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Technical note

How to perform subperichondrial and subperiosteal rhinoplasty

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ABSTRACT

Rhinoplasty, via either an open or a closed approach, is classically performed in the supraperichondrial plane, i.e. underneath the SMAS. Total subperichondrial and subperiosteal approaches, providing large exposure of all of the osteocartilaginous framework of the nose, have been described in recent years. This deeper dissection requires adaptation of surgical instruments to perform both subperichondrial and subperiosteal dissection, but also to perform osteotomies. New tools, such as the Rhinosculpture or piezoelectric motor are particularly useful in this context. Acquisition of this dissection technique, although it requires a long learning curve, is largely rewarded by the advantages of this technique in primary and secondary rhinoplasty. The objective of this technical note is to provide a detailed description of the operative technique and the instrumentation required.

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1. Introduction

Very few surgeons are able to operate correctly in a context of poor visibility. Closed rhinoplasty is the type of operation in which such surgeons are able to fully express their skills. For all other surgeons, this type of surgery constitutes a difficult challenge, often requiring a solitary learning process, as there is little room for observation.

Open rhinoplasty has therefore naturally replaced this "conventional" rhinoplasty. Today, many surgeons only use this technique, which provides good visibility of the anatomy, allows easier reconstruction and facilitates teaching. However, it has a number of disadvantages, such as the impossibility of directly observing the results of rhinoplasty until the columella has been resutured, as well as persistent postoperative oedema of the nose tip due to columellar section. Finally, the scar sometimes remains visible.

These two very different surgical approaches nevertheless share a number of features in common: remodelling of the nasal bones remains the same, with osteotomies performed via an intranasal or percutaneous approach. The plane of dissection is also the same, with sub-SMAS dissection of the lower lateral cartilages (LLC), upper lateral cartilages (ULC) and nasal hump.

New osteotomy techniques using Rhinosculpture (Bien-Air, Bienne, Switzerland) or a piezoelectric motor (Piezotome M+, Comeg, La Ciotat, France) are able to achieve very precise osteotomies, after detachment of the periosteum of the nasal bones and the frontal processes of the maxilla [1,2]. This subperiosteal dissection, especially of the lateral surfaces of the bone pyramid, via an open approach, allows even better exposure of all of the bone and cartilage structures of the nose [2,3].

Çakir has recently described a technique combining subperiosteal dissection with complete subperichondrial dissection of the ULC and LLC, which can be performed via either an open or a closed approach [4]. This dissection passes underneath the perichondrium and periosteum, thereby avoiding unnecessary soft tissue dissection that predisposes to intraoperative bleeding, interfering with optimal identification of the surfaces and contours of the cartilages, ecchymoses, haematomas, oedema and postoperative fibrosis. This extensive dissection provides very good exposure of bones and cartilages via either an open or a closed approach [5].

The objective of this technical note is to explain the principles of this technique.

2. Technique

The patient is operated under general anaesthesia or conscious sedation.

Before disinfecting the operative field, 1% or 2% lidocaine-adrenaline or mepivacaine-adrenaline solution is injected using a

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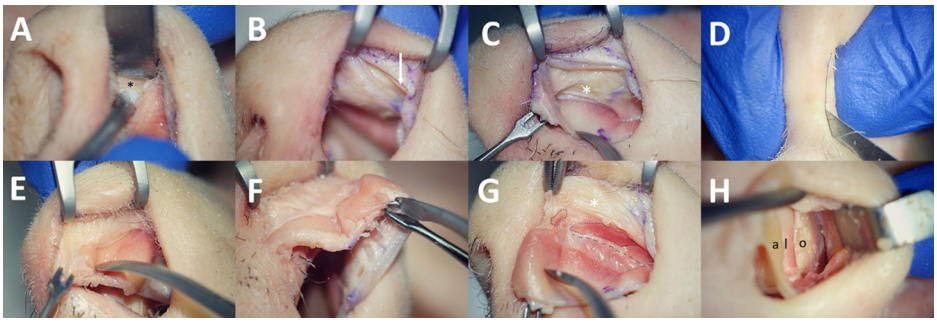

