Preventing Cheesewire and Hump Recurrence in Low Strip Preservation Rhinoplasty

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Background: Hump recurrence represents a potential complication of preservation rhinoplasty. In the low septal strip technique, the quadrangular cartilage functions as a rotational advancement flap anchored to the anterior nasal spine. Proper fixation is crucial to prevent hump recurrence caused by backward rotation of the flap.
Methods: All primary preservation rhinoplasties performed by the same surgeon with the low septal strip septoplasty technique between January of 2021 and December of 2023 were analyzed retrospectively, comparing conventional fixation with mattress sutures to a novel technique, referred to as kite fixation. The primary outcome variables were the presence or absence of hump recurrence and the need for revision surgery.
Results: A total of 823 patients were included in the study, with 405 in the conventional fixation group and 418 in the kite-shaped fixation group. Demographic characteristics were comparable between the groups. Statistically significant differences were observed in terms of hump recurrence (4.6% versus 1.2%) and the necessity of revision surgery (4.3% versus 1.1%).
Conclusions: Hump recurrence and minihumps remain significant drawbacks in preservation rhinoplasty. Proper fixation of the rotated septal flap is crucial to achieving long-term postoperative stability. Redistributing the tension of the suture loops into a triangular configuration, known as the kite-shaped method, has proven to be a simple, effective, and reproducible technique. *(Plast. Reconstr. Surg.* 158: 607e, 2026.)

Rhinoplasty surgery pursues both functional and aesthetic goals. In the ideal nasal aesthetic, the nasal dorsum is straight or slightly concave.[1] Removal of the nasal hump is a critical step in rhinoplasty, achievable through either structural techniques, which involve resection and reconstruction, or preservation techniques.[2] The latter allows for hump reduction without creating an open roof deformity. In preservation techniques, the quadrangular cartilage resection occurs beneath the cartilaginous vault, at one of 3 levels depending on the technique: subdorsal, as in the high septal strip technique[3]; at the midpoint, as in the mid–septal strip technique[4]; or in its lowest portion, referred to as the low septal strip technique.[5]

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Received for publication January 26, 2025; accepted November 13, 2025.
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DOI: 10.1097/PRS.0000000000012653

Preservation techniques significantly reduce the risk of open roof deformity, but a potential complication is recurrent hump formation, which is a multifactorial issue. Some of the contributing factors are shared across all 3 techniques. The term "blocking points," introduced by Goksel et al.,[6] describes potential causes and preventive maneuvers for this complication. However, other factors can also contribute to recurrence, even if the intraoperative result appears perfect.

Our preferred approach is the low septal strip technique, initially described by Cottle.[7] In this approach, the quadrangular cartilage functions as a rotational advancement flap that is anchored to the anterior nasal spine (ANS), providing

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marked improvement in nasal deviations and enhancing the position of the anterior septal angle (ASA). However, improper fixation of this quadrangular cartilage flap (QCF) may result in backward rotation, potentially leading to hump recurrence.[8]

The objective of this study is to describe a modification in the QCF fixation technique to the ANS that may reduce the septum backward rotation deformity and hump recurrence.

PATIENTS AND METHODS

A retrospective observational study was conducted including all primary preservation rhinoplasties performed by the same surgeon with the low septal strip septoplasty technique between January of 2021 and December of 2023.

Patients were divided into 2 subgroups based on the type of fixation used: one group underwent conventional fixation to the ANS using a horizontal shaped suture; the other group received the modified fixation technique (the kite-shaped fixation). Written informed consent was obtained from all participants. The study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology guidelines and the ethics principles outlined in the Declaration of Helsinki. This study was approved by the institutional review board of Quiron Hospitals. All participants provided written informed consent before enrollment in the study.

