Cartilaginous Pushdown Nasal Hump Treatment

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KEYWORDS

• Rhinoplasty • Preservation • Cartilage • Pushdown

KEY POINTS

- Cartilaginous pushdown hump treatments widens the indications for Preservation Rhinoplasty.
- The preservation of the bony cap reduces the complications on the Key Stone Area.
- Cartilaginous pushdown allows the correction of septal and nasal deviation concomitantly.
- The revisions of Preservation Rhinoplasty hump treatments, when necessary, are usually very simple and fast.

INTRODUCTION

Classically, nasal hump reduction is based on the partial resection of the cartilages and bones of the nose, as it was described by Joseph more than a century ago.[1] The cartilaginous portion of the hump consists of a single unity formed by the 2 upper lateral cartilages (lateral process) and the septal cartilage (posterior process). These 3 cartilages are fused on their cephalic portion in an *M* shaped manner unique in the human anatomy.[2] During the hump reduction in classic rhinoplasty, this structure is slashed in 3 pieces, which is the main cause of irregularities, shadows and pinching in long-term results. The angle and relation between the septal and upper lateral cartilages is reduced, which may compromise the functional aspect of the internal nasal valve.

In order to avoid these problems, several authors have been trying to preserve the integrity of the dorsum during nasal hump treatment. Nowadays, the main approaches for preservation rhinoplasty of the dorsum are the foundation and the surface techniques. The foundation techniques are represented by Cottle's push-down[3,4] (1946), Drumheller's let-down[5] (1993) and its variations. The surface techniques are represented by Ishida's cartilaginous pushdown[6] (1999) and its variations. The foundation techniques lower the hump as a whole (the bony and cartilaginous portions all together), preserving the integrity of the dorsum and the keystone area transition. The main indications for foundation techniques are small humps, little or no nasal deviations, and thin noses.[7] Large, angled ('S' shaped), deviated, or broad humps impose some difficulties to Cottle's push-down and Drumheller's let-down.

For the surface techniques, the cartilaginous pushdown treatment of the dorsum was described by Jorge Ishida in 1999.[6] The main idea was to preserve the cartilaginous portion of the dorsum and treat the bony portion independently. The maintenance of the cartilaginous dorsum untouched has shown a lot of advantages, including preserving the middle third of the nose width, the dorsal esthetic lines and the internal nasal valve. Also, the possibility of treating the bony hump separately increases the indications of preservation treatments of the nasal hump. With the cartilaginous pushdown, nasal and septal deviations, broad noses and *S* shaped noses are now easily treated alongside with mild humps and straight noses. As the cartilaginous hump extends itself under the nasal bones up to 0.9 mm, preserving the cartilaginous portion also provided extra support for the bony portion treatment.

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Abbreviation
ULC upper lateral cartilages

The cartilaginous pushdown gave origin to 3 variations. Ferreira[8] (2016) published the Spare roof A technique, which is a cartilaginous pushdown with a high strip cartilaginous resection and bone rasping of the bony hump. The indications of this approach were the same as the foundation techniques, small *V* shaped humps, with small or no deviations.

The second variation was the cartilaginous pushdown with bony cap preservation, described by Ishida LC[9] (2020). As the bony cap was removed in the cartilaginous pushdown, even with the underlying cartilage, irregularities and fibrous tissue might develop in this small area. To avoid these problems, it was proposed that the preservation of the bony cap on the keystone area when performing the cartilaginous pushdown dorsum reduction. By doing this, the smoothness of the keystone area was kept intact, adding some of the benefits of the foundation techniques to this surface technique.

The third variation is the Ferreira- Ishida technique or Spare roof B[10] (2022). Alongside a high strip septal resection, now a rectangular bony cap is lowered with the cartilaginous hump, a little wider than the triangular bony cap. The cephalic margin of the bony cap stayed attached to the nasal bones but is mobilized in a green stick manner. The main advantages are the maintenance of the dorsal aesthetic lines if the nose had a beautiful dorsum and the possibility of not undermining the skin of the midline of the nose. Again, this is best suited for noses that have mild deviations and a beautiful shaped dorsum.

