Technical Strategies

Open-Tip Approach: Evolutions in Rhinoplasty

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Modifications and innovations in open-structure rhinoplasty that have occurred as this technique has evolved are discussed. In addition, the philosophy and fundamentals of open-tip approach in rhinoplasty are reexamined. A retrospective review of representative patients in a hospital practice setting was performed. All surgical procedures were conducted in a department of plastic surgery of the University of Rome Tor Vergata. The preoperative and long-term results of each patient are compared to demonstrate the effectiveness of the described techniques. The fundamental philosophy of open-tip rhinoplasty is the maintenance of the integrity and strength of the nasal skeleton. Modifications of tip grafting techniques, along with additional domal grafting techniques, and a stronger focus on domal suturing techniques result in a softer contour and lack of tip tensions while maintaining structural support.

Key Words: Open tip, rhinoplasty, open approach

The philosophy of open-tip rhinoplasty focuses on restoring or maintaining the strength and support of the nasal skeleton while altering the contour to achieve the desired aesthetic result. It is this focus on maintaining the integrity and strength of the nasal architecture that leads to stable aesthetic results over time and the maintenance of a functional nasal airway. The philosophic basis of the techniques of open-tip rhinoplasty remains unchanged. However, some alterations and variations in the techniques themselves have been made based on experience and long-term follow-up. The fundamentals of open-tip rhinoplasty techniques are discussed along with the modifications and innovations that have resulted in the evolution of this approach.

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Materials and Methods

A sample of 15 patients (12 women and 3 men), selected among 452 cases treated with functional and aesthetic rhinoplasty at the Department of Plastic and Reconstructive Surgery of the "Tor Vergata" University of Rome, was analyzed. Patients were aged between 25 and 50 years, with a mean age of 40 years, and were treated with open-tip rhinoplasty.

The patients were treated with the use of a composite graft, in the dorsum and alar defects.

The preoperative study was carried out through a complete clinical examination of the nasal pyramid and of the nasal cavities through anterior rhinoscopy, a photographic examination in 4 projections (frontal, lateral, three-fourths, and axial), and through x-rays of the facial skeleton.

In addition, in the more complex cases, a high-resolution computed tomographic scan with three-dimensional imaging for a better view of the anatomic structures has been performed.

Postoperative follow-up took place after 2 and 5 weeks; 3, 6, and 12 months; and then annually, for a minimum of 1 year and a maximum of 6 years.

Discussion

The open-structure rhinoplasty approach has evolved based on the tenets of conservative resection, structural support, softer contour, and lack of tension. Conservative cartilage resection facilitates maintenance of the inherent nasal support. Grafts, autologous, and alloplastic are the foundation of restoring and augmenting nasal support.

Surgical Technique

Alar and columellar defects can be corrected by lowering or lifting the alar rim or by reducing or increasing the length of the columella, or the caudal septum or the medial crura.

An appropriate columellar remodeling can be performed after the determination of the anatomic defect.

To correct columellar defects, autologous grafts can be used.

These grafts are placed under and/or between the medial and intermediate crura to provide support and, therefore, to provide projection to the nasal tip.

Cartilage fragments, known as "bulk grafts," are positioned in the inferior columellar portion through a lower lateral incision.

These grafts provide support to the nasal tip, especially when associated with remodeling and filling of the columella-labial angle.

Cartilage grafts should have a gentle curvature, so to simulate columellar anatomy and create a pleasant "double interruption" with a correct nasal tip. Sometimes, the medial crura footplate expands laterally and increases its dimension. In this case, to provide support to the nasal tip, intercrural soft tissues are removed, and medial crura was sutured, so that the columellar width is reduced and its length increased (columellar narrowing).

Sometimes, a wide columella contributes to nasal airway obstruction. In some cases, a large space can separate intermediate and medial crura, resulting in bifid columella. It is often characterized by a vertical furrow on the medial line. Surgical technique consists of incision on both sides of the columella to expose the medial portion of the lower lateral cartilages and of removing all soft tissues between medial crura, which are sutured.

