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Effect of Nose Skin on the Columellar Incision Scar in a Turkish Population

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Abstract

Objectives. To investigate the causes of columellar scar formation in a Turkish population in relation to nasal skin thickness, texture, and type and discuss possible solutions for better results.

Study Design. Prospective, clinical study.

Setting. Otorhinolaryngology department of a tertiary hospital.

Methods. The preoperative dermal thickness of 50 consecutive patients undergoing "external approach" septorhinoplasty was measured (using a 14 MHz ultrasound probe) at the midportion of the right and left nostril, tip, supratip, and columella. Surgery was performed using a middle columellar gullwing incision. All patients had a minimum follow-up of 6 months after surgery. Assessment of the columellar scar was performed according to the Stony Brook Scar Evaluation Scale modified for columellar scars. The mean values of skin thickness measurements, skin type (according to the Fitzpatrick skin classification scale), skin texture (oily, combination, normal, dry, and sensitive types), smoking habit, and patient gender were recorded and compared with the columellar incision scar scores.

Results. There was no statistically significant difference in healing between the skin thickness of the tip, supratip, left nostril, right nostril, columella and mean skin thickness values, skin types (Fitzpatrick 2, 3, 4, 5), skin textures, and smoking with regard to columellar scar formation ($P > .05$). However, men healed significantly better than women ($P < .05$).

Conclusions. The columellar incision heals independently of the influence of skin thickness; texture; Fitzpatrick skin types 2, 3, 4, and 5; and smoking. Male gender seems to be a significant factor in healing.

Keywords

septorhinoplasty, columella, scar evaluation, skin thickness, columellar incision, columellar scar, external approach septorhinoplasty

Introduction

While most surgeons have adapted to the principles of external approach septorhinoplasty and accepted the technique as standard practice, especially in revision cases, which present difficulties in determining what was done previously, there may be some who continue to have concerns over columellar scarring.[1,2] Many surgeons are concerned about which patients scar more than others and in which patients we should avoid using a columellar incision. These patients have often been those with thick, oily skin and higher Fitzpatrick types. Despite general acceptance of columellar incisions based on our surgical experiences, there is still a need for objective substantiation of our techniques.

Recent publications have reported on complications of columellar scar healing in different populations. These studies classified these unpleasant appearances through patient questionnaires and scar assessment scales as notching, depression, and hyperpigmentation of the incision lines.[3] They analyzed the causes of poor healing of the columellar

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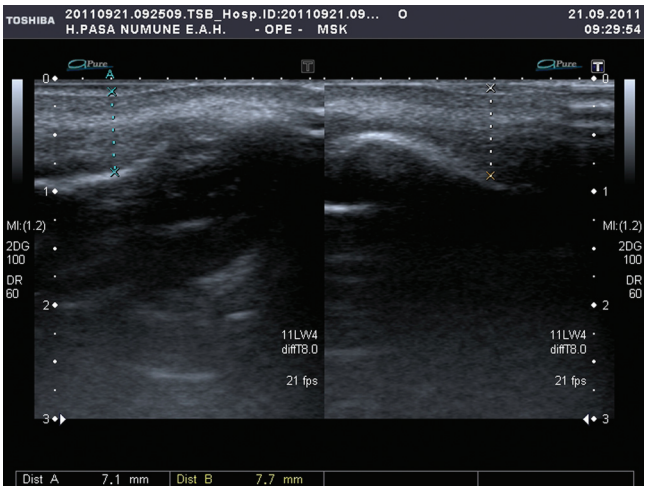

Figure 1. Measurements of skin thickness at the right and left midportions of the nostrils in ultrasound images. Concavity of the lower lateral cartilages is clearly seen.

incision and proposed different suture and incision techniques to prevent scar formation.

In this study, we aimed to critically examine columellar incision scars and to investigate the role of skin factors (thickness, texture, type), smoking, gender, and age in the etiology of unpleasant scar formation in a Turkish population and to discuss possible solutions for better results.

