A treatment, the results tend to be longer lasting and more gratifying.

5.2.5 Complications

Bleeding at the injection site is rare and may cause local and upper eyelid ecchymosis. Proper delicate injection avoiding blood vessels may control bleeding. Immediate compression is advisable in these cases. Infection is very rare due to the rich blood supply at this area. Local pain and discomfort during injection is probably the result of touching the periosteum with the needle.

Edema after injection is quite common and should be explained to the patient. Surface irregularities result from irregular placement of
the fillers. Asymmetry can be corrected with complementary injections of fillers.

The most feared complication is migration of the filler down to the upper eyelid. This can be avoided by using the proper technique and injecting only small quantities of the required product. Other complications, such as those found in association with surgical procedures (e.g., numbness, paresis, scars, alopecia, and nerve damage) do not occur as a result of treatment with fillers.

5.2.6 Tips and Tricks

Fillers injected into the eyebrow may be nicely combined with BoNT-A in the upper part of the face. This will improve the eyebrow position, especially in its upper lateral part. Care should be taken to avoid migration down to the skin of the upper eyelid.

5.3 Tear Trough, Cheekbones, and Cheek Reshaping

5.3.1 Introduction

The malar projection and full cheeks are important hallmarks of facial beauty and a youthful appearance. Degenerative changes of the skin and atrophy of the underlying fatty tissue combined with deficient bone structure at the zygoma level may produce excessive deep folds and wrinkles in the midface. One of the main goals of aesthetic medicine is to balance the proportions of the facial features. During a patient’s aesthetic evaluation, the cranial bones and the overlying soft tissue elements should be carefully analyzed for symmetry, equality of proportions, and the relationship between the aesthetic units.

Fillers may be an important tool for correcting mild asymmetries and for promoting augmentation in the cheeks and cheekbones. However, severe asymmetries and disproportions should be treated surgically. Soft tissue advancement is not an easy task even when surgical procedures are undertaken. For example, if the base of the nose advances 4 mm per 7 mm of maxillary advancement, the nasal tip advances only 2 mm (Freihofer 1976). Injectable fillers may also be useful as a pretreatment before surgery during the planning phase and as an option for correcting minor defects after surgery.

5.3.2 Anatomy

The middle third of the face encompasses the area between the eyebrows and the base of the nose, and the inferior third reaches from the nasal base to the menton. The ideal location of
The cheekbone prominence is 10 mm lateral and 15 mm inferior to the lateral canthus. Deficits at this level are the result of maxillary elongation and are usually accompanied by lack of midface projection. The cheek is framed superiorly by the malar complex and inferiorly by the mandible. The size and shape of the cheeks are determined by the parotid gland, the musculature, and the buccal fat.

Any midface analysis must include the tear-trough area and the submalar triangle (Tobias and Binder 1994). Tear-trough deformities become visible in cases of infraorbital rim depression. The submalar triangle is an inverted triangular area of midfacial depression and is limited superiorly by the prominence of the zygoma, medially by the nasolabial fold, and laterally by the body of the masseter muscle.

The SMAS comprises the superficial fascia and envelopes the majority of midfacial musculature. The superficial fat to the SMAS is dense in the cheek and the nasolabial fold and jowls. The superficial malar fat pad is divided into the cheek portion and the jowl portion. The deep fat is dense in the anterior and middle cheek. The deep components of the malar fat pad may be encountered between the facial muscles. The buccal fat pad of Bichat is anterior to the masseter and lies deeper to the deep fascia at the buccal level.

The suborbicularis oculi fat (SOOF) is situated over the lower portion of the zygomatic body and beneath the muscle. It is separated from the periorbital fat by the thin orbital and malar septa. The presence of the malar bags may result from the ptosis of the SOOF.

In the cheek area, the buccinator muscle arises posteriorly from the pterygomandibular raphe. The buccinator muscle is localized deep to the buccal fat pad and extends anteriorly to attach to the orbicularis oris. The masseter has a superficial and a deep part. The superficial part arises from the lower border of the anterior two-thirds of the zygomatic arch and the deep part originates from the inner surface of the posterior third. It inserts into the entire lateral ramus of the mandible. Its function is to elevate the mandible.

The malar prominence area has large musculocutaneous perforators. Just lateral to the nasolabial groove, there is a concentration of fatty tissue, the so-called malar fat pad. The facial nerve branches and the parotid duct are deep to the SMAS and superficial to the masseter and buccal fat pad. The zygomatic and buccal branches of the facial nerve become more superficial in the medial cheek (Hamra 1993). The infraorbital nerve is located deeply, along the bony midface. It is responsible for the sensitivity of the cheek and lip.

As the aging process progresses, ptosis and pseudoherniation of the SOOF and the orbital fat pads occur. Malar bags result from the ptosis.
of the SOOF and occur below the level of the orbital rim. Loss of midfacial cheek support causes accumulation of anterior and inferior cheek fat and loss of lateral and superior cheek fat. This change of anatomy results in deep nasolabial folds, multiple folds in the cheek when smiling and a hollow in the submalar area. The descendent vector will also produce a skeletonized appearance of the cheekbones.

### 5.3.3 Patient Evaluation and Selection

The use of fillers for reshaping the cheekbones must obey specific rules: the best results are obtained in patients with good midfacial fullness but insufficient malar projection and with minor malar and submalar deficiencies. It is also a good option for young patients with good malar bone structure who complain of early flatness of the midface.

Patients with extreme malar deformities and a severe submalar recess are not good candidates for fillers and conventional malar implants must be considered. Patients with a deficient midface present a narrow nose with a shallow dorsum and a sunken, thin upper lip. The treatment of choice is usually maxillary advancement and there is generally a 0.5:1 ratio of soft tissue to bony movement. Fillers may also be helpful for complementing soft tissue advancement.

Balancing the midface in selected cases may promote nice and natural results without the need for surgical procedures with their accompanying postoperative period with ecchymosis and edema.

The skin of the cheeks may show considerable elastosis. Patients with thin skin are suitable for this procedure. Elastotic skin may be difficult to treat. Multiple sessions with hyaluronic acid may be useful to increase its consistency.

### 5.3.4 Technique

Biodegradable products are safe, although by definition are not durable enough. Combining hyaluronic acid and collagen promotes a longer-lasting effect. Collagen may be injected deeper and hyaluronic acid more superficially. Collagen can also be injected externally as a frame and then inside the frame; combination therapy is the best choice.

Nonbiodegradable material should be injected deeper. The product will not form a lump or be palpable if placed close to the periosteum. It is preferable to inject these materials with blunt needles to help avoid blood vessels.

### 5.3.5 Tear Trough

The lower lid should be smooth with no evidence of bagginess beneath the preseptal orbicularis muscle, and no delineation of the inferior orbital rim should be evident. Mild tear-trough deformities (e.g., infraorbital rim depression) are a good indication for fillers. The presence of fillers along the infraorbital rim may improve the suborbital groove.

Topical anesthetics are usually sufficient for treatment of the tear-trough area. A careful approach is recommended as this area may lead to ecchymosis due to its vascularization and thin skin. Treatment may also encourage nodule formation. Smaller polymers are the best to start with. After skin demarcation, subdermal and intramuscular injections are undertaken (Figs. 5.10 and 5.11). It is advisable not to overcorrect this area. A two-step treatment is preferable. The inferior orbital rim can also be injected with larger particles (Fig. 5.12).
Fig. 5.10 Skin demarcation is very useful for treating the tear-trough deformity. After the demarcation, the injection is started. Care should be taken not to produce excessive ecchymosis.

Fig. 5.11 Careful injection into the tear-trough may expand the skin and decrease the deformity.

Fig. 5.12 Before (a) and after (b) photographs after correcting the tear-trough deformity with hyaluronic acid after two sessions.
5.3.6 Cheekbones

Either no anesthetic or only topical anesthesia is usually required for this procedure. Less product will be necessary if there is good bone projection at the malar level. Injecting over the malar eminence may be helpful in these cases. The best route for treating this area is transcutaneously. Outlining the entire area with eyeliner before injection may promote accurate filling and easy removal of the marking (Figs. 5.13 and 5.14).

