

ORIGINAL ARTICLE

Medicine Science 2026;15(1):288-93

Evaluation of the long-term results of strut graft alone and tongue in groove-strut graft combination on nasal tip in structural rhinoplasty

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Received 28 October 2025; Accepted 19 November 2025

Available online 23 February 2026 with doi: 10.5455/medscience.2025.10.296

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Abstract

Techniques for nasal tip support include columellar strut graft, tongue in groove (TIG) technique, septal extension grafts (SEG), septocrural suture, lateral crural steal and tip suturing techniques. In our study we aimed to investigate the effect of strut graft alone and strut graft-TIG technique combination on nasal tip in primary open structural rhinoplasty. Methods: A total of 186 patients were included between March 2021 and December 2024. The mean age of the patients was 27.7 ± 9.56 (18-49). In group 1, only strut graft was placed while in group 2, strut graft was placed in addition to the TIG technique. Retrospective analysis of demographic data, complications, follow-up periods were performed. The mean follow-up period was 21.01 ± 7.34 (9-41) months. Droopy tip was observed in 4 patients in group 1. The complication rate in Group 1 was found to be statistically significantly higher ($p=0.002$; $p<0.01$). The incidence of nasal tip drooping as a complication was found to be statistically significantly higher in Group 1 ($p=0.023$; $p<0.05$). Also, the revision rate in Group 1 was found to be statistically significantly higher ($p=0.002$; $p<0.01$). The satisfaction scores of the patients in Group 2 were found to be statistically significantly higher than those in Group 1 ($p=0.018$; $p<0.05$). The combination of strut graft and TIG technique has a longer lasting effect on tip support and has been shown to reduce tip drooping.

Keywords: Nasal tip drooping, strut graft, tongue in groove technique

Introduction

The number of rhinoplasty patients is increasing day by day. Accordingly, revision surgery rates are increasing, and many techniques have been defined to manage complications. The reasons for revision surgery include nasal tip drooping, residual or recurrent hump, deviation, internal and external valve insufficiency, nasal dorsum depression, alar rime asymmetries, inverted v deformity and saddle nose deformities. Among these revision indications, nasal tip drooping is relatively easy to operate, but there are many techniques to prevent this complication. Strut graft, tongue in groove (TIG) technique, septocrural suture, lateral crural steal, septal extension grafts (SEG) and tip suturing techniques are used to provide nasal tip support. TIG technique was popularized by Kridel in 1999 and aimed to provide tip support and projection [1].

In this study we aimed to investigate the effect of strut graft alone and strut graft-TIG technique combination on nasal tip in patients undergoing primary open structural rhinoplasty.

Material and Methods

A total of 186 patients of open technique primary rhinoplasty were included between March 2021 and December 2024. 122 patients were female (65.6%) and 64 were male (34.4%). The mean age of the patients was 27.25 ± 7.5 (18-54), (Table 1). Patients were divided into 2 groups. Group 1 included 73 patients (39.2%) while Group 2 included 113 patients (60.8%). In group 1, only strut graft was placed between both medial crus of lower lateral cartilages (LLC), while in group 2, TIG technique was performed in addition to the strut graft. Other surgical maneuvers were performed identically in both groups. Late results were evaluated by comparing the complication of nasal ptosis

CITATION

Tuluy Y, Celik V, Parspanci A. Evaluation of the long-term results of strut graft alone and tongue in groove-strut graft combination on nasal tip in structural rhinoplasty. Med Science. 2026;15(1):288-93.



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between both groups. Helsinki guidelines were followed for this study. Our study was approved by the local ethics committee of İzmir Bakırçay University on October 15, 2025, with research number 2394 and decision number 2406. All patients have given informed consent for the use of their data and photographs. The study received ethical approval from the Izmir Bakırçay University on October 15, 2025, with research number 2394 and decision number 2406. Follow-up periods, demographic data and complications were analyzed retrospectively. The Shapiro Wilks test and Box Plot graphs were used to assess the normality of the data distribution. The Student t-test was used to evaluate two groups of quantitative variables that followed a normal distribution. The Mann Whitney-U test was used to evaluate variables that did not show a normal distribution in two groups. Pearson's Chi-Square test and Fisher's Exact test were used to compare qualitative data. The results were evaluated at a 95% confidence interval and a significance level of $p<0.05$.