Materials and Methods

This was a prospective, observational study conducted at the otorhinolaryngology department of a tertiary care hospital in Istanbul with the approval of the local institutional Ethics Committee. All volunteers were provided with information about the procedures, and written informed consent was obtained before the study.

The study group comprised 50 consecutive patients undergoing primary septorhinoplasty by an external approach. Patients' nasal skin thicknesses were measured at 5 different sites of the cartilaginous nose using a 10 to 14 MHz broadband linear ultrasound probe (Toshiba Aplio MX ultrasound system, Toshiba Medical Systems, Tustin, California). Measurements were taken before the operation at the same time of day on account of the diurnal variation of the dermal edema. A 14 MHz probe with a small amount of ultrasonic gel was placed perpendicular to the skin of the tip, supratip, midportion of the left and right nostril, and mid-columellar sites of the nose. These points were adjusted to correspond to the same anatomic site on every patient. The electronic caliper of the machine measured the distance from the outer epidermal surface to the underlying cartilage on the 2-dimensional B-mode image (**Figure 1**). Mean measurement values at each of these 5 sites and mean total skin thickness values were calculated for each patient. The data were saved for statistical analysis.

To evaluate the amount of melanin pigment in the skin, which is one of the major determinants of pigmentation in the scar, patients' skin types were assessed according to the Fitzpatrick skin type classification.[4]

The skin textures (sebaceous quality) of the patients were included in the systematic evaluation as follows: normal, dry, oily, combination, and sensitive.

Surgical Technique

All patients underwent ''external approach'' septorhinoplasty (EAS). The narrowest distance between the nostrils was preferred for the columellar inverted ''V'' incision. Mid-columellar and marginal incisions were all made with a No. 15 blade with great care taken not to injure the underlying medial crura. The incision was first closed at the top of the mid-columellar triangle. The left and right corners of the triangle and left and right junctions of the horizontal and vertical incision lines were sutured with 6/0 nonabsorbable (polypropylene) suture under direct vision. Sutures were removed on postoperative day 7.

Scar Evaluation

Patients were evaluated at the final follow-up, 6 months after the operation. Scars were all evaluated objectively by another surgeon who rated them according to the Stony Brook Scar Evaluation Scale (SBSES) modified for columellar scar assessment. Initially, SBES was designed for short-term analysis of scars and was validated and developed in 2007 for long-term assessment. This scale comprises 5 items: width, height, color, suture marks, and overall appearance.[5] We adapted this scoring system for columellar incision scars by substituting notching for suture marks. Columellar scars were assigned 0 or 1 point each for the presence or absence of the following: width 2 mm, elevation or depression, discoloration, notching, and overall appearance. A total cosmetic score was then calculated by adding the individual scores for each of the 5 categories ranging from 0 (worst) to 5 (best) (**Table 1**).

Total scar scores were then categorized into 3 groups: poor (0-1 point), moderate (2-3 points), and good (4-5 points).

The scar was specifically evaluated from the alar base by the same observer to analyze the healing in 3 dimensions. The reason for using observer scores for scar evaluation was because of the inadequacy of the camera for 3-dimensional evaluations. Postoperative photographic documentation was carried out for all patients. Additional images were taken close to the alar base of the patient (**Figure 2**).

Statistical Analysis

The power and sample size were calculated based on the outcome of the columellar scar (poor, moderate, good) using comparison of means of supratip skin thickness. Sensitivity analysis was performed using our own estimates of scar formation from our previous data. The sensitivity analysis and power calculation demonstrated that a sample size of a total of 50 patients would give us the ability to detect significant differences in means of supratip skin thickness among poor, moderate, and good columellar scar groups ($\delta = 0.45$; SD = 0.8; power 80%; $\alpha = 0.05$).

Table 1. Stony Brook Scar Evaluation Scale adapted to columellar incision scar.

