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Comparing the Effects of Tongue in Groove and Strut Graft of Open Rhinoplasty on Nasal Tip Rotation and Projection

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Abstract

Background and Objectives: Managing the nasal tip is a complex aspect of rhinoplasty, requiring an understanding of anatomical variations and their impact on tip support. Various procedures have been developed to enhance tip projection and tip rotation. This study compares effects of two such techniques in long-term, the tongue in groove and strut graft methods, on nasal tip projection and rotation.

Methods: This study was a randomized controlled surgical trial that was conducted at Rizgary Teaching Hospital – Otolaryngology department between January 2023, and October 2023. Forty patients undergoing rhinoplasty were randomly divided into two groups: Group A (strut graft) and Group B (tongue-in-groove). Both groups underwent open rhinoplasty using their respective techniques. Tip projection and rotation were measured pre- and postoperatively using Goode's method and Adobe Photoshop. Statistical analysis was performed using SPSS version 26.

Results: The mean age of patients was 24.9±5.52 years, with females comprising 80%. Preoperative measurements showed no significant differences between groups. Postoperative comparisons revealed no significant difference in tip rotation (Tongue in groove: 102.9°±6.3° vs. Strut graft: 101°±5.4°, $p>0.05$), but a significant difference in tip projection (Tongue in groove: 64.1±8 vs. Strut graft: 70.6±6.8, $p<0.01$). Naso facial angles decreased significantly in both groups postoperatively.

Conclusion: Both Tongue in groove and strut graft techniques are effective for maintaining nasal tip projection and rotation. However, the strut graft technique showed a more significant increase in tip projection postoperatively.

Keywords: Open rhinoplasty, Nasal tip projection, Nasal tip rotation, Strut graft, Tongue in groove

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Introduction

Managing the nasal tip is one of the most challenging aspects of rhinoplasty. To create an effective treatment plan, surgeons need a thorough knowledge of the anatomical variations in the cartilage of the tip and soft tissues. This includes recognizing how these variations affect tip support and their interconnections, as well as understanding how each surgical adjustment will influence the final result.[1,2] Over the years, surgeons have developed a range of techniques to maintain and support the nasal tip during rhinoplasty. These methods aim to improve tip rotation and projection and include techniques such as shield-type tip grafts, premaxillary grafting, medial crural-caudal septal imbrications, various suture techniques, tip onlay grafts, columellar struts, lateral crural steal techniques, and medialization of the medial crural footplates. These approaches are frequently used to achieve the desired contour and support of the nasal tip.[3] The mechanisms supporting the nasal tip are complex, involving the ligamentous attachment of the medial crura to the septal cartilage, the length and integrity of the lower lateral cartilages, and the connections between the lower and upper lateral cartilages. Other factors include the interdomal ligamentous sling, the membranous septum, the anterior nasal spine and the lateral crural attachment to the aperture of pyriform, along with the skin and soft tissue envelope.[3] During rhinoplasty, some of these support mechanisms inevitably get disrupted through surgical techniques such as, trans fixation incisions, division of lower lateral cartilage and cephalic trim.[4] Such disruptions can change the support, position, projection, and rotation of the lower lateral cartilages. Hence, various techniques exist to maintain tip projection and rotation, with the choice often reflecting the surgeon's expertise and preferred practices.[4,5] In some cases, literature indicates that columellar struts can effectively achieve and sustain nasal tip rotation and projection, although this effectiveness remains a debated topic among authors.[6,7] Consequently, newer techniques, like the TIG, are emerging as promising options to maintain tip rotation and projection during standard rhinoplasty procedures.[7] However, the tongue-in-groove technique in rhinoplasty can lead to several complications. Patients may experience nasal obstruction due to swelling or improper positioning.[8] Infection is a risk associated with any surgical procedure.[9] Additionally, unsatisfactory aesthetic outcomes, including issues with symmetry and contour, can necessitate revision surgery.[10] Other complications include altered sensation, cartilage resorption, deviated septum, and hematoma formation.[11,12] These factors highlight the importance of careful planning and execution in the procedure to mitigate potential adverse effects on both function and aesthetics. This study examines outcomes of TIG and strut graft techniques regarding tip rotation and projection in two groups of randomly selected patients, providing insights into their relative effectiveness and application.

