

# Soft and Firm Alloplastic Implants in Rhinoplasty: Why, When and How to Use Them: A Review of 311 Cases

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## Abstract

**Background** Modern rhinoplasty is not just a reduction procedure. An optimal nasal esthetic result occasionally requires augmenting the nasal tip, the dorsum or the lateral wall with autografts or alloplasts. A large number of nasal implant types have been reported in the medical literature. **Objective** The goal of this article is to demystify the role and indications of nasal implants in rhinoplasty. As well, it offers both the novice and experienced nasal surgeon a basic, simplified and organized approach to the use of soft and firm nasal implants in rhinoplasty.

**Methods** This article presents the authors experience with 311 rhinoplasties using both soft and firm alloplastic implants. The indications for both types of alloplasts are discussed, the surgical technique detailed and the outcomes analyzed.

**Results** A total of 311 nasal implant cases were reviewed. This series revealed a low incidence of postoperative infection (5.57% for soft implants and 0.1% for the firm ones). The revision rate was 2.7% for the soft implants group and 7.1% for the firm implants group.

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**Keywords** Rhinoplasty · Protheses and implants · Nose · Reconstructive surgical procedures · Alloplast

## Introduction

Among novice rhinoplasty surgeons, there exists a popular trend of performing primarily a ‘reduction’ procedure. Seasoned surgeons, however, know for a fact that achieving a successful result in rhinoplasty does not only involve ‘subtracting’ from the nasal framework, but sometimes ‘adding’ to it as well. In other words, a successful rhinoplasty is often a combined ‘reduction/augmentation’ procedure.

There is a multitude of materials used for augmenting a nose. These include autografts, homografts and alloplastic implants. Different types of nasal alloplasts have been advocated in the medical literature [1–24]. They range from soft fabrics or sheets, to firm/hard blocks or preshaped implants. Examples of previously and presently used alloplastic materials include polytetrafluoroethylenes (such as ‘Gore-Tex’ by W. L. Gore Associates, Inc, Flagstaff, Arizona, USA), silicone rubber (such as ‘Voloshin’ by Implantech, Ventura, California, USA), polyethylenes (such as ‘Medpor’ by Porex, Fairburn, Georgia, USA, and ‘Plastipore’ by Richards Manufacturing Company, Memphis, Tennessee, USA), polyesters and ‘Dacron’ (such as ‘Mersilene’ by Ethicon Inc, Somerville, New Jersey, USA, and ‘Cooley’ by Boston Scientific, Quincy, Massachusetts, USA).

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In the following article, our large experience with soft and firm alloplasts is presented and the indications reviewed. As well, the techniques for their use are explained and the obtained results are analyzed.

## Soft Nasal Implants

### What are They: The Materials

The soft alloplasts used in this series were exclusively made of ‘Dacron’ polyester fibers. They came as a net-like ‘mesh’ that was either loosely knitted or tightly knitted [25–32]. The loosely knitted Dacron mesh, such as the ‘Mersilene’ mesh, is supplied as a beige sheet of 30 cm × 30 cm. It is non-absorbable, flexible and easily cut with scissors. The tightly knitted Dacron mesh, such as the ‘Cooley’s’ type that has been incorporated extensively in cardiac surgery, comes as a beige fabric sheet of a woven non-absorbable polyethylene terephthalate.

Soft nasal implants, in addition to being soft, have four other advantages:

First, they are not slippery thanks to their multifilament material-like structure. Therefore, when they are placed against cartilage, bone or skin, they tend to resist unintended displacement. This is not the case with other otherwise excellent soft but slippery implants, such as ‘Gortex’ [8, 9, 13, 37–41].

Second, because of their beige color, they do not cause a whitish hue under the skin, even many years following the surgery, and after the postoperative edema has dissipated. This is unlike the case with other white alloplasts (such as ‘Medpor,’ ‘Gortex’), where a whitish discoloration of the nasal skin is a potential late complication, especially in the case of a thin skin.

Third, because of their net-like nature, they are infiltrated by soft tissue growth. Therefore, they feel soft to the touch. This makes them ideal implants for the tip area, where they simulate the somewhat soft consistency of the natural nasal tip, unlike other harder implants (such as ‘Silastic’).

Finally, they are easily cut and shaped during surgery.

### When to Use Them: Indications in Our Practice

#### *In the Tip Area*

Tip augmentation is mainly indicated in two situations: a nasal tip that is recessed, or one that is too wide. In the case of a recessed nasal tip, the soft implant serves as a subcutaneous filler to increase the overall tip projection. In the case of a tip that is too wide, the soft implant used is

**Fig. 1 a** The midline of the nose is first marked as a vertical dotted line. The shape of the implant is outlined on the skin as a lozenge of about 1 cm (horizontally) by 5 mm (vertically). The horizontal axis of the implant is *ab*. **b** The surgeon keeps folding the border of the wet sheet on itself to form a long flat pad of 7 mm wide (*p*) with the desired number of layers. The surgeon cuts a 1-cm segment from the end of the folded roll, producing a rectangle measuring 1 cm by 7 mm (*i*). This rectangle is held between two mosquitoes. A 5-0 chromic transfixing suture is placed in the center of the rectangle. The four angles of the rectangle are then trimmed (*L1*). The superior angle is then cut to give the implant the shape of a ‘lozenge with a blunt top’ (*L2*). All edges are then beveled with scissors (*L3*). The final beveled implant measures 1 cm by 5 mm (*L3*). **c** Using a sharp double hook and a no. 15 blade, a 2-cm marginal incision is made inside the right nostril, along the caudal border of the right alar cartilage. **d** Using blunt scissors, a generous subcutaneous pocket is dissected in the tip area. Its size should be a little larger than the actual implant. **e** The right alar rim is pulled up. The surgeon introduces a pair of blunt medium scissors into the dissected pocket to depress the tip cartilage (the domes), which opens the pocket widely. The implant, clamped within the mosquito tip, is introduced into the pocket. **f** The mosquito is aligned so that its curved end is horizontal along the line ‘*ab*’ marked on the skin. The fingers of the surgeon’s left hand are placed above and below the line ‘*ab*’ to stabilize the implant. Then, the mosquito is opened wide and slowly withdrawn

usually smaller in all dimensions: width, height and thickness. Its aim is solely to break the flatness of the wide tip by giving more projection to the central area of its façade. Therefore, by making the tip contour ‘pointier,’ it is perceived as narrower and more defined.

