Assessment of nasal tip projection

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Introduction
The aim of this study was to compare Goode's and Byrd's method in objectively assessing nasal tip projection.

Materials and methods
This study included 20 patients from the ENT outpatient clinic, Cairo university hospital, who underwent augmentation tip rhinoplasty, closed technique, using Sheen graft, during the period from January 2008 until December 2011. Two objective methods, Goode's method and Byrd's method, were used to assess nasal tip projection preoperatively and postoperatively.

Results
There was statistically significant difference between the gain in projection by Goode's method compared with Byrd's method. The mean gain in projection was 11.6 using Goode's method, whereas it was only 9.55 when measured by Byrd's method. Goode's method correlated more with patients' and surgeon's subjective assessment and satisfaction.

Conclusion
In our study, Goode's method proved to be more accurate in representing the final outcome compared with Byrd's method in the Egyptian population.

Keywords:
Byrd, Goode, nasal tip projection

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Introduction

The three main characteristics of the nasal tip are shape, rotation and projection. Predictably maintaining or changing these nasal tip characteristics remains a challenge; even for the most experienced facial plastic surgeon, projection is notably the most difficult to control [1].

In 1975, Sheen introduced a new concept in tip surgery in the form of adding a vertical tip graft to obtain more definition and projection [2]. Modifications were introduced to the principle, including the use of several layers of grafts and changing the shape or orientation of the tip graft [3].

As regards the Middle Eastern population, the need for increasing tip projection is particularly compelling. This can be explained by the quality of the lower lateral cartilages (LLC) and the overlying skin/soft tissue envelop [4].

The amount of nasal tip projection (NTP) can be assessed using several methods that mainly depend on measurements made on the profile photograph of the patient. Goode [5] proposed his method, which calculates the ratio between the nasal height and the nasal length. Byrd and Hobar [6] saw the best way was to measure the amount of nasal projection beyond the lateral facial profile, which is determined by a line passing from the nasal root to the upper lip. The amount of nasal projection anterior to that line, compared with the total height of the nose, represents a better magnitude of NTP.

In our study, we assessed and compared the reliability of both methods in objectively measuring NTP in the Egyptian population.

Materials and methods

This clinical study included 20 patients from Kasr AlAini, Cairo University Hospital, who underwent augmentation tip rhinoplasty using Sheen graft. All procedures were performed using the 'Closed Rhinoplasty Approach' by same surgeon. The nasal septal cartilage was the graft used for all patients.

Inclusion criterion was being a candidate for graft augmentation of the nasal tip with the objective of increasing tip projection.

Exclusion criteria included congenital anomalies and traumatic conditions affecting the nasal tip area.

Thirteen female and seven male patients were included. Their ages ranged from 18 to 48 years, with an average of 26.7 years. The study was conducted during the period from January 2008 until December 2011.

Postoperative photography was started after 3 months and then repeated in each following visit. Standardized position shots were taken in each visit. The photographs at 9 months postoperatively were used for comparison and assessment of results. The follow-up period ranged from 9 to 35 months, with a mean of 14.3 months.

Assessement of nasal tip projection

Two methods were used to assess the NTP in the preoperative and postoperative photographs. The first method was introduced by Goode [5], whereas the second was introduced by Byrd and Hobar [6].

Goode's method

This method depends on a ratio between the length of the nose (as determined by a line from the root to the tip) and its height (as determined by a line from the ala to the tip). To calculate the NTP using Goode's method, three points (R, A and T) were defined on the projected photo (Fig. 1 and Table 1).

Calculation of the NTP: nasal height (Line Two) divided by the nasal length (Line One) and documented as a percentage. Normal value: 67 (±5).

Byrd's method

This method depends on the percentage of the nose that lies anterior to the upper lip line. To calculate the NTP by Byrd's method, four points and two lines have to be marked.

The four points included the previous three points used in Goode's method (R, A and T), in addition to a point marked on the most projecting point of the upper lip (L) (Fig. 2 and Table 2).

Calculation of the NTP: Line Two (A) divided by Line Two and documented as percentage. Normal value: 55 (±5).

Values were documented in the patient's data-flow sheet.

