*B-ENT*, 2013, **9**, 95-100

# Postrhinoplasty acne formation: a case-control study

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**Key-words.** Acne; rhinoplasty; aesthetic outcome; propionibacterium; open; closed; nasal surgery

**Abstract.** *Postrhinoplasty acne formation: a case-control study*. *Background*: Acne formation is a common dermatological problem which, if left untreated, may lead to severe facial scars, a consideration that may be particularly important for patients who seek cosmetic surgery. Postrhinoplasty acne development has not yet been discussed in the literature. We therefore decided to evaluate the occurrence of acne in nasal plastic surgery in a case-control study.
*Subjects & Methods*: One hundred and twenty patients were selected for this case-control study and were then assigned to case and control groups, each consisting of 60 patients. None of the participants was a known case of acne and those with any specific skin condition were excluded from the study. The cases were patients whose external nasal structures had been affected by the procedure; the control group consisted of matched patients who were candidates for closed septoplasty. After the operation, acne formation was evaluated in all participants and a comparison was made between cases and controls looking at the surgical method employed, and at the patients' personal and family backgrounds.
*Results*: Twelve patients, all from the case group, developed postsurgical acne; all these patients had undergone open rhinoplasty. Age, gender, family history for acne and recent medication use prior to the surgery showed no significant correlation with acne formation.
*Conclusion*: The incidence of acne after nasal plastic surgery was significantly higher than in the control group, especially when the method of surgery was open rhinoplasty.

## Introduction

Patients who seek nasal plastic surgery occasionally develop acne early after the surgery; this phenomenon may worry patients since it conflicts with their aesthetic goals.

Generally, the key pathological processes in acne formation are the occlusion of the hair follicle outlets and/or the over-excretion of sebum. The result is an isolated sebum-filled dermal lesion, the comedo. On the other hand, propionibacteria, which are gram-positive anaerobic diphtheroids and normal skin flora, convert the sebum (fat) to free fatty acids that lead to inflammation in the hair follicles,[1, 2] proceeding to tissue inflammation and papule or pustule formation. It is assumed that the same mechanism results in postsurgical acne formation.

Despite the importance of skin health for appearance, the role of rhinoplasty in postsurgical acne development has not yet been discussed in the literature. There are a number of possible factors that may explain this phenomenon: the surgical intervention itself can inoculate the acnegenic germs into the skin, or expose the organism to the local blood flow or lymphatics for further intradermal spread; trauma to the skin predisposes the tissue to further infections; prophylaxis with systemic antibiotics by changing the normal flora can lead to gram-negative acne formation;[3] corticosteroids, either administered exogenously or through an endogenous route due to surgical stress, can exacerbate pre-existing acne or result in new cases; [4] sexual hormones (especially androgens) directly affect sebum secretion; anaesthetics have sometimes been reported to be acnegenic;[5, 6] and finally, postsurgical packings may occlude the local hair follicle outlets.[7, 8] Sometimes, acne is even thought of as an inflammatory disease, immunologically responding to propionibacterium acnes.[9, 10]

Whatever the possible causes are, occurrence and the chief underlying mechanism remain undefined. So identifying the causes and controlling the formation of postsurgical acne would seem to be an issue of utmost importance to study because of both the negative impact on patient appearance and possible psychosocial morbidity.[11] In this study, we conducted a case-control study of patients scheduled to receive nasal surgery.

## Subjects and methods

### *Study subjects*

This case-control study was conducted in the otolaryngology ward of a tertiary healthcare centre (Imam Khomeini Hospital complex, an affiliate of Tehran University of Medical Sciences). One hundred and twenty patients were selected from nasal surgery candidates who were scheduled to receive rhinoplasty and septoplasty. The study started in January 2010 and finished in April 2011.

**The case group**: Sixty candidates for rhinoplasty were included in this group. The surgical procedure in this group necessarily involved alterations to external nasal structures. Depending on the severity of nasal deformity, the rhinoplasty component of the procedure was performed using either an open or a closed method. In severely deviated noses, over-projected noses or in cases with severe tip problems, an open approach with relatively similar techniques was used.

**The control group**: This group comprised 60 candidates for closed septoplasty; no surgical procedure was conducted involving external nasal structures or even skin incision.