Surgical Technique

The surgeries were performed under general anesthesia. Following local anesthetic infiltration, the upper lateral cartilages (ULC) and LLC were visualized through transcolumellar and infracartilaginous incisions. The dorsum and lateral walls were visualized by sharp and blunt dissection. The septum was dissected by forming submucosal tunnels. The bone hump was removed with a chisel and the cartilage hump was removed with scissors. The cartilage dorsum was repaired with turn-in flaps designed from the septum or with spreader grafts from the septal cartilage. Bilateral lateral osteotomies were performed to prevent open roof deformity. In patients without an open roof, the lateral walls were corrected by rasping. After correction of the dorsum and lateral walls, tip surgery started. Cephalic resection of LLCs was performed in patients who required it. Tip rotation and projection were increased by placing a transdomal suture. The interdomal ligament was repaired by placing an interdomal

suture. Then, in the first group, a strut graft from the septum was placed as a floating strut between both medial crus of LLCs. In the second group, a TIG suture was placed caudal to the septum with 5.0 pds from both medial crus to the septum. This suture was placed slightly loosely without being fully tightened. Then a floating strut graft was placed as in the other group and fixed with 5.0 pds. The incisions were sutured, and the procedure was finalized by placing a tampon and splint.

Result

There are 73 patients in the first group and 113 patients in the second group. Gender and age distributions by group do not show statistically significant differences ($p>0.05$), (Table 2). The mean follow-up period was 21.01 ± 7.34 (9-41) months. A nasolabial angle of less than 90 degrees in male patients and less than 95 degrees in female patients was considered to be a droopy nasal tip. Nasal tip drooping was observed in 4 patients in whom only columellar strut was placed and no nasal tip drooping was observed in Group 1 (Table 3). In the 2nd group, nasal tip rigidity was observed in 1 patient and the complaint regressed after 1 year postoperatively. Hanging columella was observed in 2 patients in the strut graft only group and no revision was performed because the patients were satisfied with the current result. In 1 patient in both groups, rasping of the dorsum was performed under local anesthesia because of residual hump. The width of the bone pyramid was narrowed by rasping and osteotomy in two patients in group 1 and one patient in group 2. In the first group, columellar flaring was observed in one patient. It was revised under local anesthesia using concha cartilage from the ear. Mild bleeding was observed in 1 patient and was followed with tranexamic acid in group 2. No other complications were observed (Figure 1a-h). The complication rate was statistically significantly higher in Group 1 ($p=0.002$; $p<0.01$), (Table 4). The incidence of nasal tip drooping as a complication was found to be statistically significantly higher in Group 1 ($p=0.023$; $p<0.05$). Also, the revision rate was found to be statistically significantly higher in Group 1 ($p=0.002$; $p<0.01$).

Table 1. Data of the patients

Parameters	Distribution	n (%)
Gender	Female	122 (65.6)
	Male	64 (34.4)
Age	Mean±SD	27.25±7.50
	Median (Min-Max)	26 (18-54)
Satisfaction of the patient	Bad	0 (0.0)
	Moderate	10 (5.4)
	Good	53 (28.5)
	Very good	123 (66.1)
	Mean±SD	3.61±0.59
	Median (Min-Max)	4 (2-4)
Follow-up (month)	Mean±SD	21.01±7.34
	Median (Min-Max)	20 (9-41)
Group	Group 1	73 (39.2)
	Group 2	113 (60.8)

Table 2. Comparison of demographic data, patient satisfaction, and follow-up periods between groups

Parameters	Distribution	Group 1 (n=73)	Group 2 (n=113)	p
Gender	Female	43 (58.9)	79 (69.9)	a 0.123
	Male	30 (41.1)	34 (30.1)	
Age	Mean±SD	26.86±7.23	27.5±7.69	b 0.576
	Median(Min-Max)	25 (18-52)	26 (18-54)	
Patient Satisfaction	Mean±SD	3.48±0.65	3.69±0.54	c 0.018*
	Median (Min-Max)	4 (2-4)	4 (2-4)	
	Moderate	6 (8.2)	4 (3.5)	
	Good	26 (35.6)	27 (23.9)	
	Very good	41 (56.2)	82 (72.6)	
Follow-up (month)	Mean±SD	23.56±6.76	19.35±7.25	b 0.001**
	Median (Min-Max)	23 (11-40)	18 (9-41)	

a: Pearson's Correlation Coefficient, b: Student t Test, c: Mann Whitney U Test. **: p<0.01, *: p<0.05

Table 3. Complications and revision surgeries

Results	Evaluation of complications and revisions	Complications and Surgical Intervention	n (%)
Complication	None		172 (92.5)
	Yes		14 (7.5)
		Nasal dorsal hump	2 (1.1)
		Nasal tip drooping	4 (2.2)
		Nasal tip rigidity	1 (0.5)
		Wide bone pyramid	2 (1.1)
		Bleeding	1 (0.5)
		Columellar flaring	2 (1.1)
		Hanging columella	2 (1.1)
	None		177 (95.2)
Revision	Yes		9 (4.8)
		Nasal tip revision	4 (2.2)
		Osteotomy and rasping	2 (1.1)
		Rasping	2 (1.1)
		follow-up with tranexamic acid and septal hematoma drainage	1 (0.5)