Scar Category	Number of Points[a]
Width	
>2 mm	0
≤2 mm	1
Height	
Elevated or depressed in relation to surrounding skin	0
Flat	1
Color	
Darker than surrounding skin (red, purple,brown, or black)	0
Same color or lighter	1
Notching	
Present	0
Absent	1
Overall appearance	
Poor	0
Good	1

[a]Total score = sum of individual scores; range, 0 (worst) to 5 (best).

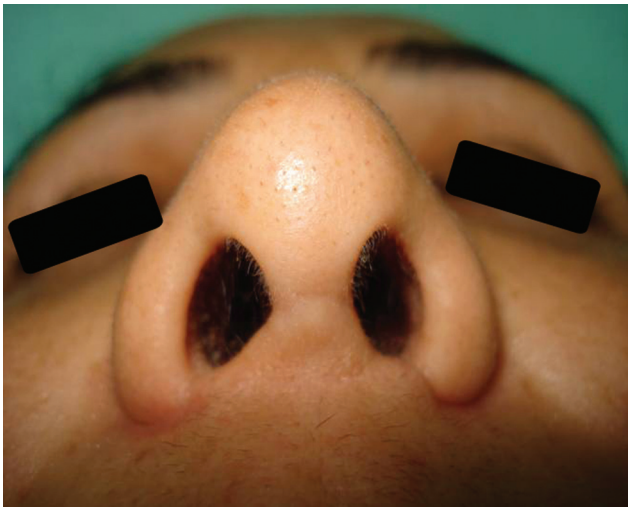

Figure 2. Columellar scar observed from the alar base.

NCSS (Number Cruncher Statistical System) 2007 and PASS 2008 Statistical Software (NCSS LLC, Kaysville, Utah) has been used for statistical analysis of the results. Descriptive (mean, standard deviation, frequency, median) and quantitative statistical methods were used in the evaluation of the study data. For quantitative analyses, the Mann-Whitney U-test was used to compare 2 groups with parameters that did not have a normal distribution, and the Kruskal-Wallis test was used to compare groups with parameters that did not have a normal distribution. Qualitative data were compared using the chi-square test. Statistical significance was accepted at a p level $<.05$.

Table 2. Distribution of patients according to Fitzpatrick skin types and skintexture (sebaceous quality).

		n	%
Fitzpatrick skin types	Type 1	1	2.0
	Type 2	9	18.0
	Type 3	16	32.0
	Type 4	21	42.0
	Type 5	3	6.0
Skin texture	Normal	12	24.0
	Oily	17	34.0
	Dry	4	8.0
	Combination	16	32.0
	Sensitive	1	2.0

Table 3. Distribution of columellar scars according to Stony Brook Scar Evaluation Scores (SBSES).

		n	%
SBSE scores	Poor (0-1) point	6	12.0
	Moderate (2-3) points	10	20.0
	Good (4-5) points	34	68.0

Results

Fifty patients (29 males 58%, 21 females 42%) with a mean age of 29.82 ± 8.45 years were included in the study. Of these 50 patients, 13 (26%) were smokers and 37 (74%) were nonsmokers.

The distribution of patients according to the Fitzpatrick skin type scale and skin texture (sebaceous quality) is detailed in **Table 2**, and the distribution of columellar scars according to SBSES is presented in **Table 3**. Six patients (12.0%) healed with an unpleasant scar, 10 patients (20.0%) healed with a visible but acceptable scar (moderate healing), and 34 patients (68.0%) healed without scar formation (good healing).

Skin thickness values (mm) measured on ultrasound images are listed in **Table 4**. Mean columellar skin thickness values showed that the thinnest skin overlying the cartilaginous framework of the nose was the skin of the columella (1.63 ± 0.83 mm). Skin of the supratip and tip area were the second and third thinnest skin, respectively (1.79 ± 0.58 mm; 1.84 ± 0.52 mm).

SBSES were compared in relation to patients' mean ages. The mean ages of patients with poor, moderate, and good scars were 31.17 ± 9.76, 28.10 ± 9.77, and 30.09 ± 8.62, respectively. There was no statistically significant difference between the mean ages of the groups with regard to the healing of the columellar incision (Kruskal-Wallis test with a significant P level $<.05$). Columellar healing ability was not related to patient age.