Use of the frame technique will limit the area before the internal part is filled. Retrograde injection is usually preferable for a more uniform result along the frame, followed by a soft massage for smoothing any surface irregularity. For the internal part, the fan technique is undertaken from each edge of the drawing in order to promote a crossing of micro tunnels. Multilayer injections are conducted. The deep reticular dermis will be filled by starting more superficially with the needle almost parallel to the skin. Opening the angle of the needle to 30–45° will allow it to reach the subcutaneous and the muscular layers (Fig. 5.15). After filling all layers, a soft massage is conducted and a final analysis of the obtained projection is undertaken. Finally, if needed, the needle must be inserted at a 90° angle almost touching the periosteum on the most prominent parts of the malar bone for major projections. Drapes are applied to reduce edema and for correct maintenance of the position of the filler. After the edema has subsided, the final result may be evaluated (Fig. 5.16). The filling of the cheekbones should be subtle and increase slightly the midface width (Fig. 5.17).

**Fig. 5.13** A small triangle is demarcated at this level. Both the frame and the internal area should be filled.

**Fig. 5.14** When major projection is desired, the zygomatic arch level is also filled.
Fig. 5.15 Injection is performed after an injection plan of the area to be treated has been drawn. At this level, the malar prominence is enhanced.

Fig. 5.16 The cheekbones were injected (a). With the improvement of the mid-third of the face, a youthful appearance may result (b).

Fig. 5.17 The filling of the cheekbones must be subtle (a) and increase slightly the midface width (b).

Fig. 5.18 Skin demarcation for the injection: It is helpful to delimitate the area to be injected.
5.3.7 Cheek

Cheek augmentation follows the same initial steps as that of the cheekbones. Topical anesthesia is usually sufficient for this area. Visual analysis is important to establish the markings, which should be done with the patient in an upright position. Pinching the skin at this level may also indicate the area where the skin and underlying tissues are atrophic. A triangle is usually drawn to limit the area to be treated (Fig. 5.18). Retrograde injections are undertaken beneath the lines. Placing the thumb against the cheek intraorally may be helpful during the injection, especially when the internal part is treated. Immediately after the fan technique, a smooth massage with both the thumb and the index finger will make the surface more uniform and make any small untreated areas evident. In some cases only one specific area needs to be filled to promote facial balance (Fig. 5.19).

5.3.8 Complications

General complications such as redness, pain, and swelling may occur. Ecchymosis and nodule formation are more likely to happen when treating tear-trough deformities.

5.3.9 Tips and Tricks

A two-step treatment with products that can be injected superficially is the best option for tear-trough deformities. Cheek bone augmentation should be undertaken with large particles. If biodegradable substances are to be used, combination therapy with collagen and hyaluronic acid is preferable. For larger augmentations, nonbiodegradable products are useful as long as they are injected close to periosteum using a blunt needle.
5.4 Nose Reshaping

5.4.1 Introduction

The surgical approach to the nose may be seen as a quite invasive procedure, especially when surgery is based on fracturing the nasal bone. Reshaping the nose with injectable fillers, however, is a minimally invasive technique with a quick recovery time that will help to evolutionize this aesthetic area. Specifically reshaping the dorsum and lifting the tip can be achieved with fillers. The knowledge of anatomy and gold standards of the nose are important tools for those who are willing to start working in this facial region.

Reshaping the nose with fillers is a method from which there is a quick recovery time with no need for general anesthesia or sedation, and does not result in ecchymosis. It definitely produces the same final results as surgery, but they are not as long-lasting if biodegradable fillers are used.

5.4.2 Anatomy

The nose consists of a framework of skin, cartilage, and bone that is supported by connective tissue and ligaments that hold them all together (Sheen and Sheen 1998). The skin is thicker and adherent in the lower third of the nose and is thinner and more mobile in the upper two-thirds.

The blood supply to the external nose is based on the facial artery. The superior labial and the angular artery are the main branches that respectively form the columnellar branches and the lateral nasal branch. Both of them supply the tip of the nose. The dorsal nasal and the external nasal arteries are branches of the ophthalmic artery. The lateral nasal vessels are 2–3 mm above the alar groove, and together with the columnellar artery arise deep at the nasal base and end at the tip in the subdermal plexus (Rohrich et al. 1995; Fig. 5.20).

5.4.3 Patient Evaluation and Selection

Patient selection is of utmost importance for nose reshape with fillers. Both thin and thick skin is suitable for fillers. Patients with thinner skin usually require less product. In these patients in particular, however, any mistake (too much material either absolutely or relatively) can be evidenced during and after treatment. Biodegradable substances, although temporary, are thus the best to start with. The vast range of products available nowadays enables the right choice for each case. Small molecules can provide a subtle result and are the first choice for beginners in patients with thin skin. Thicker skins do not expand as easily
Fig. 5.20 The nose blood supply. a Superficial temporal artery (a.), b occipital a., c transverse facial a., d posterior auricular a., e maxillary a., f inferior alveolar a., g external carotid a., h ascending pharyngeal a., i internal carotid a., j common carotid a., k superior thyroid a., l lingual a., m facial a., n submental a., o mental a., p inferior labial a., q superior labial a., r angular a., s infraorbital a.
as the thinner ones and usually require more product or larger molecules.

Another aspect to be analyzed should be the presence of deviations. Deviations can be evidenced with an imaginary line from the midglabellar area to the middle of the chin, crossing the nasal tip and the Cupid’s bow. The width of the alar base should be the same as the intercanthal distance. The columella should be only slightly visible on the frontal view. If the columella is too small, filling may produce a nicer aspect of the nose. The ratio between the columella and the nasal lobule should be 2:1. If the nostrils are flat, increasing the height of the columella may be desirable. On the basal view, the nose should be like an equilateral triangle (Farkas et al. 1986).

When analyzing the profile, some important aspects must be evaluated: the nasofrontal angle, the nasolabial angle, and confirmation of the presence of a supratip break. The nasofrontal angle should be gentle and a concave curve. It is the connection between the brow and the nasal dorsum. Lack of tip projection is found in short noses. An imaginary vertical line adjacent to the projection of the upper lip should divide the distance between the nasal base and the apex of the nasal tip. If less than 50% of the tip is anterior to this line, augmentation should be conducted.

The nasal dorsum should be evaluated after treating the tip projection. Ideally, the dorsum should lie 2 mm posterior to a parallel line from the nasofrontal angle to the nasal tip in women and a little less in men. The best cases to be treated with fillers are those too far posterior to this line; in these cases the whole dorsum should be augmented. If the dorsum is on the line or projects over it, filling the tip and the nasofrontal angle should be the choice.

### 5.4.4 Technique

As the nose is quite a sensitive area, topical anesthesia might not be sufficient. Therefore a block of the fibers of the ophthalmic and maxillary nerve branches is recommended. Tissue expansion is easier on the bone dorsum and more difficult in the lower third. Care should be taken with the vessels that pass within the subcutaneous tissue above the muscles. The injection of any
substance into patients with oily skin and large pores may be followed by extrusion and loss of the product, so injections should always be below the subdermis. When contrasting thin with thick nasal skin, the latter will require larger polymers and quantities of products. Any mistake will become quite evident in patients with thinner skin. For safety reasons beginners are advised to start with biodegradable products.

5.4.5 The Nasofrontal Angle

The best patients to fill are those whose nasofrontal angle is too deep. When the dorsum is excessive, filling the nasofrontal angle and reducing its concavity may straighten the dorsum and the nose may look smaller (Fig. 5.22). If too much product is injected into this area, the nasofrontal angle may become too shallow, producing an undesirable effect.

5.4.6 The Nasolabial Angle

The opening of the nasolabial angle is obtained with the filling of the anterior nasal spine (Fig. 5.23). Injecting deeper adjacent to the nasal spine will expand the inferior part of the membranous septum. If necessary, the columella base can also be injected, especially if widening of the medial crura is desired.

5.4.7 The Tip and the Columella

Columella Height

The medial crura should be expanded if the nostrils are flat. It should be teardrop shaped. A retracted columella can also be filled. Depending on the degree of retraction, soft-tissue expansion should be handled in more than one session. Expansion is undertaken with an injection into the membranous septum. Injecting into the...
footplates of the medial crura may increase tip projection (Fig. 5.24).

**Supratip Deformation**

Care should be taken not to erase the supratip break. Filling into this point may cause supratip deformation and consequent dropping of the nasal tip (Fig. 5.25). To enhance the supratip break, there must be a difference in height between the domes and the septal angle; a tiny injection into the tip of the dome may produce this effect.