ANATOMY

The nasal hump is a unique structure composed of an osseous and a cartilaginous portion. The main structure is the cartilaginous portion, which is the septal cartilage.[11,12] The septal cartilage is formed by its lateral portion (upper lateral cartilages [ULC]) and the posterior portion (septal cartilage). These 3 portions are fused in the midline in an *M* shaped fashion, and this anatomic structure is responsible for the spring action for opening the internal valve. McKinney showed that at 4 months of intrauterine age, the ULC and septal cartilages are already fused.[13]

The cephalic portion of the ULC (lateral process of the septal cartilage) are overlapped by the nasal bones by 4 to 9 mm. The septal cartilage in its junction with the perpendicular plate of the ethmoid prolongs itself cephalically under the nasal bones up to about 50% to 60% of the length of the overlaying nasal bones (**Fig. 1**). There is a firm adherence between the ULC and the nasal bones which is stronger toward the midline. The lateral borders of the ULC do not reach the piriform aperture and are connected to the malar bones by a fibrous connective tissue. The septal cartilage is the main structural portion of the nasal hump.[11–16] (**Fig. 2**).

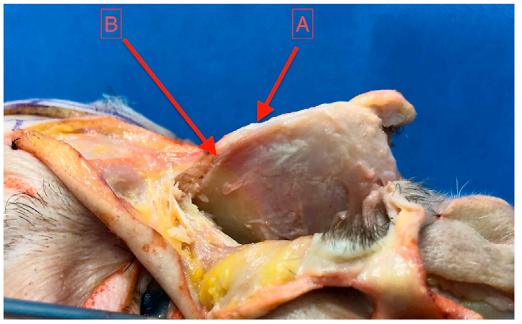

Fig. 1. Relationship between the Rhinion (A) and the E-point (B) in an elderly man.

SURGICAL TECHNIQUE

The treatment of the nasal hump with the cartilaginous push down is based on preserving its cartilaginous portion and repositioning the septal cartilage as a single unit without disrupting the *M* shaped junction that exists between the ULC (lateral process) and the septal cartilage (posterior process).[17] In the open or closed approach, the nasal dorsum is undermined in a sub superficial musculoaponeurotic system (SMAS) plane, and the posterior septum is undermined in a subperichondrial plane on both sides. The undermining goes on until the perpendicular plate of the ethmoid (PPE). A strip of septal cartilage is resected in a parallel plane to the dorsum. The

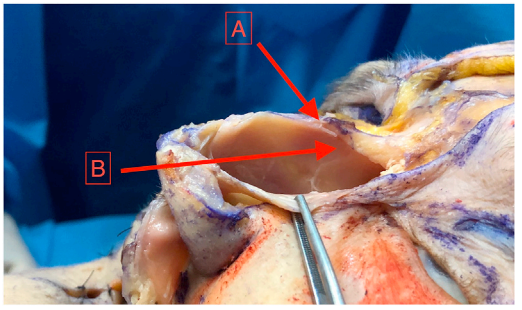

Fig. 2. Projection of the septal cartilage (B) under the nasal bones (A) Rhinion. The septal cartilage prolongs itself under the bony dorsum up to 60% of the length of the nasal bones even in elderly patients.

resection should take place at the more deviated portion of the septal cartilage. Usually most of the deviations occurs at the base of the septal cartilage by the palatal crest (low strip). When the septal deviation is absent or minimal, the preferred spot for resection is about 3 to 4 mm below the dorsum (high strip) (**Fig. 3**). The high-strip septal resection is faster than the low-strip but is less effective in correcting nasal and/or septal deviations. The mid-strip is taken from the middle portion of the cartilaginous septum and is useful in those patients with odd shaped humps or in those cases where opening of the internal valve is necessary (see **Figs. 3** and **9**).