Taking the patient's wishes into account, a thin cartilage strip can be placed in the columellar caudal portion, over the crura, to hide intercrural furrows. Finally, protruding medial crura footplates could reduce nostrils dimensions, obstructing nasal breathing.

Exposure and releasing of these structures are important to determine the real anatomy.

When medial crura footplates are too large, they can be reduced by a "razor excision" or by a wide resection, before medial suture fixation.

In some patients, the quantity of soft tissues between medial crura footplates is excessive, resulting in an important widening of the columella and obstructing nasal airways.

Soft tissue resection and crura fixation with a medial suture improves breathing.

Placement of a tip graft allows control of nasal tip projection and shape. It also provides camouflage of the underlying nasal tip skeleton, particularly useful when dome division has been performed. The tip graft allows the surgeon to set the nasal tip at the desired projection and then modify the nasal dorsal height accordingly.

The ideal material for tip grafting is autologous nasal septum because of its stiffness and relative flatness. Conchal cartilage may also be used but is less ideal because of its lack of rigidity and its inherent curvature. The graft is then carved into the appropriate shape for either a cap graft or a shield graft.

The shield graft is a three-dimensional structure. The graft is carved with carefully beveled edges to blend in with the cartilage of the nasal tip. The graft is thickest at the tip and thinnest over its base, where the elongated columellar extension is secured to the medial crura. The general dimensions are 11 to 15 mm in length, 7 to 12 mm in width, and 1 to 4 mm in thickness. Nasal tip projection can be set by altering the position of the graft on the medial crural/columellar complex. Nasal length can be affected by the thickness and position of the graft. Ideally, the shield graft should override the domes slightly (1–2 mm), with approximately 0.5 mm of overcorrection. Avoiding overprojection of the tip graft is important for preventing a tombstone deformity. The columellar complex should be completely flat and symmetric to serve as a foundation for a tip graft, and trimming of the medial crura may be required. Once the tip graft is in place, it is further carved in situ to obtain the ideal projection and contour (Figs 1 and 2). The shield graft is carved with a smooth curvature rather than a strong bidomal shape to provide softer definition to the tip (Fig 3). Care must be taken to bevel the edges and avoid any sharp angles or prominent edges. This is particularly important in the nasal tip with a thin overlying skin-soft tissue envelope (S-STE). The shield graft can be further camouflaged by placing a buttress graft immediately behind the tip graft to smooth the transition. The buttress graft is a rectangular or quadrangular piece of either septal or conchal cartilage carved with beveled edges and sutured in place behind the shield graft. The buttress

Fig 1 Intraoperative situation.

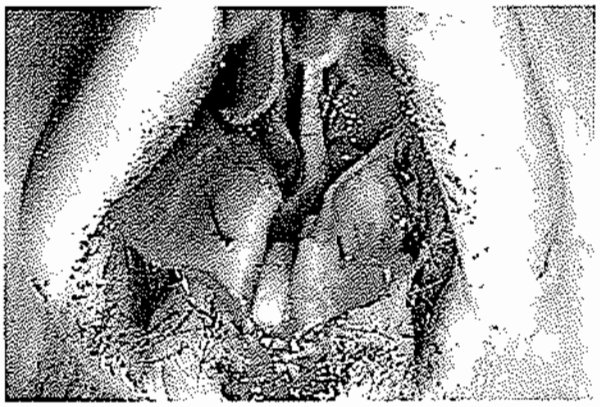

Fig 2 Intraoperative situation. Columellar strut.

graft can also support and prevent retrodisplacement of the tip graft. This is particularly important when the tip graft projects significantly above the underlying nasal tip skeleton or in patients with a heavy S-STE. When auricular cartilage is used, this double-layer technique helps to strengthen the tip graft. The contour of the shield graft can be tailored to the desired effect. Aggressive beveling to thin the leading edge allows the tip graft to bend slightly and more directly overlie the domal units. Suturing directly to the apex of the domes generally creates tension in the nasal tip and should not be done unless the graft abuts the domes, tension free. Less beveling and thinning should be used if significant projection of the shield graft above the domal units is required. A buttress graft is often used in this instance for support and contour.