**Tip Projection**

To evaluate whether the filling of the tip was correctly performed, the final tip projection must equal the width of the alar base. An increase in tip rotation is conducted in patients with a reduced nasolabial angle. Increasing the nasal tip projection may be undertaken by direct injection into the domes (Fig. 5.26). When treating the tip, it must be established whether the patient needs augmentation of the domes and/or the middle crura. When only the domes need augmentation, injections must only be made into the upper portion of the tip. If the whole tip must be treated, upper and lower injections must be undertaken. This is a nice solution for patients with thin skin who present surface irregularities on the tip.

Care must be taken not to inject too much product as this may produce widening of the middle crura and a boxy tip aspect, which is undesirable. During the injection, pinching the tip may be helpful to avoid excessive filling. A delicate caudal injection into the tip may produce an increase in tip projection and a nice upwards tip rotation. When a major increase in tip projection is necessary, filling into the soft tissue of the pre-maxilla is advisable.
5.4.8 Dorsum

When the tip of the nose is adequate but the nasofrontal angle and dorsum are low, fillers are very suitable for nose reshaping. (Fig. 5.27) The tip height helps to give an idea of the quantity of product to be injected. Injections should start with the nasofrontal angle to reduce its concavity up to the point where it equals the tip height. The dorsal augmentation should almost reach the imaginary line between these two points. Injections should be carried out with a retrograde technique. Any irregularity should be treated with a slight massage.

A dorsal hump is treated mainly by surgery. However, a very good alternative is to use fillers. (Fig. 5.28) If biodegradable substances are used, results are temporary but no postoperative period is needed. After treating the tip, injections must be made into the nasofrontal angle, onto the bone and cartilaginous dorsum, and into the nasolabial angle. Care should be taken not to produce a supratip deformation.

5.4.9 Selection of Filler

If it is the first time that the nose has been injected, it is preferable to get experience with biodegradable products. Only experienced physicians should handle nonbiodegradable products. Even some experienced physicians only use biodegradable products to avoid complications. Hyaluronic acid enables a good start, although the results may not last too long. Due to its hydrophilic properties and pseudoplasticity, it can be easily molded. Collagen is also a good choice for replacing cartilage or bone.

Nonbiodegradable products are a good choice for longer-lasting results, but care should be taken with blood vessels. Accidental injection into the nasal blood vessels, especially into the columella base, may result in tip necrosis, which may lead to a catastrophic result. PMMA, bioalcamid, and PLA are examples of products that usually produce longer-lasting results.
5.4.10 Complications

The most frightening complication associated with nasal reshaping is necrosis. It is rare and occurs mainly with nonbiodegradable products. Hardly ever is there any sort of blood vessels impairment with biodegradable materials. If a filler is inadvertently injected into a blood vessel, a massage should be promptly undertaken to break up the polymers.

Excessive filling of the cartilaginous dorsum may lead to supratip deformation and irregularities. The nasofrontal angle and the nasolabial angle rarely produce deformities if properly injected. Care should be taken not to produce a widening of the nose at these areas. If too much product is injected into the tip of the nose, a boxy deformation may occur.

General complications such as swelling, redness, pain, and ecchymosis may also occur with fillers.

5.4.11 Tips and Tricks

Nasal filling should be undertaken with care and knowledge of the anatomy. Some of the results are comparable to those achieved with surgery (Fig. 5.28). This is a good option for patients who are not willing or are unable to submit to surgical procedures.
5.5 Nasolabial Folds

5.5.1 Introduction

Nasolabial folds are one of the major indications for injectable fillers. They are not too difficult to treat if some basic guidelines are followed. There are deep nasolabial folds and more superficial ones, there are nasolabial folds that are induced by strong facial mimics and those induced by ptosis of the SMAS. Therefore there is no such thing as the nasolabial fold. Each of these folds requires special attention with regard to the injection technique used, the material to used, and the amount of filler necessary.

5.5.2 Anatomy/Structure

Nasolabial folds – the small triangle between the ala, the nose and the cheek – can be actively increased by contracting the levator labii superius alaquae nasi and the levator labii superioris muscles. Both muscles are activated when patients wrinkle their nose. The depth of the nasolabial folds at rest correlates well with the tonus of the SMAS. Therefore nasolabial folds are one of the first folds to be affected by aging.

Strong muscular tonus might lead to very deep wrinkles at quite an early age (Fig. 5.29). Ptosis of the SMAS as well as elastosis of the skin are the two main reasons for deep age-related folds.

5.5.3 Patient Evaluation and Selection

The nasolabial folds must be analyzed prior to filler injection. If there is an active contraction of the levator labii superius alaquae nasi and the levator labii superioris muscles, fillers may be accompanied by a pretreatment with BoNT-A of these muscles. In addition, the amount of filler required should be realistically estimated. In older patients with very deep folds, for example, it might be necessary to inject up to 2 ml per site. The best results are obtained in patients with either no or mild saggy skin over the nasolabial fold.

5.5.4 Technique

Stretching the skin between two fingers prior to injection helps to visualize the fold and to ensure that the material is injected where it should be (Figs. 5.30 and 5.31). To avoid an increase in the visibility of the fold, especially in patients with SMAS-related deep folds, the injections should be performed more medially (Fig. 5.32).

Nasolabial folds are quite easy and fast to treat with the retrograde injection technique. Approximately 0.05–0.1 ml of the filler is injected while withdrawing the needle. However, the multiple injection site technique can be also used. This technique will help to blend the filler better in the surrounding area. Deep and superficial nasolabial folds might require a multilevel approach. In older patients, when the subcutaneous area may be atrophic and the filler may go down, in-
stead of lifting the fold, a multilevel approach is recommended (i.e., the filler should be injected deeply as well as superficially).

### 5.5.4.1 Touch Up

When using a biodegradable filler for deep nasolabial folds, a touch up approximately 3–4 weeks after the initial treatment will prolong the durability of the effect. Different fillers with different properties might be combined to optimise the results (Figs. 5.33 and 5.34).

### 5.5.5 Complications

There are some general pitfalls that are attributable to an inappropriate injection technique that should be avoided:

1. The sausage: the sausage constitutes the remains of a filler that was too superficially injected.
2. The lump: injecting large amounts of a filler will result in filler depots that might be palpable for several weeks.
3. The increased fold: in patients with SMAS-related ptosis of the cheek, an injection made too laterally will lead to an increase in the depth of the fold.

### 5.5.6 Tips and Tricks

Strong mimic muscles and gravity are the main causes of deep wrinkles. Therefore, patients should be always seen in an upright position. An injection administered to a patient in a prone position might lead to insufficient correction. Always inject a bit medially to avoid an increase in the depth of the treated folds.

With repeated injections comes an increased risk of bruising. When the filler is injected into different levels of the dermis (the multilevel injection technique) some physicians recommend using the same injection punctures to decrease the bleeding points and, therefore, bruising.
**Fig. 5.33** Deep nasolabial folds treated with polylactic acid prior to (a), immediately after 1.4 ml (b), and 3 months later after a total of 4.3 ml (c).

**Fig. 5.34** Superficial nasolabial lines in a patient pre-treated with polylactic acid for deep nasolabial folds before and 3 months after the superficial injection of a total of 1.4 ml hyaluronic acid.
5.6 The Upper and Lower Lips

5.6.1 Introduction

The lips are very important for social interaction. A wide spectrum of emotions is represented by the lips, from happiness to sadness and sorrow. It also plays an important role in the expression of sensuality and sexuality. When the sphincter mechanism is intact normal lip function promotes a competent oral seal for liquids and solids, especially the lower lip. The free movable nature of the vermilion and cutaneous skin makes this area quite suitable for distortion. The use of BoNT-A, although sometimes quite helpful, may lead to asymmetries and temporary loss of function. Fillers, on the other hand, are highly suitable for both lip augmentation and improvement of perioral wrinkles.

5.6.2 Anatomy

The lips cover more than the area of the red part of the mouth. They also include the skin adjacent to the red part of the mouth. It must be considered as an anatomic unit with extensions superior to the nose and inferior to the chin (Salasche and Bernstein 1988). Perfect lip

Fig. 5.35 Frontal (a) and lateral view (b) on landmarks of the upper lip
structure includes a visible white or transition line between the mucosa and skin, a “V” shaped Cupid’s bow, fulfilled medial tubercle and vermilion, and ascendant line in the oral commissures. The ratio between the upper and lower lips, at golden proportions, is 1:1.618.

