Rhinoplasty approaches, closed versus semiopen: a comparative study

Nabil G. Zeid, Mahmoud S. El Fouly, Ahmed A. Kamel, Basim M. Wahba, Refaat N. Behman, Mohamed Abd Elmottaleb Sabaa

ENT Department, Cairo University, Kasr Al Ainy, Egypt

Correspondence to Mohamed Abd Elmottaleb Sabaa,
MSc, 3 El Mokaw el oon Al Arab St.,
Beside Gate 3 El Shams Club,
Masr El Gedeeda, Cairo, Egypt
Postal Code: 11786,
Phone number: +201114114699
Fax no.: +20 26 28 884
e-mail: dr.mottaleb@gmail.com

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Background
The 'open' (external) and 'closed' (endonasal) rhinoplasty approaches remain a subject for debate. Semiopen approach was proposed by Inchingolo and colleagues in 2012 with the advantages of the open technique without division of the columella.

Patients and methods
A randomized prospective single-blinded study was conducted. Thirty patients were divided into two groups. In group A, 15 patients underwent rhinoplasty with the endonasal approach, whereas in group B, 15 patients were subjected to rhinoplasty with the semiopen approach. Parameters used for evaluation were recorded intraoperatively, at 1 week, and 3 months postoperatively.

Results
In group B, the operative time was longer and tip accessibility was better compared with group A, with a high statistical significance. Postoperative edema was more in group B than in group A, with a significant difference in the immediate postoperative period.

Conclusion
The semiopen approach shows better tip accessibility compared with the ordinary closed approach, with fewer incisions compared with the tip delivery technique and with no need for columellar division as in open approach. However, it has a longer operative time with more postoperative edema compared with the closed approach. Therefore, the best use of this approach is for cases in which tip modification is needed, especially if concomitant nasal dorsum modification is also needed.

Keywords:
closed rhinoplasty, rhinoplasty approaches, semiopen rhinoplasty

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Introduction

The earliest known record of surgery to the nose was Egyptian. The Edwin Smith Papyrus is thought to be at least 1700 years old. John O. Roe is said to be the first to have introduced the intranasal approach to rhinoplasty [1]. In 1921, Aurel Rethi advocated an external approach for exposure through columellar skin incision [2].

Assessment of the external nose requires an understanding of the anatomic components that contribute to its normal topographic features. Structures that influence the external appearance include the skin, which varies in thickness, and the underlying bony/cartilaginous skeletal framework [3].

Surgical techniques

Endonasal (intranasal/closed) approach

The intranasal approach to rhinoplasty includes several routes of access to the nose, as follows (Fig. 1):

(1) Intercartilaginous incisions
(2) Transcartilaginous (cartilage-splitting) incisions
(3) Infracartilaginous incisions [4]
(4) The delivery technique (Fig. 2), through infracartilaginous and intercartilaginous incisions [5].

Open (external) approach

In this approach, a step incision is made in the mid-columella and is continued along the caudal margin of the medial and the lateral crura of the lower lateral cartilages (LLCs) [6].

Semiopen approach (external marginal approach)

In 2012, Inchingolo *et al.* [7] described the semiopen approach with the advantages of the open and closed procedures, by making marginal incision and dissection of the skin cover from the underlying framework.

Endoscopic-guided rhinoplasty

Endoscopic surgical procedures can be used for both functional and esthetic indications [8].

Patients and methods

This study was a prospective randomized single-blinded study, conducted in Kasr Al Ainy, Cairo University Hospital over a period of 18 months starting from July 2014 to December 2015. Patients were randomized by means of consecutive randomization. Thirty patients with nasal deformity who were candidates for rhinoplasty were recruited for this study.

Inclusion criteria were as follows:
(1) Crooked nose
(2) Nasal hump
(3) Nasal tip deformities.

Exclusion criteria were as follows:
(1) Recent nasal trauma (within the last 3 months)
(2) Medical contraindication to surgery.

All 30 patients were divided into two groups. Group A included 15 patients who underwent rhinoplasty through the closed approach, and group B included 15 patients who underwent rhinoplasty through the semiopen approach.

Surgical access

The surgery was performed under general anesthesia. A volume of 1:200 000 adrenaline was injected into the nasal bridge and the alar cartilages. The vibrissae were shaved.