Patients and methods

Forty patients were included in this randomized controlled surgical trial. The senior investigator operated on these patients by using two different techniques categorizing the patients into two. The patients were randomized by using block randomization method in which one of the investigators divided the patients into two groups. Group A included patients who underwent strut graft technique and group B included patients who underwent tongue in groove technique. The operations were performed at Rizgary Teaching Hospital, otolaryngology department, between January 2023, and October 2023. Convenient sampling method was used to recruit patients. The selected patients were from the

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consecutive candidates of rhinoplasty including both genders who were older than 18 years of age. The exclusion criteria included patients with history of prior rhinoplasty, congenital facial anomalies. A written informed consent was signed by each patient after thorough explanation of the procedures, as well as detailed clarification of the study's scope and aim. Ethical approval was obtained from the scientific research protocol committee of Kurdistan Higher Council for Medical Specialties. An open rhinoplasty approach was implemented involving similar techniques for both groups. The studied techniques were performed as follows: In the strut graft technique, commonly known as the "floating" strut, the graft is fashioned from slices of septal cartilage, particularly from the lower section of the quadrangular cartilage. Initially, this graft is about 2–3 cm in length, 2–3 mm in width, and 1–2 mm in thickness, but it can be trimmed to fit specific needs. A pocket is formed to insert the strut between the medial crura using curved Stevens scissors, and the strut is carefully placed into the intercrural space with a gentle push. The upper end of the strut is anchored to the midsection of the medial crura using two 5/0 nylon mattress sutures, while the lower end is left free between the crura. This design ensures that the graft doesn't extend to the nasal spine, helping to prevent any clicking sounds when the patient smiles. In the tongue-in-groove technique, the process begins by fully exposing the tip area and then separating the medial crura. Dissection is done for the caudal part of the septum on both sides, then the septum and medial crura are sutured to each other by using a 5-0 nylon suture. When necessary, a graft for septal extension was also added and secured with the same sutures. For the sake of evaluating tip projection, we utilized Goode's method, which measures the distance from the tip-defining point to the alar crease and compares it to the length of the nasal bridge (dorsal length). Based on this method, when the nose length is proportionate to the face (approximately one-third of the total facial length), the ideal tip projection should be around 67% of the dorsal length. For measuring the nasolabial angle, we employed Adobe Photoshop. This involved drawing two lines: one parallel to the columella and another aligned with the upper lip. An otolaryngologist, who had no prior knowledge of the patients' preoperative or postoperative conditions or specifics about the procedures (such as whether a strut graft or the TIG technique was used), performed these measurements independently. Statistical analysis was conducted using SPSS version 26. Categorical variables were reported as percentages, while continuous variables were summarized as means. We applied the student's t-test to compare the two study groups and used the paired sample t-test to assess changes in preoperative and postoperative outcomes within each group. This thorough approach ensures a comprehensive evaluation of the techniques used and their effectiveness in achieving the desired nasal outcomes.

Results

Forty patients undergoing rhinoplasty were included in this cohort. The mean age of the patients was 24.9±5.52 years. Females comprised 80% of the cases and males comprised only 20%. The mean pre-op tip rotation degree was 86.4°±8.1°, the mean pre-op tip projection angle was 63.3±7.3 and the mean Naso facial angle was 38.2±4.1. There were no preoperative statistically significant differences between the TIG and Strut graft groups in terms of tip rotation, tip projection and Naso facial angle ($p>0.05$), Table (1).

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Table (1): Baseline characteristics of the subjects

Variable		Total n=40	TIG n=20	Strut graft n=20	p-value
Mean age±SD, years		24.9±5.52	26.5±5.96	23.3±4.7	0.066
Gender	Male	8 (20%)	1 (5%)	7 (35%)	0.04
	Female	32 (80%)	19 (95%)	13 (65%)	
Pre-op tip rotation		86.4°±8.1°	86.8°±9.8°	86°±6.2°	0.774
Pre-op tip projection		63.3±7.3	62.7±7.3	63.9±7.4	0.594
Pre-op Naso facial angle		38.2±4.1	37.6°±3.8°	38.8°±4.4°	0.344

Post operative comparison of TIG and Strut graft procedures shows no significant difference in tip rotation between TIG group (102.9°±6.3°) and Strut graft group (101°±5.4°) ($p>0.05$). There was a significant difference between post operative tip projection between TIG (64.1±8) and Strut graft (70.6±6.8) groups ($p<0.01$). There was no significant difference in post-op Naso facial angle between the TIG group (33.1°±3°) and the Strut graft group (35.1°±2.9) ($p>0.05$), Table (2).

