

# Surgical Treatment of the Middle Nasal Vault



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## KEYWORDS

- Middle nasal vault • Internal nasal valve • Nasal obstruction • Valve collapse
- Upper lateral cartilage • Spreader graft

## KEY POINTS

- The middle nasal vault is a critical region of the esthetics and function of the nose.
- Internal valve collapse is associated with abnormalities that arises in the middle vault.
- The thinnest nasal skin is over the middle third, and irregularities are often not well masked.
- Proper resuspension of the upper lateral cartilages during rhinoplasty will prevent postoperative cosmetic deformities and nasal obstruction.
- Dorsal hump reduction may unmask underlying middle vault abnormality and should be accompanied by appropriate grafting when indicated.

## INTRODUCTION

Successful rhinoplasty is contingent on the appropriate evaluation of matching anatomic deformities to surgical strategies. The surgeon must understand the structurally sensitive regions of the nose and the implications of surgical alteration to both cosmesis and nasal function. The middle nasal vault is a critical anatomic region for the esthetics of the middle third of the nose as well as for maintaining nasal airflow. In patients evaluated for secondary rhinoplasty, middle third visual deformity and obstruction account for 2 of the 3 most common findings.<sup>1</sup> In both primary and revision rhinoplasty, special consideration must be dedicated to addressing deformities and preserving supporting structures of the middle vault because this is an important point in the prevention of postoperative complications.

## ANATOMY

The middle nasal vault is difficult to understand because of its complex 3-dimensional anatomy and dynamic alteration with nasal airflow. The middle vault is also referred to as the cartilaginous vault and comprises cutaneous tissue, a musculoaponeurotic layer, upper lateral cartilages (ULC), dorsal septum, and intranasal mucosa.

The cutaneous tissue is often the thinnest over the middle third of the nasal envelope. The superficial musculoaponeurotic system (SMAS) over the nose contains the transverse nasal and levator alaeque nasi and has fascial insertions inferiorly along the anterior septum, the lower lateral cartilages (LLCs), and the columella.<sup>2</sup> The paired ULC are deep to the SMAS and anchored superiorly to the undersurface of the nasal bones in the so-called K-area. Inferiorly, they are attached to the

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The authors have nothing to disclose.

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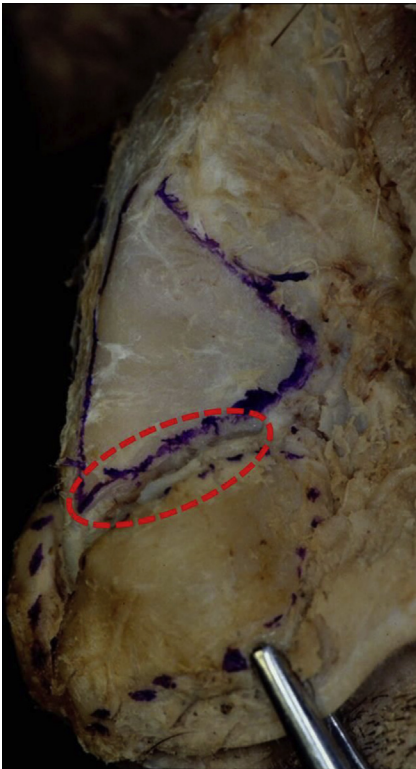
Clin Plastic Surg 43 (2016) 85–94

<http://dx.doi.org/10.1016/j.cps.2015.09.010>

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LLCs in the scroll region, and laterally, the soft tissue of the sidewall connects them to the piriform aperture. The ULC medially articulates with the dorsal edge of the cartilaginous septum, where the dorsal septum is often wider, forming a T- or Y-shaped orientation. When progressing toward the caudal aspect of the ULC, the angle between the septum and sidewall becomes more and more acute, narrowing the nasal airway.<sup>3</sup> At this level, the reported normal angle in Caucasians is 10 to 20°.<sup>4</sup> Intranasal mucosa is fixed to the under-surface of the ULC and is continuous with the septal mucosa.

The internal nasal valve is bound by the caudal aspect of the ULC anterolaterally, septum medially, and inferior turbinate posterolaterally (**Fig. 1**). Because of its low cross-sectional area, nasal airflow is physiologically subject to the highest resistance in this area, as dictated by Poiseuille's law. When accounting for Bernoulli effect, the high air velocity causes collapse at the internal valve, which can be pathologic if there is a lack of adequate structural support. In fact, approximately 1 in 6 patients with chronic nasal obstruction will



**Fig. 1.** Cadaveric dissection with blue demarcation of the ULC and LLC. The red oval indicates the area that corresponds with the internal valve in the middle vault.

have collapse of the internal nasal valve.<sup>5</sup> When considering that the cross-sectional area of the internal nasal valve decreases by 25% after reduction rhinoplasty, it is not surprising that many patients have postoperative obstruction.<sup>6</sup> Therefore, it is essential to address the middle vault effectively to avoid causing iatrogenic weakening of the nasal valve or exacerbating stenosis in patients with unfavorable anatomy.

## PREOPERATIVE PLANNING AND PREPARATION

Evaluation of the rhinoplasty patient is paramount before any surgical intervention is planned. The surgeon should be thorough in inquiry of desires and expectations of the patient and differentiate functional and cosmetic concerns. The patient should relay which specific esthetic features are bothersome and the anticipated change. Surgery should be avoided if the patient's expectations are unrealistic or there is any indication of significant psychological abnormality suggesting body dysmorphic disorder. Preoperative photographs should be taken and reviewed with the patient to facilitate discussion and education of the areas of concern. Morphing imaging software can be additionally helpful in demonstrating a reasonable result and if that is an acceptable outcome for the patient.

A detailed history should be taken regarding nasal obstruction with laterality, alleviating or exacerbating factors, prior interventions, and any concomitant sinonasal disease. Prior nasal surgery, facial trauma, history of severe diabetes, granulomatous or bleeding/clotting diseases, smoking, and intranasal drug use are also important to document. The surgeon should always inquire regarding anticoagulation use, including supplements that alter the clotting cascade and heavy nonsteroidal anti-inflammatory drug use. In the case of revision surgery, review of prior operative reports is beneficial if records are available.

Physical examination should include facial and nasal esthetics as well as a functional analysis. The middle vault correlates externally with the middle third of the nose and is best viewed from the frontal and lateral views. General observation should include patient height, facial proportions, overall skin quality and thickness, scars, and obvious deformities. Special consideration is given to the skin overlying the middle vault because it is often the thinnest of any region of the nose. The frontal view will reveal a narrow or wide middle vault, or asymmetry/deviation of the middle third that could indicate dorsal septal deviation or twisting (**Fig. 2**). A lack of appropriate shadowing along the dorsum would suggest

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