



Manuscript ID ZUMJ-2302-2752

DOI 10.21608/ZUMJ.2023.195216.2752

Original Article

Outcomes Of Open Versus Closed Rhinoplasty: A Prospective Comparative Clinical Study

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Submit Date 22-02-2023

Accept Date 05-03-2023



ABSTRACT

Background: Rhinoplasty is a surgical procedure used to reconstruct nasal structures for cosmetic and functional purposes. Modern rhinoplasty surgery can be performed by one of two different approaches, the open or the closed rhinoplasty. However, the preferred method is still a subject for debate. We aimed in this study to compare the outcomes of open versus closed rhinoplasty.

Patients and Methods: This is a prospective study included 50 patients divided into two groups according to the approach of rhinoplasty performed. Group A (25 patients) underwent open rhinoplasty, while group B (25 patients) underwent closed rhinoplasty. The outcomes are studied for advantages and limitations of each. Cosmetic outcome was evaluated by the Rhinoplasty Outcome Evaluation (ROE) questionnaire.

Results: No significant difference was noted in ROE scores when comparing between rhinoplasty groups (open vs. closed) at the same specific study visit, with p value = 0.872, 0.624 and 0.764 at preoperatively, one month postoperatively, and 6 months post-operatively respectively.

Conclusion: Although the closed rhinoplasty group has less operative time, less amount of intraoperative bleeding and less periorbital edoema, there was significant improvement in the cosmetic state compared in both groups and no significant difference occurred in improvement between the two groups.

Key words: Open, Closed, Endonasal, External Rhinoplasty.

INTRODUCTION

Rhinoplasty is a surgical procedure used to reconstruct nasal structures for cosmetic and functional purposes [1]. Modern rhinoplasty surgery can be performed by one of two different approaches the open or the closed rhinoplasty. However, the preferred method is still a subject for debate [2]. Open rhinoplasty offers many advantages for patients. By exposing the underlying nasal anatomy, surgeons are more able to fully explore nasal inequity or deformities in structures, leading to increased accuracy. However, open approach

may lead to scar formation because of the trans-columellar incision [3]. On the contrary, closed rhinoplasty decreases external scarring and needs less time to operate the procedure in comparison to open rhinoplasty. Also, the convalescence duration for endonasal rhinoplasty is significantly less than that of open rhinoplasty. However, closed rhinoplasty offers limited surgical approach, and decreases the degree of visualisation of the cartilages and bones within the nose that need to be reshaped, making it difficult to perform accurate modifications and potentially increasing the

risk of complications [4]. Most surgeons now identify the great usage of both open and closed approaches. They realize that there are occasions, a given approach gives benefits and may be considered advantageous. They agree that there is a wide “gray zone,” where either the open or the closed approach would be accurate, and the choice may be regarded as a toss-up. They also freely understand that surgeon comfort with a procedure is a fairly important factor[5]. The aim of our study was to compare and demonstrate the effectiveness and the results of open versus closed rhinoplasty.

METHODS

This is a prospective randomized comparative clinical study that included fifty patients aiming to compare and demonstrate the effectiveness and the results of open versus closed rhinoplasty. The present study was enrolled at Zagazig University Hospitals, Zagazig from December 2018 to December 2022. Approval obtained from the ethical committee in Zagazig University Hospitals. Patients were divided into two groups according to the approach of rhinoplasty performed. **Group (A)** included 25 patients who underwent open rhinoplasty. **Group (B)** included 25 patients who underwent closed rhinoplasty. Outcomes of two approaches are studied for advantages and limitations of each.

Patient Selection

Patients were randomized using the closed envelope method. Patient selection was achieved through a number of inclusion and exclusion criteria.

- **Inclusion criteria:**

- 1- Patients aged above 18 and below 60 years old.
- 2- Patients with external nasal deformities.
- 3- Post traumatic nasal deformity.
- 4- Adult patients with unilateral cleft nasal deformities in need of secondary or definitive rhinoplasty.

5- Patients with nasal skin cancer.

- **Exclusion criteria:**

- 1- Patients aged below 18 years and above 60.
- 2- Patients were not willing to participate in study.
- 3- Patients with co-morbidities that preclude sound and safe surgery.
- 4- The patients who had started with the closed technique but then had to undergo the open technique were excluded from the study.

Diagnosis and Pre-operative Preparation

All patients were submitted to full history taking, general and local examination and routine preoperative investigations.