Table 4. Skin thickness values in millimeters, measured on US images.

Skin Thickness	Min–Max (mm)	Mean ± SD (mm)
Tip	0.80–3.50	1.84 ± 0.52
Supratip	1.16–4.60	1.79 ± 0.58
Left Nostril	1.16–7.70	2.30 ± 1.06
Right Nostril	1.20–7.10	2.24 ± 1.03
Columella	1.00–6.00	1.63 ± 0.83
Mean total thickness	1.24–5.40	1.96 ± 0.72

SBSES showed significant differences with regard to patient gender. The ratios of females to males were, respectively, 5:1, 2:8, and 14:20 in the poor, moderate, and good scar groups. Women's incisions healed significantly more poorly than men's. Men's incision scars were significantly better than women's in the moderate and good scar groups ($P < .05$, chi-square test).

According to SBSES, there was no significant difference between smokers and nonsmokers ($P > .05$). Smoking was not a factor that played a role in healing of columellar scars.

To investigate the effects of skin type (Fitzpatrick classification) and skin texture (sebaceous quality) on columellar scar healing, we compared skin types and textures according to SBSES. There was no statistically significant difference between skin types (Fitzpatrick 2, 3, 4, and 5) and textures in relation to columellar scar scores (**Table 5**). Turkish skin types and textures were not determinants of columellar scar healing.

Using the Kruskal-Wallis test, SBSES were compared to the dermal thickness of the tip, supratip, columella, left nostril, right nostril, and mean total thickness values measured on ultrasound images. There were no statistically significant differences in healing with regard to dermal thickness of the tip, supratip, columella, left nostril, right nostril, and mean total thickness of these points. Healing of columellar scars was independent of the thickness of the tip, supratip, columella, left and right nostril, and mean total thickness of the measured points (**Table 6**).

Skin thickness values were compared to patient gender with the Mann-Whitney U-test. There was no significant thickness difference between men's and women's skin in the tip, columella, left nostril, and right nostril areas. However, supratip skin thicknesses of women and men were 1.75 ± 0.6 mm (median 1.6 mm) and 1.83 ± 0.44 mm (median 1.8 mm), respectively; the difference was statistically significant ($P = .025$). Men's skin was significantly thicker than women's in the supratip area.

Mean total skin thicknesses of men and women were 1.90 ± 0.21 mm (median = 1.9 mm) and 2.04 ± 1.09 mm (median = 1.74 mm), respectively. The difference in mean total skin thickness between women and men was statistically significant; women's mean total skin thickness was significantly greater than men's ($P = .045$).

Skin thickness measurements were compared to skin textures with the Mann-Whitney U-test. One patient with sensitive skin was excluded from the study, and 4 patients with dry skin were added to the normal skin group. Mean total, supratip, and tip skin thickness of patients with oily texture was significantly greater than in patients with normal, dry, and combination skin. However, there was no statistically significant difference between texture and thickness of the columella, left nostril, and right nostril skins ($P > .05$).

Finally, we evaluated the relationship between skin thickness measurements and Fitzpatrick skin types (2, 3, 4, and 5). There was no statistically significant difference between skin thickness values and skin types ($P > .05$).

Discussion

''External approach'' septorhinoplasty is now a worldwide accepted surgical technique. However, patients may sometimes be dissatisfied because of the residual scar formation on the columella. To prevent such complications, authors

Table 5. Stony Brook Scar Scores related to skin types (Fitzpatrick) and skin textures.[a,b,c]