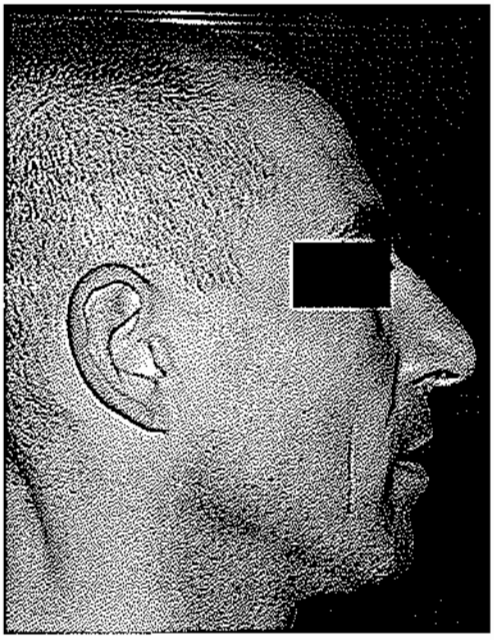

Fig 3 Preoperative situation in the lateral right projection.

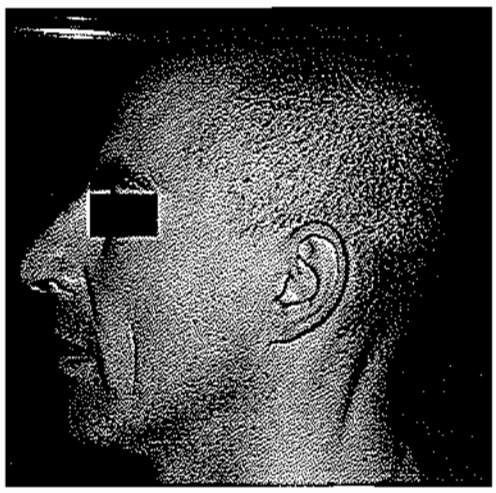

Fig 4 Preoperative situation in the lateral left projection.

An alternative tip grafting technique, particularly in the thin-skinned patient, is a cap graft. Cap grafts can be used to provide slight projection and definition. It is a quadrangular cartilage graft, with the wider aspect of the graft overlying the domes and the narrower aspect tapered over the lower lateral crura. The graft edges are carefully beveled, and it is sutured in position overlying the domes to provide definition to the tip (Fig 4). Again, it is further carved in situ to obtain the ideal contour. Because of its softer profile, it is well camouflaged even in the thin-skinned patient. It can also be used for camouflage after domal division. However, when significant tip projection is required, a shield graft is usually necessary.[1,2]

The aim of nasal valve reconstruction is the anatomic and functional correction of the superior airways. The main surgical techniques include the use of "composite grafts" (Figs 3 and 4), made up of skin and cartilage, or mucosa and cartilage, and "spreader grafts." The latter, described by Sheen,[3] are a type of graft that is placed between the septum and the lateral cartilages.