Patient Counseling and Consent

A detailed explanation of patient's condition and type of surgery using pictures of similar cases to help visualize outcome. The risks and benefits of the suggested procedure along with its possible intra and post-operative complications were also explained. A formal consent was written and explained to the patient. The need for medical photography was also explained and consented.

Medical Photography

Patient's noses photos were taken, frontal, lateral (right & left) and basal view preoperatively and postoperatively (**figure 1**). A comparison of the preoperative and post-operative photographs reveals the correction achieved.

Post operative photographs were taken after the oedema subsided.

Operative Techniques

Patient's Position:

The patient is positioned toward the surgeon's side and near the end of the operating table.

The patient's head is hyper extended so that the nasal cavity can be easily seen.

Anesthesia:

General anesthesia was used for all patients. Hypotensive anesthesia was preferred to decrease the amount of blood loss.

Adrenaline Injection:

Injection of concentration 1/100000 was done at the sites of incision and over the dorsum of the nose. The operative field is not injected in order to prevent distortion.

Surgical Techniques

•Group A (Open Rhinoplasty):

Bilateral alar marginal incisions and an inverted V-shaped trans-columellar incision (figure 2) were employed in all patients who underwent external rhinoplasty surgery to reveal the nasal bony cartilaginous framework. The external rhinoplasty incisions were closed after the necessary dorsal and tip modifications were made, starting with the trans-columellar incision, which was closed in two layers using a deep 6/0 PDS transverse mattress suture to relieve tension on the skin edges. The skin flap was then re-draped to its normal anatomical position.

•Group B (Closed Rhinoplasty):

The nose was accessed through one or both sides an inter-cartilaginous incision that might link the septum's hemi-transfixion incision. The dorsal surface of ULC was dissected, and the process was carried on to the bony nasal dorsum. The infra- and inter-cartilaginous incisions were used for the delivery technique. The interc-artilagenous incisions were made at the point where the cranial border of the LLC met the caudal edge of the ULC, and the infra-cartilaginous incisions were made on the caudal edges of both LLCs. Up until the domes could be administered through one nostril, both sides of the LLC were dissected.

Postoperative Care

After completing the procedures, antibiotic-soaked non-absorbable packs were placed in the nose bilaterally. Then, external nasal cast splints were used in all the patients. During the first 24 hours after operation, patients lay down

in a 45 degrees head-elevated position All of the patients were given the same antibiotics (amoxicillin 1 g twice per day for 7 days) and the same analgesics (paracetamol 4 times/d for 10 days) but no topical nasal medication. The nonabsorbable packs in all the patients were removed on the second postoperative day. Nasal splints were removed after 2 weeks but tapings were continued for 4 weeks thereafter.

Follow Up

Patients were given a schedule upon discharge from the hospital as following: First week every 2 days for dressing. Second week every 3-4 days until removal of stitches. Patients were asked to follow up once every 3 months for the first year, then once every year thereafter.

Assessment Of Cosmetic Outcome

The evaluation was done by means of a scoring system, the Rhinoplasty Outcome Evaluation (ROE) questionnaire⁵, which scores nasal shape (Figure 3). Each patient received two copies of previously validated surveys (ROE) for preoperative and postoperative evaluation, which were returned and scored. Five questions about the shape of the nose and one question about nasal breathing make up the ROE, and each question is assessed by the patient on a scale from 0 (worst) to 4 (best). The percentage representing the total scores is used (out of 100). Consequently, a lower score reflects greater dissatisfaction. An improvement following intervention is shown by a positive difference between postoperative and preoperative scores.

Ethical Consideration:

This study was ethically approved by Zagazig University Academic and Ethical Committee. Written informed consent of all the participants was obtained. The study protocol conformed to the Helsinki Declaration, the ethical norm of the World Medical Association for human testing.

Statistical Analysis:

Recorded data were analyzed using the statistical package for social sciences, V. 20.0

(SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean± standard deviation (SD). Qualitative data were expressed as frequency and percentage.