The medical records of the included patients were reviewed. Demographic data, including sex, age, and comorbidities, were collected. The type of nasal dorsum was recorded, classified according to the Lazovic classification. The primary outcome variables were the presence or absence of hump recurrence and the need for revision surgery, with a minimum follow-up period of 1 year. A standardized photographic assessment was used to assess postoperative hump recurrence. The photographs were standardized as described by Çakir.[9] Frontal, oblique, profile, basal, and helicopter views were taken at a preestablished distance of more than 2 meters to avoid fisheye distortion, using a single-lens reflex camera, a 100-mm macro lens, and a soft box lighting system. Postoperative follow-up was conducted at 1 and 2 weeks and 1, 4, and 12 months. The patients were discharged from follow-up after 1 year.

Statistical Analysis

The data were processed using a Microsoft Excel database format, which was later imported for statistical analysis into SAS version 9.4 (SAS Institute Inc.). For the description of continuous quantitative variables, the mean with SD was used. Qualitative variables were described using absolute frequencies and relative frequencies expressed as percentages. Comparisons between continuous quantitative variables among independent groups were primarily assessed using parametric tests, using *t* tests when comparing 2 groups. A *P* value less than 0.05 was considered statistically significant for all analyses.

Surgical Technique

All procedures were performed under general anesthesia. A closed rhinoplasty approach was used in all cases, using a modified infracartilaginous incision[10] and a septal Killian incision without transfixing the septum cartilage. Dissection of the lower lateral cartilages was performed in the subperichondrial or subareolar plane, depending on the thickness of the skin. Our preference is the subareolar plane except in patients with very thin skin. Dissection of the nasal dorsum, lateral walls, and septum was consistently subperichondrial and subperiosteal. Preservation of the Pitanguy and scroll ligaments was mandatory. To optimize skin redraping, wide lateral dissection was carried out.

The lateral keystone area was released in all cases using the ballerina maneuver. For patients with an S-shaped dorsum or convex bones, piezotome rasping was performed in the dorsal keystone area or lateral bone walls. For cases with a wide cartilaginous dorsum, a modification of the cartilaginous vault, known as the dorsal Y technique, was performed. This technique involves removing the bony cap and the shoulders of the upper lateral cartilages apart from the regular low strip preservation rhinoplasty.

A swinging-door septoplasty, as described by Cottle,[7] was undertaken equally in both subgroups. The low septal strip resection was triangular in shape, starting posterior to the posterior septal angle to prevent ASA deprojection. Following this, a vertical strip and a subdorsal strip were removed and the lateral, transverse, and perpendicular plate of ethmoid osteotomies were performed using the piezotome. We preferred piezotome-assisted osteotomies as they reduce postoperative edema[11] and bruising. After addressing the osseocartilaginous vault, the septoplasty was completed by rotating and advancing the QCF to achieve final flattening of the dorsal profile. If vomerine spur or maxillary crest