Table 1 Goode's method

Symbol	Denotes	Marking
Points		
R	Nasal root	Lowest point on the nasal profileExtension of a line from the external canal to the lateral canthus
A	Ala of the nose	Along the alar-cheek junction
T	Most projecting nasal point	The most projecting tip point
Lines		
One	Nasal length	Between point R and T
Two	Nasal height	Between point A and T

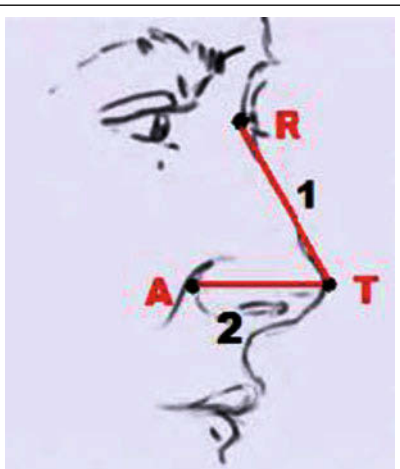
Description of the points and lines used in Goode's method.

Table 2 Byrd's method

Symbol	Denotes	Marking
Points		
R	Nasal root	Lowest point on the nasal profileExtension of a line from the external canal to the lateral canthus
A	Ala of the nose	Along the alar-cheek junction
T	Nasal tip	The most projecting tip point
L	Upper lip	The most projecting point of the upper lip
Lines		
One	Facial profile line	Between point R and L
Two	Nasal height	Between point A and T
Two (A)	Anterior	The segment of Line Two in front of the intersection of Lines One and Two

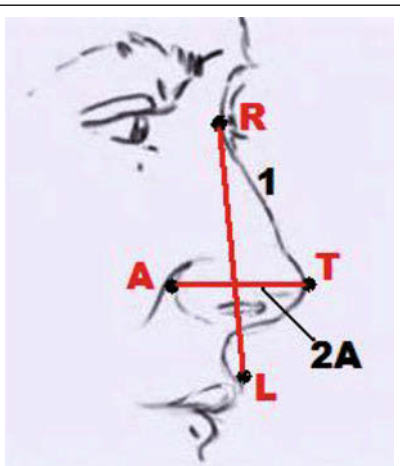
Description of the points and lines used in Byrd's method.

Figure 1



Points (letters) and lines (numbers) used in the calculation of nasal tip projection by Goode's method.

Figure 2



Points (letters) and lines (numbers) used in the calculation of nasal tip projection by Byrd's method.

Simple measurements on two-dimensional photographs were used to assess the results of surgery in this study. More precision in measurement was attempted by applying measurements on large-scale photos projected on white board. As both Goode's and Byrd's methods depend on ratios, there was no worry about changing the scale and obtaining larger photos (Fig. 3).

Subjective assessment

Subjective assessment was performed on two levels, the patient's and the surgeon's impression. A four-point score was used for both the patient and surgeon to document their satisfaction with the end result of surgery. The scores were graded as follows:

0, Bad: results are not accepted and revision surgery is needed.
1, Fair: results are acceptable (mild improvement).
2, Good: results are satisfactory with reservations.
3, Excellent: results are satisfactory without reservations.

Statistical analysis

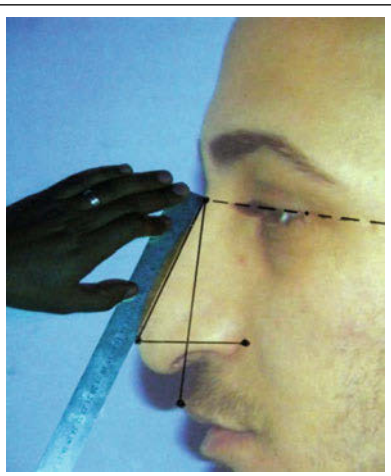
All measurements were documented in the data-flow sheet of the patient. Statistical analysis of the results was then performed using the SPSS, version 15 (IBM corporation, Endicott, New York, USA). Tests used included the independent *t*-test, the χ^2-test and the one-way analysis of variance test.

Results

Preoperative and postoperative tip projection

Preoperative NTP using Goode's method had a mean value of 58.50 ± 4.00 SD, and the postoperative measurement was 70.10 ± 2.93 SD. The mean increase in NTP was 14.00, and it was statistically significant (*P* value = 0.00).

Figure 3



Measurement on the projected photos.

Preoperative NTP using Byrd's method had a mean value of 49.40 ± 2.79 SD, and the postoperative measurement was 58.95 ± 2.92 SD. The mean increase in NTP was 17.21 and it was statistically significant (*P* value = 0.00).

Subjective assessment of surgical outcome: overall result

Patient's and surgeon's assessments of operation outcome are shown in Tables 3 and 4.