Fig. 1. Left subperichondrial dissection of an anatomical specimen. A. Subperichondrial dissection of the dorsum; asterisk: perichondrium. B. Marginal incision leaving a caudal fragment of LLC (white arrow). C. Subperichondrial dissection of the LLC; asterisk: alar perichondrium. D. Small and large scroll sesamoid cartilages (dotted line); asterisk: alar perichondrium, caudal margin of the ULC (broken lines). E. Dissection of the dome. F. Caudal columellar incision (dotted line). G. Subperichondrial dissection of the LLC; note the clearly visualized deformities of the intermediate and mesial crura. H. Subperichondrial dissection: a: LLC, l: ULC, o: nasal bone.

27 or 30 gauge needle into the following injection sites: columella, plica nasi, marginal incisions, septum, dorsum, lateral surfaces of the nasal bone pyramid. Bilateral supratrochlear and infraorbital block can be performed. Ideally, the anaesthetic solution is allowed to act for 20 to 30 minutes, during which cold compresses are placed on the nose for about 5 minutes to promote vasoconstriction and antisepsis and draping are then performed.

Surgery is performed by using a surgical headlight, but shadowless illumination can also be used. Before making the incision, nose hairs are shaved with a No. 15 scalpel blade by retracting the nostril with a Gubisch-Kilner retractor.

Surgery starts with a transfixing or semi-transfixing interseptocolumellar incision, possibly extended to an intercartilaginous approach. The subperichondrial plane in the septum is then identified. The junction between the septum and the caudal part of the ULC is identified in the superior part of this dissection. The perichondrium of the dorsum is opened at this point with scissor tips and a Cottle (or Daniel-Çakir) elevator is used to elevate the perichondrium (Fig. 1A). The perichondrium is maintained with a Crile retractor with counterpressure applied by a finger. If a Crile retractor is not available, the valved side of a Senn-Miller retractor can be used. After dissecting the dorsum over several millimetres, the ULC are dissected as far as possible superiorly and laterally in the subperichondrial plane.

Dissection of the LLC starts via a marginal approach. A Gubisch-Kilner alar retractor provides good exposure of the LLC. The incision may remove several millimetres of the caudal margin of the lateral crura when they are excessive and/or in order to avoid alar retraction in patients at risk (Fig. 1B) [6]. Frank section of the cartilage facilitates identification of the subperichondrial plane at the caudal margin of the lateral crus. The surgical assistant holds the lateral crus with a Guthrie hook. The surgeon grasps the soft tissues in contact with the lateral crus and, using the scissor tips, identifies the subperichondrial plane at the caudal margin of the crus. This procedure is highly technical and requires a learning phase. Once the plane has been identified, the perichondrium, which is very adherent to the cartilage, is then detached using a Cottle, Howarth, or Daniel-Çakir elevator (Medicon, Tuttlingen, Germany), or ideally a Rosen otology scalpel (Fig. 1C). For this manoeuvre, the surgeon applies tension on the soft tissues using a Crile retractor, exerting counterpressure with a finger. The lateral border of the columella at the level of the caudal margin of the medial crura is then incised (Fig. 1D) and this incision is extended to the marginal incision. The Crile retractor is placed in the most medial part of the marginal incision and the assistant retracts the incision infero-medially with a Guthrie hook to apply traction on the dome, allowing the surgeon to dissect the dome subperichondrially using an elevator or scissor tips to reach the intermediate crus and then the medial border of the medial crura and to completely detach the perichondrium (Fig. 1E and F). The dissection must be extended fairly inferiorly to facilitate exposure when a closed approach is considered. When an open approach is considered, the columella can be sectioned at this time. Another way to perform dissection of the LLC via an open approach is to start with the columellar incision, perform subperichondrial dissection of the medial part of the medial crura and gradually extend the dissection superiorly to reach the domes and lateral crura.

After having dissected the LLC on each side, Pitanguy's midline ligament is identified, and sectioned in the case of an open approach, or thinned and reclined in the case of a closed approach.

