# Comparison in patient satisfaction between structural component and hybrid T-bar preservation rhinoplasty : a retrospective propensity score matched cohort study

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Abstract:

Background: Recently, a modified dorsal split preservation technique has been described. In this method, the integrity of the elastic keystone area is preserved by separation of the upper lateral cartilages from the septal T-bar. Our study aimed to evaluate the aesthetical and functional outcome in patients treated with the dorsal T-bar preservation versus the 'gold' standard dorsal split component reduction approach.

Methods: We performed a retrospective propensity-score matched analysis in 234 patients enrolled for rhinoplasty. The severity of nasal obstruction was measured with the nasal obstruction symptom evaluation questionnaire (NOSE-score). Aesthetic evaluation was performed with the FACE-Q nose and nostrils and Utrecht Questionnaire (UQ). Assessments were conducted prior to surgery, at 3 and at 6 months after surgery.

After propensity score matching, 172 patients in two cohorts were retained. The following covariates were taken into the statistical calculation: age, gender, ethnicity, previous nasal surgery, nasal trauma, respiratory allergy, and preoperative NOSE scores, The first cohort of 110 patients underwent rhinoplasty with T-bar preservation technique (TDP). The control cohort consisted of 62 patients who underwent dorsal split component reduction (SCR).

Results: The mean preoperative scores for FACE-Q nose, FACE-Q nostrils, UQ and VAS score improved significantly in all patients postoperatively. Both

techniques had comparable aesthetic outcome measures that remained unchanged between 3 and 6 months postop. Functional outcome as measured by the NOSE score, was in favor of SCR at 3 months postop but the difference between both techniques was not significant anymore at 6 months postop. In contrast to SCR, in TDP only 31% of the patients needed spreader grafts or autospreader flaps at the internal valve area only for functional reasons.

Conclusion: The data in this study suggest similar patient satisfaction with SCR and TDP techniques for aesthetics as well as nasal function after 6 months postop. TDP is a very versatile cartilage-sparing method to aesthetically adapt the middle vault without interrupting the keystone area. It combines the popular component separation concept with the preservation of the delicate anatomy of the mid-vault.

Keywords : preservation rhinoplasty, dorsal component reduction rhinoplasty, NOSE, FACE-Q, Utrecht questionnaire

EBM level III

## Introduction

A septorhinoplasty impacts both function and aesthetics of the nose and therefore it is important to evaluate the patients pre- and postoperative satisfaction regarding these factors.[1] Nowadays, the split component reduction technique (SCR) described by Rohrich is still the gold standard in reduction rhinoplasty. In this technique, the upper lateral cartilages (ULCs) are separated with a sharp blade flush to the septum after which the septum and dorsal nasal bones are reduced separately.[2] [3] Due to impairment of the nasal mid-vault at the K-area, spreader grafts and autospreader flaps are needed to restore the dorsal aesthetic lines (DALs) and the passage through the internal nasal valve.[4, 3]

Although spreader grafts and flaps have shown consistency in reconstructing the keystone area and averting deformities, this is often at the cost of dorsal regularity. This may require a revisional camouflage or restructuring procedure.[5] Not surprisingly, with the recent reappraisal of nasal anatomy, dorsal configurations, the understanding of the superficial musculoaponeurotic system (SMAS) and various ligaments of the nose, there is a return to the concept of more conservative preservation techniques to reduce the complex revisions produced by destabilization of the nasal skeletal framework, particularly in relation to the nasal midvault.[2,4]

Recently, a hybrid approach has been described by Robotti et al. as a modified dorsal split preservation technique: instead of separating the upper laterals with a scalpel blade vertically flush to the septum, the short horizontal segment that composes the horizontal portion of the T that belongs to the cartilaginous septum and not to the upper laterals are preserved. Finesse contouring of the

midvault is possible with improving the DALs and narrowing the dorsum.[5] This T-bar dorsal preservation technique (TDP) has been developed to prevent the presence of a residual and/ or recurrent hump as often seen in preservation rhinoplasty.[6] In the original publication, only the cartilaginous septal T-shape was pushed down. In humps with minor bony component, the chondro-cartilaginous junction could be preserved and step-off was avoided.[5] Indications of TDP included humps less than 3 mm and a nearly perfect dorsum, with or without very little axis deviations of the cartilage.

In the present study, the indications have been extended to larger humps and crooked noses due to the combination of TDP with a subdorsal radix greenstick osteotomy as described by Ferreira et al. The radix greenstick osteotomy enables to lower the whole central dorsal compartment in one block. it is carried out subdorsally with the piezotome and can not only be combined with conventional lateral, transverse and paramedian osteotomies, but also with a let-down or push-down bony preservation technique. If paramedian osteotomies are performed, they are made at the level of the future DALs.