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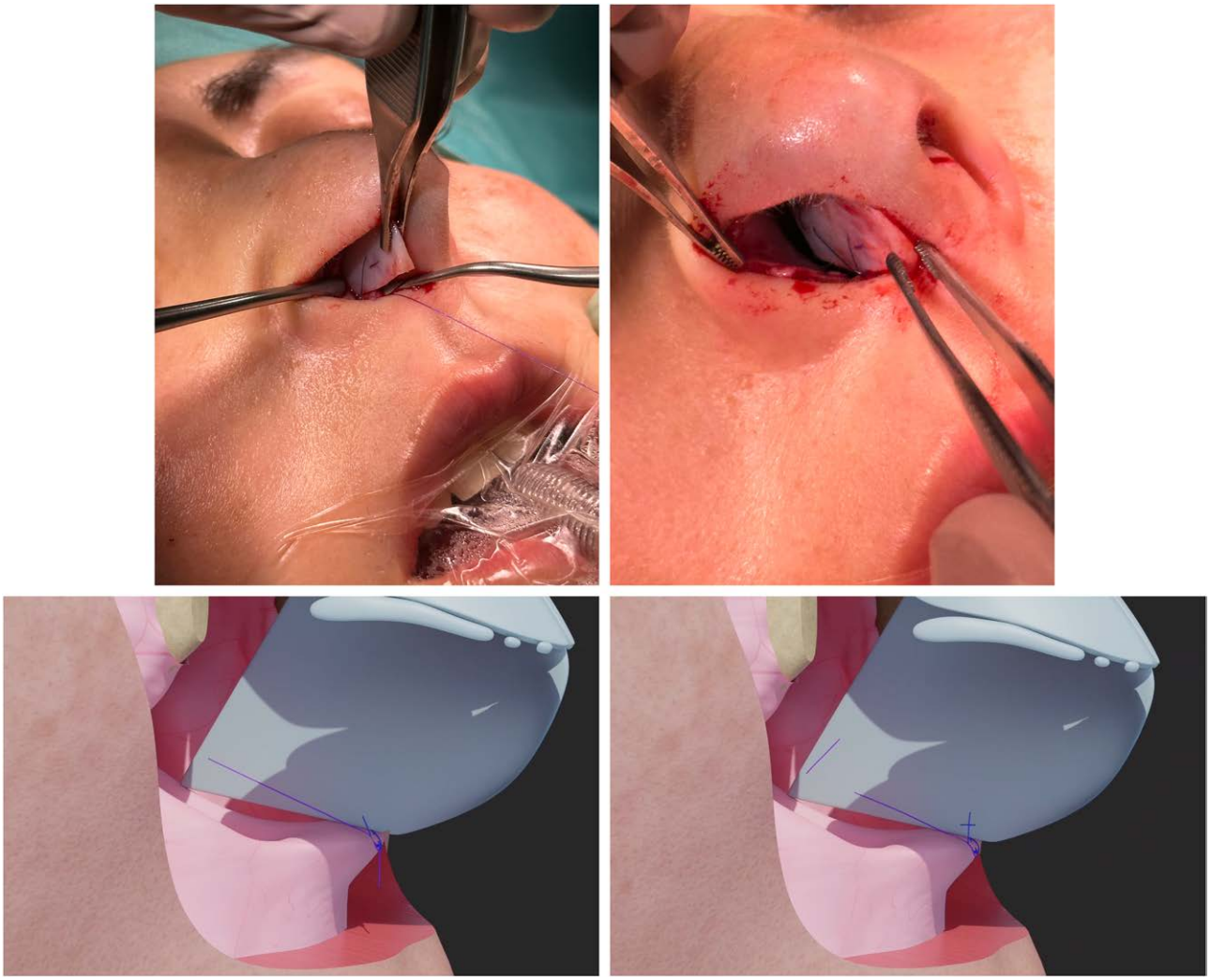


Fig. 1. Kite-shaped fixation of the QCF in low septal strip septoplasty. (*Above*, *left*) First stage: Triangular-shaped loop adjacent to the posterior septal angle. (*Above*, *right*) Second stage: Triangular-shaped loop anterior to the vertical cut of the QCF. (*Below*, *left*) Diagrammatic representation of the conventional fixation. (*Below*, *right*) Diagrammatic representation of the kite fixation.

deviation were present, these areas were also resected either conventionally or with the assistance of a piezotome. Their excision does not compromise the preservation technique, as they are located in independent areas.

In the first subgroup, the QCF was fixed to the perichondrium of the ANS using 2 loops (anterior and posterior) of a conventional horizontal suture. In the second subgroup, loop fixation was modified, perforating the septum 3 times in a triangular shape for each loop (Fig. 1). (**See Video 1 [online]**, which demonstrates the kite-shaped fixation technique.) (**See Video 2 [online]**, which presents a 3-dimensional animation illustrating the kite-shaped fixation technique.) The distance between each of these septal perforations with the needle and thread is larger at the posterior loop. Polydioxanone suture 5/0 was used in both groups.