#### *In the Dorsum*

Dorsal augmentation with soft implants is only indicated in cases of mild dorsal depression. In our experience, moderate to severe dorsal recession seems to be easier to correct with firm implants.

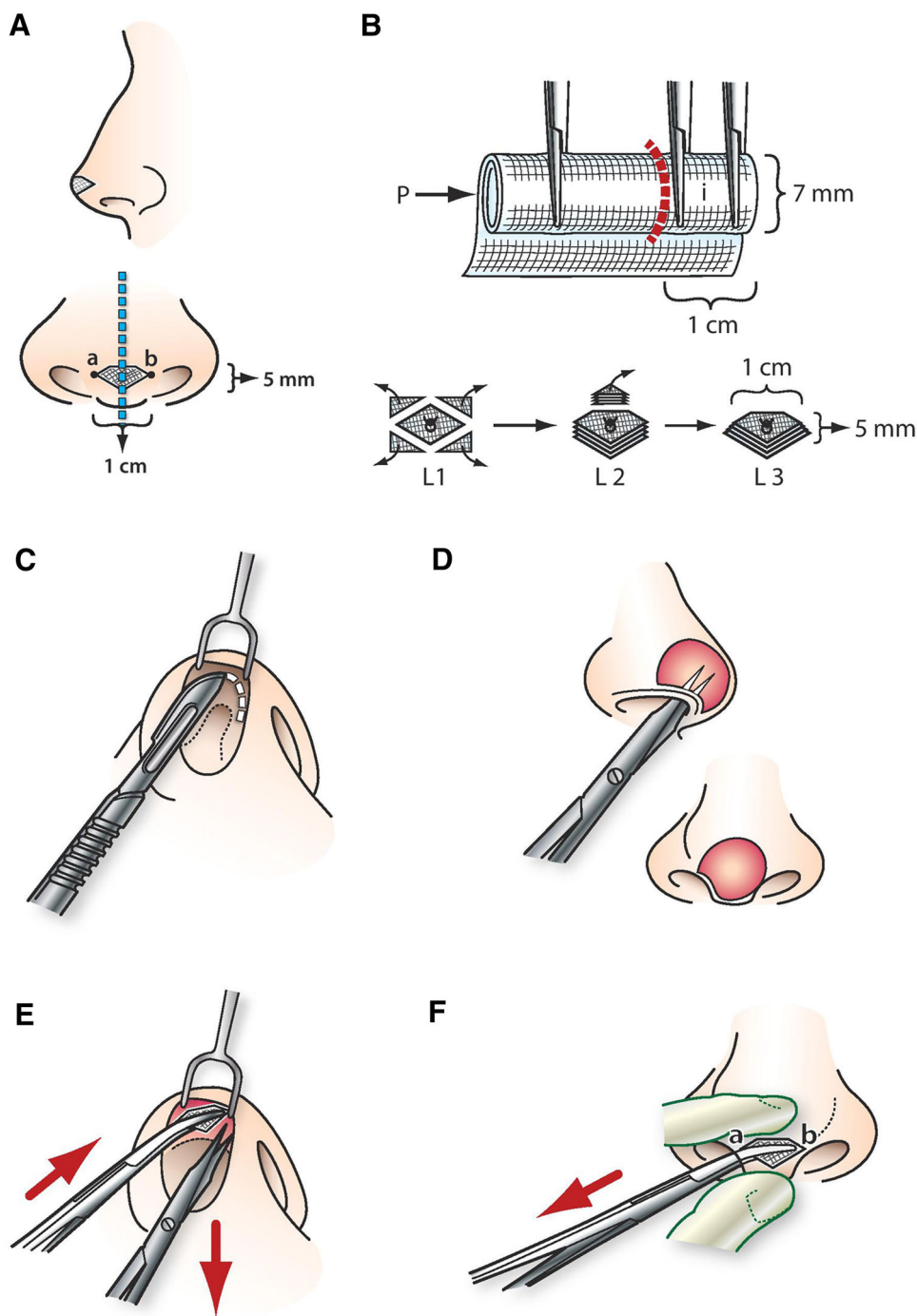
#### *In the Lateral Wall*

Lateral wall depressions, unilateral or bilateral, are indications as well.

### How to Use Them: Surgical Technique Used in Our Practice

#### *The Preoperative Marking*

*In the Tip Area* The midline of the nose is first marked as a vertical dotted line (Fig. 1a). Once the location of the tip implant is decided, the shape of the implant is outlined on the skin as a lozenge of about 1 cm wide (horizontally) by 5 mm long (vertically) (Fig. 1a, ‘a’ and ‘b’ denoting right and left ends of the implant).



*In the Dorsum* The midline of the nose is noted as a dotted line (Fig. 2a). The superior and inferior limits (Fig. 2a, points a and b) of the implant are marked on the skin. The length of the implant varies between 2.5 and 3.5 cm, and its width between 8 mm and 1 cm. In the frequent event of the dorsal recession (depression) being

deeper in one area, a third mark (Fig. 2a, point d) is placed to identify the level of the needed extra implant thickness.

*In the Lateral Wall* The depressed region in the lateral wall is marked as a triangle (Fig. 2a, lw). This prevents a demarcation line and makes the implant look more natural,

since all the natural nasal contours are somewhat triangular.

### The Choice of Implant Thickness

**In the Tip Area** The implant varies between 0.5 and 2.5 mm in thickness, with the most popular thickness being 1 to 1.5 mm. One millimeter of loose mesh ‘Mersilene’ mesh usually contains 6 layers, while 1 mm of tight mesh ‘Cooley’s’ contains 2 layers. Therefore, the rule is:

1 mm = 6 layers of Dacron loose mesh (e.g.: ‘Mersilene’), or  
= 2 layers of Dacron tight mesh (e.g.: ‘Cooley’s’)

The implant thickness needed is estimated by ‘visual’ evaluation of the approximate number of millimeters needed to be added to the tip in order to achieve an acceptable tip projection. As a general rule, when using the soft nasal implants, it is safer to underestimate rather than overestimate the nasal implant thickness needed. In our experience, the tip definition and implant projection tend to increase a little with time, up to 4 years postoperatively.