Table 4. Comparison of complication and revision surgery rates between groups

Results	Evaluation of the Results	Group 1 (n=73)	Group 2 (n=113)	p
Complication	None	62 (84.9)	110 (97.3)	a 0.002**
	Yes	11 (15.1)	3 (2.7)	
Droopy Nasal Tip	None	69 (94.5)	113 (100)	d 0.023*
	Yes	4 (5.5)	0	
Revision	None	66 (90.4)	111 (98.2)	d 0.030*
	Yes	7 (9.6)	2 (1.8)	

a: Pearson's Correlation Coefficient, d: Fisher's Exact Test, **: p<0.01, *: p<0.05

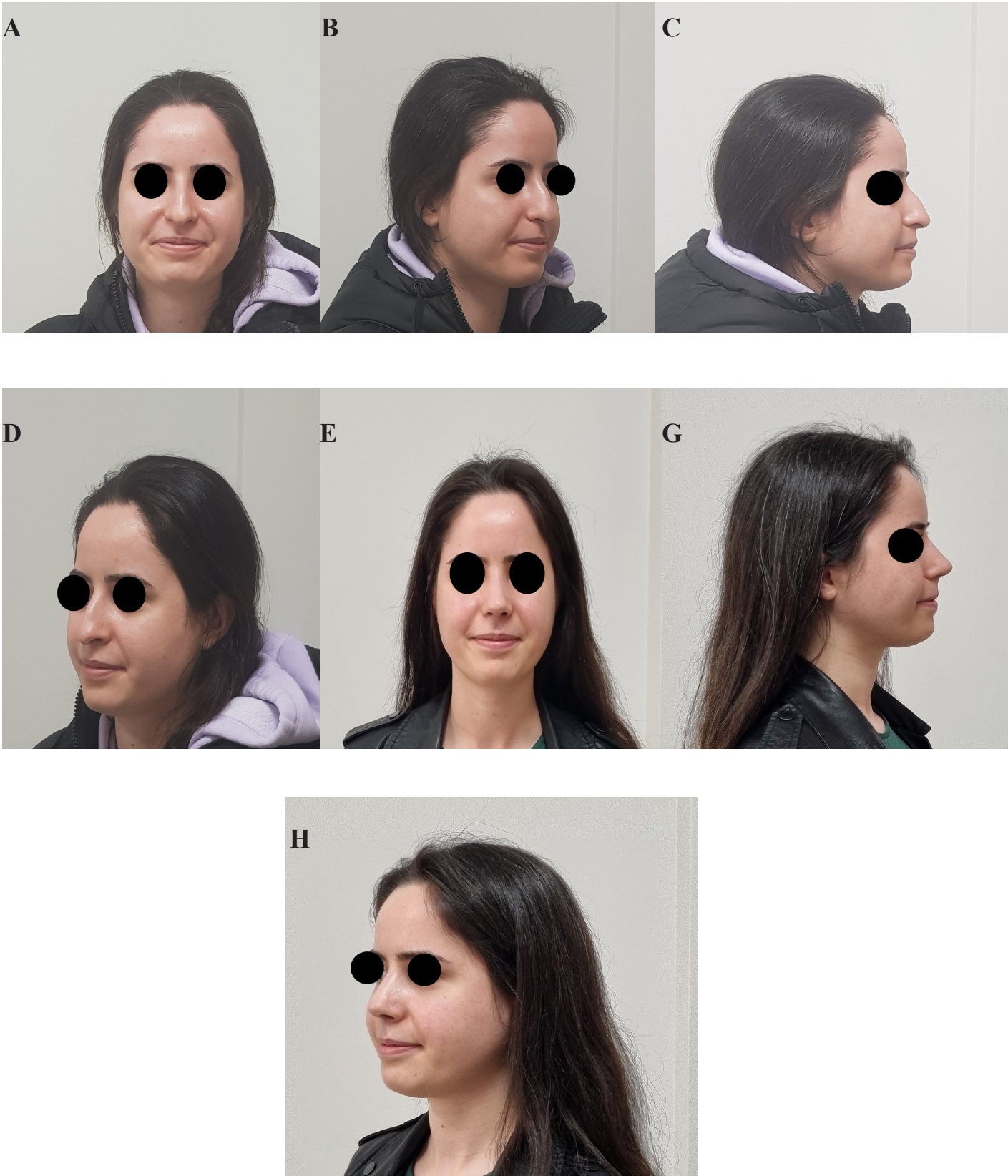


Figure 1. A 26-year-old female patient with a prominent dorsal hump and tip droop was operated on using the strut graft-TIG technique. Preoperative (a-d) and postoperative 11-month view (e-h).