The hybrid T-bar dorsal preservation technique (TDP) has gained popularity due to numerous advantages. When the bone has been rasped too much (even when the septal T has collapsed), the technique can be changed to the split component dorsal reduction. The width of the middle third of the nose can be changed by reducing the borders of the septal T.

The primary outcome of this retrospective study is to elucidate whether the functional and aesthetic outcome of patients with TDP are comparable to SCR.

## Material and methods

### Design

A retrospective matched-cohort study was performed including 234 consecutive patients who underwent an external rhinoplasty with mid-vault reduction either with the use of SCR or a TDP for both functional and aesthetic reasons. All these operations were performed by the senior author at a single center between August 2019 and July 2022. Only patients with a minimum age of 18 years were included. Patients, who had undergone previous rhinoplasty were included as revision surgery cases. Incapability to answer the questionnaires and nasal trauma, surgery or cocaine use in the past year, were exclusion criteria. From all patients demographic data were obtained. In order to overcome the lack of internal validity of non-randomized trials the method of Propensity Score Matching (PSM) was applied. The propensity score is the probability for a subject to receive a treatment conditional on a set of baseline characteristics, acting as potential confounders. PSM matches patients with similar distribution of confounders reducing the risk of a biased estimate of the treatment effect. In this study, the propensity score was estimated using logistic regression.[7] Propensity score matched sets were formed with a 1:1 nearest neighbor matching algorithm with replacement on the propensity scores. Using propensity score analysis, balanced matching was performed for the following covariates: age, ethnicity, preoperative NOSE scores, gender, previous nasal surgery, nasal trauma, and respiratory allergy.

Out of the 234 included patients, PSM computed two well-balanced patient groups in terms of propensity scores: 110 patients operated with TDP were matched to a group of 62 patients who underwent SCR.

In a recent study, the multidimensionality of available questionnaires has been demonstrated. Apart from the functional aspects, anatomical and psychosocial approaches are also important for the evaluation of rhinoplasty patients. [8] Based on their availability in Dutch at the time of the patient selection, the NOSE score was selected for the functional outcome domain. For the aesthetic outcome domain, Utrecht Questionnaire (UQ) and FACE-Q nose and nostrils were employed. The FACE-Q rhinoplasty module consists of a nose and nostrils questionnaire. The former is a 10-item satisfaction with nose scale and the latter is a 5-item satisfaction with nostrils scale. Both entities put particular emphasis on the anatomical outcome. UQ is a validated and standardized questionnaire with emphasis on the psychosocial aspects of rhinoplasty based on an earlier questionnaire of Alsarraf et al. [9] Body image in relation to nasal appearance is quantified with five simple questions on a 5-point Likert scale and a Visual Analogue Scale score.[10,11] Higher scores on the NOSE and UQ imply lower satisfaction with nasal breathing or aesthetics respectively. On the contrary, higher scores for the FACE-Q nose and nostrils or the VAS imply higher aesthetic satisfaction.

All patients were anonymized using a unique identification number. The estimates were reported as means, standard deviations (SDs), medians, interquartile ranges (IQRs), and percentages when appropriate. All continuous variables were assessed for normality with the Shapiro-Wilk test and with Levene's test for equal variance. The Wilcoxon signed-ranks test was used to assess within-group parameters, while the Mann–Whitney U test was used to assess between-group parameters. Associations between qualitative data were tested with a $\chi^2$- test and, where applicable, Fisher's exact test.

Repeated measures analysis of variance (rANOVA) was conducted to compare baseline and 3-month and 6-month follow-up NOSE scores. Bonferrroni correction was applied for multiple comparisons. A two-sided p-value of <0.05 was accepted as significance level. Statistical analyses were performed by IBM SPSS Statistics (IBM, version 27), Jamovi (The jamovi project (2022). jamovi. (Version 2.3) [Computer Software]. Retrieved from https://www.jamovi.org.Version 2.3.19.0) and R (version 4.0.5). Propensity score matching was performed using the MatchIt package (Ho, Imai, King, & Stuart, 2011) in R.

Surgical procedure

All patients underwent an open rhinoplasty with concomitant turbinoplasty under general anesthesia by the senior author. To start the surgery, about 3.5 ml of articaïn with epinephrin (Septanest Special®) was infiltrated locally in a sub-mucoperichondrial plane of the septum, the incision lines and along the areas of the designated osteotomies.

The surgical procedure involved the following principal steps, adapted according to the needs of each patient: an open approach with dissection in the supra-perichondrial or subperichondrial plane was followed by a complete subperiosteal degloving of the bony pyramid.[12] The soft tissue envelope and ligaments were preserved as much as possible. Also, Pitanguy ligament was preserved in all patients. Corrective surgery of the deviated nasal septum, including partial resection, correction, and repositioning of the septum on the anterior nasal spine, was performed in every case.

