The Pillars of the Nose-Crura Shortening for Over Projected Nose

Gabriela Kopacheva-Barsova¹, Marina Davcheva-Chakar¹, Nikola Nikolovski¹, Marjan Marolov¹, Vesna Petreska-Dukovska²

¹ENT University Clinic, University Campus “St. Mother Theresa”, Skopje, Republic of Macedonia; ²General Hospital “Remedika”, Skopje, Republic of Macedonia

Abstract

BACKGROUND: The over projected nose, commonly referred to as the “Pinocchio” nose is a significant challenge to the rhinoplasty surgeon. Firstly, we speak about a very large nose, and secondly, we speak about the correction of nasal cartilages (alar and triangular). Surgical correction of the over projected nose is the most difficult and least predictable component of rhinoplasty surgery.

AIM: By performing rhinoseptoplasty we aimed to achieve an ideal landmarks position according to concepts of nasal projection as well as by making preoperative analyses to determine the ideal position for the nasal tip after having understood and defined the ideal position for the nasion.

METHODS: We performed a retrospective study of patients who were admitted to ENT University Clinic, University Campus “St. Mother Theresa” Skopje, the Republic of Macedonia in the period 2011-2019. A total of 70 patients were enrolled in the study; 46 women (33%) and 24 men (33%). Operative technique rhinoseptoplasty was realised in 70 patients. All of the 70 (100%) patients underwent preoperative and postoperative evaluation during this period regularly to record the effects of various approaches on nasal projection, rotation, need for revision, and patient satisfaction.

RESULTS: All patients used one or more of the preferred methods to treat over projection. Patients who had undergone 2 previous rhino/septoplasty procedures were excluded from the study, and hence, a total of 70 patients were evaluated. Full-transfixion incisions were made in all patients. From 2011 to 2019, in 72 cases, 1 or more of the preferred methods were used to treat over projection.

CONCLUSION: The crural anatomy of the nasal tip relates to the size and shape of the lower lateral cartilages (LLC) and their relationship with the caudal septum and upper lateral cartilages (ULC). Modification of nasal tip rotation and projection should attempt to preserve or reconstruct major tip mechanisms.

Introduction

All wisdom starts with the solid foundation of knowledge, maturity, experience, happiness and health. If for a few minutes we stop and look at some great architectural structures, for example, cathedrals, we will notice that they are laid on perfectly designed grounds, covered with concrete blocks to support the building. We can see a variety of shapes, forms, designs, but the strong pillars are crucial supporting architecture.

The same functions have the pillars of the nose; we can reshape and change the foundation and size of the nose; we can play with different forms; we can model the nasal pyramid. But the “pillars” of the nose are very important nasal structures. Thus, in this study, we wanted to discuss the importance of these "pillars of the nose" and to present different surgical methods in resolving over the projected nose. Every rhinoplasty surgeon has to take care of the nasal pillars. The aim of each rhinoplasty surgeon is to establish a balance between facial esthetic harmony and nasal function since they are in perfect unity. If they are separated, then breathing or esthetics is being sacrificed, which is of no interest to both the rhinoplasty surgeon and the nose as a physiological and esthetic unity [1], [2], [3], [4].

The over the projected nose, commonly
referred to as the "Pinocchio" nose is a significant challenge to the rhinoplasty surgeon. Firstly, we speak about a very large nose, and secondly, we speak about the correction of nasal cartilages (alar and triangular), which have to be shortened and remodelled, but it can cause disturbance both to the nasal esthetic appearance and to the nasal function. Therefore, the rhinoplasty surgeon has to plan the surgical intervention thoroughly and to determine the ideal postoperative position of the nose to achieve an ideal esthetic and functional harmony. Surgical correction of the overprojected nose is the most difficult and least predictable component of rhinoplasty surgery. To draw a parallel with the fashion industry: “Less is more” [5], [6].