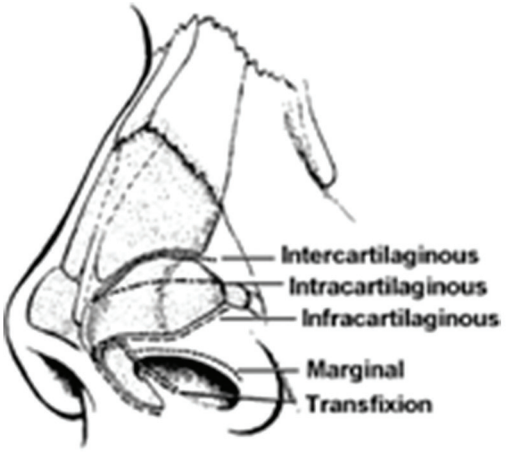
Group A (closed rhinoplasty)

One of the two routes was used to access the nose as follows:
(1) Intercartilaginous incision was made on one side or both sides, which could join the hemitransfixion incision of the septum (Fig. 3a)
(2) The delivery technique was performed through two incisions, infracartilaginous and intercartilaginous. Dissection of the LLC was performed on both sides until the domes could be delivered through one nostril (Fig. 3b).

Group B (semiopen technique)

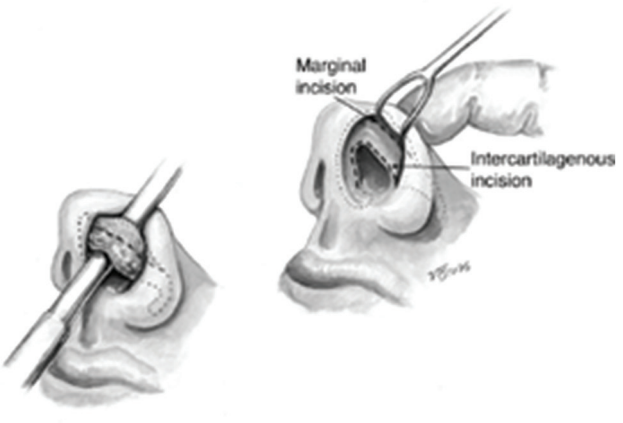
The semiopen technique was performed through marginal incision. The LLC was dissected in a direction from lateral to medial (Fig. 4a). The same steps were carried out on the opposite side (Fig. 4b and c). Domes were dissected and presented through one nostril (Fig. 4d). Retraction of the dissected domes allowed dissection to be continued over the dorsal surface of the upper lateral cartilage and bony nasal dorsum (Fig. 5a). With dissection of the skin cover from the nasal skeleton, any type of rhinoplasty can be performed to the tip (Fig. 5b) or nasal dorsum.

Figure 1



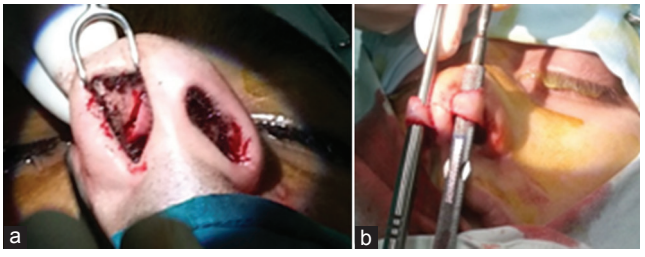
Endonasal approach incisions, after infracartilaginous incisions.

Figure 2



Tip delivery, after infracartilaginous and intercartilaginous incisions.

Figure 3

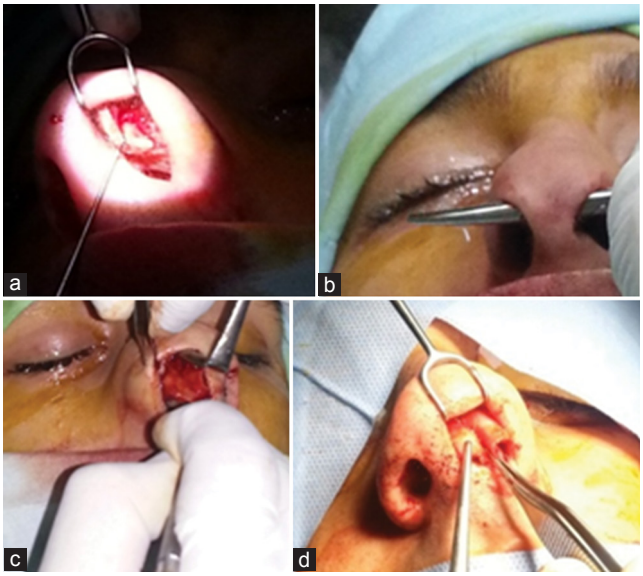


Closed technique in group A patients: (a) intercartilaginous incision; (b) tip delivery technique.