In the TDP group, a separation of the upper lateral cartilages from the septum was performed through the paraseptal clefts preserving the short horizontal segments that compose the horizontal portion of the T that belongs to the cartilaginous septum and not to the upper laterals [5]. The T-bar could be trimmed to reduce the width of the mid-vault. Usually, a subdorsal Z-flap has been used to lower the cartilaginous dorsum. [13] By starting the incision at a high level, the final septal height could be adjusted precisely. By creating a triangular shape with a vertical cut below the keystone area, which is usually the highest point of the hump, significant leverage could be applied from below the hump and the septal overlap may be sutured securely for a stable correction. [13] With severe basal septal deviations, an inferior septal strip technique according to Cottle was used. The associated bony cap was managed by osteoplasty, preferably with piezo instrumentation, as pioneered by Gerbault or by a diamond burr. [12] The central keystone area was preserved which prevents several complications e.g., asymmetry and irregularity. Wide or asymmetric DALs could be fine-tuned by trimming the septal T. In most patients, paramedian, together with lateral and incomplete transverse osteotomies were performed via an extended approach, using piezo instrumentation and the bony dorsum lowered and aligned. Paramedian osteotomies were performed according to the desired DALs in line with the cartilaginous T-bar. In the case of large humps, a subdorsal greenstick radix osteotomy of the bony septum was performed with piezo instrumentation to lower the central dorsal compartment and central keystone area as one block. [14] The lateral part of the nasal bones could then further be trimmed by rhinosculpture. [15] Alternatively in some patients with crooked noses, an asymmetric let-down bony preservation approach was used in combination with the subdorsal radix

greenstick osteotomy. After the bony work, the lowered septal T was resutured to the septum in a side-to-side fashion and thereafter spreader grafts could be added for functional reasons. [13] In the case of spreader grafts, they were subdorsally placed as pedestal spreader grafts underneath the septal T to move the ULCs and nasal bones away from the septum and enlarging the nasal valve by acting as mechanical bolsters, creating a vault and preventing an inward collapse of the ULCs.[16] In the same way, (partial) autospreader flaps were created by folding the cartilaginous excess of the ULCs underneath the septal T

In the SCR group, the ULCs were vertically separated flush to the septum with a scalpel blade. A separation-incremental reduction was performed; a standard 'en bloc' bony hump resection and lateral and transverse osteotomies were performed. The open roof of the dorsal vault was reconstructed with spreader grafts or autospreader flaps.

For the lower third of the nose, the focus was placed on tip definition. The tip was defined according to the patient 's preference via suturing, and tip grafts were placed whenever additional definition was required. Tip rotation was attained by adjusting the anterior septal angle together with septal extension grafts, tongue in groove or free columellar strut grafts. Lateral crural tensioning and cartilaginous preservation of the cephalic border and alar contour grafts were performed as necessary. Augmentation and smoothening of the nasal dorsum were accomplished with diced cartilage.

Both lower turbinates were electrocauterized and piezo-assisted lateralization was performed. The inverted-V incision was closed with 6–0 nonabsorbable (Ethylon®) sutures. All endonasal incisions were sutured using 4–0 or 5.0

absorbable suture (PDS®). Amoxicillin/Clavulanate was applied intravenously during surgery and continued orally after surgery.

All patients received Doyle splints as nasal packing in both nasal cavities and a thermoplastic cast at the end of the surgery. No other endonasal packing was used.

Both Doyle splints and cast were removed postoperatively after one week. All patients were hospitalized for 1 night on average. Regular follow-up appointments were scheduled. On the follow-up visits at 3 and 6 months postop, patients were asked to fill out the PROMs.

## Results

### Patient characteristics

Based on the inclusion criteria, 234 consecutive patients were eligible to participate in this study. PSM with replacement identified 172 patients that were divided according to the used mid-vault reduction approach into demographically two well-balanced groups. Matching with replacement involves a trade-off between bias and variance. If replacement is allowed in PSM, the average quality of matching will increase, and the bias will decrease.[15] The first cohort of 110 patients underwent rhinoplasty with TDP. The second cohort consisted of a control group of 62 patients who underwent SCR. Standardized mean differences (SMDs) before and after matching for each covariate are plotted in Figure 1. Demographics and clinical characteristics of all 172 patients following propensity score matching are summarized in Table 1. All demographic data taken into account in the propensity score matching were not significant. The operative techniques used in both cohorts are summarized in Table 2. In the cohort of structural approach, the middle vault was reconstructed either with spreader grafts and/or autospreader flaps in all patients. In contrast, only in 31% of the cases treated with TDP, these reconstruction methods were employed. A bony preservation technique (let-down) was only applied in the TDP cohort. There was not a statistically significant difference between groups with regard to a variety of other techniques aimed at the correction of nasal aesthetics or those aimed at improving nasal airflow (Table 2).

