

Postoperative Ecchymosis and Edema After Creation of Subperiosteal Tunnels in Rhinoplasty

A Randomized Clinical Trial

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 Supplemental content

IMPORTANCE Periorbital ecchymosis and edema are commonly associated with rhinoplasty and are the principal limiting factors for return to daily activities after rhinoplasty. Several methods have been evaluated to minimize these sequelae including creation of subperiosteal tunnels, which involves elevating the vascular periosteal layer, preserving it from trauma when creating osteotomies.

OBJECTIVE To assess the efficacy of the creation of subperiosteal tunnels prior to lateral osteotomies during rhinoplasty for reducing postoperative ecchymosis and edema.

DESIGN, SETTING, AND PARTICIPANTS A randomized, blinded, matched-paired, prospective, clinical trial took place between April 1 and August 30, 2015, in a private practice in a stand-alone clinic and surgical center. All patients who were undergoing aesthetic rhinoplasty requiring bilateral lateral osteotomies were offered inclusion in the trial. All 34 enrolled patients completed the follow-up requirements.

INTERVENTION Creation of subperiosteal tunnels prior to lateral osteotomies on 1 randomly selected side.

MAIN OUTCOMES AND MEASURES Three blinded evaluators independently graded the degree of ecchymosis and edema on a visual analog scale of 0 to 10 on each side of the nose on postoperative days 2 and 7. Each patient had 1 side that was randomly selected to undergo creation of subperiosteal tunnels. A difference in mean score between sides of the nose was calculated for each patient using a paired *t* test.

RESULTS Of the 34 patients (28 females and 6 males; mean [SD] age, 27.3 [9.2]), the mean (SD) difference in ecchymosis scores between sides on day 2 was -0.05 (1.94) (95% CI, -0.43 to 0.33) and on day 7 was -0.22 (1.23) (95% CI, -0.47 to 0.02), favoring the side without tunnels. The mean (SD) difference in edema scores on day 2 was -0.21 (1.66) (95% CI, 0.53 - 0.12) and on day 7 was -0.29 (1.11) (95% CI, -0.51 to -0.07). There were no clinically significant differences between sides in terms of postoperative ecchymosis and edema.

CONCLUSIONS AND RELEVANCE Ecchymosis and edema can have significant postoperative practical, emotional, and financial effects on patients. Creation of subperiosteal tunnels prior to lateral osteotomies showed no clinically significant differences in edema and ecchymosis after the procedure.

LEVEL OF EVIDENCE 1.

TRIAL REGISTRATION isrctn.org Identifier: [ISRCTN42741475](https://www.isrctn.com/ISRCTN42741475)

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JAMA Facial Plast Surg. 2019;21(2):133-136. doi:10.1001/jamafacial.2018.1716
Published online December 27, 2018.

Lateral osteotomies of the nasal bones are commonly performed during rhinoplasty for many purposes, including narrowing the bony pyramid or closing an open roof after removal of a dorsal hump. Periorbital edema and ecchymosis are minor but common sequelae of osteotomies that last several days, which may delay patients' return to regular daily activities after rhinoplasty.¹ It is theorized that edema and ecchymosis are attributed to the disruption of the vascularity contained within the periosteum or venules and capillaries in the more superficial layers. Various interventions have been used to minimize this morbidity, including intraoperative hypotension and administration of corticosteroids, as well as the creation of a subperiosteal tunnel (SPT).² Creation of an SPT consists of elevating the periosteum and overlying layers off the bony cortex in the track of the osteotomy. Despite the commonly held belief among many rhinoplasty surgeons that creating an SPT reduces vascular trauma and minimizes ecchymosis and possibly edema, its efficacy has not been objectively established, with some reports suggesting an opposite effect.³⁻⁵ Kara et al⁴ found a statistically significant increase in periorbital ecchymosis on the sides that underwent SPT but no difference in edema. Al-Arfaj et al³ demonstrated a statistically significant increase in severe ecchymosis, defined as ecchymosis that extended lateral to midline of eye, on sides with SPT. However, moderate ecchymosis, defined as ecchymosis medial to the midline of the eye, was less pronounced with SPT. Bafaqeeh⁶ did not find any statistically significant difference in ecchymosis between tunneled and nontunneled sides. The goal of this study was to evaluate the efficacy of transnasal SPT prior to lateral osteotomy for reducing postoperative ecchymosis by performing a matched-pairs prospective analysis.