A very important topographic landmark is the philtrum. The midpoint of the upper cutaneous lip is highlighted by the two vertically oriented ridges of the philtrum. The Cupid’s bow is the concavity at the base of the philtrum (Fig. 5.35). It is also very important to take into account the surroundings of the lips, which are the labiomental and nasolabial lines. If too deep, these lines may give an older appearance.

The skin of the upper lip is very thin and lacks subcutaneous fat. The lack of additional support at this level and excess of muscular movement may lead to the breakdown of the perioral area, producing wrinkling.

The major muscle of the lips is the orbicularis oris muscle. It has circumferential fibers that are responsible for the sphincter function of the mouth. There are circumoral muscles, which are intimately associated with the orbicularis oris. These muscles elevate, depress, and retract the lips, producing complex movements during normal function. The levators lie from medial to lateral: the labii superioris alaeque nasi levator, the labii superioris levator, the zygomatic minor and major, and the risorius muscles. The depressors include the depressor anguli oris, the depressor labii inferioris, and the mentalis muscles.

The upper and lower lips are supplied respec-
vatively by the superior and inferior labial arteries within the submucosa. Both of these are branch-
es of the facial artery.

Sensory innervation of the upper lip is pro-
vided by the infraorbital nerve. The lower lip is innervated by the mental nerve. The motor in-
nervation of the orbicularis oris is provided by the buccal branches of the facial nerve. The mus-
cles that act around the mouth are either innervated by the buccal or the marginal mandibular branches of the facial nerve.

5.6.3 Patient Evaluation and Selection

The best results are found in young patients who desire lip augmentation and present with pre-
served lip landmarks. With aging, the mouth may present with perioral radial grooves and a decrease in the volume of the lips. Lip reshaping will not only require augmentation, but also improvement of the radial grooves. The patient’s expectations should be established to avoid unrealistic results.

The physical examination is of utmost impor-
tance in lip reshaping. Both the upper and lower dental arcade promote an important role in lip augmentation. If the teeth (central and lateral incisors) are inclined backwards, lip projection is extremely difficult and sometimes impossible. Muscular activity in patients with very thin lips should also be evaluated. During the smile, there may be excessive inversion of the vermilion, especially in patients with gummy smile. Fillers may not produce the desired effect in this case. Injection of BoNT-A into the levator labi superi-
oris alaeque nasi muscle may be instead helpful in these patients. Patients must be evaluated in both static and dynamic situations. There are at least four different types of smile, and dynamic asymmetries are very common and should be demonstrated to the patient beforehand.

5.6.4 Technique

Filling the lips may be quite painful for patients. To avoid imperfect results or the necessity for frequent retouches, filling the lips should be achieved with as little pain as possible. The best option is nerve blocking. For the upper lip, the infraorbital nerve must be injected followed by infiltration of lidocaine in the submucosa laterally and medially to the frenulum linguæ. For the lower lip, the mentalis nerve should be blocked and infiltration into the submucosa is also beneficial. Both the intraoral and transcu-
Fig. 5.36 Transition lines of both the upper (a) and lower lips (b) are treated with collagen for its hydrophobic characteristics and similarity with the biomechanics of this white line.

Fig. 5.37 a, b Hyaluronic acid is quite suitable for the augmentation of the vermilion. As it is hydrophilic, it promotes volume and mobility.
taneous approach may be chosen. The intraoral approach is generally preferable as it is usually less painful (see Chap. 4). Nevertheless, in some patients topical anesthesia alone, or even ice bags may be acceptable.

Biodegradable products, although temporary, promote the most natural results. Because of its molecular resistance, collagen injected into the white line is the preferable choice for this area (Fig. 5.36). For the vermilion, hyaluronic acid gives the volume and the mobility that only this highly hydrophilic substance may provide (Fig. 5.37). Nonbiodegradable products are also used for lip augmentation. Care should be taken not to inject them too superficially or lump formation may occur.

After proper anesthesia, injections may be started from Cupid’s bow or from the oral commissure. It is most important to perform it as a retrograde injection. Serial techniques increase bleeding and may lead to irregular filling. The frame of the lips (the white line) should be injected first; this will help to limit the expansion of the vermilion in both the upper and lower lip. After injecting into the frame with collagen, for instance, the vermilion is then augmented with hyaluronic acid. Attention must be paid to the dental arcade at this time. If more projection is desired, the medial tubercle may be filled either from the mucosa or intraorally through the submucosa (Fig. 5.38). Mild perioral wrinkling may be improved only by this method. If not, direct injection into each small rhytide should be performed (Fig. 5.39).

In senile lips, a nicer look will be achieved if the entire lip structure is treated (Fig. 5.40). If the lips are surrounded by elastotic skin, combinations of injectable fillers are recommended with...
ablatve methods, such as chemical peels or laser resurfacing. The best results are obtained in those patients whose anatomic landmarks are preserved and who have soft, distensible skin.

### 5.6.5 Complications

Lump formation and lip asymmetries are some of the complications that can result from this procedure. Swelling, ecchymosis, and redness are very common and are dependent on the type of product, quantity of material injected, and the technique used. Nonbiodegradable products are those more often found to be associated with complications. Due to the intrinsic mobility of the lips, any capsule formation may provoke unnatural and quite obvious results.

### 5.6.6 Tips and Tricks

Be careful, lips tend to look bigger when the patient is filmed or photographed. Sometimes patients ask for more material and we should show them how they would look in a photo before going any further. Avoid excessive treatment at the medial tubercle level, this may result in patients presenting a duck-like appearance in the oblique and profile analyses.

### 5.7 Marionette Lines

#### 5.7.1 Introduction

Marionette lines draw the corners of the mouth downwards making the face appear to be sad or harder.
5.7.2 Anatomy

Marionette lines are formed by the depressor anguli oris and the platysma muscle. They may be actively pronounced when the patient forms an “I” (Fig. 5.41). In older patients the increased laxity of the SMAS contributes to the appearance of marionette lines.

5.7.3 Patient Evaluation and Selection

Patients with sagging corners of the mouth as well as patients with manifest lines are suitable for treatment.

5.7.4 Technique

Pretreatment of the depressor anguli oris and the platysma muscles with BoNT-A is highly encouraged as it decreases the downward movements of the corner of the mouth (Fig. 5.42). Topical anesthesia or nerve block is recommended. Biodegradable fillers usually give the most natural expression. The most appropriate filler must be chosen according to the depth of the lines, wrinkles, or folds. The caudal triangle at the corners of the mouth, which is formed by the margin of the lower lip and the marionette line and continues to the nasolabial fold, is injected first. Here, a triangular feathering might elevate the whole area. For deep and medium-sized lines, the retrograde tunnel technique (i.e., the filler is injected while withdrawing the needle) or the multiple injection site technique can be used. These techniques will help to blend the filler better in the surrounding area and avoid the appearance of an unnatural elevation at the area of the former fold. Deep folds usually require multilevel injections (Fig. 5.43). As for nasolabial folds, it is advisable to inject the filler medial to the fold; a more lateral injection technique would increase the visibility of the fold in patients with increased laxity of the SMAS.

5.7.5 Complications

A lateral injection will increase the visibility of the fold. In older patients with increased elastosis, a very deep injection may have little effect other than creating an unpleasant deep lump of filler.

5.7.6 Tips and Tricks

It is important to blend the filler in. If the results are not as perfect as desired following the tunnel technique the area should be treated with the multiple-point injection technique to improve the results. In patients with increased elastosis, this multilayer technique will provide the best results and help to prevent unwanted deep lumps of filler (i.e., after injecting these patients carefully with a deep filler, a filler comprising medium-sized particles should be injected more superficially to extend the dermis and thus decrease the depth of wrinkles).

5.8 Mandibular and Chin Reshaping

5.8.1 Introduction

The chin is a symbol of masculinity for men and sensuality for women. Any negative marks such as wrinkles, folds, or a deep oral commissure may impair the sense of beauty. Women must have a more delicate chin, with less fullness concentrated at the central part. Men, on the other hand, may have heavier features and should have a stronger chin. In all cases, a youthful and clean jawline is desired. Reshaping the mandible area promotes chin and jawline contours.

Despite the scientific studies concerning the safety of the use of silicone prostheses for chin augmentation, some patients simply refuse to be submitted to it. The use of fillers may be helpful in such cases. Patients prefer minor and mini-
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mally invasive procedures, although some doctors would indicate more complex procedures such as chin advancement. Patients may accept limited results with fillers rather than submitting to cranial surgery.