In our practice, the estimated implant thickness is done preoperatively as follows:

1. *No tip recession:* 0.5 mm is used (3 layers of loose mesh, or 1 layer of tight mesh). The implant is used to provide more definition to the flat tip by making it look narrower and more defined.
2. *Mild tip recession:* 1 mm is used (6 layers of loose mesh, or 2 layers of tight mesh). This is the most popular thickness.
3. *Moderate tip recession:* 1.5 mm is used (9 layers of loose mesh, or 3 layers of tight mesh).
4. *Severe tip recession:* 2–2.5 mm is used (12–15 layers of loose mesh, or 4–5 layers of tight mesh).

**In the Dorsum or Lateral Wall Areas** The thickness used in the lateral wall is minimal, usually 0.5 mm (3 layers of loose mesh or 1 layer of tight mesh).

For the recessed dorsum, a small increase in height is achieved using 0.5–1 mm (3–6 layers of loose mesh, or 1–2 layers of tight mesh). If one needs a greater thickness for the dorsum, it is better to shift to a firm implant (e.g., silicone rubber). In the past, we used thicker soft implants in the dorsum, but we rarely use them nowadays. This is because any irregularity on the surface of the saddle dorsum is transmitted to the surface of the implant. Therefore, shaping the soft implant to exactly fit the dorsal irregularities becomes very tedious and time-consuming. Therefore, for all but a minimal dorsal augmentation, we believe,

**Fig. 2 a** The midline of the nose is noted as a *dotted line*. The superior and inferior limits (points *a* and *b*) of the dorsal implant are marked on the skin. A mark (*d*) identifies the thickest point of the implant. The average dorsal implant is usually 3 cm long and 1 cm wide. The upper and lower borders of the implant are shaped as triangles to avoid an abrupt demarcation under the skin. Then, all the edges around the implant are beveled for a feathered effect to further minimize the possibility of demarcation (*c*). (i) If there is a depressed region in the lateral wall, it is marked as a triangle (*lw*) (NB: all the natural nasal contours are somewhat triangular). The majority of implants for lateral wall depressions are very thin and are usually just 0.5 mm in thickness (*lw*). In rare cases, a deep lateral depression may need a thicker implant. In such a case, after the beveling of the edges of the implant, the smaller layers of the implant are placed to face the inside (*f*). (ii) A 1.5-cm right intercartilaginous incision is done to access the dorsum (*Rii*), and then, a dorsal subcutaneous pocket is dissected. (iii) For a lateral wall implant, an intercartilaginous left incision is made (*Lii*). **b** An Aufricht dorsal retractor is introduced in the dorsal pocket to open it. The dorsal implant is held with a bayonet nasal forceps. The bayonet forceps holding the implant is introduced into the pocket. The tip of the bayonet forceps should coincide with point ‘a’ at the superior end of the skin marking. The Aufricht retractor is then pulled out: The implant is stabilized with the thumb and index finger placed on both sides of the implant, while the bayonet forceps is opened wide and slowly retracted while using a ‘rocking’ movement. **c** Firm implant insertion: A generous right marginal incision is done, which is extended along the right border of the columella. Dissecting a subcutaneous pocket across the tip and along the dorsum is carried out (*pd*). The dissection is then extended inside the columella, down to the base of the nostrils (*pc*). First, *insetting* the dorsal arm of the implant is done using an Aufricht retractor. Then, the columellar arm of the implant is teased with a forceps into the columellar pocket. If the whole implant does not fit ‘comfortably,’ it is pulled out, trimmed and re-inserted again. It is crucial to ensure that there is no tension against the skin over the tip area

based on our experience, that firm implants necessitate a shorter learning curve, are easier to use and are much more predictable in terms of results.