Postoperative care

All patients were maintained with nasal splints for 1 week, and Merocel (Medtronic - US (Minneapolis)) packs were removed on the second day. Amoxicillin clavulanate tablets 1 g/12 h and paracetamol 500 mg every 8 h were administered for 1 week.

Figure 4



Steps of performing the semiopen approach in patients of group B. (a) Marginal incision was made and dissection of the left lower lateral cartilage (LLC) began. (b) Complete transfixion incision without external division of the columella. (c) Dissection of LLCs on both sides. (d) Complete dissection of both LLCs as they were appearing from the left nostril.

Assessment parameters

Patients were evaluated intraoperatively for the following:

(1) Operative time in minutes from first incision to last closure stitch
(2) Accessibility for the entire LLCs/tip complex and exposure of the dorsum. Accessibility was scored as follows: 1, poor; 2, fair; and 3, good
(3) Edema at the end of the operation was scored as follows: 0, none; 1, mild; 2, moderate; and 3, marked
(4) Operative score was calculated as the sum of different steps required in the operation as follows:
    (a) Hump removal (1)
    (b) Osteotomies (1)
    (c) Tip modification (1)
    (d) Septoplasty (1)
    (e) Turbinate reduction (1).

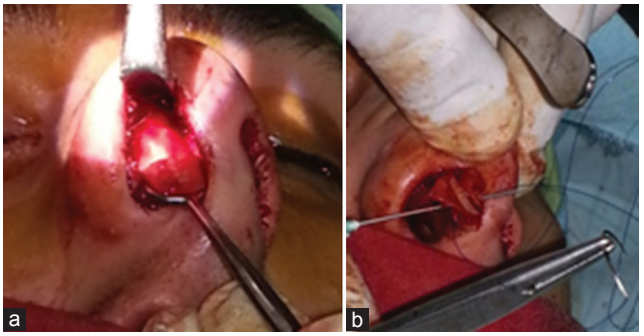
Postoperative evaluation was carried out on the seventh day and 3 months postoperatively for the following:

(1) Residual edema, which was scored as described before
(2) Scars
(3) Patient's visual analogue scale (VAS), which was graded as follows: 1, very poor; 2, poor; 3, fair; 4, good; and 5, excellent
(4) Surgeon's VAS, which was graded similar to patient's VAS.

Statistical analysis

Data were coded and entered using the statistical package for the social sciences (SPSS, version 22; SPSS Inc., Chicago, Illinois, USA). Data were summarized using mean, SD, median, minimum, and maximum in quantitative data and using frequency (count) and relative frequency (%) for categorical data. Comparisons between quantitative variables were made using the nonparametric Mann–Whitney test [9]. For comparing categorical data, the χ^2-test was performed. An exact test was used instead when the expected frequency was less than 5 [10]. *P* values of less than 0.05 were considered as statistically significant.

Figure 5



(a) View of the nasal dorsum after dissection in one of group B patients. (b) Columellar strut being fixed in one of group B patients.

Results

This study included 30 patients with nasal deformity. Patients' ages ranged from 17 to 57 years, with a mean (SD) age of 26.3 (9.0). Twenty patients were male and 10 were female.

Preoperative deformities the patients had were as follows: hump deformity (60%), nasal twist (56%), septal deviation (53%), tip deformities (43%), broad nose (20%), and saddle nose (3%).

Twenty-three (out of 30) operations were performed by the same surgeon. None of the patients had undergone previous rhinoplasty operations, except one revision case. Rhinoplasty is a complex operation and has different varieties according to the patient's deformity, which was clear in this study, as 83% of the patients underwent osteotomies to the nasal bones, 63% underwent septoplasty, 60% were subjected to nasal hump removal, 43% underwent nasal tip modification, and only 6% underwent turbinate reduction within the operation.

