Introduction

Rhinoplasty is a safe surgical procedure with low complication risks. Late complications include local swelling and inflammation. Apart from mucous cyst formation, which occurs infrequently, foreign body reactions are increasingly being diagnosed due to the increasing popularity of “filler-materials” in the face and nose.

Filler (or non-surgical) rhinoplasty can be defined as the use of dermal filling agents (instead of surgery of the nasal skeleton) to correct aesthetic features of the nose. Fillers can be used to augment specific areas in order to modify nasal contours. The first “fillers” used in rhinoplasty were Vaseline and paraffin, used to correct saddle nose deformities at the end of the 19th century by Robert Gersuny. These remained popular during the first two decades of the 20th century, but subsequently these products were abandoned as a consequence of severe complications. The formation of “paraffinomas” (a granulomatous foreign-body reaction against paraffin) were a particular worry. Public demand drove a “filler” revival in the 1980s, with the adoption of novel agents with which to treat the signs of aging. At first, fillers were popular for the correction of nasolabial folds, and for lip augmentation, but in the last decade, filler rhinoplasty has gained popularity. In the following two case reports, we illustrate how foreign body reactions can occur in filler rhinoplasty. Despite the use of modern filler materials, complications do still occur, and we should remain alert to signs of them.

Case 1

A 31-year-old male patient presented at the OLVG hospital in Amsterdam with nasal obstruction. He had undergone rhinoplasty, including alar base wedge resections that were performed abroad. Following this surgery, a hyaluronic acid filler was used to augment the nasal columellar area. This treatment, also performed abroad, and was initially intended to improve the nasolabial angle. Symptoms developed approximately six months after filler injection, and remained stable over the next three years. Inspection of the nose showed a swollen mass of the columella, with progression in the membranous and caudal areas of the cartilaginous nasal septum (Figure 1a). Due to this mass, the external nasal valve, the nasal vestibule, was
blocked. The lateral view showed a bulbous nasal tip with loss of nasal tip projection and definition due to a round and hanging columella (Figure 1b). Subsequently, the mass was completely removed by external approach rhinoplasty (Figure 1c), without destruction of the nasal septal cartilage. Histopathologic examination of the mass showed evidence of a foreign body reaction. Although we could not identify the type of filler used histologically, we assume, based on the medical history, that this was a hyaluronic acid filler.

Figure 1
(a) Pre-operative basal view of a male patient. This patient had undergone an endonasal rhinoplasty elsewhere, including alar base wedge resections. Post-operatively, the patient received filler injections with hyaluronic acid in his columella, probably to improve the nasolabial angle. Six months after this treatment he developed a tumour-like mass in the columella and caudal part of the nasal septum. Due to this mass, the external nasal valve was blocked, with impaired nasal breathing. (b) Pre-operative lateral view (c) Perioperative view of the mass. The lesion was removed through external approach rhinoplasty. (d,e) Postoperative basal and lateral view of the same patient, 12 months after surgery; the columella and nasal septum are within normal limits, and the valve area has a normal configuration.
Injectable fillers in rhinoplasty

Discussion

In the last decade, injectable fillers have gained popularity as an alternative to surgical rhinoplasty. This type of filler rhinoplasty is principally performed by “cosmetic doctors” offering these procedures as cheap, on-demand, non-surgical procedures. Some rhinoplasty surgeons also use injectable agents, for example to smooth out any small irregularities or asymmetries of the nasal skeleton that may occur after surgery. In general, fillers can augment certain regions of the nose in order to improve the aesthetic aspect of the nasal contours. For that reason the indications are limited. Nevertheless, some practitioners argue that fillers are an alternative to surgical rhinoplasty without the risks associated with anaesthesia, and are

Postoperatively, there were no complications. Nasal breathing improved and examination of the nose showed a normal aspect of the columella and nasal septum 12 months after surgery (Figure 1d and 1e).

Case 2

A 19-year-old male patient, with a left sided unilateral cleft lip, presented at the University Medical Center Utrecht for revision rhinoplasty. He had undergone nasal surgery elsewhere, a year before, but was displeased with the functional and aesthetic results. In particular the asymmetry of the ala and bulbous aspect of the nasal tip. During an open approach revision rhinoplasty we noticed granulomas and transparent greasy material on top of the left lateral crus of the lower lateral cartilage (Figure 2a–c). Histopathology of the granulomas and filler material showed evidence of a foreign body reaction against the silicone oil. The nose was reconstructed using a columellar strut graft, a shield graft, and an alar batten graft on the left side. Postoperatively, no complications were observed, and the patient was satisfied with the functional and aesthetic outcomes.

