

Internal valve graft technique versus spreader graft/autospreader flap in functional rhinoplasty: A prospective cohort study

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Abstract

Objective: To compare a novel internal nasal valve graft technique with conventional spreader graft and autospreader flap methods in functional rhinoplasty, with respect to both functional and aesthetic outcomes.

Materials and Methods: Forty patients undergoing primary rhinoplasty were prospectively enrolled and randomly allocated into two groups (n = 20 per group). Group 1 received a conventional spreader graft or autospreader flap, whereas Group 2 underwent the internal nasal valve graft technique, in which cartilage was positioned caudal to the conventional spreader graft line to augment the internal nasal valve without increasing dorsal width.

Results: Preoperative dorsal widths and NOSE scores were comparable between the two groups. At 1-year follow-up, Group 1 demonstrated a statistically significant increase in dorsal width, whereas no significant change was observed in Group 2. NOSE scores improved significantly within both groups, with no statistically significant difference between the groups.

Conclusion: The internal nasal valve graft technique provides functional improvement comparable to that of conventional methods while preventing dorsal widening, thereby representing an effective alternative in functional rhinoplasty that preserves the natural dorsal contour.

Keywords: rhinoplasty, nasal obstruction symptom evaluation, internal nasal valve, spreader graft, functional outcomes

Introduction

Rhinoplasty is regarded as one of the most technically demanding facial procedures, as it must simultaneously achieve both aesthetic harmony and functional integrity of the nasal airway [1]. Increasingly, surgical success is evaluated not only by postoperative nasal appearance but also by the preservation or enhancement of nasal breathing, with particular emphasis on the internal nasal valve as a key determinant of airflow. Anatomically

situated between the septum and the upper lateral cartilages, the internal nasal valve constitutes the narrowest segment of the nasal airway and accounts for approximately 50% of total nasal airway resistance [2,3]. Even minimal reductions in the valve angle may result in clinically significant airflow compromise, consistent with the principles described by Poiseuille's law [4]. Consequently, preservation or reconstruction of the internal nasal valve is a critical component of contemporary rhinoplasty [5].

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The most frequent iatrogenic cause of internal nasal valve dysfunction is dorsal hump resection. Detachment of the upper lateral cartilages from the septum during this maneuver weakens midvault structural support and predisposes the valve to collapse [1,6]. This may lead not only to functional airway obstruction but also to characteristic aesthetic deformities, such as midvault narrowing and the inverted-V deformity[1]. To mitigate these adverse outcomes, several reconstructive strategies have been developed, most notably the use of spreader grafts.

The spreader graft technique, first described by Sheen in the 1980s, involves placement of cartilage between the septum and upper lateral cartilages to widen the internal nasal valve angle, restore laminar airflow, preserve dorsal aesthetic lines, and provide additional support in cases of septal deviation [1,3]. Multiple studies have demonstrated significant functional improvement following spreader graft placement, as reflected by reductions in NOSE and VAS scores. Furthermore, systematic reviews suggest comparable functional efficacy between traditional spreader grafts and autospreader flap techniques [7].

Despite their widespread use, classic spreader grafts have notable limitations. Lateral displacement of the dorsal aesthetic lines may result in undesirable dorsal widening, a concern that is particularly pronounced in thin-skinned patients [2,8]. Additionally, the need for long, rigid cartilage grafts increase operative complexity, and limited graft availability may constrain their application. Comparative analyses indicate that while butterfly grafts may offer functional outcomes similar to spreader grafts, they often produce more pronounced lateralization and, in some cases, superior functional improvement [8].

Several modifications to the original spreader graft concept have been proposed, including the autospreader flap, bilateral extended spreader grafts (BESG), and composite dorsal augmentation techniques. The autospreader flap obviates the need for additional graft material through folding of the upper lateral cartilages, whereas BESG provides more extensive septal support but may still contribute to dorsal widening [6,9]. Composite techniques—such as diced cartilage wrapped in fascia or gap grafts—are technically more demanding and may be associated with increased morbidity [10]. Importantly, emerging evidence suggests that the level and orientation of graft placement play a decisive role

in determining both functional and aesthetic outcomes [2].

Recent meta-analyses show that functional rhinoplasty yields significant improvements in NOSE, VAS, and SNOT-22 scores[5]. Nevertheless, considerable aesthetic variability persists among different surgical techniques [7]. In the present study, we introduce the internal nasal valve graft technique, which involves positioning cartilage caudal to the conventional spreader graft line to selectively expand the internal nasal valve while avoiding dorsal widening. We hypothesize that this technique preserves the functional benefits of traditional spreader grafts while maintaining a more natural dorsal contour.