5.8.2 Anatomy

The chin may be defined as the area between the mental foramina and the central part of the mandible. The midlateral zone can be defined as the region extending from the mental foramen posteriorly to the oblique line of the horizontal body of the mandible. The posterior lateral zone is defined as the posterior half of the horizontal body including the angle of the mandible and the first 2–4 cm of the ascending ramus. The submental area is located under the chin between the platysmal band and above the cervicomental angle.

The most suitable skin for chin and mandible reshaping is that which is soft and has mild atrophy. The fat tissue superficial to the SMAS in the mental area is densely attached to the dermis by strong fibrous septa. It makes the deep soft tissues very adherent to the skin at this level. It becomes progressively looser and more mobile lateral to the cheek and caudal to the neck.

The contraction of the mentalis muscle produces protrusion of the lower lip. This muscle arises from the mandible below the central and lateral incisors and inserts into the skin of the chin. Wrinkles can form in a cobble stone pattern where it inserts into the skin in some patients.

The chin is supplied by the mental and submental arteries; the former a branch of the inferior alveolar artery and the latter a branch of the facial artery. The venous drainage corresponds to the arterial supply. The mandible is supplied by the facial and inferior alveolar artery. The mandibular branch of the facial nerve passes just anterior to the middle portion of the mandible into the midlateral zone. The marginal branch of the facial nerve has a variable course but its location is normally at the angle of the mandible. The greater auricular nerve is in the cervical fascia, posterior to the angle of the mandible. The mental nerve exits from the mental foramen, below the second mandibular premolar.

The aging process may be accompanied by a reduction in the size of the mandible with absorption of the alveolar processes. In older patients, there may also be soft-tissue atrophy lateral to the anterior chin, producing a deep triangle almost directly underneath the oral commissure. With the increase of the jowl pad and soft tissue atrophy, marionette lines and a sad mouth develop. The migration of fat down to the mandible creates the jowls that may extend below the lower mandible border. The superficial subcutaneous tissues tend to sag more than the deeper subcutaneous tissues.

5.8.3 Patient Evaluation and Selection

The ideal relationship in a patient’s face is one-third upper lip and two-thirds lower lip and chin. Patients with mandibular hypoplasia appear to have a round face due to a short lower facial height. The ratio between the upper lip and
Fig. 5.45 Mandible filling may improve the definition of the mandible (a) and even treat mild saggy skin (b)
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The lower lip and chin becomes 1:1. On the profile examination, the face presents a convex appearance, jowls, and obtuse mentocervical angle with redundant skin.

When considering a patient for chin augmentation with fillers, evaluations of the occlusion, skeletal, and dental relationships must be performed. Patients with a normal occlusion are the best candidates for fillers. Patients with class II or III malocclusion are surgical candidates. In some cases, avoiding extensive orthognathic surgery means giving fillers a try, while understanding their limitations and the number of sessions involved to obtain a nice result.

The classic mandibular retrognathia patient presents with a retruded mandible and convex soft tissue profiles. Treatment involves orthodontic correction; surgical mandible advancement with osteotomy with rigid fixation.

Patients may present good chin projection and no lateral fullness. These patients are ideal candidates for fillers in these areas. Fillers will improve chin projection and promote a jawline reshape. Some patients may need forward and downward projection; filling into the upper and lower part of the menton may increase the distance between the mandible tip and the lip, thus balancing the face. Fillers are also suitable as a pretreatment before surgery to give an idea of the amount of projection either required or desired by the patient.

5.8.4 Technique

Fillers may be placed in the central segment alone, between the mental foramina and along the mandible body. When the central mentum and the midlateral zone is augmented, there is a resulting widening of the anterior jawline contour. Fillers in the mandibular angle will either widen or elongate the posterior mandibular angle, promoting a strong posterior jawline contour.

Before starting the injection, topical anesthesia is applied and drawings are performed to limit the area to be treated (Fig. 5.44). The filling of the mandible area associated with the nasolabial fold may promote an interesting result, especially among patients who do not desire a surgical procedure or do not have enough time to be submitted to it. A face-lift effect may be obtained (Fig. 5.45).
Depending on the physical examination, patients are only treated in the chin area for minor chin advancement and balance (Fig. 5.46). If the patient is older, the presence of jowls of mild degree can be improved with the injection of the triangle reaching from the mental foramen to the midlateral zone of the mandible. This area may not be easily expanded, and the mobility of the skin at this site must be evaluated prior to starting corrective procedures. In older patients, this triangle of soft tissue is generally atrophic and this area may be filled because of its mobility.

Retrograde injection is started by filling along the frame, followed by a soft massage to smooth the surface. Placement of the filler should be in all layers from the deep reticular dermis next to the periosteum. The multilayer technique promotes augmentation of all soft tissues within the delineated area. One of the greatest advantages of fillers is the possibility of using complementary volumes if needed. Although edema usually appears during the injection, a predictable view of the augmentation can be foreseen (Fig. 5.47).

### 5.8.5 Complications

In contrast to surgical procedures with implants, there is no bone resorption, no fistula, no nerve damage, and rarely any extrusion or nodule formation. Chin prostheses may cause an abnormal projection, even in patients with adequate soft tissue. Mandibular and chin reshaping with fillers may only produce mild ecchymosis and edema, and entails a quick recovery. The short duration of the result is a drawback of the use of biodegradable fillers. That is why patients must be very well informed about it. Inflammatory reactions and infections are rare and can also be found with nonbiodegradable products. Proper technique and a good choice of products may decrease these adverse events.

### 5.8.6 Tips and Tricks

Fillers are only highly suitable in these areas in selected cases. Do not expect long-term results with biodegradable fillers. Chin reshaping may be undertaken with nonbiodegradable fillers as long as they are injected deeply.
References

6.1 Introduction

Although most injectable fillers are usually considered to be safe, adverse reactions do occur. These reactions might vary from persistent erythema and edema to granulomatous reactions or even ulcerations (Table 6.1). Although these reactions are rare, patients should be made aware of the possibility of an adverse outcome. It is the responsibility of the doctor to communicate these risks to the patient without exaggerating the potential harm.

Table 6.1 Possible adverse reactions to fillers

<table>
<thead>
<tr>
<th>Immediate reactions (within 72 h after injection)</th>
<th>Subacute reactions</th>
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</thead>
<tbody>
<tr>
<td>Transient erythema</td>
<td>Discoloration (i.e., bluish)</td>
</tr>
<tr>
<td>Transient edema</td>
<td>Persistent local symptoms (hypersensitivity reactions):</td>
</tr>
<tr>
<td>Transient induration</td>
<td>Erythema</td>
</tr>
<tr>
<td>Transient pruritus</td>
<td>Edema</td>
</tr>
<tr>
<td>Transient ecchymosis</td>
<td>Induration</td>
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<td>Infections</td>
<td>Pruritus</td>
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<td></td>
<td>Hyperpigmentation</td>
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<td></td>
<td>Local necrosis</td>
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<td></td>
<td>Reactivation of herpes</td>
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<td></td>
<td>Local infections</td>
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<td></td>
<td></td>
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<tr>
<td>Delayed reactions</td>
<td>Granulomatous formations</td>
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<tr>
<td></td>
<td>Ulcerations</td>
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</tbody>
</table>

6.2 Epidemiology

6.2.1 Biodegradable Fillers

6.2.1.1 Collagen of Bovine Origin

6.2.1.2 Collagen of Human Origin

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6.3 Treatment of Adverse Reactions

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6.3.3.1 Side Effects of Steroid Therapy

6.3.3.2 Surgery for Granulomatous Reactions

6.4 Guiding the Patient

References
Only a few clinical trials exist that allow the estimation of the risks of acute and frequent adverse reactions to aesthetic fillers. As these trials are mostly limited to a few months duration and usually confined only to a few hundred patients, delayed and rare reactions have not been reported (Strom 1994). Therefore, most data on adverse reactions to injectable fillers are based primarily on retrospective patient cohorts, case series, and case reports.

### 6.2.1 Biodegradable Fillers

Adverse reactions to biodegradable fillers are usually relatively easy to control because their life span is limited. Nevertheless, some unpleasant reactions might occur.