Our preferred approach for tip surgery is the polygonal tip plasty technique developed by Çakir,[9] combined with the use of a columellar strut, a membranous tongue-in-groove technique along with bilateral resection of septal mucosa, and the 6 preservation steps described by Çakir.[9]

RESULTS

A total of 823 patients were included, with 405 in the conventional fixation group and 418 in the kite-shaped fixation group. Demographic characteristics, including age, sex, and comorbidities, were comparable between the groups ($P > 0.05$). The mean age of the total study population

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Table 1. Demographic Characteristics[a]

Characteristics	Conventional (n = 405)	Kite-Shaped (n = 418)	P
Age, yrs	32.4 ± 8.2	31.9 ± 7.9	0.37
Male sex	14 (3.5)	12 (2.9)	0.63
Comorbidities	38 (9.4)	36 (8.6)	0.71
Back type (Lazovic)			0.84
I	210 (51.9)	214 (51.2)	
II	122 (30.1)	128 (30.6)	
III	73 (18.0)	76 (18.2)	

[a]Data are presented as mean ± SD or n (%).

was 32.2 ± 8.1 years. Follow-up was comparable between the 2 groups, with an average follow-up of 1 year in both groups (Table 1).

A total of 769 patients who underwent closed-approach rhinoplasty underwent low-strip dorsal preservation, with or without an additional surface technique. A total of 54 patients underwent Y-shaped low-strip dorsal preservation. All the impactions were accomplished using a piezo-assisted let-down technique.

In the conventional fixation group (n = 405), hump recurrence was observed in 19 patients (4.6%), versus 5 patients (1.2%) in the kite-shaped fixation group (n = 418), representing a statistically significant difference ($P < 0.05$) (Figs. 2, 3, and 4). Revision surgery due to recurrence was required in 17 patients (4.3%) in the conventional fixation group, whereas only 5 patients (1.1%) in the modified fixation group required surgical revision ($P < 0.05$) (Table 2). The revision rate differs from the recurrence rate because not all patients with slight dorsal hump recurrence expressed dissatisfaction or desired revision surgery. Hump recurrence



Fig. 2. (*Above*) Preoperative appearance of a patient who underwent a low septal strip septorhinoplasty with kite-shaped fixation, shown in frontal, oblique, profile, basal, and helicopter views. (*Below*) One-year postoperative appearance, shown in frontal, oblique, profile, basal, and helicopter views.

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Fig. 3. Preoperative and 1-year postoperative profile views of a patient with a V-shaped dorsum who underwent a low septal strip septorhinoplasty with kite-shaped fixation.

revisions were consistently performed using an intercartilaginous incision, followed by subperichondrial and subperiosteal dissection of the dorsal osteocartilaginous vault to facilitate dorsal surface techniques, such as bone rasping or electroshaving of the cartilaginous hump. In 2 cases in the conventional fixation group, the hump was accompanied by drooping of the ASA, so the septal quadrangular flap was redone and fixated with the modified technique.

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Fig. 4. Preoperative and 1-year postoperative profile views of a patient with an S-shaped dorsum who underwent a low septal strip septorhinoplasty with kite-shaped fixation.

DISCUSSION

Hump recurrence remains a well-documented complication in preservation rhinoplasty, with reported rates ranging from 1% to 15% across various series.[12,13] This complication is multifactorial in pathogenesis, with some causes being common to all preservation rhinoplasty techniques.[6] Tuncel and colleagues published 2 consecutive articles, in 2019[14] and 2021,[15] describing their recurrence rate in the

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Table 2. Outcome Comparisons[a]

Outcome	Conventional ($n = 405$)	Kite Shaped ($n = 418$)
Hump recurrence	19 (4.6)	5 (1.2)
Revision surgery	17 (4.3)	5 (1.1)

[a]Data are presented as n (%). Both comparisons were significant at $P < 0.05$.

first article and the surgical maneuvers used to reduce this rate from 12% to 5% in the second. These maneuvers included more accurate resection of the underlying cartilaginous and bony septum, release of the lateral keystone area, vertical cuts through the subdorsal septum under the hump, and 2-point suture fixation of the dorsum. The first 2 maneuvers are broadly applicable across preservation rhinoplasty techniques; the latter 2 are specific to the high strip technique.