None of the selected patients were known cases of acne, although three patients in the case group and two patients in the control group reported peripubertal pimples. Patients with dermal lesions (like cysts, cellulitis, rosacea, comedones), previous procedures on the skin, rhinophyma, high-dose vitamin A or retinoic derivative use, systemic diseases or immunity disorders were excluded from the study, as were revision cases and patients using systemic drugs with comedogenic effects.

The case and the control groups were matched in terms of patient characteristics to allow comparison between the methods of surgery and the relationship with postsurgical acne development.

### *Ethical Approval*

The Institutional Review Board of the Tehran University of Medical Sciences approved the protocol for this study. Detailed information about the study was given to the participants and written informed consent was obtained from all patients. All aspects of the study were conducted in accordance with the Declaration of Helsinki. Patients entering the study were all cases for whom septorhinoplasty was indicated. They were informed of the extent of the operation, the possible complications and outcomes, and the way their photos would be used for analysis.

### *Method of surgery*

Depending on the severity of the nasal deformity, either open or closed rhinoplasty was performed in each patient. In severely deviated noses, over-projected noses or severe tip problems, an open approach with relatively similar techniques was used. All procedures were performed under general anaesthesia by one of the senior authors. Additionally, internal lateral osteotomy was performed in all procedures.

In addition, in septoplasty cases, an internal nasal splint made from silicone sheets and quilting sutures with 4-0 vicril were used.

During and after the surgery, no packing or corticosteroid drugs were used in any of the patients (septoplasty or rhinoplasty). However, antibiotic prophylaxis (Cephalexin 500 mg/QID for five days) was given to all patients and the only prescribed analgesic was acetaminophen. Subsequently, the nasal splints were removed after 7 days but tapings were continued for 4 weeks more in rhinoplasty cases.

### *Variables and evaluation*

All the cases and the controls were investigated for acne development before and after surgery. Postoperatively, the patients were visited at weekly intervals and evaluated for acne formation for up to four weeks by a dermatologist; when patients developed postsurgical acne, another month was added to their dermatologic follow-up period to assess the course of the disease and the severity of the lesions. None of the patients received any medication as treatment for acne.

A questionnaire completed pre-operatively by the patients provided information about their age, gender, family history for acne, and medication use in the three months prior to the surgery. Skin characteristics (mainly skin thickness) were evaluated and documented by a dermatologist. Moreover, skin conditions interfering with surgical intervention were ruled out and finally, the skin was divided into three groups (thin, moderate, and thick skin). Analyses were performed looking at the surgical method, family history of acne, and also the use of all medication affecting acne formation.

*Table 1*
Characteristics of patients in case and control groups

| Groups | | Case group | Control group | P value |
|---|---|---|---|---|
| **Age** | *Mean ± SD* | 23.85 ± 3.79 (years) | 24.12 ± 5.29 (years) | 0.34 |
| **Gender** | *Male* | 14 (40%) | 20 (36%) | 0.068 |
| | *Female* | 36 (60%) | 40 (64%) | |
| **Skin Thickness** | *Thin* | 8 (13%) | 10 (17%) | 0.073 |
| | *Moderate* | 33 (55%) | 36 (60%) | |
| | *Thick* | 19 (32%) | 14 (23%) | |

*Statistical methods*

Data was analysed using SPSS 11.5 for Windows. Paired *t* testing and chi-square tests were used for the evaluation of the variables in each group. The values were evaluated using descriptive statistical methods (mean ± SD) and $p<0.05$ was adopted as the threshold for significance.

## Results

A total of 120 participants, 44 (36.6%) male and 76 (63.3%) female with a mean age of 23.94 ± 5.45 years (ranging from 18 to 31), entered the study. They were divided into two groups: cases and controls. Table 1 shows the characteristics of the patients in each group.

According to our data, the cases and the controls were not significantly different in terms of age, sex or skin characteristics, making two relatively homogenous samples. Table 2 summarises the procedures used for cases and controls:

*Table 2*

| Variable | | cases | control |
|---|---|---|---|
| **Surgical procedure** | *Rhinoplasty* | 14 (23.3%) | 0 |
| | *Septorhinoplasty* | 46 (76.7%) | 0 |
| | *Septoplasty* | 0 | 60 (100%) |
| **Surgical method** | *Open* | 47 (78.4%) | 0 |
| | *Closed* | 13 (21.6%) | 60 (100%) |

Only 12 patients, all from the case group and all of whom underwent open rhinoplasty, developed acne after the surgery (chi-square, $p = 0.00$). Of these 12 patients, eight were male and four were female and their mean age was 21.75 ± 3.23 (range 19 to 27). Since all were from the rhinoplasty group, this difference was significant in this group (chi-square, $p = 0.00$).