The over the projected nose is important for aesthetic and functional reasons. The rhinoplasty surgeon must understand the concepts of nasal projection and with preoperative analyses to determine the ideal position for the nasal tip after having understood and defined the ideal position for the nasion.

The anatomy of the nasal tip is in close relation with its "pillars": lower lateral cartilages (LLC), upper lateral cartilages (ULC) and their connection with the caudal septum. Any surgical intervention that might cause their distinct reshaping and resise can lead to disturbance of these supporting pillars, nasal mechanisms that can have an impact on the nasal function or irregularities in the esthetics. Many authors have discussed ways to deproject the tip and shorten the nose [7], [8].

Nasal tip projection has to be in relation not only to the nasal dorsum but also to overall facial proportions. Rhino/septoplasty manoeuvres can increase, preserve, or decrease nasal tip projection. Therefore, they have to be chosen properly (Figure 1).

![Anatomy of the nasal tip: lower lateral cartilages (LLC), caudal septum and upper lateral cartilages (ULC) [9]](image)

Nasal tip projection is defined as the length of the perpendicular drawn from the vertical facial place to the tip-defining point [10], [11].

Nasal tip support has typically been classified as major and minor. Major tip support mechanisms were first described by Janke and Wright and have been further studied.

The "Tripod concept" is an oversimplification of nasal tip dynamics and emphasises the intimate relationship between projection and rotation. It also determines the position of the nasal tip. Each lateral crus represents the lateral legs of the tripoid, while the medial crus constitutes the central leg. The "Tripod concept" also highlights the effect of the operative procedure on one limb may have on the spatial position of the entire nasal tip [12], [13], [14], [15] (Figure 2).

![The "Tripod concept" [16]](image)

Preoperative evaluation is necessary to prepare patients for surgical treatment. First of all, patients’ preoperative photographs were obtained to give the surgeon a clear picture of the correct amount of necessary surgical reduction. The nasal projection was measured from the alar facial groove to the tip-defining point. The amphas (horizontal plane) and profile view are important to show the irregularities of the nasal dorsum (dorsal hump), nasal length, nasofrontal angle, naso-facial angle, nasolabial angle [17], [18] (Figure 3).

![Profile view measurements [19]](image)
The nasal skin is very important because the thick skin can cause more postoperative oedema and scarring, and less refinement is noticeable. Thin skin is more predictable healing, but less forgiving of minor asymmetries. Palpation of the nose helps in determining tip support, identifying septal character and better visualisation of the cartilages.

Considering the surgical anatomy, "the pillars of the nose" are lower lateral cartilages (LLC), upper lateral cartilage (ULC), medial crus, nasal dome, lateral crus, which are important in defining the nasal tip and projection. The term crural arch refers to the alar cartilage, which components arches are the lateral crura and the medial crura. They are joined by a transitional segment of cartilage in the domal region, which is termed the intermediate crura. The tip-defining point refers to the highest point of the tip cartilages [20], [21], [22] (Figure 4).

Several techniques of deprojecting nose have been described, and most involve weakening, dividing or excising segments of the alar area. The most commonly used techniques are delivery approach, non-delivery approach and "Open Nose" approach. The delivery approach allows better visualisation of cartilaginous structures but requires more extensive dissection, more tissue trauma and greater risk of tip oedema but slightly increased risk of postoperative scarring. Non-delivery approach is less traumatic with less tip oedema, but allows poor visualisation of the cartilage and sacrificing of the scroll area. The "Open nose" technique allows the best visualisation of the cartilaginous skeleton, but the risk is that columellar incision has potential for scarring. Tip oedema is significant, and it makes intraoperative assessment more difficult.

The last step in correcting the over projected tip is decreasing the ala and sill of the nostril. Upon completion of the deprojection, a widened nasal base is left. If necessary, osteotomies are applied at this point. The incisions are closed and a routine dressing is applied [24], [25], [26], [27], [28].