With a freer dissector, the ULC are freed from the nasal bones. The ULC stretches under the nasal bones and is much softer than the overlying bones, so special care must be taken not to damage these structures. The septal cartilage above the resection is detached from the perpendicular plate of the ethmoid.

If preservation of the bony cap is desired at the keystone area, 2 osteotomies are made on the nasal bones. These osteotomies begin following the width of the middle third of the nose (dorsal esthetic lines) and converge to the midline at about 50% to 60% of the nasal bones' length. This keystone area bony cap will be lowered with the cartilaginous portion of the hump (**Figs. 4** and **5**).

The bony cap should not be extended much more cephalad than the middle of the nasal bones length for 2 reasons: to avoid the thicker portion of the nasal bones and to lessen the necessity of ethmoid osteotomies.

The lateral length of dissection between the ULC and the osseous piriform aperture will determine how much the dorsum will be lowered. It is possible to correct nasal deviations without lowering the dorsum if needed. Usually, the ULC are separated from the nasal bones, but special care must be taken not to disrupt the pyriform ligament.

After lowering the middle third of the nose, the residual lateral bony hump is then rasped to the level desired (**Fig. 6**). The lateral osteotomies will bring the bones closer to the midline and help to stabilize the cartilaginous hump in place with the help of the pyriform ligaments. **Fig. 7** demonstrates intraoperative performance of these maneuvers.

DISCUSSION

Nasal hump treatment with preservation of the dorsum goes back to Lothrop in 1914,[1] where he performed wedge resections at the lateral osteotomies alongside with a transverse osteotomy at the nasion. Cottle and colleagues in 1946 described the push-down technique, with the low septal strip, septal disarticulation from the ethmoid, and ethmoid wedge resection.[3,4] In the 1990s, Gola published the high septal strip excision technique.[17] Drumheller in 1973 described wedge resections at the lateral osteotomies to better adapt the nasal pyramid (let-down).[5] Nowadays, there are 3 main approaches to septal resection: (1) Cottle, with low septal-high ethmoid resection (2) Saban-Gola, with high septal-ethmoid strip and (3) Ishida, with cartilaginous only septal strip resection.[18,19] Also, the preservation dorsum treatment can be divided in the foundation techniques that lower both the cartilaginous and the osseous hump altogether, and the surface techniques that treat the cartilaginous and bony hump separately.

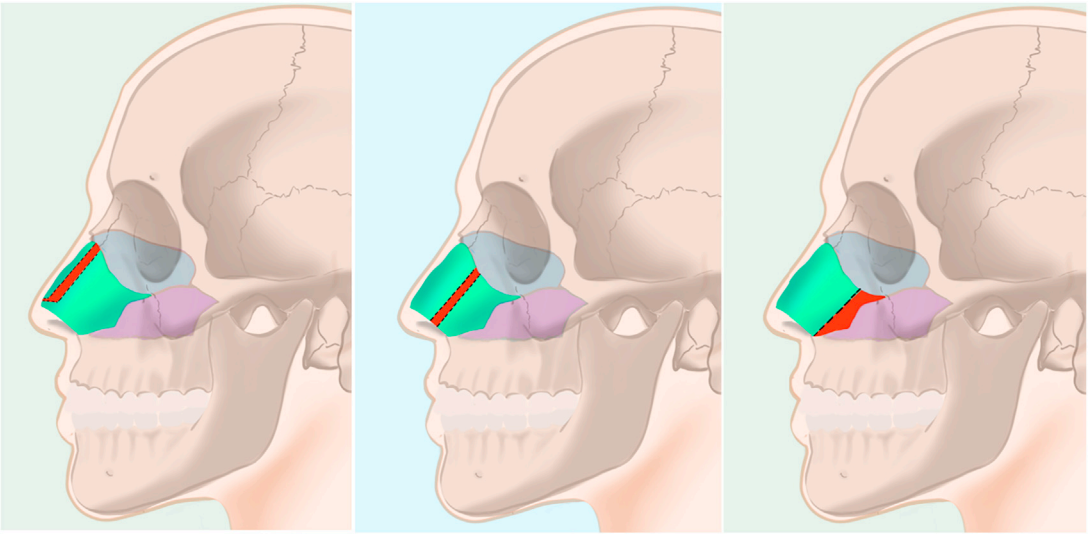

Fig. 3. High, intermediate, and low septal strip resection.