Chronologically, during the four weeks of follow-up, one, five and six patients developed acne in the first, second, and third postop weeks respectively but no case of acne formation was seen in the fourth week. Six patients had mild acne, and the other six had moderate acne when examined by our dermatologist. No other patients in the case group and none of the patients in the control group developed acne. These 12 patients accounted for 25.53% of the total of 47 patients who underwent open rhinoplasty.

*Acne formation and age*

In the rhinoplasty group, age correlated with acne formation (*t* test, $p = 0.014$), as summarised in Table 3:

*Table 3*
Correlation between acne formation and age

| Acne | Number | Mean age ± SD (years) | P value |
|---|---|---|---|
| **Positive** | 12 | 22.08 ± 2.3 | 0.014 |
| **Negative** | 48 | 25.03 ± 0.3 | |

*Acne formation and gender*

Acne formation did not significantly correlate with gender in the study as a whole (chi-square, $p = 0.5$). Of those who developed acne, 4 (33.3%) were female and 8 (66.6%) were male.

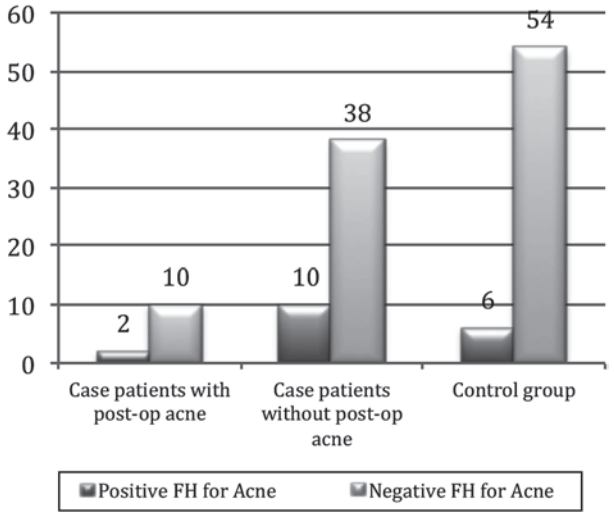


*Figure 1*
Family history of acne in cases and controls

*Acne formation and family history of acne*

Figure 1 summarises positive and negative family history in cases and controls. According to the data, a positive history of acne in family members did not significantly correlate with postsurgical acne development (chi-square, $p = 0.125$).

## Discussion

Given the importance of the cosmetic outcome in patients who undergo aesthetic rhinoplasty, complications or other factors altering appearance are never welcome; even the best possible aesthetic outcomes, if accompanied by postsurgical acne formation, will negatively impact appearance. Our study was designed to evaluate postsurgical acne development, an area that has received little attention according to PubMed and ISI. Accordingly, the role of patient variables, including the method of surgery, was evaluated along with other potential factors.

The characteristics of cases and controls were a close match in terms of age, sex and skin thickness and there were no significant differences between the two groups. Patients in the case group were scheduled to undergo rhinoplasty or septorhinoplasty, meaning that some procedures would be performed on their external nasal structures. Patients in the control group were scheduled to undergo closed septoplasty and no intervention was planned on the external nasal structures. The manipulation of these structures was the basis of patient categorisation since they underlie the susceptibility to acne skin. The surgery conditions, anaesthetics and premedication, packing protocol and postsurgical hospital stay in the cases and the controls were relatively similar. This similarity helped us to focus on surgery-related dermal outcomes.