They allow the separation of the mobilized upper lateral cartilages and the most caudal part of the frontal apophysis from the nasal septum. Spreader grafts are made up of a small bar of cartilage (generally from the septum) attached to the sides of the dorsal margin of the quadrangular cartilage. A spreader graft exhibits the following relationships:

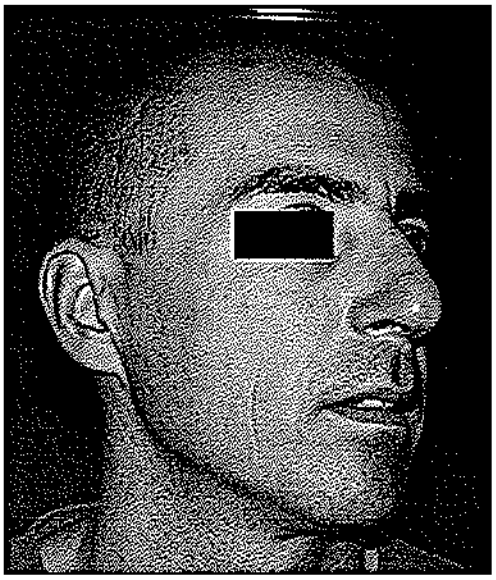

Fig 5 Preoperative situation in the three-fourths right projection.

medially, it is in contact with the cartilaginous tissue of the septum, and laterally, it rests on the septal perichondrium. It is mandatory that it is contained in the integral extramucosal space.

Therefore, correcting the collapse of the lateral walls while keeping them apart permits the widening of the internal nasal valve, thus correcting the patency of the nasal airway spaces.

Better results were obtained in this study by the use of composite grafts.

These grafts provide a functional support to the lower part of the lateral cartilages which, in most cases, collapse because of excessive resection during previous surgical operations (the cartilages collapse during inspiration), giving support to the external nasal valve. They are implanted through what is known as "open-tip" access, which permits a wide exposure of the dorsum, a broad view of the osteocartilaginous structures to be reshaped, and also allows the nonabsorbable sutures that are not exposed on the surface (to avoid them being touched from the outside) to perfectly stabilize the graft.

All this is possible only with this type of access; otherwise, we would risk distorting the grafts with poor results in the postoperative period and in the long term. It is important that the grafts are well attached so to minimize their movement, given that their reabsorption is caused by mobility. From a biologic point of view, the graft nourishes itself through imbibition, thanks to the establishment of new microvascular bridges between itself and the receiving bed.

Therefore, if the graft is not stable, the irroration will not be perfect over time, and dehydration and reabsorption could occur. Unlike cutaneous transplants, composite transplants have a receiving bed only along the perimeter, where the margins are in direct contact with the defect, and therefore, the revascularization and take of the transplant pose serious limitations to the size of the transplant used for reconstruction.

In most cases, a composite graft that is more than 5 mm from the vascular bed is at risk for necrosis. Nevertheless, surprising successes have been achieved, which can be explained by the fact that highly vascularized tissues, like the nose and the ear (the most frequent donor sites), contain a proportionally denser network of endothelial channels than other tissues.

This characteristic facilitates the imbibition of fluids from the receiving tissues, which maintain the hydration of the graft, until the vascular connections and the vascular growth toward the interior of the transplanted tissue establish the final revascularization of the graft. As in the case of skin grafts, stereomicroscopic observations on humans show how, after a period of 48 hours, vascular flow in composite grafts can be observed. The flow gradually expands inside the graft in the following days. The conclusion that seems to emerge from what we have said is that the larger the surface of contact between the composite graft and the receiving bed, the more rapid the revascularization of the graft will be. In this study, however, even better results were obtained with a graft that we define as "precise," that is, not too small that could impede its insertion nor too big that could cause early mobility and reabsorption or retraction of the graft itself. If one plans not to use the open-tip access, then the receiving

Fig 6 Preoperative situation in the three-fourths left projection.

bed must be extremely precise and perfectly shaped on the graft to avoid movement, given that stabilizing sutures cannot be placed. In this case, one should make an intranasal incision, which must be smaller than the graft, which must thus enter with force and stay put (otherwise, the graft will come out of the incision in the postoperative phase). As we previously mentioned, the most frequent donor sites are the nasal septum and the retroauricular area. The first is ideal for its consistency and abundance and because a fragment can be removed without affecting its mechanical stability. It is not used only when it is not available. In this case, the tissue is obtained from the retroauricular area, which represents the second choice, because since it is curved, it must be straightened, and is therefore not easy to shape. Skin and cartilage grafts obtained from this area are also used because retroauricular skin positioned inside the nasal structure undergoes metaplasia and becomes mucosa. Moreover, the skin does not need contact with the osseous structure, and this increases the probability of success of the take.