Backward rotation of the QCF due to inadequate fixation represents a specific cause unique to the low strip technique. Our results demonstrate that the modified fixation technique significantly reduces the incidence of hump recurrence compared with the conventional horizontal suture technique. Moreover, the need for revision surgery was substantially lower in the modified fixation group, highlighting improved long-term stability and patient outcomes.

Other complications, such as low radix or saddle nose deformities, have also been described in preservation rhinoplasty. However, these tend to become rare once the learning curve has been surpassed. The cases reviewed in this study pertain to a period in which the senior author was already experienced in preservation rhinoplasty. This clinical experience led to the development of the new fixation technique, aimed not at avoiding major complications, which were already rare, but at further minimizing the risk of minihumps and other minor contour irregularities.

When analyzing the conventional suture technique, the horizontal shape configuration anchors the periosteum of the ANS, a highly resistant structure, to the posterior septal angle of the QCF, a comparatively less resistant structure. This disparity can create a biomechanical imbalance. Postoperative tension on the suture, exacerbated by edema, may lead to tearing of the quadrangular cartilage (ie, cheesewire), ultimately causing backward rotation and hump recurrence.[16]

Our modified fixation technique addresses these challenges by creating a more robust and balanced anchoring system. Three perforations are created in the septal cartilage, allowing the tension exerted by the QCF to be distributed across multiple fixation points. This prevents tearing (cheesewire) of the septum cartilage and minimizes the risk of backward rotation and hump recurrence. Biomechanically, applying tension across 3 points rather than 1 reduces the localized stress that could lead to cartilage failure. The tension is distributed more effectively, minimizing the risk of injury to the cartilage. In addition, by using a kite-shaped suture pattern, we are able to create a more even distribution of forces, which prevents excessive tractive stress on any single area.

Çelik and Tuluy[17] have also proposed modifications to reduce the incidence of recurrence. Their approach involves leaving a 2-mm rim of septal cartilage on the maxilla and vomer and approximately 1 mm on the ANS, ensuring structural support to enhance stability of the fixation. This method differs from our modified fixation approach, but both strategies underscore the critical role of secure and anatomically mindful fixation in achieving durable outcomes. Future comparative studies could further elucidate the advantages and limitations of these evolving techniques.

The modified fixation technique appears to offer significant benefits. However, this study has some limitations. The retrospective design may introduce selection bias. Another potential limitation is the 1-year follow-up period, although recurrence of the hump after this time would be exceptional. Future prospective studies with longer follow-up periods could provide additional insights. Moreover, the kite fixation technique was performed in later years compared with conventional fixation, which could introduce a bias due to the refinement process of the technique; however, the principal author had more than 5 years of experience with this technique before the study. The presence of only 1 surgeon limits the external validity of the study. In addition, the assessment of aesthetic and functional outcomes relied on subjective evaluations during follow-up, which could benefit from the inclusion of validated patient-reported outcome measures in future studies.

Despite these limitations, this study provides compelling evidence supporting the efficacy of the modified fixation technique. Further research, including prospective randomized trials and longer follow-up periods, is needed to confirm these findings and evaluate the durability of outcomes.

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CONCLUSIONS

Hump recurrence and minihumps are significant drawbacks in preservation rhinoplasty. Addressing all the structures involved in the hinge is crucial, but proper fixation of the rotated septal flap is equally important to ensure long-term postoperative stability. Redistributing the tension of the suture loops used for this purpose into a triangular configuration, known as the kite-shaped method, has proven to be a simple and reproducible technique.

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DISCLOSURE

The authors declare no potential conflicts of interest with respect to, and received no financial support for, the research, authorship, and publication of this article.

PATIENT CONSENT

Patients provided written informed consent for the use of their images.

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