Methods

A prospective, randomized, blinded, clinical trial of patients undergoing unilateral SPT during rhinoplasty was performed between April 1 and August 30, 2015 (Figure 1). The trial protocol is available in Supplement 1. No financial or other incentives were offered to patients for participating in the study. The setting was the private practice of one of us (M.S.) in a stand-alone clinic and surgical center where all patients were recruited and surgical procedures took place. All procedures were performed by one of us (M.S.). Patients presenting to our center for aesthetic rhinoplasty requiring bilateral osteotomies were included. Patients excluded were those undergoing rhinoplasty without osteotomies, those with unilateral or intermediate osteotomy, those declining to participate or failing to provide consent, and those in whom follow-up after exactly 7 days was not possible because of scheduling conflicts. Preoperative standardized photographs were taken as part of routine preoperative planning. Approval for the study was granted by the McGill University Faculty of Medicine Institutional Review Board. Written informed consent was obtained from all participants.

Key Points

Question Does creating subperiosteal tunnels prior to lateral osteotomies in rhinoplasty affect postoperative ecchymosis and edema?

Findings In this randomized blinded clinical trial of 34 patients, there were no significant differences in terms of postoperative ecchymosis and edema after creation of a periosteal tunnel in one side compared with the side without tunnels.

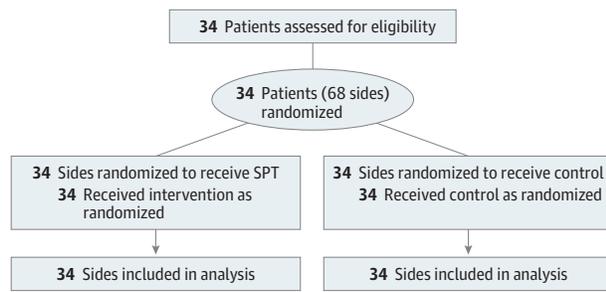
Meaning The creation of subperiosteal tunnels may not be an effective technique to reduce postoperative edema and ecchymosis.

During rhinoplasty, a 5-mm mucosal incision was made using a No. 15 scalpel at the base of the pyramid at the vertical level of insertion of the inferior turbinate. The depth of the incision was mucosal only, sparing the periosteum. A McKenty elevator was then used to incise the periosteum and develop an SPT on 1 randomly selected side. The randomization process was performed by using Siri, the voice-activated virtual assistant on an iPhone (Apple Inc), at the time of surgery. Siri was asked to randomly select a number; if an even number was generated, the patient would undergo the creation of tunnels on the right side. Bilateral lateral and medial osteotomies were performed using a 6-mm unguarded Cottle osteotome (Figure 2). The side on which the tunnel was created was noted in the operative report. Postoperative photographs were taken at days 2 and 7. Grading of both postoperative ecchymosis and edema was performed using a visual analog scale from 0 to 10 (where 0 indicates no ecchymosis and edema and 10 indicates severe ecchymosis and edema) by 3 nonexpert evaluators (D.S.C., M.R., and A.A.J.) who were not present in the operating room and were blinded to the side with SPT.