In this study, we wanted to present that the application of contemporary rhinoplasty techniques has increased the surgeon’s ability to control tip projection, without disruption of the domes and medial crura. With the loss of tip support, scar contracture has led to an increased incidence of postoperative tip ptosis, alar insufficiencies, nasal asymmetries and other tip deformities.

Material and Methods

We performed a retrospective study of patients who were admitted to ENT University Clinic, University Campus "St. Mother Theresa" Skopje, the Republic of Macedonia in the period 2011-2019.

A total of 70 patients were enrolled in the study; 46 women (33%) and 24 men (33%). The age of the patients ranged from 16 to 50 years (mean age ± SD 33 ± 5.6 min = 16 max = 50). Operative technique rhinoseptoplasty was realised in 70 patients.

Inclusion criteria for septo/rhinoplasty were: patients older than 16 years, patients with nasal septal deviation, nasal obstruction as a result of nasal septal deviation, rhinokyphosis, rhinoscoliosis, rhinolordosis, functional tension nose, saddle nose, moderate to severe degree of nasal obstruction detected with functional tests. All of those patients had nasal tip asymmetries and over the projected nose.

The exclusion criteria for septo/rhinoplasty were: severe nasal deformities that were to be managed with an open approach, septo/rhinoplasty after verified malignant processes of the nose and nasal septum, severe degree of nasal obstruction caused by chronic rhinosinusitis without changes in the nasal septum or nasal pyramid, cardiovascular and other chronic diseases, coagulopathies and diseases of the hematopoetic system, autoimmune diseases. All of the 70 patients gave oral consent that their images can be used for research-medical purposes.

All of the 70 (100%) patients underwent preoperative and postoperative evaluation during this period regularly to record the effects of various approaches on nasal projection, rotation, need for revision, and patient satisfaction. All patients used one or more of the preferred methods to treat over projection. Patients who had undergone 2 previous rhino/septoplasty procedures were excluded from the study, and hence, a total of 70 patients were evaluated. Full-transfixion incisions were made in all patients.
Results

A total of 70 patients were enrolled in the study; 46 women (33%) and 24 men (33%). The age of the patients ranged from 16 to 50 years (mean age ± SD 33±5.6 min=16 max=50). Operative technique rhinoseptoplasty was realised in 70 patients (Table 1).

Table 1: Demographic characteristics of the patients

| Variable                      | Men    | Women  |
|-------------------------------|--------|--------|
| Gender n (%)                  | 24 (34.3%) | 46 (65.7%) |
| Age (year) Mean ± sd          | 33±5.6 | 5.6 min=16 max=50 |

The preoperative data showed the following results: 47 (67.14%) patients had rhinoseptoplasty for the first time, 9 (12.9%) patients had had the previous rhinoplasty performed by another physician, 13 patients (18.6%) were classified as having tension nose and only 1 (1.4%) patient had congenital tip deformity. There were no cases of postoperative functional complaints (Figure 5).

The operative procedures included full-transfixion incision, release of tension septum, lateral crural overlay (LCO) in 12 (17%) of patients, dome truncation in 12 (17%) of patients, medial crural overlay (MCO) in 12 (20%) of patients and combinations of both techniques were performed in 32 (46%) of patients (Figure 6).

In further medical attention in the postoperative period, we made major and minor secondary revision procedures, monitored for postoperative complications, and any functional complaints. Sixty-three (90%) patients were satisfied without qualification, 3 (4.3%) were not satisfied and went for revision surgery, 2 (2.9%) patients underwent radix graft after the first rhinoseptoplasty, and 2 (2.9%) of the patients wanted to have minor revision of the dorsal irregularities (Figure 7).

Case study

Case 1: Rhinokyphosis (nasal septal deviation) DSN. Closed approach, reducing of the nasal hump, rasping of the dorsum, medial and lateral osteotomy, septal medioposition, resection of lateral alar cartilages for alar rim grafts, tip reconstruction with dome suturing (Fig. 8).