### Summary of the Average Used Implant Thickness

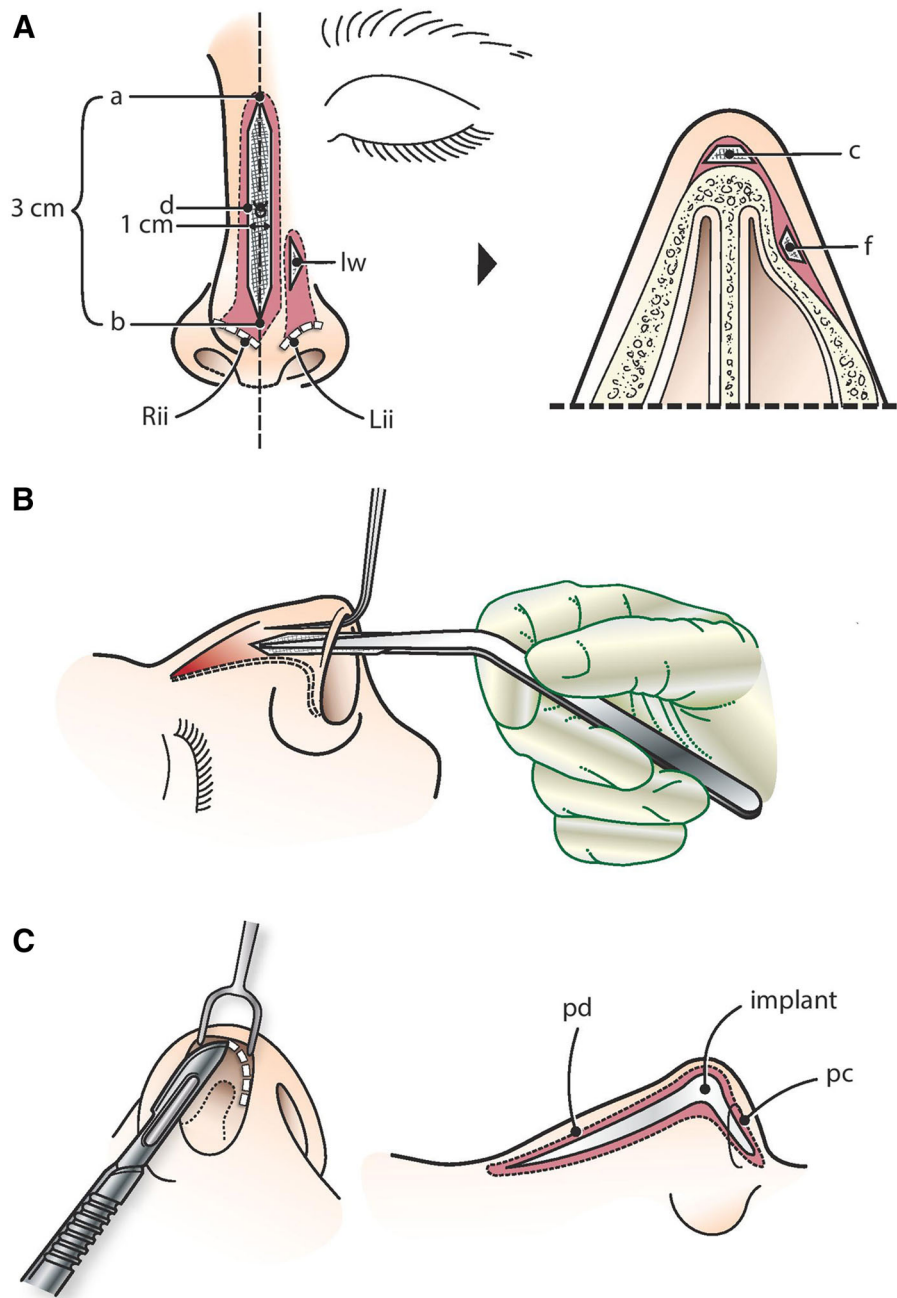
1. In the nasal tip: 0.5–1.5 mm
2. In the dorsum: 0.5–1.0 mm
3. In the lateral walls: 0.5 mm

### The Wetting of the Implant

For infection prevention, the implant sheet is soaked in a concentrated antibiotic solution (e.g., Bacitracin). This also renders the sheet easier to handle. In addition to the local antibiotic soaking, a general antibiotic coverage is provided in the form of 1 gm of cefazolin given intravenously at the start of the surgery.

### The Layering of the Implant

Using both hands, the surgeon rolls the wet sheet on itself, in order to form a long flat pad (roll) of 7 mm wide (Fig. 1b, P). The surgeon keeps folding the roll on itself repeatedly, adding one



extra layer at a time, until the desired number of layers is reached. As an example, a 1.5-mm implant needs a folded sheet (pad), containing 9 layers of loose mesh (Mersilene) or 3 layers of tight mesh (Cooley's). The height and width of the implant should be about 1 cm horizontally and 5 mm vertically (Fig. 1b, L3).

#### *The Shaping of the Implant*

**In the Tip Area** Once the folded pad contains the desired number of layers (the desired implant 'thickness'), it is

clamped with three mosquitoes (one at the center, and two near each end) to fix it in place (Fig. 1b, P). Since the folded roll is 7 mm wide, all the surgeons have to do is cut a 1-cm-long segment from the end of it, which produces a rectangle measuring 1 cm by 7 mm (Fig. 1b, i). This rectangle is then stabilized by holding it with two mosquitoes. A 5-0 chromic transfixing (back-and-forth) suture is placed in the center of the rectangle to hold the layers together and to prevent them from sliding over one another while being inserted into the nose. The four angles of the rectangle are then trimmed



(Fig. 1b, L1). This turns the rectangle into a lozenge measuring about 1 cm horizontally and 7 mm vertically. Finally, two last adjustments are done: a) The superior angle is cut to give the implant the shape of a ‘lozenge with a blunt top’ and three angles (inferior, left and right) (Fig. 1b, L2). This decreases the vertical dimension to about 5 mm. b) All the edges of the implant are beveled with scissors for a feathering effect (Fig. 1b, L3) to ensure a soft transition between the borders of the implant and the surrounding tissue, therefore preventing the appearance of demarcation lines as a late postoperative esthetic complication. The final beveled implant measures about 1 cm by 5 mm (Fig. 1b, L3).

*In the Dorsum* The average dorsal implant is usually 3 cm (2.5–3.5 cm) long and 1 cm (8 mm–1 cm) wide (Fig. 2a). A 1 cm-wide folded pad containing the desired number of layers is fashioned as previously described, then clamped with two or three mosquitoes to stabilize it. If the dorsal implant is 3 cm long, we simply cut 3 cm off the end of the folded pad (which will give us a dorsal implant 3 cm long by 1 cm wide). One or two through-and-through sutures of 5-0 chromic are used to approximate the layers of the implant and stabilize them. The upper and lower borders of the implant are shaped as triangles to avoid an abrupt demarcation under the skin. Then, all the edges around the implant are beveled (feathered) to further minimize a demarcation or step deformity (Fig. 2a, c).

*In the Lateral Wall* The majority of implants for lateral wall depressions are just 0.5 mm in thickness (3 layers of mesh or 1 layer of tight mesh). They are always shaped as a triangle (Fig. 2a, lw).

### The Insertion of the Implant

*In the Tip Area* The following is the step-by-step technique to insert a soft nasal tip implant. Figure 3 shows these surgical steps for the soft nasal implants.