### Patient outcome analysis

The results of repeated measures ANOVA showed that the UQ ($F = 132.808$; $p < 0.001$) and VAS score ($F=302.9282$; $p<0.001$) as well as the FACE-Q nose ($F= 313.74$; $p<0.001$) and nostrils ($F=61.27$; $p<0.001$) were significantly different. The outcome results of UQ, VAS, FACE-Q nose and nostrils at 3- and 6-months follow-up were statistically not significantly different from each other (Fig. 2-3). In the whole patient population, the mean improvement for the VAS score was $4.37 \pm 0.194$ at 3 months follow-up and $4.34 \pm 0.212$ at 6 months follow-up. No statistical differences were found in the postoperative outcome whether a bony dorsal preservation technique (let-down) or conventional osteotomies were performed. The same was true for fixed struts like septal extension grafts or the tongue-in-groove technique versus free columellar struts.

Patients demonstrated in both cohorts a statistically and clinically significant reduction in NOSE score at 3 months ($p<0,001$) and at 6 months ($p<0,001$) postoperatively as compared to the preoperative scores.

The results of repeated measures ANOVA showed that the NOSE- scores were significantly different ($F = 188.63$; $p < 0.001$). Post-hoc tests revealed that there was a significant improvement in nasal obstruction 3 months ($p < 0.001$) and 6 months ($p < 0.001$) after septorhinoplasty compared with baseline. Between subjects-effects (SCR versus TDP) was significant ($p= 0.031$). At 3 months follow-up, the functional outcome was statistically significant different between both cohorts with a higher value on the NOSE score in TDP as opposed to SCR (+11.1%, $p<0,001$). However, at 6 months postop, the difference between both cohorts was not significant anymore (+ 7.7 %, $p= 0.111$) (Table 3).

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## Discussion

We present a retrospective propensity-matched cohort study of 234 patients operated at the middle vault either with SCR or TDP. While initial descriptions of DP were relatively consistent in preservation of the dorsum, a plethora of newer methods for modification of the osseocartilaginous vault have emerged. Nowadays, TDP can be considered as a hybrid method along a continuum, from pure dorsal preservation and its implied complete preservation of the dorsal hump to conventional hump resection.[17] DALs are violated in SCR and require meticulous care to restore continuity and symmetry.[18] Although spreader grafts and flaps have shown consistency in reconstructing the keystone area and averting deformities, this is often at the cost of dorsal regularity. [5, 2]

In conventional DP by let-down or push-down techniques, the cartilaginous vault remains intact, providing a natural dorsal architecture, but this approach is indeed not suitable for every patient. [2,19] The main issues for DP are a broad cartilaginous dorsum, axis deviation of the repositioned dorsum or producing a marked supratip depression from excess removal at the anterior septal angle. [20] Because DALs are maintained in DP, this technique is only desirable if the lines are pleasing preoperatively. [2] Also, a residual hump (no flexion at the central keystone area) may affect the aesthetic outcome. Whereas DP is not recommended in severe kyphotic humps, saddle noses that need grafting, and in noses with an irregular bony pyramid, the hybrid T-bar approach is still applicable in these cases. [19, 5,4]

In TDP, the central dorsal compartment is preserved but the surgeon keeps the freedom to reshape the DALs as necessary, which may be especially important in crooked noses.

In the present study, both techniques had a comparable aesthetic outcome that remained stable at 3 and 6 months postoperatively. Our results, as measured by UQ, were very comparable with those published by Gostian et al. and Maldonado-Chapa et al. [11,21] Also, Burks et al. found similar pre- and postop FACE-Q nose and nostrils scores in a prospective cohort of functional and cosmetic rhinoplasty patients as in the present study. [22]

As mentioned by Robotti, introducing the advantage of reshaping wide or asymmetric DALs by differential trimming of the lateral junction of the septal T, allowed us to preserve an elastic chondro-cartilaginous junction, avoiding any discontinuity with step-off at the keystone area and need for camouflage. [5] The strength of this hybrid preservation technique lies therefore in its versatility. The architecture of TDP is based on the ideal DALs and therefore resembles the spare roof type B technique (SRT B) of Ferreira et al. [23] Both are considered surface techniques and have similar ways to lower the bony dorsum. Nevertheless, TDP is also compatible with a bony push-down or let-down approach. Both techniques keep the central dorsal osseocartilaginous compartment intact, but in TDP the cartilaginous middle vault is split at the DALs and therefore more freedom is kept reshaping them over the entire length of the osseocartilaginous dorsum and not just at the bony part. Consequently, no ‘Ballerina’ manoeuvre is needed (and even contraindicated) at the lateral keystone areas. [24]

Once the septal T is repositioned, the width of the middle third can be finally perfected and adjusted by reducing the flared edge of the septal T and/or the abutting edge of the upper laterals. [5] As the central dorsal compartment and central keystone area remain intact, TDP can safely be combined with subdorsal septal reduction and less dorsal onlay grafting is needed.