Materials and Methods

This is a prospective cohort study conducted in a tertiary care plastic surgery department between 2023 and 2025. Ethical approval was obtained from the institutional review board (Decision No. E-93471371-514.10-244516005), and written informed consent was secured from all participants in accordance with the principles of the Declaration of Helsinki.

Patients aged 18 years or older who underwent primary rhinoplasty were eligible for inclusion. Exclusion criteria comprised a history of previous nasal surgery and the need for postoperative nasal interventions, either surgical or medical. A total of 40 patients were enrolled and allocated into two groups of equal size (n = 20 each). Group 1 (control group) underwent reconstruction with a conventional spreader graft or autospreader flap, whereas Group 2 (experimental group) received the internal nasal valve graft technique, in which cartilage was positioned caudal to the conventional spreader graft line to enlarge the internal nasal valve without inducing dorsal widening. Demographic variables, including age and sex, were recorded for all participants.

All procedures were performed using an open rhinoplasty approach. In surgery, all lateral osteotomies were performed in a standardized low-to-low fashion bilaterally by the same senior surgeon in all patients, regardless of study group, to minimize variability that could influence postoperative dorsal width measurements. No excision was performed from the caudal margin of the upper lateral cartilage in either group. Preservation of the caudal border of the upper

lateral cartilage was intentionally maintained to avoid compromising midvault stability and to prevent potential postoperative internal nasal valve insufficiency. After standardized surgery, in group 1, following dorsal hump resection, stabilization of the internal nasal valve region was achieved using a spreader graft or autospreader flap. In group 2, following dorsal hump reduction, a cartilage graft was positioned caudal to the conventional spreader graft plane, along the internal nasal valve region, rather than between the septum and upper lateral cartilages at the dorsal septal level. The graft was placed parallel to the septum and secured to selectively widen the internal nasal valve angle without lateralizing the dorsal aesthetic lines. This graft positioning allows targeted support of the internal nasal valve while preserving dorsal width (Figure 1).

Standardized frontal facial photographs were obtained preoperatively and at 12 months postoperatively under identical lighting conditions, with a fixed camera-to-subject distance of 1.5 m. Interpupillary distance (IPD) was measured in millimeters by an ophthalmologist. Using Fiji (ImageJ) software, the IPD measured in pixels was calibrated to the actual IPD value via the “Set Scale” function. Dorsal width was subsequently assessed by drawing two parallel lines along the nasal dorsum and recording the perpendicular distance between them (Figure 2).

Measurements were made on both preoperative and postoperative photographs. Each measurement was performed twice by the same investigator, and the mean of the two values was used for analysis to minimize interobserver variability.

Nasal function was evaluated using the Nasal Obstruction Symptom Evaluation (NOSE) scale which consists of five items scored on a 0–4 Likert scale[11]. The validated Turkish version of the NOSE questionnaire was administered preoperatively and at 12 months postoperatively[12,13].

Continuous variables were reported as mean \pm standard deviation (SD), and categorical variables as frequencies and percentages. Between-group comparisons were conducted using the student's t-test for parametric data and the Mann–Whitney U test for nonparametric data. Within-group preoperative and postoperative comparisons were performed using the paired t-test or the Wilcoxon signed-rank test, as appropriate. Statistical significance was defined as $p < 0.05$. All statistical analyses were performed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA).