As to the technique of transposition of mucocartilaginous flaps, better results can be achieved for internal valvular stenosis, whereas results are not as satisfactory for internal-external valvular stenosis. In fact, in our experience, because this method has been applied in only 1 case of internal-external stenosis

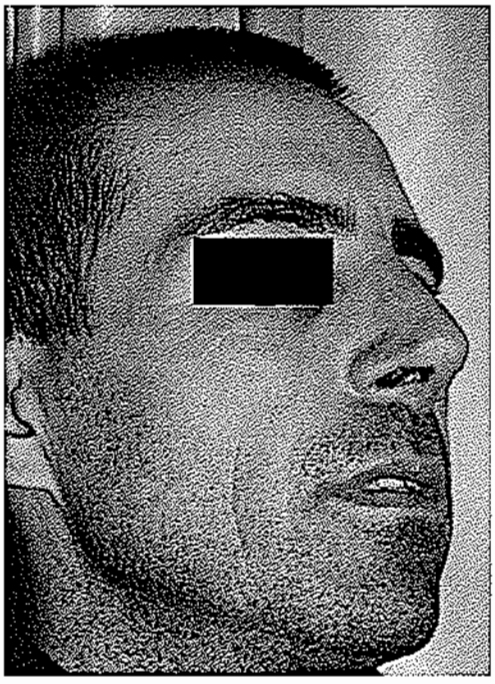

Fig 7 Postoperative situation in the three-fourths right projection.

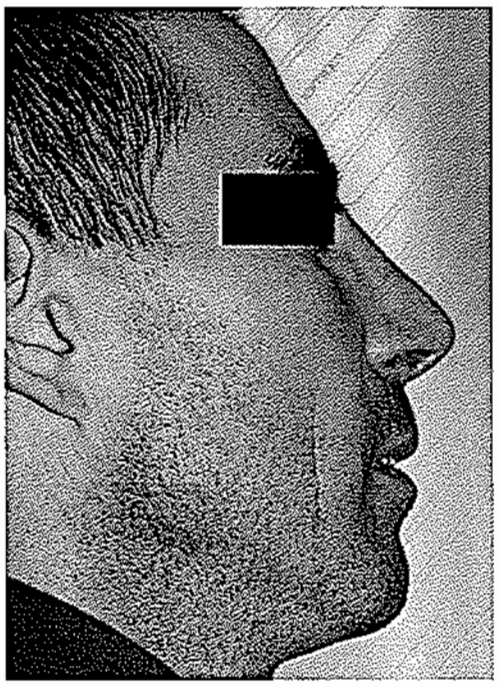

Fig 8 Postoperative situation in the lateral right projection with increase of the tip.

(still in the follow-up phase), it should not be considered statistically significant; the method is therefore still in a phase of study, although we expect to experiment on it in more cases.

Defects of the nasal dorsum can occur in the osseous or in the cartilaginous portion and can be associated with deformities affecting the whole third facial midline. The most common causes of saddleback nose are: trauma, infection, congenital deformity, septal bone and nasal bone necrosis, mycotic infection of septum in immunodeficient patients, craniofacial congenital deformities of the facial skeleton, hypoplasia of medial third, ethmoidal, midface and nasal pyramid traumas, and finally, iatrogenic problem as a consequence of crushing of cartilaginous septum in nasal surgery. Among nasal deformities, saddleback is one of the most difficult to correct surgically. It results from traumas to the nasoethmoidorbital region (centrofacial fractures) and, in this case, is associated with other evident signs like telecanthus, teleorbitism, and orbital dystopia. It can also be a consequence of surgical procedures in the nasal area, where a loss of bone or septal cartilaginous support has occurred. The sinking of the cartilaginous portion is frequently observed after an excessive resection of septal cartilage, especially if the mucoperichondrium flaps have been torn, because, besides the loss of bony support, the