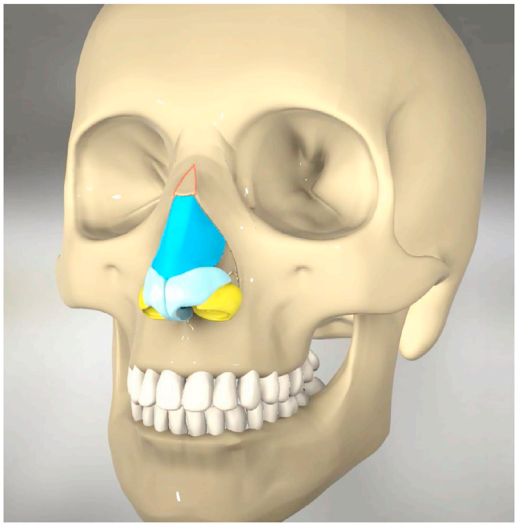

Fig. 4. Schematics of the bony cap design on the nasal bones for preservation. Ideally, the bony cap should be drawn up to 50% of the nasal bones length so that there is cartilaginous septum on its underside.

While preserving the integrity of the nasal dorsum and the keystone area in the push-down (Cottle) and let-down techniques, these *en bloc* (foundation) hump treatments have some limitations in broad, large, angled or deviated humps. Nasal humps with a big angle between the bony and the cartilaginous portions may need additional procedures to be lowered properly.

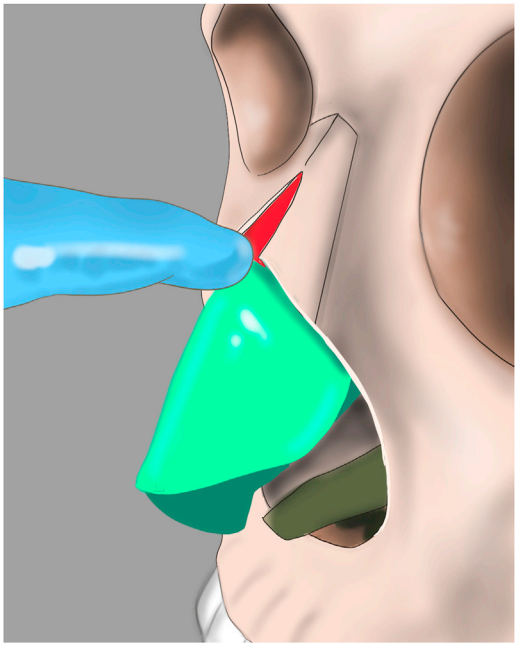

Fig. 5. Bony cap lowered alongside with the cartilaginous middle third of the nose.

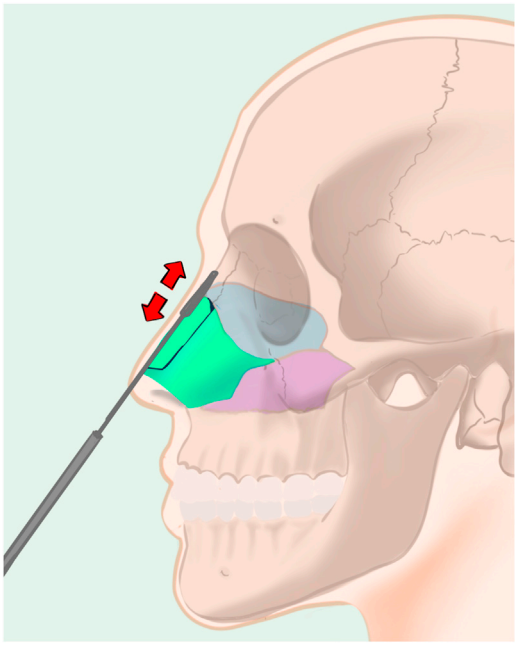

Fig. 6. Rasping the lateral excess of the bony hump after lowering of the middle third of the nose with the bony cap.