#### 6.2.1.1 Collagen of Bovine Origin

Adverse reactions to collagen are well known. Pretesting with collagen can reduce the number of patients who will develop these reactions. Data on the prevalence of adverse reactions due to skin pretesting or therapeutic injection are based on several large case series. In a 6-year study involving 9427 patients, the incidence of adverse reactions to collagen pretesting (here Zyderm I) was 3%. Of all test site reactions, 50% occurred within the first 24 h, and over 70% developed within the first 72 h. An additional 1.3% of patients experienced adverse reactions despite a negative pretest (Fig. 6.1). The observed reactions ranged from localized swelling to induration, erythema, and pruritus. Onset ranged from immediate to 3 weeks after implantation, and 66% occurred within the 1st week (Cooperman et al. 1985).

In another study, which was based on voluntary adverse reports and the sales date of the manufacturer, the overall rate of adverse reactions to bovine collagen was estimated to be 0.4% after one to seven treatments (DeLustro et al. 1987).

Similar numbers were reported by Charriere et al. (1989) for another bovine collagen. Here, 27 out of 705 (3.8%) patients reported a positive skin test. Among the remaining 656 patients, an adverse reaction to the collagen implant developed in 15 (2.3%) patients. The onset of the adverse reactions ranged from immediate to 1 week after implantation.

Infections, such as recurrent herpes simplex, abscess formation, tissue necrosis, and granulo-
matous foreign body reactions, occurred less frequently. Systemic reactions with athralgies and myalgia, fever, and pruritus occurred in fewer than 5 per 1000 patients (Homicz and Watson 2004). These reactions appeared approximately 3 weeks after the treatment (Cooperman et al. 1985).

### 6.2.1.2 Collagen of Human Origin

There are few studies on human collagen so far, with only limited study population (5–20 patients), that focus on the safety of allogenous and autologous human collagen. Pretesting might reveal adverse selflimited local reactions (Moody and Sengelmann 2000). Adverse reactions after pretesting appeared only as mild, nontender erythema. Acute or severe reactions like allergic ulcerations or chronic granulomatous reactions were not reported in a nonsystematic review (Fagien 2000). Case reports describe acute choroidal infarction following the subcutaneous injection of allogenous collagen in the forehead region (Apte et al. 2003).

### 6.2.1.3 Collagen of Porcine Origin

Thus far only a few hundred patients have been treated with the new porcine collagen (Evolence). So far no serious adverse reaction have been observed (personal communication, manufacturer). Due to the limited number of treated patients, however, it is somewhat premature to draw any conclusions from this.

### 6.2.1.4 Hyaluronic Acid

Hyaluronic acid is thought to be less allergenic than bovine collagen. Skin testing is not generally recommended. Although hyaluronic acid of human and animal origin is identical in structure, immunological reactions in the recipient can be caused by residual proteins from the donor (avian or bacterial antigens) or from the crosslinking process.

Several larger case series about safety are available. Lowe et al. (2001) reported 709 patients who were observed for a minimum of 1 year. Patients were treated with hyaluronic acid of avian or bacterial origin (patient cohort, follow-up study) between September 1996 and September 2000. The overall incidence of late inflammatory reactions (indurations, inflammation/erythema, abscess formation an average of 8 weeks after injection) is given as 0.42% (3 out of 709 patients). Friedman et al. (2002) retrospectively reviewed the data of all unwanted effects of nonanimal hyaluronic acid from the Restylane family that were reported to the manufacturer between 1999 and 2000, world-wide (Europe, Australia, South America, and Asia). For 1999, based on 144,000 treatments, the incidence was calculated at 0.15%; for 2000, based on approximately 262,000 treatments, the incidence of 0.06% was given. Since the incidences reported by Lowe et al. (2001) and Friedmann et al. (2002) are based either on patients returning to their private practice or voluntary reports, the real incidence might be higher.

In 2004, Andre evaluated the incidence of adverse reactions with nonanimal, stabilized hyaluronic acid between 1997 and 2001 using a questionnaire-based survey. Out of 12,344 syringes sold and 4,320 treated patients, 16 cases of immediate hypersensitivity and 18 cases of delayed reactions were recorded. The global risk of sensitivity was calculated at 0.8%. Since 2000, the amount of protein in the raw product had decreased and the incidence of hypersensitivity reactions has been reported to be around 0.6%. As 50% of these reactions were immediate and resolved within less than 3 weeks, the risk of a strong but transient, delayed reaction is around 0.3%. Four cases of sterile abscess were reported (Andre 2004). Again, although the data were quite systematically assessed, an underestimation of the real incidence can not be ruled out.
Further case reports that are available describe in detail adverse reactions such as erythema, pruritus, edema, urticae, and papulocystic nodules after injection with hyaluronic acid preparations of various origins. Arterial embolization and exudative granulomatous reaction after treatment with hyaluronic acid of avian origin have also been reported (Fernandez-Acenero et al. 2003; Lombardi et al. 2004; Lowe 2003; Lupton and Alster 2000; Micheels 2001; Raulin et al. 2000; Shafir et al. 2000).

In rare cases, a bluish discoloration might occur. This bluish discoloration is thought to be attributable to injections made too superficially (Fig. 6.2). Fortunately, this response lasts in most patients only several weeks and therefore requires only that the practitioner reassures the patient.

6.2.1.5 Polylactic Acid

Despite of the frequent application of this filler for aesthetic indications, so far no Medline-listed clinical trials are known that focus on the efficacy and safety of this substance in aesthetic medicine. However, there are some larger case series on the treatment of the lipoatrophy in HIV patients with PLA (Cheonis 2002; Moyle et al. 2004; Valantin et al. 2003). Based on the HIV-lipodystrophy data, granulomatous reactions, described as palpable but invisible subcutaneous micronodules, were observed in 22 out of 50 (44%) patients. In 6 of these 22 patients the nodules disappeared at week 96. In that particular study, one vial of PLA was diluted in a volume of 3–4 ml.

Clinically relevant granulomatous reactions have also been observed in patients treated for aesthetic indications (Rzany et al. 2004). Between January 2000 and April 2003 (approximately 30,000 treatments), 45 cases with adverse events were reported to the manufacturer. Most of these were defined as granulomatous reactions and arose in the period of 6–12 months after the injection. Granulomatous reactions to PLA are usually not as inflamed as those to Dermalive (Wölber et al. 2005). These granulomatous reactions are thought to be attributable to inadequately diluted PLA. The manufacturer now recommends that it be diluted to a volume of up to 5 ml. Since this new recommendation was only introduced in 2004 it is not yet clear what impact it will have.

6.2.1.6 Calcium Hydroxylapatite

Sklar and White (2004) and Tzikas (2004) reported case series with 64 and 90 patients treated with CHP for facial soft tissue augmentation. In addition to mild bruising and swelling, no immediate side effects were observed. Sklar and White (2004) reported five patients with complications after CHP treatment. Three patients had palpable bumps, one had puffiness of the lower eyelid, and another patient developed a pink/white plaque. The two latter adverse events occurred when treating the tear-trough area. The treatment period in that study was 6 months. In the study of Tzikas (2004), 7 out of 90 patients developed persistent visible mucosal lip nodules, 4 of whom required an intervention. The treatment period for this study was also 6 months.

No more safety data is available for this filler.
Patients must be advised that this filler is detectable on x-ray, as it might interfere with certain diagnostic procedures.

### 6.2.1.7 Polyvinyl Alcohol

No adverse events have been published concerning polyvinyl alcohol. However, acute inflammatory reactions have been reported to the Berlin registry (not published so far).

### 6.2.2 Nonbiodegradable Fillers and Combinations

Adverse reactions to nonbiodegradable fillers and combinations between biodegradable and nonbiodegradable fillers are usually more severe and more difficult to treat.

#### 6.2.2.1 Silicone

Publications regarding injectable silicones date back to the 1960s. Several silicone preparations are known. Despite being touted by many authors as the ideal augmentation material, silicone injected in large volumes has led to some disastrous local and systemic effects. In general, the inflammatory reaction surrounding injected silicone is selflimiting; however, the extent of the reaction is unpredictable and in some cases can be quite severe. Local adverse reactions include chronic inflammation, migration, extrusion, ulceration, and silicone granuloma formation. Once these complications are recognized, removal of the injected silicone is quite difficult, necessitating wide tissue resections and complicated reconstructions (Homicz and Watson 2004).

In reaction to these complications, the FDA declared the use of injectable silicone in the United States illegal in 1991. Nevertheless, silicone oil is still widely used in other countries.