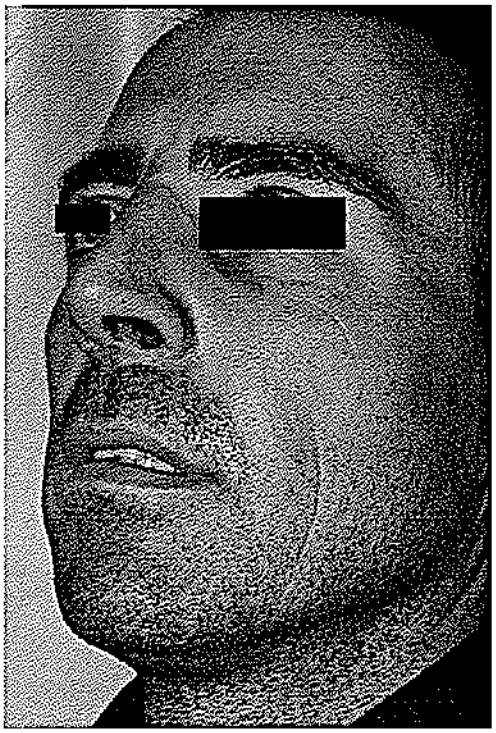

Fig 9 Postoperative situation in the three-fourths left projection.

contraction of the flaps while healing accentuates the depression of the dorsum. Cartilaginous depressions due to hematomas and infections of the septum with destruction of cartilage can also occur. All the defects listed above can be corrected through the use of cartilage grafts obtained from the ribs. The authors present their experience with the correction of nasal saddleback through Medpore implants.

In our experience, this technique has been used in 5.1% of rhinoplasty operations. The diagnosis that the patients brought to our attention was deformity of the nasal pyramid of iatrogenic origin for previous surgical operations, with the presence of associated nasal obstruction. The clinical case also involved a deformity of traumatic origin after the initial operation.

The deformities observed involved a failure of the projection of the nose pyramid and an insufficient projection of the tip caused by the retraction of the columella and the anterior nasal spine and lateral deviation of the pyramid.

The technique used was in 93.4% of the cases "open-tip" and in 4.9% closed approach. The open-tip technique allows a better view of the anatomic structures, especially in secondary rhinoplasties, and is therefore preferred by the authors. Postoperative

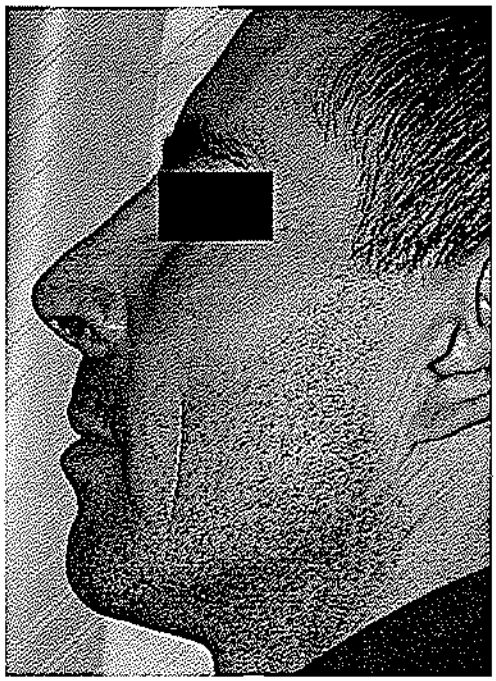

Fig 10 Postoperative situation in the lateral left projection.

follow-up was done after 2 and 6 weeks; 3, 6, and 12 months; and then annually, for a minimum of 1 year and a maximum of 8 years.