Septal deviations can be concomitantly corrected even as an extracorporeal septoplasty. [5]

Regarding the functional outcome, there was a statistically significant difference between both cohorts with a higher value on the NOSE score in TDP as opposed to SCR at 3 months postop. Although higher NOSE scores still were detected at 6 months postop, the difference was statistically and clinically not significant anymore. It seems that wound healing of the nose had a positive effect on the internal nasal valve and consequently on nasal breathing. The same tendency has been found in the data of Patel et al. [25] Also Law et al. described a statistically significant decrease of the NOSE scores between 1 and 6 months postop. [26] According to Floyd et al., nasal obstruction as measured by the NOSE survey is substantially improved for up to 12 months after functional rhinoplasty and may persist beyond 12 months.[27]

According to Lipan and Most, a score of 30 on the NOSE survey best differentiates patients with and without nasal obstruction[28]. The postoperative mean scores for both SCR and TDP cohorts were under this limit and can, according to their classification, be considered as mild.

The slightly elevated NOSE scores in TDP are probably caused by the fact that, in contrast with SCR, TDP often can be employed without the use of spreader grafts or autospreader flaps: as there is no open roof to restore, the keystone area remains intact. Consequently, there is no need to use these grafts or flaps for contour enhancement. However, once the cartilaginous middle vault is split, either flush to the septum or at the paraseptal cleft, the spring force that widens the valve area is lost and may consequently compromise the nasal airway. Therefore, functional reconstruction of the middle vault with spreader grafts and/or autospreader flaps may be needed to restore the airflow through the

middle vault and at the inner nasal valve. However, in TDP, the horizontal T-bar segment acts as a natural passive spreader and therefore additional spreaders were only required in 31% when there was a narrow apex angle at the internal valve area. The horizontal T-bar camouflages their presence, and as the keystone area remains intact, they solely have a functional purpose.

On the other hand, in SCR, spreader grafts and/or autospreader flaps were utilized in every patient not only for functional but also for aesthetic purposes. Also, Patel et al. reported a more common use of spreaders in SCR in a comparative study between SCR and DP patients. [25] In contrast to their study, radix grafting was rarely needed in the TDP cohort because of the conservation of the central dorsal compartment and the application of the radix greenstick osteotomy approach. Accordingly, for functional as well as aesthetic purposes less cartilage grafting is needed in TDP.

In the present study, the application of spreader grafts and autospreader flaps gave similar functional results in both TDP and SCR. In a recent meta-analysis of Buba et al., no statistical difference in efficacy was found between both spreader techniques. [29] A cadaveric radiologic study has shown that the internal nasal angle in SCR (with autospreader reconstruction) was similar to that in DP patients with let-down, while DP with push-down caused significant valve narrowing. [30] It is unclear whether these findings have clinical significance.

In a study done by Taş et al. a comparison between the let-down preservation and conventional (with autospreader flaps) techniques also showed no significant difference regarding functional results (measured with NOSE score and SNOT-22) between both groups. [4] According to Alan et al., DP with a push-down technique provided good functional and aesthetic results comparable with

structural rhinoplasty.[31] In a randomized prospective study from Ferreira et al. comparing the spare roof preservation technique to SCR, both aesthetic and functional visual analogue scale scores were superior in the preservation group. [32]

Limitations of our study relate to the missing randomization of the evaluated patients. However, the applied PSM allows for a distribution of patients similar to a randomized trial as it displays the recorded characteristics of patients of both treatment groups explicitly. Accordingly, using the statistical method of PSM, the presented results derive from the analysis of two highly comparable groups of treated patients. [33, 21] A general drawback of PSM is the inevitable exclusion of patients for whom there is no matching partner thus reducing the sample size. [34]

The natural history of nasal obstruction and cosmesis in patients who underwent rhinoplasty was reported by Kandathil et al. [35,36] These authors showed improvements in nasal breathing and cosmesis as early as < 2 months that were sustained through a follow-up interval > 12 months. However, Okland et al. found worse NOSE scores on the initial postoperative visit as compared to the follow-up visits. [37] They suspected the initial increase in obstructive scores was due to perioperative swelling, which resolved on subsequent visits. Therefore, as we have detected a positive evolution in the NOSE scores between the visits at 3 and 6 months, further long-term follow-up may be warranted to confirm these results.