Patient satisfaction scores range from 2 to 4, with an average of 3.61 ± 0.59 . The satisfaction scores of the patients were found to be statistically significantly higher in Group 2 ($p=0.018$; $p<0.05$).

Discussion

Tip drooping is mostly observed in revision rhinoplasty cases. Loosening of the existing sutures over time, lysis of the cartilage grafts placed, and especially the thickness of the tip skin, that is, the heavy tip, also increase the risk of this complication. In this study, nasal tip drooping in primary structural rhinoplasty patients was compared between patients with strut graft only and patients with strut graft and TIG technique in tip plasty surgery. The disadvantages of the TIG technique are that it retracts the columella and reduces the mobilization of the nasal tip, leading to a more rigid tip. In our study, the TIG suture was not fully tightened but left slightly loose. Thus, restriction of nasal tip movement and columellar retraction were tried to be prevented. Except for 1 patient, none of the other patients had any complaints about this. Tip rigidity of the patient was regressed after the 1st year.

In the study by Martinez et al, the effect of columellar strut and caudal SEG on nasal tip was investigated [2]. Although similar effects in nasal tip were seen in both groups in the late period, it was observed that the tip projection was better preserved in the long term in patients with SEG than in patients with columellar strut. SEG was first described by Byrid [3]. It was presented as an effective option for lengthening the nose and preserving tip rotation and shape. In a study by Sazgar et al. the effect of TIG technique and the combination of TIG and SEG on tip rotation was investigated [4]. In the study, they obtained more stable tip rotation in patients who underwent SEG combination with TIG technique. SEG was used by Toriumi and recommended in patients with retracted columellae. In our study, caudal septal resection was not performed in patients with retracted columella and the columellar retraction that may be caused by the TIG technique was eliminated by placing a strut graft. Therefore, no retracted columella was observed in the postop period. Rohrich et al. investigated the effect of SEG and columellar strut graft on nasal tip and found that columellar strut graft alone was not reliable in increasing tip rotation and projection [5].

In the study by Guyuron and Varghai, strut graft and SEG were used to lengthen the nose [6]. Although a more rigid tip was obtained in this combination, an effective lengthening, adequate tip position were obtained with the appropriate insertion of the grafts. The study conducted by Akkuş and Eryılmaz investigated the effect of columellar strut and SEG on tip support and no statistically significant difference was observed, but less decrease in nasal length, columella labial angle and nasal projection ratios was observed in SEG group in the late period [7].

The common features of SEG and columellar strut graft are that they are both visible grafts and can lead to columellar hanging. However, what should be considered here during graft inset is to perform the inset in a way to obtain 2 mm columella hanging in the lateral view. If the SEG causes more than 2 mm columellar hanging, it should be shortened. Similarly, if the columellar strut graft causes columellar hanging, cartilage excision can be performed caudal to the septum. In our study, no hanging columella was observed in Group 2. Hanging columella was observed in 2 patients who received strut grafts only, and no revision was performed because the patients were satisfied with the current result.

In a study by Karaiskakis et al. evaluating tip support with columellar strut graft and TIG technique, nasal tip rigidity was observed in 92.3% of patients who underwent TIG technique [8]. In our study, nasal type rigidity was observed in only 1 patient and regressed after the 1st postoperative year. The fact that this rate was low in our patient group was thought to be because the TIG suture was left loose without being fully tightened.

In a study by Demir, the effect of TIG technique, strut graft and cap graft on nasal tip was investigated. In the study, it was stated that TIG technique and columellar strut graft both influence the nasal tip, and a more effective aesthetic result can be obtained by supporting with cap graft in necessary patients [9]. In our study, total complication rates, nasal tip drooping complications, and revision surgery rates were significantly lower in the second group. This demonstrates that more effective results can be achieved with combined techniques; however, the current results should be confirmed with larger patient series.

The satisfaction scores of the patients in Group 2 were found to be statistically significantly higher in our study ($p=0.018$; $p<0.05$). This also shows that patients are more satisfied with the aesthetic and functional results achieved using combined techniques. Although this survey is a subjective assessment, it contributes to forming an opinion on the results. Also, the study is retrospective and prospective study and validated surveys can be used to make more objective assessments.

Conclusion

The combination of strut graft and TIG technique has a longer lasting effect on nasal tip support and has been shown to reduce tip drooping, one of the most common complications after rhinoplasty.

Conflict of Interests

The authors declare that there is no conflict of interest in the study.

Financial Disclosure

The authors declare that they have received no financial support for the study.

Ethical Approval

The study received ethical approval from the Izmir Bakırçay University on October 15, 2025, with research number 2394 and decision number 2406.

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