A 33-year-old patient came to our attention with an evident deformity of the nasal pyramid of iatrogenic origin 11/2 years after a previous cosmetic rhinoplasty.

The nasal obstruction that the patient complained about was almost total.

After clinical examinations, the patient was operated on at the first time with the use of Medpore implants. The postoperative recovery occurred without any problems, and the results from both cosmetic

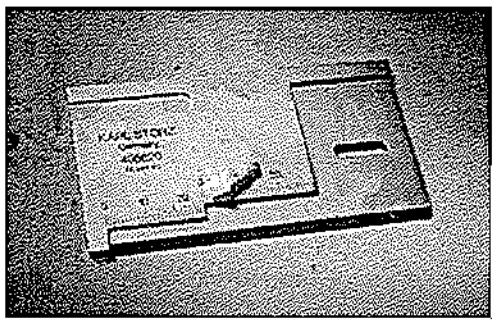

Fig 11 Intraoperative situation (composite graft).

and functional points of view were satisfactory. The implant of a dorsal implant has produced increased tension of the external nasal valve, improving its caliber and, consequently, its capacity of dilating. The postoperative follow-up (1–1.5 years) by clinical trials and nasal manometry led to the clinical evaluation of minimal improvement of the breathing function, previously compromised by trauma and consequence valve stenosis.

Of all the patients treated, good cosmetic results were obtained in 84% of the cases, with complete satisfaction on the part of the patient and the surgeon and excellent functional results in almost all of the cases (94%), with the resolution of the nasal obstruction. With a few exceptions, the patients had good postoperative recoveries without events of any notice. There were no infections, thanks to careful asepsis and to antibiotic coverage; there was 1 dislocation of the implants caused by a successive trauma and a modest reabsorption in 16% of the cases, suggested by small irregularities of the dorsum. There were 1 case of cutaneous necrosis and exposure of the implants, whereas nasal obstruction beyond 6 months occurred in 6.1% of the patients.

Reoperations were performed in 9.1% of the cases for dislocation, reabsorption, or aesthetic dissatisfaction on the part of the patient.

Medpore implants are preferred by the authors in this case because the pyramid and dorsum nasi are high depression, and it can be easily cut, more than other types, it retains its thickness over time, and it is easily revisable. However, it does present the complications of artificial materials, and with respect to osseous grafts, it is elastic and flexible, so it does not fracture.

Another advantage is that it needs only minimal retouching in the time immediately after its removal, compared with the numerous remanipulations that must be done with grafts taken from other places like the seventh or eight ribs that are more frequently used.

Its main disadvantages are its low resistance to infection, the variable and nonpredictable resorption, and the chance of dislocation because it does not attach to the surrounding tissues.

On the basis of the results obtained, we can recommend Medpore implants as an excellent option for the reconstruction of the dorsum and the nasal columella and, especially, whenever there is severe saddling or loss of the sagittal projection of the nose. The method preferred by the authors is the "open-tip" approach[6] (Figs 5–11).

Conclusions

The philosophy of open-tip rhinoplasty emphasizes recontouring, rather than reduction, of the nasal skeleton. Maintenance or augmentation of structural integrity through grafting techniques facilitates aesthetic results able to resist the forces of scar contracture and remain stable over time. The evolution of open-structure rhinoplasty has been based on the triple tenets of softer contour, increased structural support, and lack of tip tensions. Thus, open-structure rhinoplasty techniques have evolved to a greater focus on domal suturing techniques, softer contouring of tip grafts, and additional structural grafting techniques providing support to the existent domal units without tip grafting. The goal of structural strength is unchanged, but with additional grafting and suturing techniques, along with modifications of tip grafting techniques, we can achieve a softer and more natural contour while maintaining the structural and skeletal integrity that is the foundation of open-tip rhinoplasty.[4–6]

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