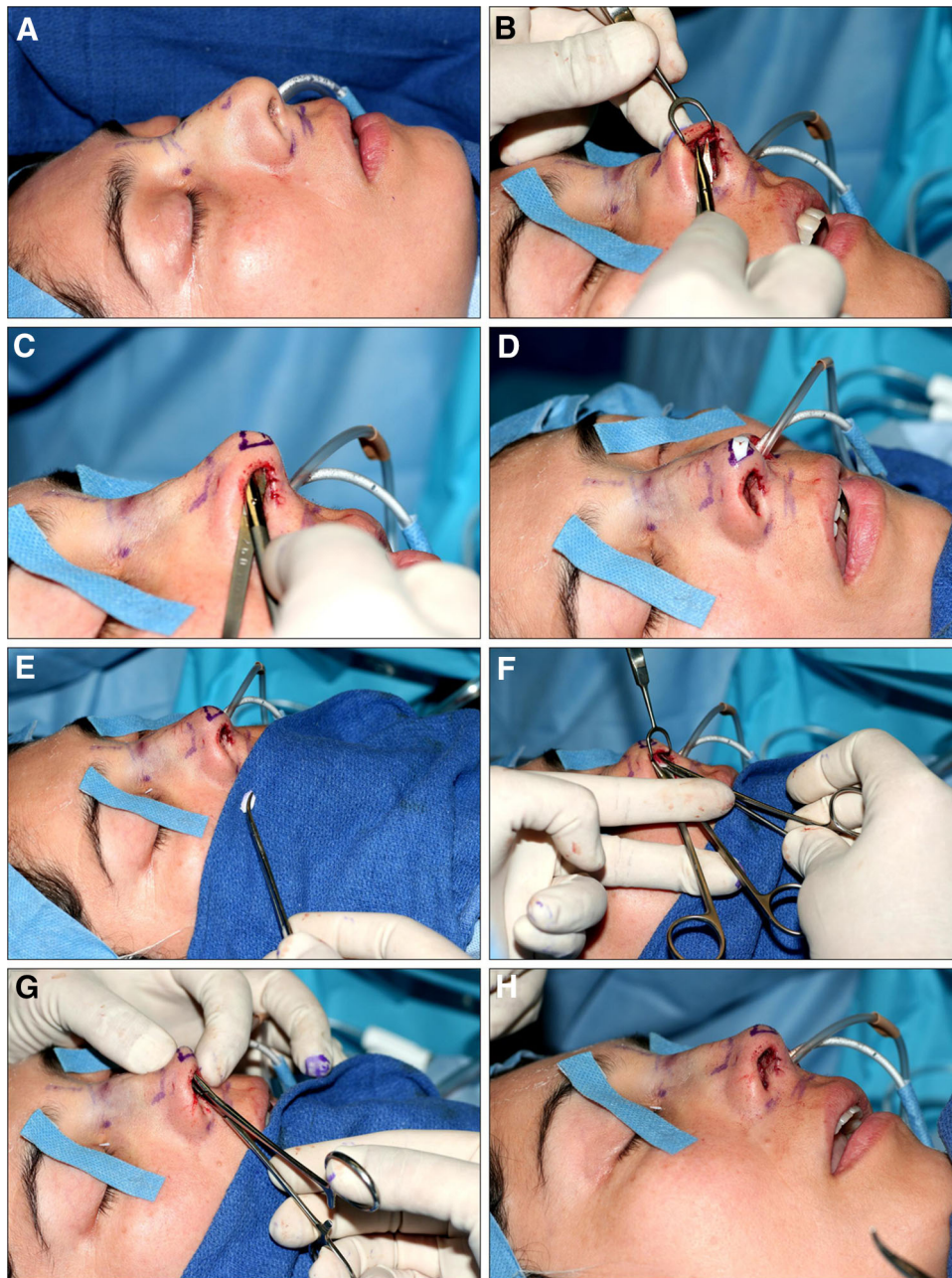
1. Preoperatively, a lozenge-like outline of the implant has been drawn on the skin, making sure that the lozenge is centered on the nasal midline (Fig. 1a) and that its lateral extremities (a and b) are horizontal.
2. Using a sharp double hook to lift the right nostril, a 2-cm marginal incision (Fig. 1c) is made with a blade or sharp small scissors, along the caudal border of the right alar cartilage.
3. Using blunt medium-sized scissors (e.g., curved Stevens), a generous subcutaneous pocket is dissected (Fig. 1d). Its size should be a *little larger* than the actual implant. This increase in the pocket size is important in any soft implant, since the pocket always shrinks postoperatively. *In the main author’s*

*experience, a pocket as large as the implant is probably the prime cause of soft implant extrusion.* Ironically, this rule is the exact opposite to the one used for autografts (e.g., cartilage, fascia), where a tight pocket helps the survival and the good take of the graft.

4. The implant is then soaked in a small volume (2 cc) of a concentrated antibiotic solution (e.g., Bacitracin).
5. A curved mosquito is used to clamp the implant. This is done in such a way as to have the end of the mosquito clamping the horizontal axis of the implant (Fig. 1e, f). Therefore, the tip of the mosquito should rest on the left end of the implant, at point b.
6. To insert the implant under vision, a sharp double hook is used to pull up the right alar rim. The double hook is left to the assistant to hold up (Fig. 1e). The surgeon introduces a pair of blunt medium scissors, such as curved Stevens, into the dissected pocket. These scissors are slightly opened, then moved down to depress the tip cartilage (the domes). This opens the pocket widely.
7. The implant, clamped within the mosquito tip, is introduced into the pocket (Fig. 1e). The tip of the curved mosquito is positioned at point b under the skin, and the mosquito is aligned so that its curved end is horizontal along the line ‘ab’ marked on the skin (Fig. 1f). The double hook and blunt scissors are then removed slowly and gently, while the mosquito holding the implant is left as is.
8. The fingers of the left hand are placed above and below the line ‘ab’ to stabilize the implant against the skin (Fig. 1f). Then, the mosquito is opened wide and slowly withdrawn, while it is being ‘rocked’ gently to disengage it from the implant.
9. Then, using a double hook, the incision is checked on the inside to make sure that the implant is not too close to it (which may lead to its extrusion). Finally, a single 5-0 chromic suture is used to approximate the center of the incision, allowing drainage on either side.

*In the Dorsum* The following is the step-by-step technique to insert a soft dorsum implant. Figure 4 shows the typical surgical steps for the firm nasal implants.

1. A 1.5-cm right intercartilaginous incision is done to access the dorsum (Fig. 2a, Rii).
2. A subcutaneous pocket is dissected along the dorsum.
3. An Aufricht dorsal retractor is introduced in the dorsal pocket to open it and the retractor is then held by the assistant (Fig. 2b).
4. The implant is held between the two sides of an angled bayonet nasal forceps, in such a way that the end of the implant coincides with the tip of the forceps (Fig. 2b).