Case 2: "Pinocchio" nose, rhinokyphosis, DSN, closed approach, reducing of the nasal hump, rasping of the dorsum, medial and lateral osteotomy, septal medioposition, resection of lateral alar cartilages for alar rim grafts, tip reconstruction with dome suturing (Fig. 9).
Case 3: Overprojected nose. Rhinokyphosis, DSN. Closed approach, reducing of the nasal hump, rasping of the dorsum, medial and lateral osteotomy, septal medioposition, resection of lateral alar cartilages for alar rim grafts, tip refinement (Fig. 10).

Case 4: Overprojection nose, DSN. Closed approach, the rasping of the dorsum, medial and lateral osteotomy, septal medioposition, resection of lateral alar cartilages for alar rim grafts, tip reconstruction with dome suturing (Fig. 11).

Case 5: Overprojected nose. Rhinokyphosis, DSN. Closed approach, reducing of the nasal hump, rasping of the dorsum, medial and lateral osteotomy, septal medioposition, resection of lateral alar cartilages for alar rim grafts, tip refinement (Fig. 12).

Case 6: Overprojection nose, DSN. Closed approach, the rasping of the dorsum, medial and lateral osteotomy, septal medioposition, resection of lateral alar cartilages for alar rim grafts, refinement of the nasal tip (Fig. 13).

Discussion

Surgery of over projecting nose has become significantly more complex since the introduction of tip grafting and the many suture designs that followed open rhinoplasty. Two nasal tip features require mandatory preoperative identification: whether the tip is adequately projecting and whether the alar cartilage lateral crura are orthotopic or cephalically rotated (malpositioned).

According to literature, only 33% of the patient population have adequate preoperative tip projection, and only 54% have inadequate lateral crura, whereas 46% of the patients have lateral crura cephalically rotated [29], [30], [31], [32].
Numerous authors have (pointed to the tripod theory and) suggested that when the medial crura are shortened about the lateral crura, there is a high tendency for alar flaring. However, this was not the case with our patients when we used MCO. When MCO was used alone, no cases needed alar base reduction. Even more surprising was our finding that in our entire experience with deprojection, only 7.5% of the patients needed alar base reduction, and many of these patients desired this reduction before deprojection [33], [34], [35], [36].

The surgeon can reduce excessive tip support mechanisms, reduce overdeveloped anatomic components, and normalise adjacent anatomic components.

As with any rhinoplasty, tip asymmetries can arise. Compared to literature reports, our revision rate of tip irregularity is low. Also, a larger number of patients have been satisfied with the operative procedure undertaken, and there has been no nasal obstruction. Being satisfied with the esthetic appearance, patients recovered their self-confidence and showed better social adaptation [37], [38], [39], [40].

In conclusion, from an aesthetic point of view, this type of operative procedure is superior in resolving overprojected nose.