Figure 2
(a) Perioperative view of open approach revision cleft-lip rhinoplasty. Note massive scar tissue in the nasal tip area with granuloma formation on top of the lateral crus left. (b) The granuloma was removed for histopathologic examination. (c) Greasy, semi-transparent material was detected beneath the granuloma, with the suspicion that this was silicone oil.
One has to be aware that these so called “minimally invasive” approaches are not free of complication, some of which can be particularly severe. Depending on the interval between the injection and complication, one can categorise these events as early (in the first few weeks), or delayed (months/years; Table 1).

Minor early adverse events include discomfort at the injection site (pain, swelling, tenderness), which may arise because of suboptimal injection technique. For example, injecting too superficially can cause asymmetry, nodules, skin irregularities, and bluish discoloration of the skin (Tyndall effect). Other authors favour calcium hydroxyapatite because of its long lasting effects and perfect moulding capacities. Collagen fillers have a relatively short durability, lasting only a few months, which is too limited for most patients. Silicone implants and fillers were used as a permanent filler agent in the early days of filler rhinoplasty, but their use has been more or less abandoned by most physicians with the advent of newer and safer products. The possibility of serious granulomatous reactions is however still a considerable drawback for these newer agents.

One has to be aware that these so called “minimally invasive” approaches are not free of complication, some of which can be particularly severe. Depending on the interval between the injection and complication, one can categorise these events as early (in the first few weeks), or delayed (months/years; Table 1). Minor early adverse events include discomfort at the injection site (pain, swelling, tenderness), which may arise because of suboptimal injection technique. For example, injecting too superficially can cause asymmetry, nodules, skin irregularities, and bluish discoloration of the skin (Tyndall effect). Filler injection can also encourage infection or abscess formation, or elicit an acute herpetic reactivation, which can present as tissue necrosis. A severe, and fortunately rare, but potentially life threatening complication is an immediate hypersensitivity reaction, leading to anaphylactic shock. Another complication that can arise early after the procedure is tissue necrosis resulting from embolization, when the filler is accidentally injected intra-vascularly by direct vessel damage, or from compression of the local vasculature by the injected substance. The advantage of hyaluronic acid under such circumstances is, as already mentioned, the availability of hyaluronidase with which to reverse the effect. Tissue necrosis can result in scarring and skin or tissue defects. The arterial supply of the

### Table 1

<table>
<thead>
<tr>
<th>early complications</th>
<th>late complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>discomfort at the injection site (0-20 %)</td>
<td>telangiectasia</td>
</tr>
<tr>
<td>pain</td>
<td></td>
</tr>
<tr>
<td>oedema, swelling</td>
<td>skin defects (&lt;0.001 %)</td>
</tr>
<tr>
<td>erythema</td>
<td></td>
</tr>
<tr>
<td>ecchymosis</td>
<td>hypertrophic scarring (&lt;0.001 %)</td>
</tr>
<tr>
<td>tenderness</td>
<td>granuloma formation (0.01 - 1%)</td>
</tr>
<tr>
<td>improper injection technique</td>
<td></td>
</tr>
<tr>
<td>nodules - irregularities</td>
<td></td>
</tr>
<tr>
<td>infection (0.09 %)</td>
<td></td>
</tr>
<tr>
<td>anaphylaxis (&lt;0.001 %)</td>
<td></td>
</tr>
<tr>
<td>herpetic reactivation</td>
<td></td>
</tr>
<tr>
<td>vascular compromise</td>
<td></td>
</tr>
<tr>
<td>skin necrosis (0.09 %)</td>
<td></td>
</tr>
<tr>
<td>embolization (&lt;0.001 %)</td>
<td></td>
</tr>
</tbody>
</table>
Injectable fillers in rhinoplasty

injection (for example pharyngitis, sinusitis, influenza), or a facial injury as the trigger. It is still unclear as to whether these granulomas are a delayed hypersensitivity reaction, or are of bacterial origin. Some authors suggest that biofilms (the accumulation of microorganism in a self-developed matrix) are involved in granuloma formation and that embedded with the biofilm, bacteria can resist immune defence mechanisms and antibiotics.14

Some injectable fillers, such as hyaluronic acid, can lead to long-lasting tissue reactions, necessitating surgical intervention, especially if the granuloma formation is extensive. A more conservative approach should be used with biodegradable fillers. Additionally, as illustrated by our first case study, hyaluronic acid can induce long-lasting tissue reactions, with the need for surgical intervention. In early complications of hyaluronic acid, the injection of hyaluronidase can be considered in order to reverse the result.8 Alternatively, repeated intra-lesional steroid injections (Triamcinolone acetonide 10 mg/ml) can be attempted. Other suggested treatment options for granulomas/biofilms include the prolonged use of antibiotics (quinolone and advanced generation macrolide), intra-lesional 5-FU, and intra-lesional laser therapy.11 There is no current consensus in the literature as to the appropriate therapeutic regime. Finally, for instances of extensive granulomatous reactions in response to a permanent filler, with the associated risks of serious aesthetic disfiguration or severe functional problems, surgical excision may become necessary.10 In the case of a foreign body reaction in the nose, we would advise open approach rhinoplasty as the method of choice with which to remove what are often multiple nodular lesions.