**Fig. 3** Successive intraoperative views of the soft implant technique: **a** A view of the nose at the start of the rhinoplasty. **b** Using a sharp double hook and a no. 15 blade, a 2-cm marginal incision is made inside the right nostril, along the caudal border of the right alar cartilage. Then, using blunt medium-sized scissors, such as curved Stevens, a generous subcutaneous pocket is dissected. **c** The preoperative marking of the shape of the soft implant is visible on the tip. The size of the pocket should be a little larger than the size of the actual implant. This increase in the pocket size is important when using any soft implant, since the pocket always shrinks postoperatively. **d** The lozenge-shaped implant is made of layers of tight Dacron mesh, which are tied together with a central chromic suture (the implant is placed over the tip to show its future placement inside). **e** A curved mosquito is used to clamp the implant. This is done in such a way as to have the 1-cm tip of the mosquito positioned along the *horizontal axis* of the implant. **f** Using a sharp double hook,

the right alar rim is pulled up. The double hook is left to the assistant to hold. The surgeon introduces a pair of blunt medium scissors, such as curved Stevens, into the pocket. These scissors are slightly opened, then pushed down to depress the alar cartilages (the domes). This opens the pocket space in the tip area. The implant, clamped within the mosquito tip, is introduced into the pocket. The tip of the curved mosquito is aligned so that it follows the *horizontal axis* of the implant that is marked on the skin (*line 'ab'* in Fig. 1a). The double hook and blunt scissors are then removed slowly and gently, while the mosquito holding the implant is left as is. **g** The fingers of the left hand are placed above and below the implant to stabilize it against the skin. Then, the mosquito is opened wide and slowly withdrawn while being 'rocked' gently to disengage it from the implant. **h** A single 5-0 chromic suture is used to approximate the center of the incision, while still allowing drainage. The final view at the end of the rhinoplasty is shown

5. The bayonet forceps holding the implant is introduced into the pocket, sliding against the Aufrecht retractor so that it does not get caught against the nasal tissues.
6. The Aufrecht retractor is pulled 1 cm back so that the end of the bayonet forceps can be palpated under the skin. The bayonet forceps is then positioned so that its tip coincides with point 'a' at the superior end of the skin marking. The Aufrecht retractor is then slowly removed.
7. The fingers of the left hand are placed on the skin on both sides of the bayonet to hold down the implant. The bayonet is then opened wide and slowly retracted while using a 'rocking' movement to avoid catching the implant on its way out.
8. The inner incision is then inspected to ensure that the lower end of the implant is not too close to it. Finally, a single 5-0 chromic suture is used to approximate the incision, allowing drainage on either side.
9. A plaster cast is applied post-op. This same splint is used for all of our rhinoplasty cases, regardless of the presence of an implant.

*In the Lateral Wall* The following is the step-by-step technique to insert a soft lateral wall implant.

1. An intercartilaginous incision, if not been done already, is made on the side of the augmentation, whether it is on the right or left (Fig. 2a, Rii or Lii).
2. The steps to introduce the implant are similar to those followed for the dorsal implant.

## Firm Nasal Implants

### What are They: The Materials

As for firm nasal implants, we use exclusively medium-firm silicone rubber implants of medium consistency. In our series, the L-shaped dorsal-columellar 'Voloshin' implants (Implantech, Ventura, California, USA) were used after intraoperative shape modification. However, the rules stated here could be applied to any other firm/hard alloplast.

### When to Use Them: Indications in Our Practice

The main indication for firm implants is a depressed dorsum. This is particularly relevant in Asian and Black patients, but is occasionally so in Caucasians.

Asian and Black noses with a poor dorsal height usually exhibit a concomitant weakness of the premaxilla, leading

to a recession of the columella and the nasolabial angle. This is why an L-shaped implant is often very practical in augmenting the dorsum, the columella and the nasolabial angle, all at the same time. In addition, the short columellar arm of the 'L' shape implant helps stabilize its long dorsal arm. However, if the premaxillary deficiency is severe, an additional premaxillary implant is often needed [33–35].

### How to Use Them: Surgical Technique in Our Practice

#### *The Preoperative Markings*

They are similar to the previously described technique for the dorsal soft implants (Fig. 2a).

#### *The Choice of Implant Thickness*

The firm implants can vary from 2 to 5 mm at its thickest point, a point usually located at the mid-length of the dorsum (Fig. 2a, point d).

#### *The Wetting of the Implant*

As in the case of a soft implant, the firm implant is also briefly soaked in a concentrated antibiotic solution for antibacterial protection. As well, 1 gm of intravenous cefazolin is given to the patient at the start of the surgery.