References

1. Perkins SW. Anatomy and Physiology. In: Krause ChJ. Aesthetic facial surgery. Philadelphia: Lippincott Company; 2003.
2. Pirsig W, Kern EB, Verse T. Reconstruction of anterior nasal septum: back-to-back autogenous ear cartilage graft. Laryngoscope. 2004; 114:627-638. https://doi.org/10.1002/lary.2058
3. Rettinger G. Aktuelle Aspekte der Septorinoplastik. Otorhinolaryngol Nova. 2005; 84:2-42.
4. Samad I, Stevens HE, Maloney A. The Efficacy of nasal septal surgery. J Otolaryngol (Canada), 1992; 21:88-91.
5. Silver WE, Zuliani GF. Management of the overprojected nose and ptotic nasal tip. Aesthet Surg J. 2009; 29(3):253-8. https://doi.org/10.1016/j.asj.2009.01.020 PMid:19608076
6. Kridel RW, Konior RJ. Dome truncation for management of the overprojected nasal tip. Ann Plast Surg. 1990; 24(5):385-96. https://doi.org/10.1097/00000637-199005000-00001 PMid:2350149
7. Sands NB, Adamson PA. Nasal tip deprojection with crural cartilage overlap: the M-arch model. Facial Plast Surg Clin North Am. 2015; 23(1):93-104. https://doi.org/10.1016/j.fsc.2014.09.007 PMid:25430931
8. Sykes JM. Management of the middle nasal third in revision rhinoplasty. Facial Plast Surg. 2008; 24(3):339-47. https://doi.org/10.1055/s-0028-1083087 PMid:18951320
9. Gubisch W, Eichhorn-Sens J. The sliding technique: a method to treat the overprojected nasal tip. Aesthetic Plast Surg. 2008; 32(5):772-8. https://doi.org/10.1007/s00228-008-9211-1 PMid:18661172
10. Foda HM. Alar setback technique: a controlled method of nasal tip deprojection. Arch Otolaryngol Head Neck Surg. 2001; 127(11):1341-6. https://doi.org/10.1001/archotol.127.11.1341 PMid:11701071
11. Funk E, Chauhan N, Adamson PA. Refining vertical lobule division in open septrhinoplasty. Arch Facial Plast Surg. 2009; 11(2):120-5. https://doi.org/10.1016/j.archfacial.2008.02.027 PMid:19289685
12. Pedroza F, Pedroza LF, Achiques MT, Felipe E, Becerra F. The tripod graft: nasal tip cartilage reconstruction during revision rhinoplasty. JAMA Facial Plast Surg. 2014; 16(2):93-101. https://doi.org/10.1001/jamafacial.2013.2348 PMid:24458140
13. Gubisch W, Eichhorn-Sens J. Overresection of the lower lateral cartilages: a common conceptual mistake with functional and aesthetic consequences. Aesthetic Plast Surg. 2009; 33(1):6-13. https://doi.org/10.1001/archfacial.2008.67 PMid:19037690
14. Alexander AJ, Shah AR, Constantinidies MS. Alar retraction: etiology, treatment, and prevention. JAMA Facial Plast Surg. 2013; 15(4):268-74. https://doi.org/10.1001/jamafacial.2013.151 PMid:23619765
15. Menick FJ. Aesthetic and reconstructive rhinoplasty: a continuum. J Plast Reconstr Aesthet Surg. 2012; 65(9):1169-74. https://doi.org/10.1016/j.bjps.2012.04.017 PMid:22554677
16. Givens V, Sykes J. The Tripoid Concept of the Upper Nasal Third. Facial Plast Surg 2019; 21(6):498-503. https://doi.org/10.1001/jamafacial.2019.0884 PMid:31647524
17. Menick FJ, Salibian A. Primary intranasal lining injury cause, deformities, and treatment plan. Plast Reconstr Surg. 2014; 134(5):1045-56. https://doi.org/10.1016/j.prs.2014.05.007 PMid:25347637
18. Weber SM, Baker SR. Management of cutaneous nasal defects. Facial Plast Surg Clin North Am. 2009; 17(3):395-417. https://doi.org/10.1016/j.fsc.2009.05.005 PMid:19698919
19. Soliemanzadeh P, Kridel RW. Nasal tip overprojection: algorithm of surgical deprojection techniques and introduction of medial crural overlap. Arch Facial Plast Surg. 2005; 7(6):374-80. https://doi.org/10.1016/j.archfacial.2005.04.004 PMid:16301456
20. Solomon P, Rival R, Babini A, Boyd J. Transfixion incision as an initial technique in nasal tip deprojection. Can J Plast Surg. 2008; 16(4):224-227. https://doi.org/10.1177/229255030801600412 PMid:19949502 PMCID:PMC2691028
21. Huizing E. Implantation and transplantation in reconstructive nasal surgery. Rhinology. 1974; 12:93-106.
22. Huizing E, de Groot JAM. Functional reconstructive nasal surgery. Thieme; 2003. https://doi.org/10.1055/b-0034-40789
23. Tardy ME Jr, et al. Micro-osteotomy in Rhinoplasty. Facial Plast Surg. 1984; 1:137-145 29. https://doi.org/10.1055/s-0028-1085244
24. Jacobson WE, et al. Psychiatric evaluation of male patients seek in cosmetic surgery. Plast. Reconstr. Surg. 1950; 26:356. https://doi.org/10.1097/00006653-196010000-00003 PMid:13788613
25. Killian G. The submucous window resection of the nasal septum. Ann Otol Rhinol Laryngol. 1905; 14:363. https://doi.org/10.1177/00034894901001400020
26. Lemmens W, Lemmens P. Septal suturing following nasal septoplasty, a valid alternative for nasal packing. Acta Otorhinolaryngol Belg. 2001; 55:215-221.
27. Midana R, Krajina Z. The influence of the caudal process on the formation of septal deformities. Rhinology. 1999; 27:113-118.
28. Seltzer A. The nasal septum: plastic repair of the deviated septum associated with deflected tip. Arch Otolaryngol. 1996; 40:433-444. https://doi.org/10.1001/archotol.1994.00680020563001
30. Rettinger G, Steininger H. Lipogranulomas as Complications of Septorhinoplasty. Arch Otolaryngol Head Neck Surg. 1997;
31. Rettinger G, Kirsche H. Complications in septoplasty. Facial Plast Surg. 2006; 22:289-297. https://doi.org/10.1055/s-2006-954847 PMid:17131271