Table (2): Comparison of post-op measurements between TIG and Strut graft groups

Variable	TIG n=20	Strut graft n=20	p-value
Post-op tip rotation	102.9°±6.3°	101°±5.4°	0.299
Post-op tip projection	64.1±8	70.6±6.8	0.008
Post-op Naso facial angle	33.1°±3°	35.1°±2.9	0.589

Table (3) shows the difference of pre-op and post-op results between the groups. There was a 16.15±7.1 increase in tip rotation among the TIG group and 14.95±6.1 among the Strut graft group and the difference were statistically significant in both groups. Tip projection increased by 1.35±11.7 in TIG group and this difference was not statistically significant; whereas, tip projection increased by 6.7±6.99 among the Strut graft group and this difference was statistically significant. Naso facial angle decreased by 4.5±2.4 degrees in the TIG group and 2.7±3.1 degrees in the Strut graft group and these differences were statistically significant for both groups, Figure (1) and (2).

Table (3): Pre and post operative comparison of variables

Variable	Group	Pre-op — post-op mean difference	p-value
Tip rotation	TIG	-16.15±7.1	0.000
	Strut graft	-14.95±6.1	0.000
Tip projection	TIG	-1.35±11.7	0.612
	Strut graft	-6.7±6.99	0.000
Naso facial angle	TIG	4.5±2.4	0.000
	Strut graft	2.7±3.1	0.002

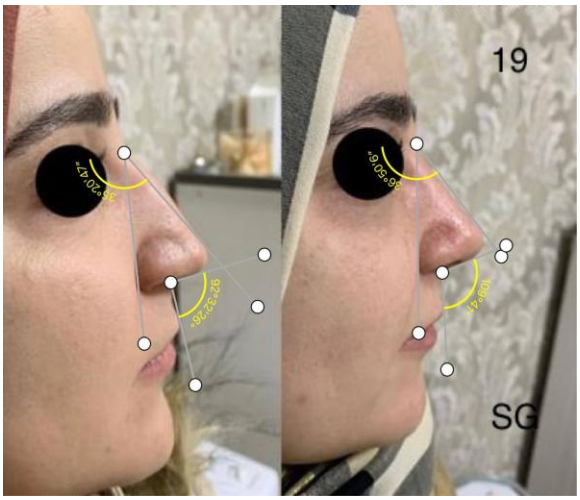

Figure (1): The preoperative and postoperative measurements of a Strut graft patient

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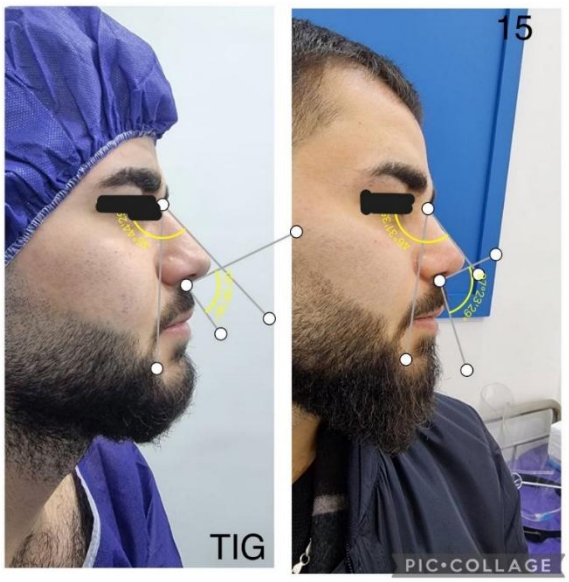