In contrast, the cartilaginous push-down can deal with large, deviated, and/or very angled humps. In addition, the septal deviation is corrected as part of the hump treatment. As described by Ishida and colleagues in 1999, a rough area can form where the bony cap is removed after lowering a bony hump.[6] This area, right above the keystone area, may develop irregularities or even a small open roof in the upper third of the nose.

The cartilaginous push-down with preservation of the bony cap addresses these problems. The preservation of the bony cap maintains the integrity and smoothness of the keystone area. In addition, the ample array of indications of the cartilaginous push-down are maintained. Also, the bony cap does not hinder the possibility of lateral and medial osteotomies, allowing the narrowing of the bony pyramid when necessary.

The authors of this article have been doing preservation rhinoplasty to treat nasal humps in 100% of primary cases since 2001. For the cartilaginous push-down cases, there was around a 10% to 15% hump recurrence, but only one-third of these cases needed a revision surgery. These revisions were almost all very simple and fast (under 30 minutes) with local anesthesia.

The middle third cartilaginous vault plays an important role in the aesthetics and in the function of the nose. The structure responsible for the shape and support of the middle third of the nose is a single cartilaginous unit, composed of

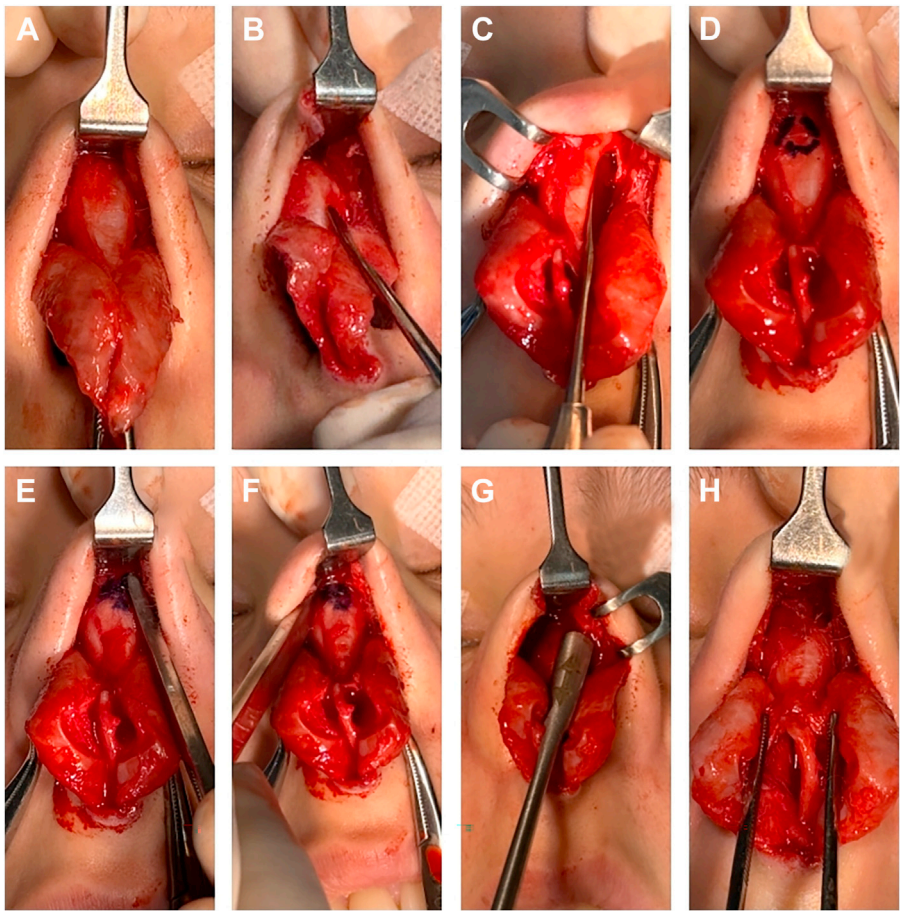

Fig. 7. (*A*) supraperichondrial/supraperiosteal dorsum dissection, (*B*) entry point for lateral keystone area dissection, (*C*) upper lateral dissection from the nasal bones, (*D*) bony cap marking, (*E*) bony cap left osteotomy, (*F*) bony cap right osteotomy, (*G*) rasping of the lateral excess bony hump and (*H*) final aspect after a cartilaginous pushdown with bony cap preservation.

the fusion of the ULC (lateral processes) and the septal cartilage. The preservation of this connection during the hump treatment allows the maintenance of the internal nasal valve or even improvement in its function (see **Fig. 9**). The liberation of the keystone region allows correction of the nasal hump and nasal deviations. It is also possible to correct the middle third deviation without changing the hump shape if desired.t

One of the main concerns about treating the keystone area is nasal collapse. The integrity of the connection between the ULC and the septal cartilage stabilizes this structure. Control of the height of the hump can be achieved by the incremental undermining of the ULC from the nasal bones and the width of the cartilage strip resected. When performing a low-strip resection, the surgeon may also do a *swinging door* maneuver that will prevent the middle third collapse and the keystone area hump recurrence.[20] After a low-strip resection, the cartilaginous septum is completely released from the perpendicular plate of ethmoid (PPE) and Vomer and rotated caudally. This maneuver will lower the keystone area, project the supratip area, and elongate the caudal border of the septum. If fixed to the anterior nasal spine, it will prevent hump recurrence.