Statistical Analysis

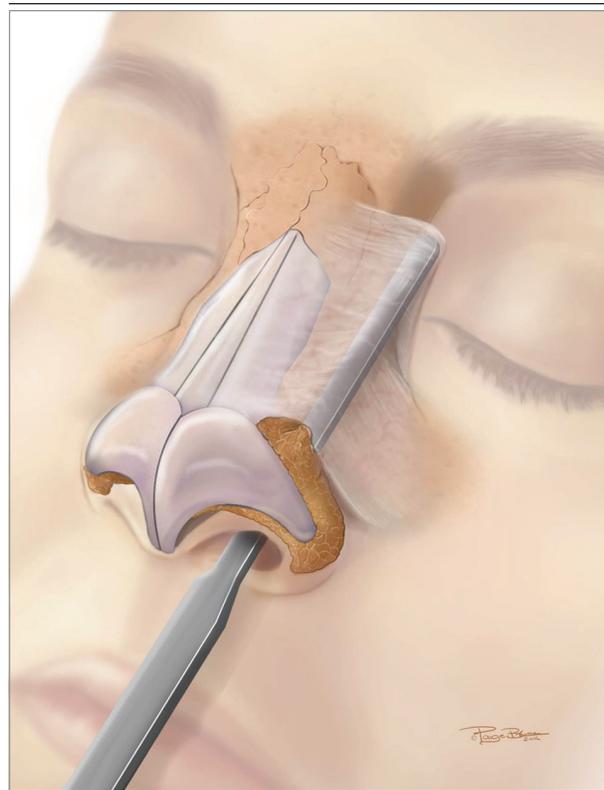
All data were collected prospectively. Patient information was anonymized and stored in a password-encrypted database. Demographic data were collected, including age, sex, nasal anatomical characteristics, and presenting symptoms, and compiled using simple descriptive statistics, including means and SDs for continuous variables and percentages for categorical data. Each evaluator was asked to rate ecchymosis and edema separately, for each side of the nose, on a visual analog scale of 0 to 10. Each side of the nose received a mean score based on the scores of all 3 evaluators for both ecchymosis and edema. The difference in the mean score between sides was used to quantify the effect that SPT had on ecchymosis or edema. Once the difference in mean score was obtained for each individual, a within-patient paired *t* test was computed using 95% CIs. All *P* values were from 2-sided tests, and results were deemed statistically significant at *P* < .05. The required sample size was calculated such that the difference between groups could be estimated to an accuracy of ±0.75 points. All data were analyzed using SAS, version 9.2 (SAS Institute Inc).

Figure 1. CONSORT Diagram of Participant Enrollment, Randomization, and Analysis



SPT indicates subperiosteal tunnel.

Figure 2. Creation of a Subperiosteal Tunnel on the Left Side



Procedure is exaggerated for illustrative purposes. Copyright Paige Blumer, BSc, MSc.

Results

A total of 34 patients (28 females and 6 males; mean [SD] age, 27.3 [9.2] years) were recruited for this prospective study. Photographs were taken preoperatively and on days 2 and 7 for all patients. Demographic data are summarized in Table 1. A total of 68 sides were compared. Differences between mean ecchymosis and edema scores for the tunneled and nontunneled sides for all raters is shown in Table 2. Both ecchymosis and edema were similar in the SPT and non-SPT sides at postop-

Table 1. Demographics and Preoperative Nasal Characteristics

Variable	No. (%) (N = 34)
Age, mean (SD) [range], y	27.3 (9.2) [17-55]
Sex	
Male	6 (18)
Female	28 (82)
Dorsal hump	
Present	32 (94)
Absent	2 (6)
Nasal pyramid	
Normal	4 (12)
Wide	23 (68)
Narrow	5 (15)
Deviated axis	2 (6)
Nasal obstruction	
Present	4 (12)
Absent	30 (88)
Main subjective concern	
Dorsal hump	26 (77)
Pyramidal deformity	1 (3)
Tip deformity	4 (12)
Axis deviation	3 (9)
Subperiosteal tunnel	
Right side	17 (50)
Left side	17 (50)

Table 2. Differences in the Mean Ecchymosis and Edema Scores

Day	Difference in Score, Mean (SD) [95% CI]
Ecchymosis	
Day 2	-0.05 (1.94) [-0.43 to 0.33]
Day 7	-0.22 (1.23) [-0.47 to 0.02]
Edema	
Day 2	-0.21 (1.66) [-0.53 to 0.12]
Day 7	-0.29 (1.11) [-0.51 to -0.07] ^a

^a Statistically significant.