32. Tardy ME Jr, Kron TK, Younger R, Key M. The Cartilaginous Pollybeak: Etiology, Prevention, and Treatment. Facial Plast Surg. 1983; 6:113-120. https://doi.org/10.1055/s-2006-1064718 PMid:2487866

33. Murakami CS, Larrabee WF Jr. Comparison of Osteotomy Techniques in the Treatment of Nasal Fractures. Facial Plast Surg. 1992; 8:209-219. https://doi.org/10.1055/s-2008-1064652 PMid:1286831

34. Sheen JH. Spreader Graft: A Method of Reconstructing the Roof of the Middle Nasal Vault Following Rhinoplasty. Plastic and Reconstructive Surgery. 1984; 73(2):230-239. https://doi.org/10.1097/00006534-198402000-00013

35. Toriumi DM, Josen J, Weinberger M, Tardy ME Jr. Use of Alar Batten Grafts for Correction of Nasal Valve Collapse. Arch Otolaryngol Head Neck Surg. 1997; 123:802-808. https://doi.org/10.1001/archotol.1997.01900080340002 PMid:9260543

36. Menger DJ. Lateral Crus Pull-up. Arch Facial Plast Surg. 2006; 8:333-337. https://doi.org/10.1001/archfaci.8.5.333 PMid:16982991

37. McCollough EG, Mangat D. Systematic Approach to Correction of the Nasal Tip in Rhinoplasty. Arch Otolaryngol. 1981; 107:12-6. https://doi.org/10.1001/archotol.1981.00790370014002 PMid:7468673

38. Adamson PA, Litner JA. Applications of the M-arch Model in Nasal Tip Refinement. Facial Plast Surg. 2006; 22:42-48. https://doi.org/10.1055/s-2006-939951 PMid:16732503

39. Adamson PA, Funk E. Nasal tip dynamics. Facial Plast Surg Clin North Am. 2008; 17:29-49. https://doi.org/10.1016/j.fsc.2008.09.008 PMid:19181279

40. Byrd HS, Andochick S, Copit S, Walton KG. Septal Extension Grafts: A Method of Controlling Tip Projection Shape. Plast Reconstr Surg. 1997; 100:999-1010. https://doi.org/10.1097/00006534-199709001-00026 PMid:9290671