*The surgical aspect of the phenomenon*

Only 12 patients from the case group developed postsurgical acne (20% of the group, 10% of the total). They all therefore underwent open rhinoplasty. On the other hand, no patients in the control group and none of the patients in the case group who received closed septorhinoplasty/rhinoplasty developed postsurgical acne. Even so, the authors' experience was that acne could develop in both closed and open groups. However, the small number of closed rhinoplasties in this series may explain this outcome. As shown by our study, gender (despite a prevalence of acne formation in male patients that was twice as high: 8 cases v. 4 cases in women patients) and family history for acne did not correlate with postsurgical acne formation but the concurrence of the open method of rhinoplasty and acne formation is suspicious here. The following explanations can be proposed:

First, rhinoplasty involves incisions to access the external nasal structures. This procedure, by cutting the skin open, affects skin integrity and so, with the removal of the innate dermal immunity, the subdermal components are exposed to normal local flora; in other words, the incision creates a potential bacterial inoculation site. This potentiality of germ inoculation has been even reported for non-biologic and non-virulent substances such as the petroleum-based substances using during surgeries.[9]

Secondly, there are reports indicating that surgical intervention itself may change normal nasal flora to new infective nosocomial species,[12] which opens up the possibility of the introduction of new acnegenic flora, even in patients with no preoperative history of acne.

Thirdly, the surgical procedure performed on the external nasal components, with or without dermal incisions, inevitably traumatises the local covering skin, and a traumatised, inflamed, bruised oedematous skin is vulnerable enough to secondary infections. This may be why acne formation is more often observed on mid-face skin. In addition, the manipulation of external nasal skin may change the

normal secretion pattern in the adnexal skin structure, since this manipulation is more aggressive in open rhinoplasty than in closed procedures and also more aggressive in rhinoplasty than septoplasty.

Fourthly, nasal splints and tapes which are used for fixation in rhinoplasty patients could occlude the local hair follicle outlets and lead to acne formation.

*The dermatological aspect of the phenomenon*

Acne is a skin bacterial infection usually caused by the propionibacteria in occluded hair follicles. In specific circumstances, flora other than propionibacteria or non-floral organisms can lead to acne formation. One of these circumstances is systemic antibiotics administration, which predisposes the patients to gram-negative acne formation.[3] This could be due to alterations in the microbial balance. Rhinoplasty patients also receive prophylactic systemic antibiotics prior to their surgery. However, since gram-negative acnes usually develop after long-term and multiple antibiotic uses and because our septoplasty patients received similar medication, antibiotics can be excluded from the list of the possible causes of acne formation.[13]

Another important finding of our study was that, in most patients who developed acne (11 out of 12 patients), lesions formed in the second and third postsurgical weeks; only one patient developed acne in the first week and none in the fourth week. This finding could be explained by the use of tape after rhinoplasty. Surprisingly, after removal of the tape for one day or after removing all tapes in the end of the fourth week, the patients recovered without further medication. On the other hand, most of the acnes were not confined to the nose, extending to the forehead also. Furthermore, despite the fact that we used taping in closed rhinoplasty, acne was observed more often in open rhinoplasty patients and therefore it could be concluded that the taping is not the only factor underlying acne formation.

Corticosteroids, sometimes exogenously administered before the surgery to reduce swelling and oedema, can result in new acne or exacerbate preexisting acne. Glucocorticoids, androgens, oestrogen and also prolactin are all endogenous hormones that influence sebaceous gland function.[4,14] Progesterone may also cause acne by causing dermal oedema.[14,15] Even sebaceous glands themselves are fully capable of sexual hormone synthesis[16] and, furthermore, skin stress sensation has been reported to lead to the production and release of corticotrophin-releasing hormone from dermal nerves and sebocytes; this process has a dose-dependent regulatory effect on sebaceous lipids.[4] Sexual hormones increase sebum secretion and high blood levels of androgens may increase the population of propionibacterium acnes on the skin surface.[17] This means that hormones can be justifiably blamed for acne formation, but because of the fact that we used steroids in both our case and control groups, their effect on any increase during or after surgery is debatable here.

The findings of this study, given the rather similar dermatological events during the procedures in all the patients who undergo nasal surgery and the higher prevalence of acne formation after one method of surgery, indicate that the surgical method maybe more responsible for acne development.

Given the fact that this was a case-control study, one can only conclude that there is postrhinoplasty acne formation. The authors therefore suggest further investigation (possibly in multicentric trials) to identify precisely the possible causes of this postoperative acne (length of the taping, near-open approach versus inside approach, assessment of the changes in the bacteriology of the skin after the surgery, hormonal dosages) by other researchers.

## Conclusion

The development of acne after nasal plastic surgery is significantly higher in cases than in controls, especially when the method of surgery is open rhinoplasty, although details of the processes involved are not yet well understood.

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