erative days 2 and 7. The mean (SD) difference in ecchymosis scores between sides on day 2 was -0.05 (1.94) (95% CI, -0.43 to 0.33) and on day 7 was -0.22 (1.23) (95% CI, -0.47 to 0.02), favoring the nontunneled side. The mean (SD) difference in edema scores on day 2 was -0.21 (1.66) (95% CI, -0.53-0.12) and on day 7 was -0.29 (1.11) (95% CI, -0.51 to -0.07). The difference in edema scores on postoperative day 7, although statistically significant favoring the non-SPT side, was not considered to be clinically significant. All mean differences between the SPT and non-SPT sides for individual raters were not statistically significant, and no differences were greater than 4.8% for ecchymosis or edema on postoperative days 2 or 7.

Discussion

Postoperative periorbital ecchymosis and edema are 2 of the main sequelae after rhinoplasty. They contribute to days off from work or school or postponing regular activities because

patients will often elect to wait until all bruising is resolved. The addition of SPT prior to osteotomies is controversial. Few studies^{3,4,6} in the literature have evaluated the effect of this surgical maneuver on postoperative ecchymosis and edema, with most studies showing conflicting evidence.^{3,4,6} Our study did not demonstrate any clinically significant differences in ecchymosis or edema between the SPT and non-SPT sides on postoperative days 2 and 7.

In contrast to previous studies,^{3,4,6} ours used multiple non-expert evaluators to assess postoperative photos and a scale was used to grade the degree of ecchymosis and edema separately. Although nonexpert evaluators may not pick up the nuances of the sequelae after an aesthetic rhinoplasty, they were chosen for the purpose of this study because they would be more representative of the general population that patients would encounter after the procedure. This study also assessed patients at 2 time points to evaluate differences within the recovery period.

Theoretically, there should be a benefit to performing SPT for minimizing periosteal trauma from the osteotome. However, a significant benefit was not observed in our study. It is possible that any potential benefit may have been offset by factors that may produce edema and ecchymosis. For example, the action of creating the SPT can be damaging to the superficial vessels if, in the course of developing the tunnel, the subperiosteal plane is lost and the elevator migrates superficial to the periosteum. Another possibility is that the track of the

osteotome does not remain exactly within the confines of the SPT created, leading to an effect similar to an osteotomy without SPT. Finally, it is possible that there may be edema generated from the additional manipulation of the tissue.

Limitations

To our knowledge, there is no validated grading scale that exists for the assessment of bruising or edema after rhinoplasty. We therefore elected to use a visual analog scale for the purpose of this study as has previously been done.⁷ Our sample size did not permit statistical validation of the visual analog scale, although validation would have been useful for future use in similar studies.

Conclusions

Rhinoplasty remains the most commonly performed facial plastic surgical procedure.⁸ Although the associated ecchymosis and edema are minor consequences, decreasing their duration, even by a modest amount, could have a significant practical, emotional, and financial (lost work days) effect on patients. It thus behooves surgeons to seek solutions aimed at reducing edema and ecchymosis after rhinoplasty. This study demonstrates that performing SPT prior to osteotomy in rhinoplasty does not yield a clinically appreciable decrease in postoperative periorbital edema or ecchymosis.

ARTICLE INFORMATION

Accepted for Publication: October 4, 2018.

Published Online: December 27, 2018.
doi:10.1001/jamafacial.2018.1716

Author Contributions: Dr Samaha had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Concept and design: Roskies, Samaha.

Acquisition, analysis, or interpretation of data: All authors.

Drafting of the manuscript: Chan, Roskies, Jooya.

Critical revision of the manuscript for important intellectual content: Roskies, Samaha.

Statistical analysis: Roskies.

Administrative, technical, or material support: Chan.
Supervision: Roskies, Samaha.

Conflict of Interest Disclosures: None reported.

Data Sharing Statement: See Supplement 2.

Additional Contributions: Paige Blumer, BSc, MSc, Biomedical Visualization, University of Illinois,

created the medical illustration. She was not compensated for her contribution.

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