The main advantage of the cartilaginous pushdown and its variations is that the revisions for hump recurrence, residual deviations, and small irregularities are very easy and fast. Usually, a little rasping will suffice for the irregularities. A reexploration of the keystone area, releasing again the connections between the cartilages and the bones of the keystone area will correct any residual hump and deviations. Most of the hump recurrences are due to incomplete release of the nasal bones from the ULC and the PPE from the septal cartilage, specially at the confluence of these structures at the keystone area.

The preservation approach for nasal hump treatment has several advantages over classic hump

Fig. 8. Preoperative and postoperative pictures from Case 1.

Fig. 9. Preoperative and postoperative pictures from Case 2.

treatment.[21,22] It preserves the internal valve function, the smoothness of the dorsum and the nasal dorsum aesthetic lines. The cartilaginous push-down widens the indications of the preservation techniques allowing the treatment of larger, deviated, and/or high angled humps (*S* shaped). The addition of the bony cap to the cartilaginous push-down preserves the external portion of the keystone area, thus adding a smooth osteocartilaginous transition similar to the push/let down techniques.

PICTURES

Case 1: Preoperative and 1-year postoperative of a 37 year old male patient with a mild nasal deviation and functional impairment (**Fig. 8**). Dorsum treated with a high strip septal resection and cartilaginous push-down with preservation of the bony cap.

Case 2: Preoperative and 1-year postoperative of a 28 year old female with congenital internal valve insufficiency (**Fig. 9**). Note the facial changes after the functional correction. No grafts were used besides the columellar strut graft. All functional improvement was obtained reallocating the middle third of the nose by a cartilaginous push-down.

CLINICS CARE POINTS

- Preservation of the cartilaginous portion of the hump maintain the internal valve function.
- The main complication os Cartilaginous push-down hump treatment is hump recurrence, wich is easily treated if necessary.
- The preservation of bony cap brings some of the advantages of Foundation Techniques to the Surface Techniques, like the smothness of the key stone area preservations.

DISCLOSURE

The authors have nothing to disclose.

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