		Stony Brook Scores			
		Poor (n = 6) n (%)	Moderate (n = 10) n (%)	Good (n = 34) n (%)	*P* Value
Fitzpatrick types	Type 1	0 (0.0%)	0 (0.0%)	1 (2.9%)	.529
	Type 2	1 (16.7%)	1 (10.0%)	7 (20.6%)	
	Type 3	1 (16.7%)	3 (30.0%)	12 (35.3%)	
	Type 4	4 (66.7%)	6 (60.0%)	11 (32.4%)	
	Type 5	0 (0.0%)	0 (0.0%)	3 (8.8%)	
Skin textures	Normal and dry	3 (50.0%)	1 (10.0%)	12 (36.4%)	.300
	Oily	1 (%16.7%)	6 (60.0%)	10 (30.3%)	
	Combination	2 (33.3%)	3 (30.0%)	11 (33.3%)	

[a]Chi-Square test.
[b]Type 1 was excluded from the study (1 patient).
[c]Sensitive skin was ignored (1 patient).

Table 6. Stony Brook Scar Scores related to the dermal thickness of the tip, supratip, columella, left nostril, right nostril, and mean total thickness values measured on ultrasound images.[a]

	Stony Brook Scores			
Thickness (mm)	Poor (n = 6) Mean ± SD (Median)	Moderate (n = 10) Mean ± SD (Median)	Good (n = 34) Mean ± SD (Median)	*P* Value
Tip skin	2.07 ± 0.93 (1.95)	1.92 ± 0.48 (1.95)	1.78 ± 0.44 (1.67)	**.755**
Supratip skin	2.08 ± 1.28 (1.70)	180 ± 0.26 (1.65)	1.74 ± 0.47 (1.60)	**.640**
Left nostril skin	2.62 ± 1.85 (2.20)	2.15 ± 0.37 (2.08)	2.29 ± 1.04 (2.15)	**.952**
Right nostril skin	2.62 ± 2.02 (2.00)	2.16 ± 0.43 (2.15)	2.19 ± 0.94 (2.00)	**.771**
Columella skin	1.88 ± 1.40 (1.40)	1.56 ± 0.33 (1.50)	1.61 ± 0.82 (1.50)	**.810**
Mean total thickness	2.25 ± 1.44 (1.75)	1.92 ± 0.19 (1.92)	1.92 ± 0.66 (1.80)	**.458**

[a]Kruskal-Wallis test.

have directed their studies to the causes of unsatisfactory columellar scar formation. Hereby new methods and considerations have been proposed to obtain satisfactory scars.

In a study on columellar scar analysis among the Arabian population in 1998, Bafaqeeh et al pointed out the lack of detailed columellar scar assessment among rhinoplasty surgeons. They criticized authors for their failure to evaluate columellar wound healing objectively and were surprised to find a high percentage of unsatisfactory scars (22%).[6] In fact, there is a paucity of information about the scars in the literature since the study by Adamson et al[3], which came at a time when EAS was a more novel technique.

In our opinion, a rhinoplasty surgeon should not rely on patient statements alone but rather on more objective and consistent evaluation methods. In this study, we preferred SBSES validated and developed for long-term analysis of scars. We substituted notching for the stretch mark parameter, so as to adapt our scar evaluation to columellar scars. Every scar was strictly scored by another surgeon according to the evaluation parameters. Our failure rate (12%) was lower than for the Arabian population (Fitzpatrick type 5, 6).

Although the populations were different according to the Fitzpatrick classification, we did not notice a correlation between scar score and skin types of the Turkish population (mostly Fitzpatrick 3 and 4). In our opinion, the Arabian population is mostly composed of Fitzpatrick types 5 and 6 and is exposed to more direct rays of sunlight because of the geographical position of this region, so it is plausible that their skin tends to form a more hyperpigmented scar.

In a retrospective study comparing the inverted ''V'' incision with the transverse columellar incision, Aksu et al formulated a scar assessment scale based on modification of the Vancouver and Manchester scar scales. The authors compared the scars from these incisions using 3 parameters: visibility from 2 m, pigmentation, and notching. They found that with the inverted ''V'' incision, there was less notching and a more satisfactory scar in terms of visibility. But scar pigmentation was irrelevant to the incision technique employed.[7]

In the present study, columellar scars were evaluated from a very close basal view. The success rate was about 88%. We believe that this is an acceptable result because our evaluation parameters were stricter than the aforementioned authors.'