Assessment of surgical outcome: gain in the nasal tip projection

Assessment of the difference in the mean value of gain of NTP classified by patient's and surgeon's satisfaction score using either Goode's or Byrd's method of measurement revealed no statistically significant difference. The *P* value was 0.68 and 0.09 for subjective assessment, and 0.69 and 0.20 for objective assessment, respectively (Table 5).

Three representative cases from our study are shown below with their satisfaction scores and NTP measurements using both Goode's and Byrd's methods.

Figure 4 shows a patient with an excellent satisfaction score (3). Both his Goode's and Byrd's indices matched precisely the satisfaction score and overall outcome,

Table 3 Patient's subjective Assessment of surgical outcome

Patient's assessment	Patient [*n* (%)]
Bad	2 (10)
Fair	1 (5)
Good	2 (10)
Excellent	15 (75)

Figure 4

The patient who underwent tip augmentation. Patient satisfaction score: 3; Goode's: before, 53.3; after, 67.5. Byrd's: before, 50.0; after, 55.5.

as both methods show an increase in values from a hypoprojection state to a normoprojection outcome.

Figure 5 shows a patient with an excellent satisfaction score (3). Her Goode's index increased from hypoprojection to normoprojection state, correlating with both patient's and surgeon's satisfaction scores. However, her Byrd's indices did not match with the subjective assessments. It calculated a normoprojection index preoperatively and hyperprojection index postoperatively, which correlated neither to patient's nor to surgeon's assessment and satisfaction.

Figure 6 shows a patient with a Bad satisfaction score (0). This is in correlation with the high postoperative Goode's index denoting hyperprojection, which matched our subjective assessment. However, using Byrd's method postoperatively gave an index within normal, which again shows its inaccuracy in matching both patient's and surgeon's satisfaction. This patient was rescheduled for surgery.

Figure 5

The patient who underwent tip augmentation. Patient satisfaction score: 3; Goode's: before, 56.0; after 66.7. Byrd's: before, 53.5; after 66.7.

Table 4 Surgeon's subjective assessment of surgical outcome

Surgeon's assessment	Patient number (%)
Bad	1 (5)
Fair	1 (5)
Good	7 (35)
Excellent	11 (55)

Discussion

Normal tip projection represents an important objective and a strong challenge for surgeons performing rhinoplasty. This has been stressed on by world renowned surgeons, who exerted much time and effort in this interesting field.

The difficulty in achieving adequate tip projection is both an objective and subjective challenge. This challenge varies on the basis of the ethnic features of the population. Although Caucasian noses are considered a model, Middle Eastern noses represent a greater challenge [7].

There are several surgical ways to increase tip projection. These include transdomal suturing, placement of columellar struts, footplate approximation, nasal spine augmentation and grafting. The multitude of surgical

Figure 6

The patient who underwent tip augmentation. Patient satisfaction score: 0; Goode's: before, 62.2; after, 75.0. Byrd's: before, 42.8; after, 54.0.

Table 5 Assessment of surgical outcome: gain in nasal tip projection

Assessment	Excellent	Good	Fair	Bad	*F*	*P* value
Subjective assessment						
Goode's method	13.33 ± 5.13	11.00	9.62 ± 2.38	10.42	4.87	0.68
Byrd's method	12.33 ± 3.21	13.00	9.62 ± 3.29	8.89 ± 2.29	2.32	0.09
Objective assessment						
Goode's method	12.00	14.00 ± 7.07	10.47 ± 4.54	10.10 ± 4.32	0.48	0.69
Byrd's method	11.00	13.00 ± 4.24	9.47 ± 3.24	8.90 ± 1.86	0.59	0.20

One-way analysis of variance test for the difference in mean value of the gain in nasal tip projection classified by patient's and surgeon's assessment scores.

techniques is the best proof that the challenge has not been solved [8].

In 1972, he presented his triangular nasal tip graft at a meeting of the California Surgical society and then he published his experience with his newly designed graft in 1975. He therefore pioneered the concept of closed tip grafts. He considered the introduction of the tip graft as one of the most important conceptual milestones in his experience [9].

Nasal tip underprojection is a common finding in Egyptians seeking rhinoplasty for different reasons. This might be due to certain anatomical features that characterize the population and account for deficient tip projection. Those features include thick heavy skin, weak floppy LLC and lack of cartilage definition.