In conclusion, the data in this study suggest that both SCR and TDP techniques give similar aesthetic as well as functional patient satisfaction after 6 months. The T-bar hybrid preservation technique is a very versatile cartilage-sparing

method to aesthetically adapt the middle vault without interrupting the keystone area and is compatible with various bony dorsal preservation approaches.

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Patient consent:
Patients provided written consent for the use of their images.

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Table 1: Patient characteristics

| | | SCR | TDP | P value [1] |
|---|---|---|---|---|
| No. of patients | | 62 | 110 | |
| Gender (%) | Male | 13 (21.0%) | 24 (21.8%) | 1.000 |
| | Female | 49 (79.0%) | 86 (78.2%) | |
| Age (yr) | Median (IQR) | 26.00 (13.00) | 27.00 (13.00 ) | 0.425 |
| Ethnicity | Caucasian | 37/62 (59.7%) | 78 (71.01%) | 0.308 |
| | Middle Eastern Mediterranean | 24/62 (38.7%) | 28/110(25.5%) | |
| | Asian | 1/62 (0.02%) | 2/110 (1.9%) | |
| | African | 0/62 (0.0%) | 1 /110(0.9%) | |
| | Latin American | 0/62 (0.0%) | 1/110 (0.9%) | |
| Previous rhinoplasty | Primary cases | 51/62 (82.2%) | 90/110 (81.8) | 1.000 |
| | Secondary cases | 11/62 (17.8) | 20 /110(18.2) | |
| Nasal trauma | | 32/62 (51.6%) | 45/107 (42.1%) | 0.358 |
| Respiratory allergy | | 25/62 (40.3%) | 51/110 (46.4%) | 0.523 |
| Use of topical Corticosteroids | | 36/62 (58.1%) | 37/108 (34.3%) | **0.004** |
| Positive effect of topical corticosteroids | | 3/39 (7.7%) | 11/37 (29.7%) | **0.018** |
| History of chronic sinusitis | | 8/61 (13.1%) | 7/110 (6.4%) | 0.162 |
| OSAS | | 2/62 (3.2%) | 0/109 (0%) | 0.129 |
| Smoking | | 11/62 (17.7%) | 28/110 (25.5%) | 0.263 |
| Snoring | | 28/62 (45.2%) | 43/107 (40.2%) | 0.451 |

[1]Significant values are set in bold.

Table 2: Operative techniques applied in both cohorts.

| Technique | SCR (N =62) | TDP (N=110) | P-value[1] |
|---|---|---|---|
| Spreader grafts | 48 (77.4%) | 29 (26.4%) | **<0.0001** |
| Autospreader flaps | 31 (50.0%) | 5 (4.5%) | **<0.0001** |
| Turbinate surgery | 62 (100.0%) | 107 (97.3%) | 0.298 |
| Fixed Columellar strut (SEG. CEG) | 34 (61.5%) | 62 (56.4%) | 0.534 |
| Free Columellar strut | 17 (27.4%) | 47 (42.7%) | 0,05 |
| TIG | 22 (35.5%) | 34 (30.9%) | 0,612 |
| Cephalic trim/insertion | 36 (55.4%) | 69 (62.7%) | 0.344 |
| Rib/auricular cartilage | 6 (9,7%) | 15 (13.6%) | 0.628 |
| Septoplasty | 61(98,4%) | 108 (98.2%) | 1 |
| Bony hump resection | 42 (67.7%) | 81 (73.6%) | 0.482 |
| Lateral crural strut/batten graft | 5 (8.6%) | 4 (3.6%) | 0.286 |
| Lateral crural suspension | 1 (1.6%) | 1 (0.9%) | 1 |
| Medial crural overlay | 3 (4.8%) | 8 (7.3%) | 0.748 |
| Lateral crural overlay | 7 (11.2%) | 7 (6.4%) | 0.262 |
| AARG | 8 (12.9%) | 12 (10.9%) | 0.805 |
| Classical osteotomies | 62 (100%) | 96 (87.3%) | **0.002** |
| Dorsal bony preservation (let-down) | 0 (0%) | 14 (12.7 %) | **0.002** |
| Radix graft | 0 (0%) | 2 (1.8%) | 0.536 |

[1] Statistically significant values are set in bold.