The LLC and part of the ULC have therefore been dissected. At this stage, the space between the caudal part of the ULC and the cephalic part of the LLC has not been dissected. This is an important zone, as it contains the lateral expansion of the SMAS [7] connected to Pitanguy's midline ligament and is adherent to cartilages called by Saban "transverse cartilages of the valve" or "scroll sesamoid cartilages" or "sesamoid cartilages" or "scroll cartilages" in English (Fig. 1G) [8]. These cartilages and the SMAS onto which they insert appear to contribute to the stability of the external valve [4,8].

This region can be dissected in two ways: either superoinferiorly by sliding an elevator in the subperichondrial plane in the inferior part of the ULC and by detaching tissue in the direction of the LLC, or inferosuperiorly using a Rosen scalpel by continuing the cephalic subperichondrial dissection of the LLC, identifying the scroll sesamoid cartilages, and passing underneath and then in contact with the caudal margin of the ULC. While the surgeon ensures good exposure, the assistant applies suction and places tension of the cartilages with a Guthrie hook.

After completing the subperichondrial dissection, subperiosteal dissection is then performed.

In Cottle's K-area, the ULC pass underneath the nasal bones (NB) and subperichondrial dissection cannot be continued without disinserting the ULC (which is partially performed by Jankowski in rhinoplasty with nasal bone disarticulation [9], but not in the technique described here). A number 11 or 15 scalpel blade is used to incise the periosteum at the most caudal part of the NB and the periosteum is detached with a Daniel-Çakir or Howarth elevator, ensuring exposure with an Aufricht retractor (Fig. 1H). This detachment includes the frontal processes of the maxilla around the piriform orifice. An incision is also performed at the summit of the K-area to release the bone-cartilage junction and to allow subperiosteal dissection as far as the summit of the root of the nose. Figs. 2 and 3 summarize the technically challenging zones and the steps of subperichondrial and subperiosteal dissection.

The various steps of rhinoplasty can then be performed with very good exposure of the osteocartilaginous framework. As a result of subperiosteal detachment of the NB, the bone phase of rhinoplasty cannot be performed by classical osteotomy techniques due

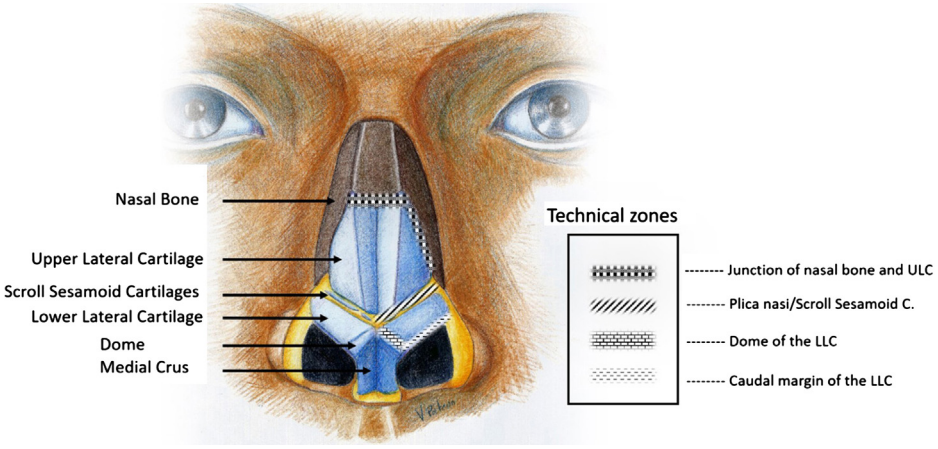

Fig. 2. Technically challenging zones of subperichondrial and subperiosteal dissection.