In 1987, Adamson referred to studies reporting no patient dissatisfaction or scars requiring revision.[8] In addition, in his experience, there was no excessive scarring even with Asians and blacks, and he considered the columella as a preferred site for healing.[8] However, his statements were not backed by objective scar assessments, and his criteria for good or poor scars were not defined precisely, so we cannot compare the results of Adamson with our findings.

Later, in their review in 1990, Adamson et al elaborated a subjective and objective scar analysis of 81 patients who underwent EAS.[3] They compared basal view photographs of patients at 12 months postoperatively with the preoperative images and considered as failure any barely visible, level, and thin line scars. Their method of scar assessment included 3 items: absence or presence of level, visibility, and notching. Our assessment included 5 items: width, height, color, notching, and overall appearance. However, the complication rate of the aforementioned authors (2.5%) was lower than in our study (12%). Even though the relationship between skin types and scar formation in our study was not in agreement, the difference between these studies may be because of different skin composition of the Turkish population (20% Fitzpatrick type 1 and 2, 32% type 3, 42% type 4, and 6% type 5) or poor suturing techniques.

In their article in 1990, Adamson et al emphasized the finesse required in closing wound edges, which are of different thicknesses at different incision lines and angles.[3] They advised no subcutaneous sutures other than undermining the skin even at the junction of vertical and horizontal incision lines where the potential for trap door deformity was greatest.

The suturing technique used in the present study was consistent with the incision closure of Adamson et al. We used a monolayered closure undermining the skin at the tension angles, but we were not able to achieve a similar success rate. However, in terms of scar evaluation from 2 m, only 1 of 50 patients required revision.

According to Foda's review of 500 consecutive EAS, the transcolumellar scar has been found to be very favorable

cosmetically.[9] In 97% of patients, the scar was reported as imperceptible; 2.2% of scars were slightly raised but flattened later on, and only 0.8% of patients required revision. The author suggests the successful result is due to his meticulous multilayered closure starting with the transcolumellar incision closed in 2 layers to take the tension of the skin edges.

Many investigations have been carried out to improve the undesirable appearance of the columellar scar. The role of the depressor septi nasi muscle was studied recently to reveal the anatomic basis for notch deformity after inverted ''V'' incision. In their anatomic study on fresh cadavers, Gamboa et al put forward the immediate distortion of the septi nasi muscle to be the cause of notch deformity in EAS. To prevent skin deformation and ensure proper alignment, they proposed to place a pre-incision landmark at the angle of transverse and vertical incision lines and to close under loupe magnification.[10]

The distortion of the depressor septi nasi muscle seems to be a very credible factor in the formation of notch deformities after transcolumellar incisions. It explains the importance of undermining the wound edges or additional subcutaneous sutures or multiple suture placement to prevent poor scar formation.

In our opinion, to avoid the detrimental effects of this muscle, we should use multiple sutures[11] or different methods of closure under magnification with the wound edges everted to prohibit scar leveling postoperatively.[12]

At the start of this study, our aim was to examine the factors that may play a role in columellar scar formation in order to help settle a long-standing argument within rhinoplasty surgery. We investigated scar formation related to skin (epidermal and dermal) thickness, type, texture, gender, age, and tobacco consumption. Skin thickness, types (20% Fitzpatrick type 1 and 2, 32% type 3, 42% type 4, 6% type 5), texture, patient age, and tobacco consumption were not determinants of columellar scar healing in our population. However, incision healing was significantly better in men than women. It seems that gender is a factor in columellar incision healing. One plausible explanation for scar development among women may be the possible role of the estrogen hormone in this process. Recently, aging in healthy females was reported to be associated with a reduced rate of cutaneous wound healing but an improved quality of scarring both microscopically and macroscopically.[13] Likewise, Tamoxifen, an antagonist of the estrogen receptor, was found to be an effective and acceptable agent to prevent hypertrophic scars.[14]

The limitation of this study is its small sample size and its low external validity related to its restriction to Turkish population. The assertion that Fitzpatrick classification does not have a significant impact on poor scarring would be strengthened with equal numbers of Fitzpatrick scale patients.