Table 3: Outcome measures preoperatively at 3 and at 6 months follow-up. Reported are the number of patients (N), mean and standard deviation (SD) in each cohort. Group 1: split component dorsal reduction. Group 2: T-bar dorsal preservation reduction.
[1]Mann-Whitney U test. Statistically significant values between both cohorts are set in bold.

| | **Group** | **N** | **Mean** | **SD** | **P value[1]** |
|---|---|---|---|---|---|
| PREOPERATIVE | | | | | |
| FACE-Q nose | 1 | 60 | 40.30 | 10.23 | 0.260 |
| | 2 | 110 | 39.08 | 13.09 | |
| FACE-Q nostrils | 1 | 60 | 53.53 | 23.93 | 0.476 |
| | 2 | 110 | 49.33 | 23.95 | |
| UQ | 1 | 61 | 14.74 | 5.22 | 0.477 |
| | 2 | 109 | 15.45 | 5.27 | |
| VAS | 1 | 61 | 3.66 | 2.02 | 0.760 |
| | 2 | 106 | 3.51 | 1.78 | |
| NOSE | 1 | 61 | 63.52 | 26.76 | 0.959 |
| | 2 | 108 | 64.49 | 25.39 | |
| POSTOPERATIVE 3 MONTHS | | | | | |
| FACE-Q nose | 1 | 53 | 72.81 | 16.25 | 0.292 |
| | 2 | 99 | 70.40 | 15.78 | |
| FACE-Q nostrils | 1 | 54 | 77.59 | 18.91 | 0.150 |
| | 2 | 99 | 71.40 | 23.57 | |
| UQ | 1 | 53 | 7.00 | 3.31 | 0.108 |
| | 2 | 99 | 8.04 | 4.04 | |
| VAS | 1 | 53 | 8.02 | 1.41 | 0.364 |
| | 2 | 99 | 7.82 | 1.43 | |
| NOSE | 1 | 54 | 15.00 | 19.40 | **< .001** |
| | 2 | 97 | 26.08 | 23.87 | |
| POSTOPERATIVE 6 MONTHS | | | | | |
| FACE-Q nose | 1 | 49 | 75.98 | 15.91 | 0.130 |
| | 2 | 86 | 71.97 | 18.07 | |
| FACE-Q nostrils | 1 | 50 | 77.38 | 20.06 | 0.316 |
| | 2 | 86 | 72.93 | 23.44 | |
| UQ | 1 | 46 | 7.87 | 4.75 | 0.965 |
| | 2 | 85 | 7.53 | 4.12 | |
| VAS | 1 | 51 | 8.10 | 1.19 | 0.732 |
| | 2 | 86 | 7.91 | 1.78 | |
| NOSE | 1 | 51 | 14.70 | 17.75 | 0.111 |

| | Group | N | Mean | SD | P value[1] |
|---|---|---|---|---|---|
| | 2 | 85 | 22.40 | 24.45 | |

Figure 1: Love (Covariate balance) plot of the absolute standardized mean difference for covariates age, ethnicity, preoperative NOSE scores, gender, previous nasal surgery, nasal trauma, and respiratory allergy. Note that balance was quite poor before matching (distance), but full matching improved the balance on all covariates within 0.2. On the right side, Kolmogorov-Smirnov statistics are given.

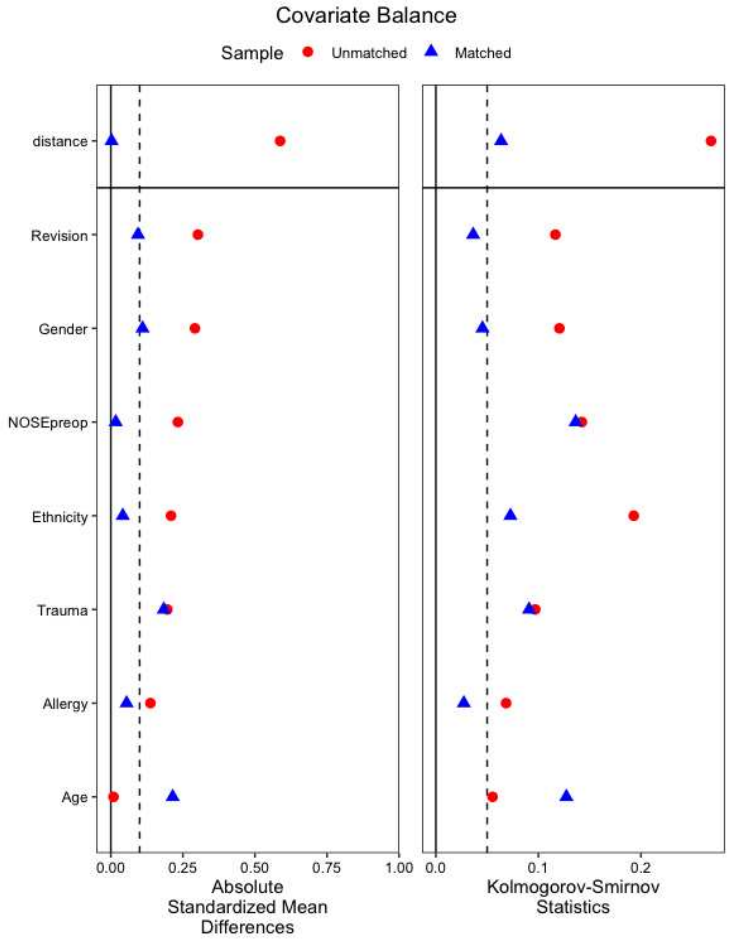


Figure 2. Representative photograph of a patient undergoing a conventional split component reduction.