Group A included 15 patients who underwent rhinoplasty through closed approach (12 cases through intercartilaginous incision and three cases through the delivery technique), and group B included 15 patients subjected to rhinoplasty through semiopen approach.

On comparing the two groups as regards the accessibility, the semiopen approach showed the same accessibility to the dorsum. However, the semiopen approach showed better accessibility to the tip, which was statistically highly significant ($P < 0.001$) (Table 1).

Time factor had also a high statistical significance when comparing the two groups ($P < 0.001$), as group B had a longer operative time compared with group A (Table 2).

Immediate postoperative edema showed statistical significance ($P = 0.006$) as patients in group B had more edema compared with group A patients. As regards 1 week and 3 months' postoperative follow-up, edema levels were higher in group B. However, there were no statistical differences between the two groups (Table 3).

Both groups showed nearly the same postoperative VAS for the patients and doctors (Table 4).

Most of the operations performed had a score of 3 (40%) for both groups, and hence further statistical analysis was performed for this group of operative score to minimize operation's variability.

Twelve patients had an operative score of 3, with six patients in each group.

On comparing the two groups with operative score 3 as regards tip accessibility, group B showed better accessibility to tip, with a statistically significant ($P < 0.05$) (Table 5).

Although group B had a longer operative time compared with group A, there was no statistical significance between the two groups considering this operation score.

Table 1 Comparison between the two groups as regards accessibility

	Group (*n* (%))		*P*
	Group A	Group B	
Tip accessibility			
Poor	12 (80.0)	0 (0)	<0.001
Fair	0 (0)	1 (6.7)	
Good	3 (20.0)	14 (93.3)	
Dorsum accessibility			
Good	15 (100.0)	15 (100.0)	

Discussion

The 'open' (external) and 'closed' (endonasal) rhinoplasty approaches remain a subject for debate [11].

External approach rhinoplasty allows the surgeon to visualize, assess, and modify the structures of the nose under an 'open sky'. Advantages of this 'external' approach include full visualization of the operative field that allows the surgeon and assistant/trainee to appreciate the surgical steps with the ability to create minute changes to the tip. However, there is a rarely visible columellar incision line [12].

In contrast, in endonasal approaches, there are no external incisions, and there is less dissection required; therefore, soft-tissue trauma and scarring are minimized [11].

The semiopen approach was described by Inchingolo *et al.* [7] with the advantages of the open technique, and it does not involve the presence of postsurgical scars.

On comparing tip accessibility between the two groups, there was high statistical significance ($P < 0.001$). In group B cases, in whom semiopen rhinoplasty was performed, tip accessibility was good in 14 cases, representing 93% of cases, and fair in one case (7% of cases), which could be explained by the small-sized nostril the patient had, resulting in less tip accessibility. Kim and Park [13] described very small nostrils as a contraindication to the semiopen approach. In group A population who had been subjected to closed rhinoplasty, tip accessibility was poor in 12 (80%) cases but good in three (20%) cases; in these particular three cases, tip delivery was performed, which gave good exposure for the tip.

Although exposure to tip was good in these three cases that underwent tip delivery in group A, more incisions were needed, including marginal and intercartilaginous incisions. Kamburoglu and Kayıkcıoglum [14] described some disadvantages of the tip delivery technique: the inability to visualize the relation between the upper lateral cartilage and LLC, and the risk of scarring the internal nasal valve during the intercartilaginous incision.

Exposure to the dorsum of the nose was good in all cases with respect to the two approaches.

Table 2 Comparison of operative time between the two groups

	Group										*P*
	Group A					Group B					
	Mean	SD	Median	Minimum	Maximum	Mean	SD	Median	Minimum	Maximum	
Time (min)	59.33	17.69	60.00	27.00	90.00	109.47	44.01	96.00	54.00	210.00	<0.001

Critics of open rhinoplasty have reported prolonged tip edema and extended operating time [15], whereas closed rhinoplasty has shortened operative time and less swelling [13], which matched this study results. Time factor was highly significant when comparing the two groups ($P < 0.001$), as group B had a longer time with a mean of 109 min compared with group A, which had a mean of 59 min.