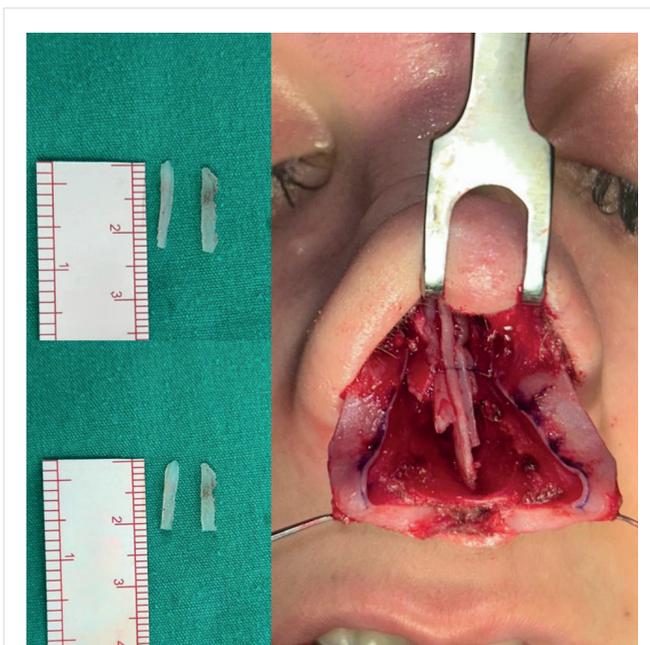


Figure 1. Internal valve graft placement

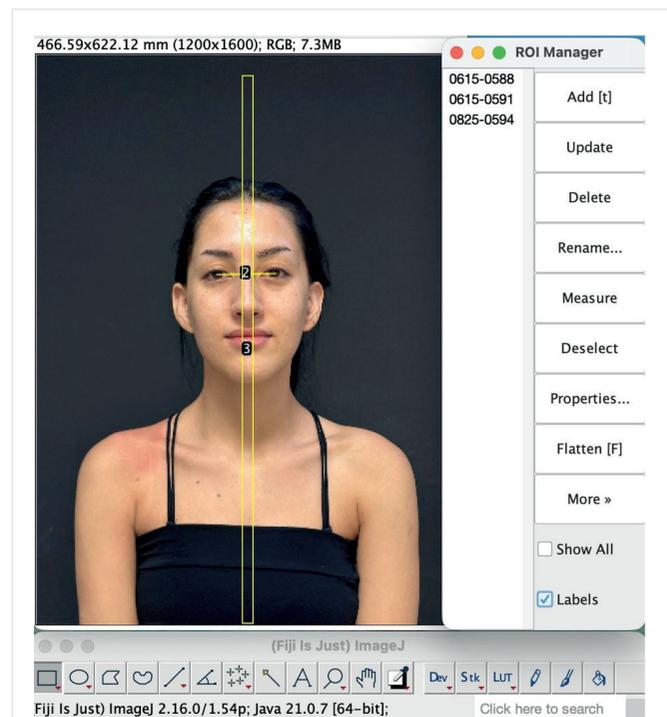


Figure 2. Dorsal width measurement

Results

A total of 40 patients were included in the analysis, with 20 patients in Group 1 and 20 patients in Group 2. The two groups were comparable in terms of age and sex distribution, with no statistically significant differences observed ($p > 0.05$) (Table 1).

Preoperative dorsal width measurements did not differ significantly between the groups ($p > 0.05$). At the 12-month follow-up, Group 1 demonstrated a statistically significant increase in dorsal width compared with baseline ($p < 0.05$), whereas no statistically significant change was observed in Group 2 ($p > 0.05$). Intergroup analysis revealed that postoperative dorsal width was significantly greater in Group 1 than in Group 2 ($p < 0.05$) (Table 2).

Baseline NOSE scores were comparable between the two groups ($p > 0.05$). At 12 months postoperatively, both groups exhibited a significant reduction in NOSE scores, indicating marked improvement in nasal obstruction symptoms ($p < 0.001$ for both). No statistically significant difference was detected between the groups with respect to postoperative NOSE scores ($p > 0.05$) (Table 3).

From a functional standpoint, both surgical approaches resulted in comparable improvements in nasal airway function. Aesthetically, however, dorsal widening was observed in Group 1, whereas Group 2 maintained stable dorsal width, reflecting preservation of the natural dorsal contour. (Figure 3, Figure 4).

Discussion

In this prospective study, we compared a novel internal nasal valve graft technique with conventional spreader graft and autospreader flap methods in functional rhinoplasty. The findings demonstrate that the internal valve graft achieves functional outcomes comparable to those of established techniques while effectively avoiding the undesirable dorsal widening commonly associated with classic spreader grafts.