a, b, c, d. Preoperative views. This 18-year-old female requested correction of asymmetric nasal b conventional split component reduction ones and a dorsal hump, as well as restoration of proper breathing function.

e, f, g, h. Postoperative views. This patient is shown 12 months post-op. She underwent dorsal exposure by sub-SMAS dissection and perichondrial-periosteal flaps, decapping of the bony hump; dorsal septal split; lateral, paramedian and superior osteotomies followed by fracturing, narrowing and alignment of the bony dorsum. Osteoplasty of the nasal bones. Lowering of the septum (3 mm); bilateral placement of spreader grafts; septoplasty with leaving a sizable L-strut; repair of the scroll ligament. Tip-plasty with alar rim

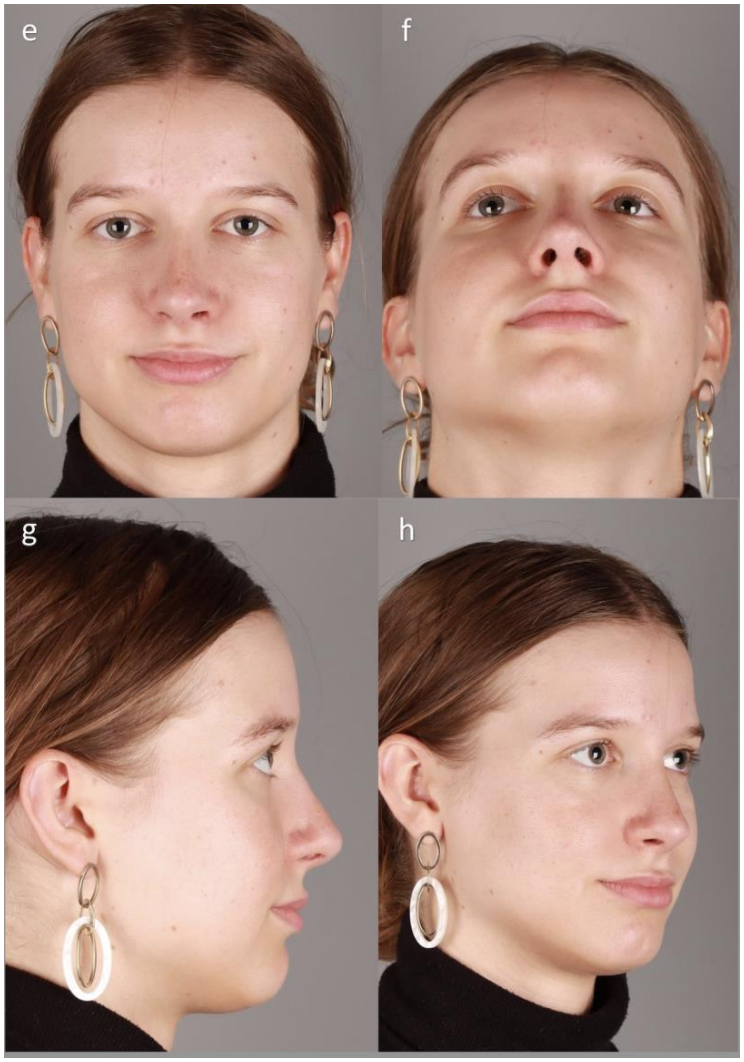
grafts and columellar strut.


e
f
g
h

Figure 3. Representative photograph of a patient undergoing T-bar preservation technique.

a,b,c,d. Preoperative views. This 19-year-old woman requested improvement of the dorsal hump, tip drooping, and restoration of proper breathing function.

e, f, g, h. Postoperative views. This patient is shown at 6 months post-op. She underwent dorsal exposure by sub-SMAS dissection and perichondrial-periosteal flaps, decapping of the bony hump; lateral, paramedian and superior osteotomies followed by fracturing, narrowing and alignment of the bony dorsum. Osteoplasty of the nasal bones. Subdorsal Z-flap for lowering the septal T (4 mm) and side-to-side suture fixation at the right side; septoplasty with leaving a sizable L-strut and correction and refixation of the anterior septum on the premaxilla; repair of the scroll ligament. Tip-plasty and alar rim grafts. Tongue-in-groove fixation of medial crurae.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