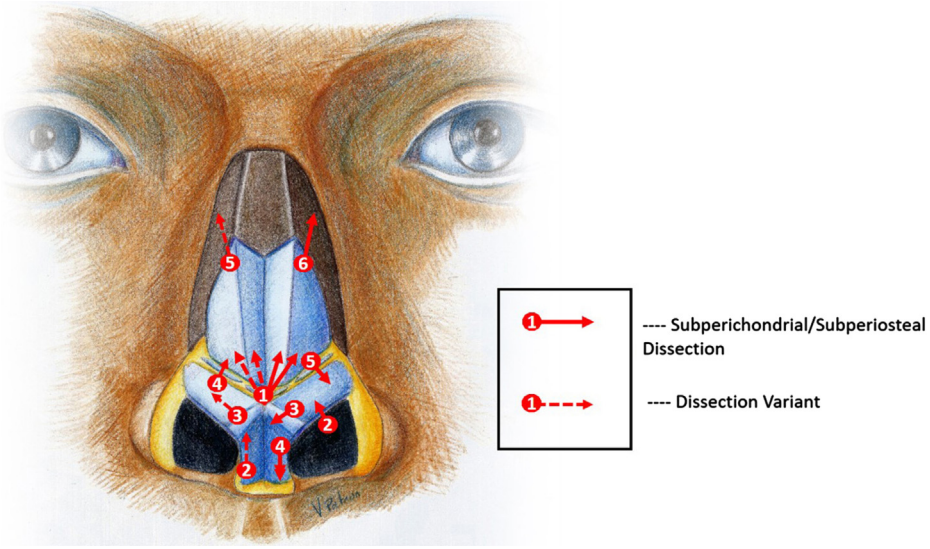

Fig. 3. Steps of subperichondrial and subperiosteal dissection.

to the risk of collapse of the bone flaps if the nasal aspect of the periosteum situated underneath the bone flaps is ruptured by the osteotome. An M+ piezoelectric motor (Comeg, La Ciotat, France) or Rhinosculpture (Bienair, Bienne, Switzerland) are ideal instruments to perform the hump, paramedian and lateral greenstick osteotomies. A Visao otology motor (Medtronic France, Boulogne-Billancourt) with a 2 mm curved multiplane drill can also be used fairly easily to perform osteotomies. A Çakir 90 osteotome (Marina Medical, Sunrise, Florida) can also be used to perform lateral osteotomies [10]. A 6 mm curved osteotome and a 2 mm osteotome may then be necessary to complete the osteotomy (Fig. 4).

At the end of the operation, the scroll sesamoid cartilages are resutured in their original position between the LLC and ULC by several absorbable Maxon 5/0 sutures (Covidien, Dublin, Ireland), and Pitanguy's midline ligament is also resutured when it was sectioned during an open approach.

To prevent paralateronasal haematoma due to the detachment, 16 gauge Cathlons are placed endonasally, along the nasal bones, to act as drains and are removed 24 or 48 hours postoperatively.

3. Discussion

The subSMAS approach is the surgical approach classically used in rhinoplasty. Rhinoplasty is rarely performed in the subcutaneous plane when thinning of the nose tip is necessary due to the risk of thickened skin or fibrosis after a previous rhinoplasty. The disadvantage of these planes is that they require deep tissue dissection with a risk of damaging their blood supply, and an increased risk of intraoperative bleeding, and postoperative oedema and fibrosis.

Subperichondrial and subperiosteal dissection, when performed correctly, limits soft tissue and especially muscle damage, allows preservation of the SMAS [4,5] and sensory nerve contingents, which are important for nasal sensitivity and postoperative facial expression. It allows the creation of a thicker flap, which more effectively masks any imperfections of cartilage and bone sections, especially in the presence of thin skin [3]. Finally, it allows very good visualization of all of the osteocartilaginous framework of the nose, and consequently precise diagnosis and precise correction of the deformities via an open or closed approach (Fig. 5).

However, this dissection is not easy to perform and must be repeated many times before it can be performed correctly. Although subperichondrial dissection of the septum is easy to perform because the septal mucosa is very adherent to the septal perichondrium, subperichondrial dissection of the LLC is difficult as the soft tissues situated above the perichondrium predominantly consist of adipose connective tissue and are poorly adherent to the perichondrium [11]. A false passage, resulting in supraperichondrial dissection can therefore easily occur. When the