RESULTS

Demographic Data:

This study involved 50 patients with nasal deformity. Patients’ age ranged from 19 to 46 years with a mean age of 29.48 ± 6.74 standard deviation (SD). Eighteen patients were males (36%), while females represented thirty-two patients (64%) out of the total number of patients. Group A involved 9 males and 16 females, with ages ranging from 19 to 44 years with a mean age of 29.04± 6.80 SD. Patients in group B were 11 males and 14 females, with ages ranging from 21 to 46 years with a mean age of 29.92± 6.52 SD. The gender and age distribution were not of significant difference between the groups with the p-value of 0.773 and 0.649 (P>.05) for gender and age as measured by Fischer’s exact test and independent sample t-test respectively (**table 1**) (**figure 4**).

Operative Evaluation:

Operative Time

Mean Operative time was 90.6 minutes (range 80 - 105 min) for group (A) and was 80.8 minutes (range 70- 95 min) for group (B). Time factor had a high statistical significance when comparing both groups (P value < 0.001) as the group (A) had a longer operative time than the group (B) (**Table 2**).

Amount of Intraoperative Bleeding:

The mean amount of intraoperative bleeding was 150.80 ml (range 100 - 200 ml) in group (A) and was 145.60 ml (range 80 - 190

ml) in group (B). The amount of intraoperative bleeding was higher in group (A) but was not statistically significant when comparing both groups (P value = 0.541).

Post-Operative Edema:

Immediate postoperative oedema showed that the post-operative edema levels were more in group (A). However, they were statistically insignificant with a P value was 0.305.

Regarding one-week postoperative oedema post, the edema levels were greatly improved in both groups but still more in group (A). However, there were no statistical differences between both groups as P value was 0.256.

Patients’ Satisfaction: The ROE score increased significantly in overall patients from 29.75 (16.67 - 41.67) preoperatively to 81.92 (70.83 - 91.17) and 87.30 (75 - 95.83) one month and 6 months after rhinoplasty respectively with p value < 0.0001.

Regarding the open rhinoplasty group, the ROE score increased significantly from 29.50 (16.67 - 41.67) preoperatively to 82.03 (70.83 - 87.5) and 87.06 (75 - 91.17) one month and 6 months after rhinoplasty respectively with p value < 0.0001. In closed rhinoplasty group, the ROE score increased also significantly from 30.00 (16.67 - 41.67) preoperatively to 81.81 (70.83 - 91.17) and 87.54 (75 - 95.83) one month and 6 months after rhinoplasty respectively with p value < 0.0001.No significant difference was noted in ROE scores when comparing between rhinoplasty groups (open vs. closed) at the same specific study visit, with p value = 0.872, 0.624 and 0.764 at preoperatively, one month postoperatively, and 6 months post-operatively respectively (**Table 3**).

Table 1. Comparison between both groups regarding demographics.

Demographic Data		Group A (n=25)	Group B (n=25)	P value
Gender (n, %)	Male	9 (36%)	11 (44%)	0.773*
	Female	16 (64%)	14 (56%)	
Age (years) Mean ± SD		29.04± 6.80	29.92± 6.52	0.649#

* Fisher’s exact test, # independent sample t-test

Table 2. Operative time comparison between both groups.

	Group								P value
	Group A				Group B				
	Mean	SD	Minimum	Maximum	Mean	SD	Minimum	Maximum	
Time (min)	90.60	7.11	80.00	105.00	80.80	6.88	70.00	95.00	<0.001

Table 3. Comparison of preoperative and postoperative results regarding the ROE score at preoperative, 1st, and 6th months follow up periods.

	ROE scores				p value (a)
	Preoperative	Postoperative			
		1 st Month	6 th Month		
Overall (n = 50) Mean Range	29.75 (16.67 - 41.67)	81.92* (70.83 - 91.17)	87.30* ^{***} (75 - 95.83)	< 0.0001	
Technique of surgery Open (n = 25) Closed (n = 25)	29.50 (16.67 - 41.67)	82.03* (70.83 - 87.5)	87.06* ^{***} (75 - 91.17)	< 0.0001	
	30.00 (16.67 - 41.67)	81.81* (70.83 - 91.17)	87.54* ^{***} (75 - 95.83)	< 0.0001	
p -value (b)	0.872	0.624	0.764		

Data are expressed as mean (range).
 Comparison between study visits in the same specific patients (overall patients, open group patients, or closed group patients); Friedman test with at $p < 0.05$.
 Comparison between rhinoplasty groups at the same specific study visit (preoperatively, 1st month postoperatively, or 6th months post-operatively); Mann-Whitney U test with at a p value of < 0.05 .
 * $p < 0.001$ in comparison to preoperative scores.
 ** $p < 0.001$ comparison to 1st month scores.