To the best of our knowledge, this is the first prospective study on columellar incision scars. We expect that with further investigations on a larger sample and a more generalized population, new perspectives will be added to columellar scar literature in the future.

Conclusion

Six patients (12.0%) healed with an unpleasant scar. The thinnest skin overlying the cartilaginous framework of the nose was the skin of the columella. Women's incisions healed significantly more poorly than men's. Men's skin was significantly thicker than women's in the supratip area. Mean total, supratip, and tip skin thickness of patients with oily texture was significantly greater than in patients with normal, dry, and combination skin.

Author Contributions

Ayşegül Verim, study designer, drafting the article, data collector, writing of the text, revising the article; **Recai Duymuş**, data acquisition, interpretation of the data, contribution to data drafting; **Ömer Faruk Çalım**, data interpretation, statistical analysis, drafting the article; **Çiğdem Tepe Karaca**, substantial contribution to study conception, drafting the article, final approval; **M. Haluk Özkul**, substantial contribution to the design, revising the article for intellectual content, final approval of the version to be published; **Hüsamettin Yaşar**, final approval of the version to be published, revising the article for intellectual content, contribution to conception and design; **Esra Bahadır**, acquisition of data, interpretation of data, correction of the data, substantial contributions to design; **Nuray Bakal**, substantial contribution to data acquisition, contribution to study concept, acquisition of the data.

Disclosures

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References

1. Goodman WS. External approach to rhinoplasty. *Can J Otolaryngol*. 1973;2:207-210.
2. Anderson JR, Johnson CM Jr, Adamson PA. Open rhinoplasty. An assessment. *Otolaryngol Head Neck Surg*. 1982;90:272-274.
3. Adamson PA, Smith O, Tropper GJ. Incision and scar analysis in open (external) rhinoplasty. *Arch Otolaryngol Head Neck Surg*.1990;116:671-675.
4. Fitzpatrick TB. The validity and practicality of sun-reactive skin types I through VI. *Arch Dermatol*. 1988;124:869-871.
5. Singer AJ, Arora B, Dagum A, Valentine S, Hollander JE. Development and validation of a novel scar evaluation scale. *Plast Reconstr Surg*. 2007;120:1892-1897.
6. Bafaqeeh SA, Al-Qattan MM. Open rhinoplasty: columellar scar analysis in an Arabian population. *Plast Reconstr Surg*. 1998;102:1226-1228.
7. Aksu I, Alim H, Tellioğlu AT. Comparative columellar scar analysis between transverse and inverted-V incision in open rhinoplasty. *Aesthetic Plast Surg*. 2008;32:638-640.
8. Adamson PA. Open rhinoplasty. *Otolaryngol Clin North Am*. 1987;20:837-852.
9. Foda HM. External rhinoplasty: a critical analysis of 500 cases. *J Laryngol Otol*. 2003;117:473-477.

10. Gamboa M, Shayani P, Schmid R, Bobadilla E, Blackwell S. Anatomic basis of notch deformity in open rhinoplasty. *Ann Plast Surg*. 2003;50:282-285.
11. Inanli S, Sari M, Yanik M. A new consideration of scar formation in open rhinoplasty. *J Craniofac Surg*. 2009;20:1228-1230.
12. Petropoulos I, Karagiannidis K, Kontzoglou G. Our experience in open rhinoplasty. *Hippokratia*. 2007;11:35-38.
13. Ashcroft GS, Dodsworth J, van Boxtel E, et al. Estrogen accelerates cutaneous wound healing associated with an increase in TGF-beta1 levels. *Nat Med*. 1997;3:1209-1215.
14. Mousavi SR, Raaiszadeh M, Aminseresht M, Behjoo S. Evaluating tamoxifen effect in the prevention of hypertrophic scars following surgical incisions. *Dermatol Surg*. 2010;36: 665-669.