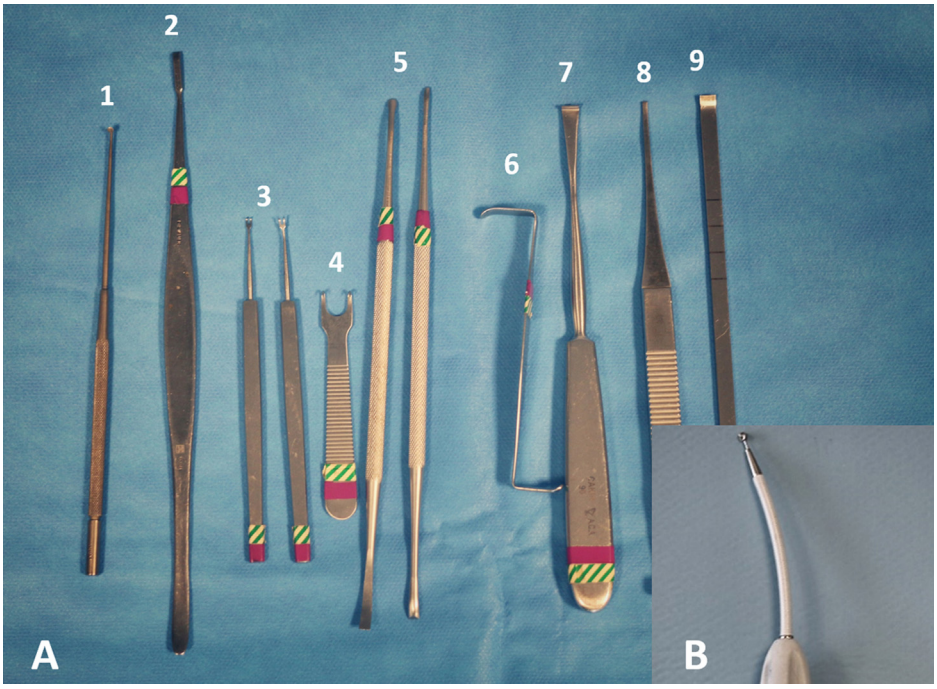

Fig. 4. The various instruments used (A): 1, Rosen scalpel; 2, Howarth elevator; 3, Guthrie hooks; 4, Gubisch-Kilner alar retractor; 5, Daniel-Çakir elevator; 6, Crile retractor; 7, Çakir 90° osteotome; 8; 2 mm osteotome; 9, 6 mm curved osteotome (B): 2 mm protected multipane curved drill for Visao motor.

Fig. 5. Preoperative photograph, then at 3 months and 6 months after open subperichondrial and subperiosteal rhinoplasty.

subperichondrial dissection is performed correctly, the cartilage is white and homogeneous, allowing the use of a dermographic pen without blurring [5]. The white perichondrium that remains attached to the detached soft tissues is clearly visible.

Paradoxically, subperichondrial dissection is easier to perform in the context of secondary rhinoplasty, as subperichondrial dissection, especially of the LLC, is facilitated by the presence of supraperichondrial fibrosis.

As osteotomies are performed after detachment of the lateral surfaces, they cannot be performed via an endonasal approach with a buttoned osteotome due to the high risk of damaging the inner layer of periosteum (or even the mucosa), resulting in a step deformity and flap instability. Percutaneous osteotomies are also not recommended as they can predispose to haematomas and a risk of laceration of the inner layer of periosteum and mucosa. The osteotomy methods described in this technical note spare the inner layer of periosteum and induce greenstick fractures by creating visible lines of weakness to guide the fracture [1,2,10]. They also allow in situ correction of bone irregularities or excessive convexity of the lateral surfaces by direct abrasion, in situations in which grafts or double osteotomies would probably have been necessary.

4. Conclusion

The subperichondrial and subperiosteal plane is a natural plane for rhinoplasty, proving very good exposure of all of the osteocartilaginous framework of the nose and limiting surgical trauma, especially soft tissue trauma. The postoperative course is therefore simpler with, in particular, less postoperative oedema and bruising. This technique requires a considerable learning phase and adaptation of surgical instruments, although nevertheless corresponding to classical ENT surgical instruments. However, acquisition of this technique is largely rewarded by its advantages in primary or secondary rhinoplasty.

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