Immediate postoperative edema was more in group B than in group A, which was statistically significant with a P value of 0.006, whereas at 1 week and 3 months' follow-up, edema levels were higher in group B than in group A, yet statistically nonsignificant. Grau [16] also mentioned that closed rhinoplasty had shorter recovery time due to less edema.

On comparing the two groups as regards the VAS (out of 5), in the closed rhinoplasty group (group A) the mean patient's VAS at 1 week and 3 months' follow-up was 3.93 and 3.87, respectively, whereas in the semiopen group (group B) the mean patient's VAS at 1 week and 3 months' follow-up was 3.67 and 3.87, respectively. In group A, the mean doctor's VAS at 1 week and 3 months' follow-up was 4.27 and 4.07, respectively, whereas in group B the mean doctor's VAS was 4.27 at both 1 week and 3 months' follow-up. Therefore, both groups nearly had similar results, with a VAS of ~4 (good). Kamburoglu and Kayıkcıoglum [14], in their study, also reported a high satisfaction rate (96%) for the semiopen approach.

Rhinoplasty remains one of the most difficult procedures to perform in plastic surgeries. There are multiple anatomic components and factors that need to be managed during surgery [17]. Each rhinoplasty is different from one patient to another due to many variables around and within each operation – for example, the surrounding environment of the operation theater, instruments, surgeon, anesthesiologist, assistant, patient's pulse, blood pressure, intraoperative bleeding state, deformity, and anatomical variations. Operative score was proposed in this study to minimize variations as regards intraoperative management. As most of the patients had an operative score of 3, representing 40% of cases, further statistical analysis was performed for the population within this operation score.

Considering the study population with operative score 3, tip accessibility was greater in group B than in group A with a significant difference ($P = 0.015$). Although group B operations consumed more time compared with group A, the difference between the two groups as regards the operative time was statistically nonsignificant with a P value of 0.055. Postoperative edema levels were higher in group B than in group A immediately postoperatively, at 1 week, and at 3 months' follow-up, with a significant difference at 3 months' follow-up ($P = 0.015$).

Bruschi *et al.* [18] added another advantage to the approaches using marginal incision, which is the more precise intraoperative assessment of the nasal shape as there is overlying skin cover and no need for frequent columellar closure for intraoperative assessment.

Kim and Park [13] noted a major disadvantage to transcolumellar incision, as the columellar artery is scarified in the transcolumellar incision, the lateral nasal arteries become the main blood supply for the nasal tip. In a bulbous fatty tip, defatting is a compulsory procedure in the nasal tip, and the lateral nasal artery can be easily damaged. If both lateral nasal arteries are damaged in an open approach with transcolumellar incision, the nasal tip can be compromised and become necrotic. Even a hematoma on the nasal tip, which can compress both lateral nasal arteries, may contribute to

Table 3 Comparison between the two groups as regards edema: immediately postoperative

Immediate edema	Groups (*n* (%))		*P*
	Group A	Group B	
None	1 (6.7)	0 (0)	0.006
Mild	11 (73.3)	3 (20.0)	
Moderate	2 (13.3)	8 (53.3)	
Marked	1 (6.7)	4 (26.7)	

Table 4 Comparison between the two groups as regards patients' visual analogue scale and doctor's visual analogue scale in the period of 1 week and 3 months postoperative follow-up period

	Group										*P*
	Group A					Group B					
	Mean	SD	Median	Minimum	Maximum	Mean	SD	Median	Minimum	Maximum	
1w P VAS	3.93	1.16	4.00	1.00	5.00	3.67	0.82	3.00	3.00	5.00	0.282
1w D VAS	4.27	0.59	4.00	3.00	5.00	4.27	0.46	4.00	4.00	5.00	0.92
3m P VAS	3.87	1.13	4.00	2.00	5.00	3.87	0.92	4.00	2.00	5.00	0.827
3m D VAS	4.07	1.03	4.00	2.00	5.00	4.27	0.70	4.00	3.00	5.00	0.723

1w P VAS, patients' visual analogue scale at 1 week; 1w D VAS, doctor's visual analogue scale at 1 week; 3m P VAS, patients' visual analogue scale at 3 months; 3m D VAS, doctor's visual analogue scale 3 months.