Figure (2): The preoperative and postoperative measurements of a TIG patient

Discussion

In this study we found that in the preoperative assessment there was no significant difference in nasal tip rotation between the patients undergoing TIG and Strut graft groups (86.8°±9.8° vs. 86°±6.2°, respectively) ($p>0.05$). Similarly in the postoperative assessment of tip rotation we found no significant difference between the groups (102.9°±6.3° vs. 101°±5.4°) ($p>0.05$). However, compared to the preoperative tip rotation, the postop tip rotation was higher in both groups. This finding is in agreement with Aksakal et al.'s study, in which they also reported that their TIG group increased from 96.8° to 108.2° on average; whereas, their Strut graft group increased from 100.8° to 104.2°.[13] Demir et al. also reported an increase in nasal tip rotation.[14] Delarestaghi et al. reported that tip rotation had improved significantly in both of their strut graft and TIG groups.[15] They also reported that the immediate postoperative tip rotation was better in their strut graft group; however, the long term outcome was comparable in both the TIG and the strut graft groups. Studies indicate that while the outcome measures tend to decrease over time compared to early postoperative values, they still show improvement from baseline levels.[15] Some researchers have proposed various reasons for this reduction in rotation.[16] It might be due to the natural elasticity of the lateral crura, the weight of soft tissue on the nasal tip, the type of suture used, or even excess mucosa. Interestingly, it appears that sutures with longer-lasting strength, like polydioxanone and polypropylene (Prolene, Ethicon), lead to a smaller decrease in the nasolabial angle.[17] In the current study, we found that the increase from preoperative nasal tip rotation to the postoperative state was statistically significant in both groups ($p<0.05$). In line with our study, Demir et al. reported a significant increase from preoperative nasal tip rotation in both strut graft and TIG groups.[14] Aksakal et al. reported that the difference between postoperative nasal tip rotation with the preoperative nasal tip rotation was significant only in their TIG group and not in the Strut graft patients.[13] This can be attributed to the preoperative nasal rotation measurement which was significantly higher in their strut graft group compares to the TIG group. In our study, nasal tip projection in the preoperative assessment of the TIG group was not significantly different from the Strut graft group (62.7±7.3 vs. 63.9±7.4, respectively) ($p>0.05$). However, in the postoperative assessment there was a significant difference in nasal tip projection between the TIG group and the Strut graft group (64.1±8 vs. 70.6±6.8) ($p<0.05$). Evidently, post operative tip projection increased in both groups of our study and this is finding is consistent with Aksakal et al.'s findings where they reported that the tip projection increased from 57 to 62 in their TIG group and from 58 to 62 in their Strut graft group.[13] Similarly, Demir et al. also reported that nasal projection increased in both groups.[14] The increase in tip

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projection in our study was statistically significant ($p<0.05$) in the Strut graft group but not in the TIG group ($p>0.05$). In Aksakal et al.'s study they reported a significant increase in tip projection of both TIG and Strut graft groups ($p<0.05$).[13] Demir et al. also reported that the increase in tip projection was significant in both of their TIG and strut graft groups.[14] We also found that the preoperative Naso facial angle was not significantly different between the TIG group (37.6°±3.8°) and the Strut graft group (38.8°±4.4°) ($p>0.05$). Similarly, there was no significant difference between the postoperative Naso facial angle of the TIG and the Strut graft groups (33.1°±3° vs. 35.1°±2.9, respectively) ($p>0.05$). However, there was a decrease in the Naso facial angle in both the TIG group from 37.6°±3.8° to 33.1°±3° and the Strut graft from 38.8°±4.4° to 35.1°±2.9°. This is in accordance with Aksakal et al.'s study where they also reported a decrease from 147.8° to 144.0° in the TIG group and 149.1° vs 146.3°.[13]

The decrease between the preoperative and postoperative Naso facial angle was significant in both the TIG and Strut graft groups ($p<0.05$). This is in line with Aksakal et al.'s findings where they also reported a significant decrease in the Naso facial angle ($p<0.05$).[13]

Conclusion

Both TIG and strut graft techniques can maintain nasal tip rotation and nasal tip projection effectively, with the strut graft method demonstrating a more substantial postoperative increase in tip projection.

Limitation

A small sample size was a limitation of our study.

Conflict of interest

The authors declare no conflict of interest

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