#### *The Shaping of the Implant*

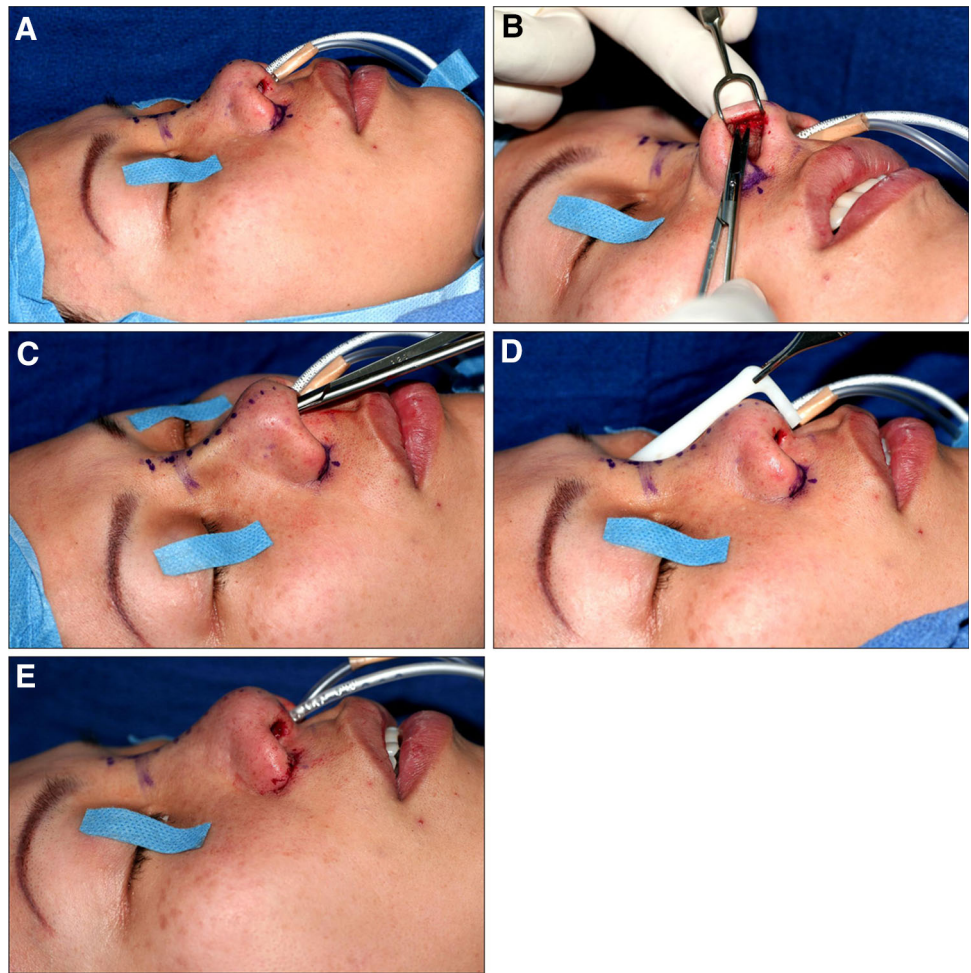
There are many types and styles of firm L-shaped dorsal-columellar implants produced by different companies. In almost all cases, some intraoperative trimming of the different parts of the implant is needed. The dorsal arm is usually shortened at its superior border, while making sure to keep that end of the implant triangular in contour. The tip area of the implant, which shows as a prominent joint at the angle of the 'L,' is occasionally trimmed if it is deemed to be too projecting. In the case of a very thin skin in the tip area, a graft of morcellized septal cartilage or of temporalis fascia may be used to cover the implant in this area and is then sutured to it with a 5-0 chromic suture. As well, the columellar arm is often shortened and trimmed to become thinner.

#### *Adding a Graft to the Tip Area of the Implant*

In cases of thin skin, we opt for use a graft (mastoid fascia or morcellized cartilage) sutured over the tip area of the L-shaped implant. This is done to decrease the theoretical chance of extrusion or skin blanching.



**Fig. 4** Successive intraoperative views of the firm implant technique: **a** A view at the start of the rhinoplasty showing a nose with a dorsal saddle deformity. **b** A right marginal incision is done and is extended along the right border of the columella. **c** Dissection is performed with blunt scissors to create a subcutaneous pocket along the dorsum and another pocket between the medial crura of the columella. **d** The L-shaped implant is shown before being introduced into the two nasal pockets. **e** The nasal contour is depicted after the trimming and the introduction of the L-shaped implant



### *The Insertion of the Implant*

An important point here is to *only use a marginal incision (along the caudal inferior border of the alar cartilage), never an intercartilaginous one* (Fig. 2c, left drawing), in order to make sure that the pocket of the L-shaped implant only communicates with the nasal cavity through the one marginal incision used to introduce it. According to a general perception among many surgeons, a synthetic implant that crosses an incision may have a higher chance of being extruded.

The L-shaped dorsal-columellar implant is inserted as follows:

1. A generous right marginal incision (2 cm), similar to the one described for the tip of the soft implant is done, then it is extended along the right border of the columella (Fig. 2c).
2. Dissecting a subcutaneous pocket above the tip cartilages, then along the dorsum is carried out (Fig. 2c, pd).
3. The dissection is then extended inside the columella, between the two medial crura and down to the anterior nasal spine (Fig. 2c, pc).
4. Inserting the dorsal arm of the implant is first done using an Aufrecht retractor in the same way described for the soft implant. Then, the columellar arm is teased with a forceps into the columellar pocket. The two arms of the implant as well as its tip part (at the junction of the two arms) should not cause any skin tension whatsoever. If the implant does not fit ‘comfortably,’ it is pulled out, trimmed and re-inserted again. It is particularly crucial to ensure that there is *no tension against the skin over the tip area*.
5. The right marginal incision is then approximated with a single 5-0 chromic suture, allowing drainage on either side.
6. A plaster cast is applied post-op. This same splint is used for all of our rhinoplasty cases, regardless of the presence of an implant. Oral antibiotics are also prescribed for one week.

**Fig. 5** Example of a soft nasal implant: **a, b** Preoperative photographs of a 28-year-old Caucasian woman with a boxy and ill-defined round tip in the profile. **c, d** Postoperative photographs depicting 27 months following rhinoplasty, including interruption of the alar crura and a soft nasal tip implant of 2 layers



## Results

Our series of 311 rhinoplasties reviews the use of both soft and firm alloplastic implants. The male/female ratio was 1:3.9. The average age was 28.3 years, ranging from 16 to 62. All rhinoplasties were performed by the same surgeon. Examples of results are shown in Figs. 5, 6, 7, 8 and 9.

### Soft Implants

Soft implants were used in 269 out of 311 cases (86.49%). The Mersilene mesh was used in 104 cases and the Dacron Cooley's fabric in 165 cases. The tip area was involved in 263 cases (97.76%) of all soft implant cases, compared to 67 cases (24.9%) involving the dorsal or lateral wall areas.

The follow-up ranged from 6 months to 15 years (an average of 21 months).