Table 5 Comparison between the two groups with operative score 3 as regards tip accessibility

Tip accessibility	Group (*n* (%))		*P*
	Group A	Group B	
Poor	5 (83.3)	0 (0)	<0.015
Fair	0 (0)	0 (0)	
Good	1 (16.7)	6 (100)	

an unstable blood supply in the nasal tip, which can ultimately result in necrosis.

Conclusion

The semiopen approach shows better tip accessibility compared with the ordinary closed approach, with fewer incisions compared with the tip delivery technique and with no need for columellar division as in open approach. However, it has longer operative time with more postoperative edema compared with the closed approach. Therefore, the best use for this approach is for cases in which tip modification is needed, especially if concomitant nasal dorsum modification is also needed.

Further comparative studies with larger sample size and for longer follow-up periods are recommended to assess its long-term effect. Future studies can include objective nasal flow tests to assess the effect of different approaches on the nasal air flow.

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Nil.

Conflicts of interest
There are no conflicts of interest.

References

1 Eisenberg I. A history of rhinoplasty. S Afr Med J 1982; 62:286–292.
2 Zijlker T, Vuyk H, Adamson P. External incisions in rhinoplasty: a historical review. Face 1993; 2:75–86.
3 Oneal R, Beil J. Surgical anatomy of the nose. Clin Plast Surg 2010; 37:191–211.
4 Ha R, Meade R. Rhinoplasty. Selected Readings Plast Surg 2007; 10:2–19.
5 Ducic Y, Defatta R. Closed rhinoplasty. Operative Tech Otolaryngol 2007; 18:233–242.
6 Guyuron B. Primary rhinoplasty [Chapter 4]. In: Bahman Guyuron Rhinoplasty, editor: Bahman Guyuron, Elsevier Inc. British library; 2012. pp. 103–109.
7 Inchingolo F, Tatullo M, Marrelli M, Inchingolo AD, Corelli R, Inchingolo AM, *et al.* Semi-open rhinoplasty: a new maxillofacial technique. Head Face Med 2012; 8:13.
8 Behrbohm H, May J. Endoscopic guided rhinoplasty. Facial Plast Surg 2013; 29:133–139.
9 Chan YH. Biostatistics 102: quantitative data – parametric & non-parametric tests. Singapore Med J 2003; 44:391–396.
10 Chan Y. Biostatistics 103: qualitative data – tests of independence. Singapore Med J 2003; 44:498–503.
11 Burke A, Cook T. Open versus closed rhinoplasty: what have we learned? Curr Opin Otolaryngol Head Neck Surg 2000; 8:332–336.
12 D'Ascanio L. 'Closed' rhinoplasty: an out-of-date procedure? Ann Otolaryngol Rhinol 2014; 1:1008–1013.
13 Kim PC, Park DH. External marginal approach rhinoplasty (EMA rhinoplasty) [Chapter 21]. In: Shiffman MA, Di Giuseppe A, editors. *Advanced aesthetic rhinoplasty. Art, science, and new clinical techniques*. Springer Heidelberg, New York: Dordrecht London; 2013:pp. 241–295.
14 Kamburoglu H, Kayıkcıoglum A. Closed rhinoplasty with open approach advantages: extended intranasal incisions and tip rearrangement sutures. Aesth Plast Surg 2014; 38:653–661.
15 Gunter J, Rohrich R, Adams W, Ahmad J. Basic nasal tip surgery: anatomy and technique [Chapter 17]. In: Dallas rhinoplasty: nasal surgery by the masters. USA: CRC Press, FL; 2014:pp. 347.
16 Grau A. The controversy between open and closed rhinoplasty [Chapter 22]. In: Shiffman MA, Di Giuseppe A, editors. *Advanced aesthetic rhinoplasty. Art, science, and new clinical techniques*. Springer-Verlag Berlin Heidelberg; 2013:pp. 295–327.
17 Dayan S. Evolving techniques in rhinoplasty. Facial Plast Surg 2007; 23:62–69.
18 Bruschi S, Bocchiotti M, Verga M, Kefalas N, Fraccalvieri M Closed rhinoplasty with marginal incision: our experience and results. Aesth Plast Surg 2006; 30:155–158.