Figure 1.Example of Medical Photography; Patient's noses photos were taken, frontal, lateral (right & left) and basal view preoperatively.



Figure 2. inverted V-shaped trans-columellar incision

Rhinoplasty Outcomes Evaluation (ROE)

The ROE instrument is used to evaluate aesthetic changes primarily.

1. How well do you like the appearance of your nose?

Not at all	Somewhat	Moderately	Very much	Completely
0	1	2	3	4

2. How well are you able to breathe through your nose?

Not at all	Somewhat	Moderately	Very much	Completely
0	1	2	3	4

3. How much do you feel your friends and loved ones like your nose?

Not at all	Somewhat	Moderately	Very much	Completely
0	1	2	3	4

4. Do you think your current nasal appearance limits your social or professional activities?

Always	Usually	Sometimes	Rarely	Never
0	1	2	3	4

5. How confident are you that your nasal appearance is the best that it can be?

Not at all	Somewhat	Moderately	Very much	Completely
0	1	2	3	4

6. Would you like to surgically alter the appearance or function of your nose?

Definitely	Most likely	Possibly	Probably not	No
0	1	2	3	4

Figure 3. Rhinoplasty Outcome Evaluation (ROE) questionnaire.

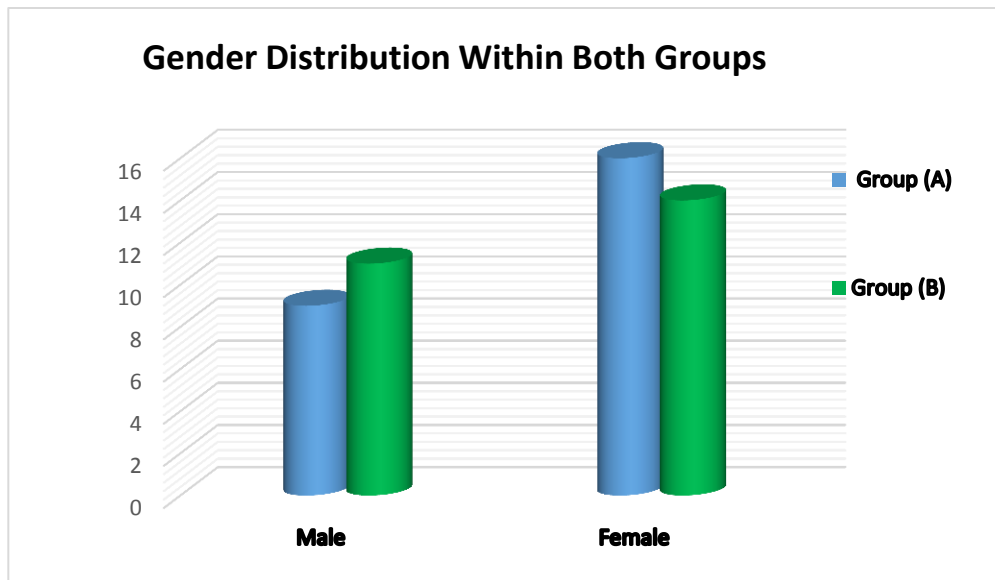


Figure 4. Comparison of gender distribution in our study within both groups.

DISCUSSION

Our study aimed to compare and demonstrate the effectiveness and the results of open versus closed rhinoplasty. The patients were enrolled into two groups. Group A consisted of 25 patients who had undergone open rhinoplasty while group B included 25 patients who had undergone closed rhinoplasty. The Assessment parameters included the operative time, amount of intraoperative bleeding, postoperative oedema (immediately and one week postoperatively), and assessment of cosmetic outcome by using the **Rhinoplasty Outcome Evaluation (ROE)** questionnaire.

The six questions of the ROE questionnaire each have five possible responses that graded from 0 to 4. The results of the questionnaire can therefore range from 0 to 24. To make the results easier to interpret, the score must be multiplied by 100 and divided by 24, yielding a number between 0 and 100. The higher the score, the more satisfied the patient is with the nasal surgery [6].

Regarding the characteristics of the patients in our study we found that; overall, the mean age was 29.48 ± 6.74 standard deviation (SD). In group (A), ages ranged from 19 to 44 years with a mean age of 29.04 ± 6.80 SD, while in group (B) ages ranged from 21 to 46 years with a mean age of 29.92 ± 6.52 SD.