Conclusion

Non-surgical or “filler” rhinoplasty seems an attractive tool to fine-tune the aesthetic results of surgery, and is also gaining popularity as a primary technique. The physicians performing these procedures should be aware of their potential drawbacks. Inflammatory granulomas can arise with all types of injectable material, although the risk of complications and damage are reduced with temporary and semi-permanent fillers (e.g. hyaluronic acid and calcium hydroxyapatite). Permanent fillers, especially silicone fillers, should be abandoned altogether. We envisage that the increased popularity of filler rhinoplasty will result in a higher incidence of complications in the near future. While intra-lesional steroid injections can

nose is partially derived from the internal carotid artery. Intravascular injection of a filler in non-surgical rhinoplasty, under high injection pressures, may force the filler into the internal carotid artery, the ophthalmic artery. Although rare, this can create a very serious complication, since embolization of the terminal branches of these vessels can cause blindness, panophthalmpia, and cerebral ischaemia.13

Delayed complications include the skin defects mentioned previously, scarring, but also telangiectasis.11 Our cases illustrated another late complication of filler rhinoplasty, the development of a granulomatous foreign body reaction against the injected material. These unpredictable reactions, often occurring many years after the procedure, can result in permanent tissue damage14 and was the main reason for the abandonment of Vaseline-paraffin fillers at the beginning of the 20th century.

The injection of filler into subcutaneous tissue elicits a resorption process, which includes a cellular response necessitating the differentiation of monocytes into epithelioid cells, and the formation of foreign-body giant cells. Fibroblasts are recruited a month later, and collagen deposition begins. Ordinarily, this foreign body response will gradually decline to a low-grade response, and eventually fade away after 2 years. This reaction pattern is seen for most injectables and is considered to be the normal host response to a foreign material.14 In some patients, as was the case for the first patient, nodules or tumour-like lesions develop, with histopathology revealing an active “foreign body” reaction; i.e. “inflammatory granulomas”.15 The reported rate of granuloma formation is 0.01% to 1%,14 with these leading, in some cases, to ulceration, pus discharge, tissue necrosis, and scarring.14 In fact, such inflammatory granulomas are described for most injectable fillers, including hyaluronic acid and calcium hydroxyapatite.15 Since these fillers are biodegradable, these reactions are likely to disappear spontaneously within a few months. Granuloma formation appears to be more prevalent, and pronounced, in response to permanent i.e. non-biodegradable fillers (e.g. silicone, acrylates, etc.), and in these cases a more aggressive approach to ameliorate side effects may be warranted.15 Granulomas often become clinically apparent in the first half of the year after filler injection, although these can arise after several years.10 The patient often describes a severe infection (for example pharyngitis, sinusitis, influenza), or a facial injury as the trigger. It is still unclear as to whether these granulomas are a delayed hypersensitivity reaction, or are of bacterial origin.14 Some authors suggest that biofilms (the accumulation of microorganism in a self-developed matrix) are involved in granuloma formation and that embedded with the biofilm, bacteria can resist immune defence mechanisms and antibiotics.15

In general, a more conservative approach should be used with biodegradable fillers. Additionally, as illustrated by our first case study, hyaluronic acid can induce long-lasting tissue reactions, with the need for surgical intervention. In early complications of hyaluronic acid, the injection of hyaluronidase can be considered in order to reverse the result.8 Alternatively, repeated intra-lesional steroid injections (Triamcinolone acetonide 10 mg/ml) can be attempted. Other suggested treatment options for granulomas/biofilms include the prolonged use of antibiotics (quinolone and advanced generation macrolide), intra-lesional 5-FU, and intra-lesional laser therapy.11 There is no current consensus in the literature as to the appropriate therapeutic regime. Finally, for instances of extensive granulomatous reactions in response to a permanent filler, with the associated risks of serious aesthetic disfiguration or severe functional problems, surgical excision may become necessary.10 In the case of a foreign body reaction in the nose, we would advise open approach rhinoplasty as the method of choice with which to remove what are often multiple nodular lesions.
be attempted as a treatment, the surgical resection of these “granulomas” is often ultimately required.

References


D. J. Menger
Department of Otorhinolaryngology, Head and Neck Surgery Center for Facial Plastic and Reconstructive Surgery Heidelberglaan 100
3584 CX, Utrecht, The Netherlands
E-mail: ENT-research@umcutrecht.nl