The most important complication was infection, which occurred in 15 patients (5.57%), usually during the first year. This infection rate is comparable to infection rates previously published in the literature for soft alloplastic implants such as Mersilene (4–9%) and Gore-Tex (0–10%) [2–4, 10, 13, 18, 36–41]. In all cases, the implant was immediately removed. Pulling out the implant was usually very easy because of the lack of any tissue ingrowth in an infected implant. The implant removal procedure was done under local anesthesia only, using a small incision to access the implant and a mosquito to pull it out without direct visualization. Implant infection manifests itself as swelling, redness or



**Fig. 6** Example of a soft nasal implant: **a, b**. Preoperative photographs of a 19-year-old Latino woman with a recessed nasal dorsum and ill-defined round nasal tip with thick skin. **c, d** Postoperative photographs depicting a long term 6-year follow-up after a rhinoplasty including soft nasal dorsum and tip implants. A firm nasal implant could also have been used in this case



purulent discharge inside the vestibule characterized by an offensive smell. If neglected (which should never happen), the implant may start extruding inside the nose, or worse, externally through the skin.

The second most common complication was esthetic revision to correct an implant that was too thick, too thin or displaced. This happened in 7 cases (2.6%). We had no implant rejections.

### Firm Implants

Firm implants were used in 42 cases (13.5%). All cases were Asians, except for five Black patients and one Caucasian patient. The follow-up ranged from 3 months to

5.1 years (average of 12.7 months). The main reason for the lower number of cases of firm implants compared to the soft ones is the somewhat uncommon indication of saddle nose deformity, which is mostly limited to Asian and Black patients. As well, our experience with soft implants started over a decade earlier than the firm ones. This explains why our average follow-up for the soft implants is longer than that of the firm ones.

The most common complication was esthetic revision for an implant that was tilted to one side or was too thick. This occurred in 3 cases (7.1%). This rate is also comparable to the revision rates published in the literature for firm alloplastic implants such as Silicone (0–16.1%) [15–17, 42–45] and Medpor (0–7.7%) [14, 46–49].

**Fig. 7** Example of a soft nasal implant: **a, b** Preoperative photographs of a 21-year-old Mediterranean woman with an ill-defined nasal tip. **c, d** Postoperative photographs 19 months following the insertion of one layer of a soft Dacron implant in the nasal tip



Interestingly, there were no cases of infection. This may be explained by the low porosity of the medium-firm silicone, which does not allow blood to infiltrate the implant and eventually initiate an infection process. There were no cases of extrusion, which could be due to the great care taken to make sure the implant is comfortable in its pocket and is not exercising any pressure on its skin coverage. We also believe that allowing drainage from the pocket by using a single suture at the incision is very important in preventing hematoma formation around the implant, which could lead to infection or extrusion. The infection and extrusion rates published in the literature are 0–5.2% and 0–25%, respectively. The reports that we came across had either infection or extrusion with few reporting both [14–17, 42–49].

## Discussion

Autografts are widely used in rhinoplasty. The most popular ones are derived from septal and auricular cartilages, and occasionally from costal cartilage. These grafts suffer virtually no infection. A major advantage of autogenous grafts is their very excellent record of safety in both the short and long terms [11].

However, in terms of esthetic result, we believe that cartilage grafts are only predictable in the columella, but somewhat unpredictable everywhere else, such as in the tip, dorsum and lateral wall areas. In our previous experience, as well as documented in the literature, *the more time passes after surgery, the more likely previously hidden problems are to suddenly appear*, such as sharp edges, graft



**Fig. 8** Example of a firm nasal implant: **a, b, e** Preoperative photographs of a 28-year-old Black woman with a saddle nose deformity and ill-defined round wide bulbous nasal tip. **c, d, f** Postoperative photographs 6 months following the insertion of an L-shaped nasal columellar firm implant. The surgery also included reduction of the nostrils and chin augmentation



deviation, displacement, curling, resorption (partial or total) [50]. In addition, there are some intraoperative limitations: the limited volume of cartilage available, the limited choice of shape and of consistency and the additional surgery to the donor site [11].

Alloplasts, on the other hand, have the risk of infection as their main disadvantage [44, 50]. In our series, by using appropriate precautions such as local antibiotics, intravenous antibiotic, soaking the implant in an antibiotic solution and using a single suture to close the incision and

allow drainage, we found this risk to be low in cases of soft implants and extremely low in cases of firm ones. Other uncommon complications include displacement, improper size and extrusion [42, 44, 50].

The current medical literature heavily favors autografts over alloplasts in nasal surgery [50, 51]. The synthetic implants are perceived by a majority of surgeons as dangerous, unpredictable or hard to use. However, if we consider the esthetic result, the alloplasts have some advantages: They do not undergo resorption, they do not

**Fig. 9** Example of a firm nasal implant: **a, b** Preoperative photographs of a 31-year-old Asian woman with a saddle nose deformity. **c, d** Postoperative photographs 19 months following the use of a L-shaped firm nasal implant and nasal base resection



curl, they look and feel reasonably natural (especially the soft implants), they have no sharp edges, they are rarely displaced, they offer an unlimited supply of volume, form and consistency, they do not need a donor site, and they need a shorter surgical time.

In this article, the authors have tried to present a step-by-step and simplified approach for the use of nasal alloplasts. Multiple colored diagrams and operating room photographs are included in order to make the surgical technique easy to duplicate. As well, the article has demonstrated the low complication rate of alloplasts, which is more reasonable than generally assumed. By presenting both soft and firm implants in the same article, the authors tried to give a comprehensive approach to the surgeon unaccustomed to nasal implants.

The authors hope this article will contribute to the rhinoplasty literature by demonstrating that alloplastic

nasal implants are not as dangerous or as complicated as widely perceived. It also suggests that alloplasts could have a beneficial role to play in rhinoplastic surgery.

### Conclusion

Soft and firm alloplastic implants can be a valuable tool in the rhinoplasty surgeon's armamentarium of techniques for nasal augmentation. Although alloplasts carry certain risks and complications, they do have valuable advantages, especially in terms of producing predictable esthetic results. It is time that alloplasts be considered as an additional option and a helpful tool in the field of rhinoplasty.

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### Compliance with Ethical Standards

**Conflict of interest** The authors declare they have no conflict of interest and did not receive any funding for this study.

**Statement of Human and Animal Rights** For this type of study, formal consent is not required.

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