Although the quality of the product in terms of purity has improved significantly in the last decades, a significant number of adverse events have been published. Adverse reactions occur more frequently when silicone is implanted into the papillary dermis (Requena et al. 2001). Recent case reports describe multiple events of granulomatous reactions, infection, ulceration, and migration (Ersek et al. 1997; Ficarra et al. 2002; Rapaport et al. 1996).

#### 6.2.2.2 Polyacrylamide

A pilot study published by De Cassia Novaes in 2003 reports on a treatment series with 59 patients. Aside from mild to moderate immediate redness, swelling, and pain, which dissipated in less than 36 h, no long-term side effects were observed (De Cassia Novaes and Berg 2003). In 2004, Breiting reported the results of a retrospective case series of 104 patients, 49 of whom had undergone breast augmentation. Palpable regional lymph nodes were observed in ten patients, which was considered to be within the range of usual coincidental findings. Migration of the gel was demonstrated in three women who had their nasolabial folds treated. No long-term adverse effects were observed in this study, which reported an average observation time of 3.9 years (Breiting et al. 2004).

In 2003, Wang published a case series of 15 patients with adverse reactions assessed over 2 years and reported the following: nodules (80 %), pain (60 %), secondary deformity (20 %), discomfort (13 %), and long-lasting swelling (6.6 %). Pathologic examinations showed macrophagocyte infiltration (60 %), capsule formation (53.3 %), and granulomatous reactions (20 %; Wang et al. 2003). No further data is available on the safety of this product.
6.2.2.3 Polyalkylamide

In 2003, Protopapa implanted this substance in 73 patients and carried out follow-up examinations for up to 3 years. No implant dislocation, implant migration, granuloma, allergic reaction, or intolerance were recorded (Protopapa et al. 2003). No further data is available for this filler.

6.2.2.4 Hydroxyethylmethacrylate and Hyaluronic Acid

So far, Medline lists only a few studies on this filler. These reports are mostly case reports focusing on granulomatous reactions to HEMA (Requena et al. 2001; Waris 2003). The Berlin registry, however, documents patients with granulomatous reactions as well as a patient with ulcerations following treatment with HEMA (Figs. 6.3 and 6.4). In 2001, Begeret-Galley published an overview in which the overall incidence of late side effects and complications (nodules, swelling, and erythema, on average 6 months after injection) based on data from the manufacturer is given as <1.2 per 1000 patients (Begeret-Galley et al. 2001). As the data from the manufacturer is based on spontaneous reports, some degree of underreporting is likely.

6.2.2.5 Polymethylmethacrylate and Collagen

The combination of PMMA and collagen was the first combination therapy to become available. Granulomatous reactions are a well known complication of this combination treatment, as reported in a large case series (Lemperle et al. 1998, 2003) and in various case reports (Alcalay et al. 2003; Hoffmann et al. 1999; Lombardi et al. 2004; Reisberger et al. 2003; Requena et al. 2001; Rudolph et al. 1999).

The retrospective case series, published in 1998 by Lemperle, is based on 515 questionnaires from 290 patients treated between 1993 and 1994. Immediately after PMMA implantation, swelling, redness, and itching was reported. Late reactions such as erythema, transparency, unevenness, and dislocation have also been documented. Longer-lasting redness after Artecoll implantation was reported in 6.1% of reported cases in 1993 and in 0.5% of reported cases in 1994. The overall complication rate in 1994 was 3% (6 out of 201
patients). In addition, an acute allergic reaction was reported in one woman. Based on data from the manufacturer, the rate of granulomatous reaction was given as 1 in 1000 patients. Nodules did arise 6 months to 2 years after treatment. Again, as this data relies on spontaneous reports, underreporting is likely to have occurred.

6.3 Treatment of Adverse Reactions

Adverse reactions to fillers are not common and so our knowledge of how to treat them is limited to expert opinions and the reporting of case series. Each adverse event requires a specific approach.

6.3.1 Acute Infections

Acute infections require an adequate antibiotic response. An antibiotic that focuses on infections of the skin is recommended. A bacterial culture to identify the pathogen is also encouraged.

6.3.2 Bluish Discoloration

There is no good concept for the treatment of bluish discolorations that arise after superficial injections of hyaluronic acid. If possible, the patient should be reassured that this adverse event will resolve itself with time. Steroids are not helpful as there is no inflammation.

Fig. 6.5 Granulomatous reaction 2 years after the injection of a combination of hydroxyethylmethacrylate and hyaluronic acid. Before (a) and after (b) 5 months of triamcinolone acetonid 40 injections (11 treatments)
6.3.3 Granulomatous Reactions

Several types of granulomatous reactions exist, and all are treated with injections of steroids. It is hypothesized that a higher initial dosage and/or frequent injections might increase the healing time (personal communication, G. Lemperle).

Initially patients are treated with triamcinolonactonid, either 10 mg in 1 ml or 40 mg in 1 ml. Please note that triamcinolonactonid 40 may induce severe atrophy in areas with underlying fatty tissue. Therefore, the steroid should be injected directly into or beneath the granuloma. If this is not possible (granulomas due to HEMA are particularly difficult to penetrate) the steroid should be injected around the granulomatous tissue. Per granuloma the injected volume should not exceed 0.05–0.1 ml. Initially the injections should be performed weekly. If the granulomatous tissue reduces, subsequent injections can be carried out every 2 weeks. The duration of therapy varies between patients (Fig. 6.5). The aim of the treatment should be to make the granulomatous reaction less visible.

If there is no response after approximately eight injections over a 2-month period, 5-fluoruracil (50 mg/ml) can be added to the steroid (triamcinolonactenoid 1 mg/ml). As for all other interventions, the efficacy of the addition of 5-fluoruracil is based on a case series in patients with hypertrophic scars and expert opinion (see Table 6.2; Fitzpatrick 1999). A further case report suggests that oral 200–600 mg allopurinol per day given over 16 weeks should be helpful. However, this particular patient was also treated with topical steroids and the results have never been confirmed by another paper (Reisberger et al. 2003). Based on the nature of these granulomatous reactions a livelong therapy – with remissions lasting several months – might be necessary in some patients.

Table 6.2 Therapy for granulomas

| Step 1: Injection of triamcinolonactonid 10 mg or triamcinolonactonid 40 mg if possible directly into or beneath the granuloma. A further dilution is not recommended. Injections at weekly intervals until an improvement can be seen or up to 10 injections |
| Step 2: If there is no improvement, 5-fluoruracil can be added to triamcinolon 10 mg or 40 mg. Again, injections should be performed at weekly intervals until an improvement can be seen. Osteoporosis prophylaxis with a combination of calcium carbonate 1.25 g and cholecalciferol (Vitamin D3) 10 μg is advisable for patients at risk of osteoporosis if the treatment should continue. |
| Step 3: If there is no improvement a surgical intervention should be considered. |
6.3.3.1 Side Effects of Steroid Therapy

Atrophy of the fatty tissue might occur, especially in the forehead region (Fig. 6.6). This can be corrected with a biodegradable filler (e.g., hyaluronic acid if the source of the initial reaction is not hyaluronic acid but another filler). The continuous administration of highly potent steroids at short intervals should be accompanied by osteoporosis prophylaxis, especially in high-risk patients. One tablet of a combination of calcium carbonate 1.25 g and cholecalciferol (Vitamin D3) 10 μg should be sufficient.

6.3.3.2 Surgery for Granulomatous Reactions

Plastic surgery might be helpful in those patients in whom granulomatous reactions are limited to defined areas. Patients should be aware that all surgical interventions will lead to some kind of scarring.

6.4 Guiding the Patient

Patients with adverse reactions usually feel very insecure. Patients need to be guided. The goal should always be to reduce the visible impact of the adverse reaction, not to remove all injected filler material, which is in some cases absolutely impossible. The patient should understand this aim and not focus on something that might not be achievable.

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Chapter 7

Combination Therapy

M. de Maio

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7.1 Introduction

The aging process is complex and single therapies have already proven to be inefficient in dealing with all the signs that appear with time. Instead of using one method exclusively, the tendency in aesthetic medicine nowadays is to use combined therapies. When analyzing the aging face, signs such as saggy skin, static and dynamic wrinkles, deep folds, and hyperpigmented spots result from various etiologies. It is easy for physicians to understand, therefore, that multiple therapies should be applied, although unfortunately this might not be obvious to patients. Patients should be educated to understand that the most natural appearance that can be obtained involves the use of multiple treatments.