Our results agree with **Kütük and Arıkan**[7] and **Sakallioğlu et al.** [8], where the mean age of overall patients was 27.4 ± 6.5 SD years and 28 ± 8 SD years respectively. On the contrary, **Hosseini et al.** [9]

showed younger mean of age 23.3 ± 4.5 SD years, while **Howldar**[10] showed an older mean of age 33.78 ± 7.41 SD years.

Regarding Mean Operative time, it was 90.6 ± 7.11 minutes for group (A) and was 80.8 ± 6.88 minutes for group (B). Time factor had a high statistical significance when comparing both groups (P value < 0.001) as the group (A) had a longer operative time than the group (B).

In agreement with our results, **Sakallioğlu et al.** [8] showed an operation time was 91 ± 13 minutes in open rhinoplasty group and 82 ± 11

minutes in closed rhinoplasty group. **Talmadge et al.** [11] in contrast showed prolonged mean operative time reached 198.6 minutes for open rhinoplasty group and 131.6 minutes for open rhinoplasty group.

As regards the mean amount of intraoperative bleeding it was 150.80 ± 29.57 ml in group (A) and was 145.60 ± 30.15 ml in group (B). The amount of intraoperative bleeding was higher in group (A) but was not statistically significant when comparing both groups (P value = 0.541).

These results agree with **Sakallioğlu et al.** [8] where the amount of intraoperative bleeding was 156 ± 68 ml in open rhinoplasty group and 148 ± 74 mL in closed rhinoplasty group with no significant importance statistically.

Regarding the postoperative edema our results showed that the level of postoperative edema was higher in group (A), however, they were not statistically significant. Oedema levels were significantly reduced in both groups after one week postoperatively, however group A still had a higher degree of oedema (A), but also there were no statistical difference between the two groups.

Sathe et al. [12] showed also that almost all patients of both approaches had periorbital edema and ecchymosis which resolved completely in a week. Also, **Kütük and Arıkan**[7] showed the scores of periorbital edema or ecchymosis between both groups (open and closed) on the first, third, or seventh postoperative days did not differ significantly from one another clinically or statistically.

As regard the patients' satisfaction, our study's ROE scores increased significantly in overall patients from 29.75 (16.67 - 41.67) preoperatively to 81.92 (70.83 - 91.17) and 87.30 (75 - 95.83) one month and 6 months after rhinoplasty respectively with p value < 0.0001. No significant difference was noted in ROE scores when comparing between rhinoplasty groups (open vs. closed) at the same specific study visit, with p value = 0.872, 0.624 and 0.764 at preoperatively, one month

postoperatively, and 6 months post-operatively respectively.

Saleh et al. [5] showed significant improvement in the postoperative cosmetic state compared with the pre-operative state. The mean ROE score preoperatively was 45.30 and the mean postoperative score was 76.95. They showed also no significant difference occurred in improvement between the two groups (endonasal versus the external approach with P value= 0.36).

Kütük and Arıkan[7] also reported overall significant increase in ROE scores from 31.2 (20.8–41.7) in the preoperative period to 85.4 (79.2–95.8) in the 6th month after the rhinoplasty. Although they showed that ROE scores significantly increased from the preoperative to the postoperative period and from the 1st month to 3rd and 6th month of postoperative follow-up in all patients, regardless of the rhinoplasty approach ($p < 0.001$ for each), they found no significant difference noted in ROE scores with regard to the technique (open vs. closed).

CONCLUSION

The debate over open vs. closed rhinoplasty will probably continue, and that the surgeon's personal expertise will continue to be the primary factor in determining the strategy to rhinoplasty and neither technique is best in all indications of rhinoplasty.

Although we found in our study that closed rhinoplasty group had less operative time, less amount of intraoperative bleeding and less periorbital edoema, we found significant improvement in the postoperative cosmetic state compared with the pre-operative state in all patients and no significant difference occurred in improvement between the two groups.

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To Cite:

Baz, A., Sidhom, S., Amr, W., Abdelaziz, A., Anany, A. Outcomes Of Open Versus Closed Rhinoplasty: A Prospective Comparative Clinical Study. *Zagazig University Medical Journal*, 2024; (1163-1172): -. doi: 10.21608/zumj.2023.195216.2752