Daniel [10] studied the features of Middle Eastern noses in his practice. He found that only 36% of his Middle Eastern noses had thick skin. However, the fixed features were concerning the quality of LLC. These include flat domal segment, lack of dome projection beyond septal angle, long caudal septum pushing the tip downwards and wide asymmetric nasal sills. Azizzadeh and Mashkeyich [4] reported similar results and described the Middle Eastern noses as 'amorphous and hanging'. Lack of projection and definition were referred both to the weak integrity of the LLC and the relatively thicker soft tissue envelop.

In this study, there was no statistical difference in preoperative NTP values using both Goode's and Byrd's methods. However, as regards the postoperative values, there was a significant difference in values when measured by Goode's method as compared with Byrd's method. The mean gain in projection was 11.6 using Goode's method, whereas it was only 9.55 when measured by Byrd's method. This shows that both measures were compatible throughout all phases, except in the postoperative gain.

The lack of correlation between NTP measurement and facial attractiveness may explain the limited satisfaction of some patients included in this study despite the obvious gain in projection documented by measurement.

Devcic *et al.* [11] tried to correlate between different nasal projection quantifying ratios and facial attractiveness. They measured NTP ratios in 300 digital portraits of women aged 18–25 years. The results of their study showed that none of the ratios correlated with facial attractiveness. However, Goode's ratio had the strongest correlation with facial attractiveness.

In light of our results, when we compared the patient's and surgeon's satisfaction scores with their postoperative NTP values using both Goode's and Byrd's methods, we deduce that, in the Egyptian population, Goode's method is more accurate in representing the final overall outcome compared with Byrd's method.

Subjective assessment scores deal with the overall satisfaction (of the patient and surgeon) with the result of surgery, which in turn addressed several aspects of deformity apart from the NTP. Second, the difference in the threshold of satisfaction among patients renders their results relative rather than absolute. Finally, there may be a lack of correlation between NTP and facial attractiveness.

Conclusion

Nasal tip underprojection is a rather common problem in Egyptians seeking advice for rhinoplasty, due to ethnic features of the LLC and the overlying skin. Tip augmentation using autogenous cartilage represents the standard of care in modern rhinoplasty and is considered as the cornerstone in increasing tip projection.

Quantitative measurement of NTP after surgery includes simple measurements on two-dimensional photographs. The two methods designed by Goode and Byrd are the two methods mostly used in the assessment of NTP.

There was significant difference between the gain in projection using the Sheen graft between Goode's and Byrd's method. In the Egyptian population, Goode's method proved to be more accurate in representing the final outcome compared with Byrd's method. This was apparent when correlating the postoperative values of both methods with patient's and surgeon's overall satisfaction.

Larger sample sizes, elimination of multiple variables and more advanced quantitative assessment modalities may alter these results and recommendations.

Acknowledgements

Conflicts of interest

None declared.

References

1 Vuyk HD, Oakenfull C, Plaat RE. A quantative appraisal of change in nasal tip projection after open rhinoplasty. Rhinology 1997; 35:124–129.

2 Sheen JH. Achieving more nasal tip projection by the use of a small autogenous vomer or septal cartilage graft. Plast Reconstr Surg 1975; 56:35–40.

3 Sheen JH. Tip graft: a 20-year retrospective. Plast Reconstr Surg 1993; 91:48-63.

4 Azizzadeh B, Mashkeyich G. Middle Eastern rhinoplasty. Facial Plast Surg Clin North Am 2010; 18:201–206.

5 Goode RL. A method of tip projection measurement. In: Powell HB, editor. *Proportions of the esthetic face*. New York, NE: Thieme-Stratton Inc.; 1984. 15–39.

6 Byrd HS, Hobar PC. Rhinoplasty: a practical guide for surgical planning. Plast Reconstr Surg 1993; 91:642–654.

7 Rohrich RJ, Ghavami A. Rhinoplasty for Middle Eastern noses. Plast Reconstr Surg 2009; 123:1343–1354.

8 Guyuron B, Jackowe D. Modified tip grafts and tip punch devices. Plast Reconstr Surg 2007; 120:2004–2010.

9 Sheen JH. Rhinoplasty: personal evolution and milestones. Plast Reconstr Surg 2000; 105:1820–1852.

10 Daniel RK. Middle Eastern rhinoplasty: anatomy, aesthetics, and surgical planning. Facial Plast Surg 26:2010; 110–118.

11 Devcic Z, Rayikanti BA, Hevia JP, Popenko NA, Karimi K, Wong BJ. Nasal tip projection and facial attractiveness. Laryngoscope 2011; 121:1388–1394.