7.2 Laser Resurfacing and Fillers

Both of these methods are indicated for the treatment of static wrinkles. The depth of the wrinkle, skin type, and recovery time after the procedure may influence the choice of either method. Usually, patients with a fair complexion benefit from laser resurfacing. Patients with a dark complexion may present hyper- and/or hypopigmentation. Due to skin quality, it is more common that patients with fair and sun-damaged skin may present full-face wrinkling and should be treated first with a skin resurfacing method to decrease the number of rhytides. After 3–6 months, biodegradable fillers may be injected into deeper wrinkles and folds. The degree of collagen remodeling that occurs following laser treatment varies according to laser aggressiveness and levels of enzymes, such as collagenases, which must have stabilized before any biodegradable product is injected. The appropriate time for commencement of collagen treatment is when the erythema subsides.

Some patients who cannot schedule the required recovery time may find fillers a nice method for improving the appearance of wrinkles and scars until the time is appropriate for laser resurfacing.

Patients with darker skin are not suitable for aggressive laser resurfacing and should undergo lighter methods with lasers. For these patients, the combination of a mild exfoliative methods and fillers are quite appropriate. Skin resurfacing should improve skin quality, and fillers should be used to treat deeper defects. Since mild exfo-
Plasticative methods do not promote natural collagen remodeling, both procedures can be done in the same session.

Fillers must be seen as the primary therapy when the deep dermis is compromised. In contrast, laser resurfacing is the first method to be used for superficial rhytides and sun damage. For complex scars, both methods should be used, even though the results are not long lasting. If any resurfacing method reaches the deep dermis, scar tissue may result. Fillers injected too superficially into rhytides may result in nodule formation and cause irregularities in the skin. When full-face resurfacing is performed, laser resurfacing of the nasolabial fold may decrease its depth if it was a superficial crease, because it tightens the skin from both the cheek and upper lip. Aggressive therapy may result in scar tissue formation. Patients with deep nasolabial folds may benefit from combination therapy with fillers and laser. As a rule, the injection of fillers into the dermis should not be carried out until laser-induced collagen remodeling has ceased. If injection of nonbiodegradable fillers or fat transfer are to be carried out in the subdermal layers (fat or muscle), it may be possible to combine them in the same session. Fillers should be injected immediately before laser resurfacing is begun. Vertical lines of the upper and lower lip benefit from laser resurfacing. Results can be quite impressive. If partial improvement is obtained, fillers can be used after the laser resurfacing to achieve better results (Fig. 7.1).

7.3 Chemical Peels and Fillers

Chemical peels are also an important tool for the removal of superficial wrinkles. Although patients may find the word laser more attractive, depending on the skin type and the time required from recovery, superficial or medium-depth peels are better suited for some patients. The rules are the same as for laser resurfacing: there are advantages and disadvantages with laser, chemical peels, or dermabrasion. Combining any of these resurfacing methods may maximize the advantages of each and minimize the disadvantages.

Superficial peels must be used over several sessions to promote a visible result. Since it only exerts its effect in the epidermis, the recovery time is quite quick and skin conditioning can be obtained. There is absolutely no problem in

**Fig. 7.1**

_**a** Patient before treatment to improve the lips and balance the asymmetries. **b** This patient was submitted to laser resurfacing and fillers were injected 6 months later._
performing superficial chemical peels and dermal or subdermal fillers in the same session. Fillers must be injected first and the superficial peel applied soon after. Patients must be warned that skin redness may be more prominent at the sites of injection. It may be the perfect method for a “lunch-time” visit and patients can go back to their social or professional activities immediately after.

On the contrary, medium-depth peels, such as trichloroacetic acid peels require at least 1 week away from work and social activities. When resurfacing methods extend down to the dermis, dermal fillers should not be injected in the same session. Injections should only be given when the collagen remodeling has stopped and when skin redness fades. In general, dermal filler injection can take place sooner after chemical peels than after deep laser resurfacing.

7.4 Botulinum Toxin and Fillers

The use of BoNT-A has changed the way cosmetic procedures are handled. Nonsurgical treatment of wrinkles used to consist of filling or resurfacing methods, both of which were focused on static rhytides. Dynamic wrinkles could at that time only be treated by a surgical approach and only in a few areas, such as the forehead and glabella. Muscle action may affect the duration of biodegradable fillers so that the presence of wrinkles in areas of direct muscular action produces only partial results in treatments with fillers and skin resurfacing. Inhibition of muscular activity with BoNT-A has been the solution to this problem in various areas, especially in the upper third of the face.

The aging process produces a change in muscular behavior. Continuous contraction of specific muscles may lead to dermal alteration and produces static rhytides. For such wrinkles, BoNT-A is injected before the fillers; indeed in some cases it may even be the only method required. In some cases, however, the dermis is so affected by both muscular hyperactivity and sun damage that fillers should also be used. Although the onset of the BoNT-A effect starts after 24–72 h, a period of 15 days must be respected before treatment with fillers is commenced. Experienced practitioners may inject both BoNT-A and fillers in the same session.

Glabellar lines result from the action of the corrugator and procerus muscles. Surgical section
of both muscles often produces imperfect results and may cause a distorted frown line. BoNT-A is the optimal solution to treat this area, and fillers may be needed as complementary treatment (see Fig. 5.2 and 5.4; see Chap. 5). This is the case when the wrinkle is very deep; some wrinkles are so deep that they seem to be scars, and thus unsolvable. In these cases, direct excision or subcision should be considered. Horizontal lines in the forehead are due to excessive movement of the frontalis. BoNT-A is usually the single method needed in this area. Depending on the skin thickness and dermal injury, however, fillers may also be needed. After the effects of BoNT-A are complete, fillers can be injected into the remaining wrinkles. The use of combination treatment with BoNT-A and fillers is also interesting in the oral commissure. BoNT-A inhibits the hyperactivity of the depressor anguli oris muscle and fillers promote structural support (Fig. 7.2; see Fig 5.43 Chap. 5).

Platysmal bands reduce or disappear with BoNT-A. However, some of the horizontal lines in the neck need complementary treatment with fillers. Fillers may be injected in the same session or after the BoNT-A has completely worked.

Other areas where both methods can be combined are in the nose and nasolabial folds. As mentioned earlier (Chap. 5), nose reshaping may be conducted with fillers. Here fillers can be nicely combined with BoNT-A, which will block the action of the depressor of the septum and thus lift the tip of the nose (Fig. 7.3).

Treating the nasolabial fold is feasible with BoNT-A, but it must be conducted only in very few cases where muscular action plays an important role. In this situation, the opposite happens: fillers should be injected first into the nasolabial fold and BoNT-A may be injected subsequently to decrease the muscular puffiness next to the nasal flare. Care should be taken because asymmetry is not an uncommon occurrence in this situation. BoNT-A should be injected to flatten this area. The gummy smile may also be treated with fillers and BoNT-A. The former is used to make the lips thicker and the latter to inhibit hyperactivity of the alaeque nasi labii superioris levator and the labii superioris muscles.

7.5 Facial Plastic Surgery and Fillers

As BoNT-A has changed the approach to remodeling of the upper face, fillers have revolutionized the surgical approach to the face. Minimal facial surgery with a quicker recovery time and combined with fillers is the treatment of choice for cosmetic facial improvement. In addition to treating wrinkles, fillers may be used to promote
the volumetric augmentation that was unachievable in facial surgery (Fig. 7.4).

As facial subcutaneous tissue decreases with age, the flattened appearance of the face after facial surgery may no longer be considered an issue. Fillers may be helpful in eye surgery both for reshaping the eyebrow and treating tear trough deformities, and even to improve the appearance of sunken eyes after excessive eye-bag removal. When saddle deformity results from rhinoplasty, fillers are perfect allies, because they can promptly correct the deformity without the need for a second surgical review (see Fig. 5.28 Chap. 5). Fillers can be used to lift the tip of the nose in situations where surgery is either unsuccessful or inadvisable. Malar and chin augmentation with fillers is also very helpful during facial surgery, promoting a more harmonious result. If the mandible angle becomes too flat after skin traction, fillers may also be used to diminish this effect with volumetric augmentation.

In conclusion, the combination of fillers with other methods in aesthetic medicine is quite rewarding when they are seen as being more than just dermal fillers, but also as tools to enhance the volume of fat and muscle.

**Fig. 7.4** a Patient before treatment. b This patient submitted to minimum invasive surgery and full-face filling for volumetric improvement
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