Since its original description by Sheen, the spreader graft has been widely regarded as the standard technique for midvault reconstruction [3]. By increasing the internal nasal valve angle, it restores laminar

Table 1. Demographic characteristics

Variable	Group 1 (n=20)	Group 2 (n=20)	p
Age (years, mean \pm SD)	28.5 \pm 5.0	27.9 \pm 4.4	0.699
Sex (F/M)	11/9	10/10	1.000

Table 2. Preoperative and postoperative dorsal width (mm)

	Preop (Mean \pm SD)	Postop (Mean \pm SD)	p (within)
Group 1 (Spreader/Autospreader)	10.98 \pm 0.9	12.50 \pm 1.0	<0.001
Group 2 (Internal valve graft)	10.88 \pm 1.0	11.00 \pm 1.1	0.420
p (between)	0.712	<0.001	–

Table 3. Preoperative and postoperative NOSE scores

	Preop (Mean \pm SD)	Postop (Mean \pm SD)	p (within)
Group 1	15.2 \pm 2.1	5.8 \pm 2.0	<0.001
Group 2	15.0 \pm 2.0	5.5 \pm 1.9	<0.001
p (between)	0.730	0.431	–

airflow, preserves continuity of the dorsal aesthetic lines, and provides structural support in the presence of septal deviation [1,7]. Numerous studies have reported significant postoperative improvements in patient-reported outcomes, including reductions in NOSE scores and high levels of patient satisfaction [7]. Similarly, the autospreader flap has gained popularity in primary rhinoplasty due to its technical simplicity and elimination of the need for additional graft harvesting, while offering functional results comparable to those of traditional spreader grafts [6].

Despite these advantages, dorsal widening remains a well-recognized limitation of classic spreader grafts, particularly in thin-skinned patients in whom subtle contour changes are more readily apparent [2,8]. Moreover, the requirement for long, rigid cartilage grafts increases operative complexity and may pose challenges in patients with limited septal cartilage reserves [8]. Alternative strategies, including butterfly grafts, bilateral extended spreader grafts (BESG), and composite augmentation techniques, have been proposed to address these concerns; however, each



Figure 3. Group 1 patient preoperative and postoperative 1st year photographs



Figure 4. Group 2 patient preoperative and postoperative 1st year photographs

carries its own technical demands and potential drawbacks [9,10]. Consistent with previous reports, our findings underscore the importance of graft placement plane and orientation as critical determinants of both functional and aesthetic outcomes [2].

In our experience, the internal nasal valve graft technique provided functional improvement equivalent to that achieved with conventional methods, while preserving the natural dorsal contour. This suggests that positioning the graft caudal to the conventional spreader graft line allows selective expansion of the internal nasal valve without inducing dorsal lateralization. An additional advantage of this technique is the reduced requirement for long cartilage grafts, which may be

particularly advantageous in patients with limited graft availability.

Importantly, no excision was performed from the caudal margin of the upper lateral cartilage in this technique. Preservation of this anatomical region is critical for maintaining midvault stability and internal nasal valve competence. Resection of the caudal upper lateral cartilage may predispose patients to postoperative internal valve collapse unless adequately compensated with structural grafting. By avoiding cartilage excision and instead providing targeted caudal support with an internal nasal valve graft, the described technique enhances valve patency while preserving native cartilage anatomy and dorsal aesthetic lines. In cases where caudal upper lateral cartilage resection is unavoidable, we recommend simultaneous reinforcement of the internal nasal valve to prevent secondary functional compromise.

Several limitations of this study should be acknowledged. The sample size was relatively modest ($n = 40$), and follow-up was limited to one year. Furthermore, functional assessment relied primarily on patient-reported NOSE scores and photographic measurements of dorsal width. Future studies incorporating objective airflow assessments, such as acoustic rhinometry or rhinomanometry, would provide a more comprehensive evaluation of functional outcomes.

In conclusion, the internal nasal valve graft technique appears to be a promising alternative in functional rhinoplasty, offering functional improvements comparable to those achieved with spreader grafts while minimizing dorsal widening. Larger, long-term studies are warranted to further validate the durability and broader applicability of this technique.

Author contributions

Conception and design: S.Y., S.K.A., U.K.; Data acquisition: S.Y., S.K.A., U.K.; Data analysis: S.Y., S.K.A., U.K.; Data interpretation: S.Y., S.K.A., U.K.; Drafting of the manuscript: S.Y., S.K.A., U.K.; Critical revision of the manuscript: S.Y., S.K.A., U.K.. All authors reviewed the results, approved the final version of the manuscript, and agreed to be accountable for all aspects of this study.

Ethical approval

This study was approved by the Ankara Training and Research Hospital Ethics Committee (Date: May 23, 2024, Decision/Protocol No: E-93471371-514.10-244516005). Informed consent was obtained from all participants involved in this study.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare that this study was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Generative AI statement

The authors declare that no generative AI or AI-assisted technologies were used in the writing or preparation of this study.

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