ORIGINAL ARTICLE

Rhinoplasty surgery with carved silicone nasal tip graft performed at a clinic in Lima, Peru, in 2022

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ABSTRACT

Objective: To demonstrate the stability of the nasal tip over time with the use of carved silicone among patients with nasal tip stability deficit, previous aesthetic rhinoplasty and manipulation of the nasal septum.
Materials and methods: A descriptive, analytical, interventional study using the nasal tip stabilization reconstruction technique performed at a private clinic in the city of Lima, Peru, in 2022. The study included 22 patients between the ages of 30 and 55 with tip instability, previous rhinoplasty and manipulated nasal septum, without comorbidities. The patients were evaluated at intervals of one, three and six months as well as one year after the reconstruction and stabilization of the nasal tip. Non-probabilistic sampling was performed. No sample was used, since the total number of patients who met the inclusion criteria were included. All the participants underwent the surgical technique with carved silicone.
Results: Using the surgical technique with carved silicone, less bleeding and less bruising were observed. In the follow-up one year after surgery, the technique maintained similar characteristics over time, in both alignment and height of the nasal tip. One case of extrusion of the silicone sheet was evidenced as a complication following trauma caused by a patient's fall.
Conclusions: Silicone is widely accepted as a material employed for facial contouring with extended use in rhinoplasty. Our study demonstrated that it provides long-lasting nasal tip support. It is a viable alternative in rhinoplasties that do not have autologous cartilage or where the use of an alternative to costal cartilage is sought. Silicon, being a readily available synthetic material that is easily moldable and does not reabsorb, is a useful alternative that shortens operating time and maintains tip projection.

Keywords: Nasal Surgical Procedures; Rhinoplasty; Nasal Cavity; Surgery, Plastic (Source: MeSH NLM).

INTRODUCTION

The nasal tip is a mobile anatomical structure supported by a combination of bone, cartilage and soft tissue, with its shape significantly influenced by facial muscles. As the most prominent portion of the nose, it is one of the most important aesthetic substructures at the time of reconstruction. Changes to the nasal tip largely determine the volume and direction of airflow entering the nostrils. Given its association with the nasal valves, any alteration in the cross-sectional area may affect the airflow into the respiratory tract [1,2].

Stabilizing the nasal tip presents a challenge for plastic surgeons, particularly when dealing with patients who have insufficient or inadequate quadrangular cartilage, calcified costal cartilage or a preference to avoid chest scars from the extraction of costal cartilage for nasal restructuring. Currently, scientific advances in alloplastic grafts—such as silicone, porous polyethylene, polytetrafluoroethylene and hydroxyapatite—in the design of implants have expanded the surgeon's options for nasal reconstruction. Several studies have demonstrated low complication rates for these materials, with silicone being a prominent choice. Its widespread medical use and ability to deliver long-lasting results make it a preferred material among plastic surgeons [3,4].

Silicone has been widely accepted as a material employed for facial contouring over the past five decades, with extended use in rhinoplasty. It is used for dorsal augmentation, especially in Asian populations, where silicone grafts are preferred over autologous tissue for nasal support [5].

Silicone is an elastic, non-degradable, non-porous, moldable and autoclavable solid material, commonly used in soft tissue applications due to its low reactivity.

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MATERIALS AND METHODS

Study design and population

A descriptive, analytical, longitudinal and interventional study conducted at a private clinic in the city of Lima, Peru, in 2022. A total of 22 patients, aged 30 to 55 years and of both sexes, who visited the Plastic Surgery Unit between January 2021 and January 2022, participated in the study. These patients presented in the clinic with a history of previous rhinoplasty with tip instability and manipulated nasal septum, without comorbidities. A non-probability sampling was employed; however, no sample was selected, as all patients meeting the inclusion criteria were enrolled in the study. All participants underwent a surgical procedure using carved silicone [8,9].

Variables and measurements

The height of the nasal tip was measured using a ruler and a surgical caliper. This measurement was taken from the subnasal point to the most prominent point of the nasal tip.

The study aimed to evaluate the stability of the nasal tip using carved silicone at intervals of one, three, six and nine months as well as one year after the procedure. Additionally, it sought to identify any potential complications.

Statistical analysis

A statistical analysis comparing the baseline measurement with follow-up measurements at one, three, six and twelve months revealed highly significant changes ($p < 0.001$). The technique demonstrated consistent results over time [6,7]. Among the 22 patients evaluated, one experienced extrusion of the silicone sheet as a complication.

Ethical considerations

The study adhered to ethical principles, including beneficence, justice and non-maleficence. Patient confidentiality was safeguarded through informed consent, in which participants authorized and confirmed their involvement prior to the intervention. The research was approved by the clinic's ethics committee.

RESULTS

One case involved a 40-year-old female patient who underwent secondary rhinoplasty using a silicone graft as tip support and a cartilage spreader (Figure 1).

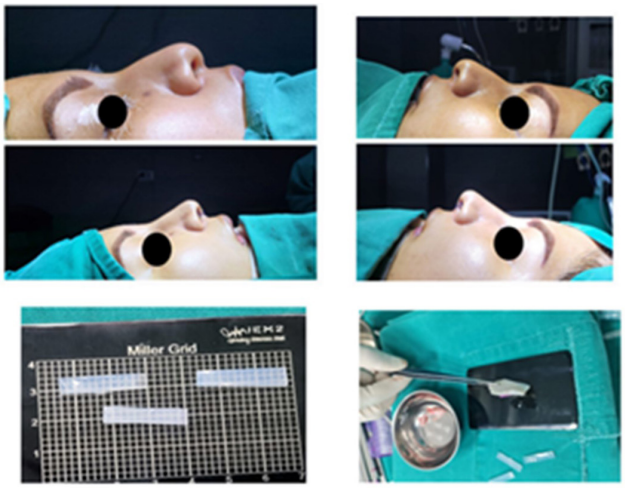

Figure 1. Surgical results of secondary rhinoplasty using a silicone graft as tip support and a cartilage spreader in a female patient

Another case included a 45-year-old female patient who also underwent secondary rhinoplasty using a silicone graft as tip support and a cartilage spreader. The silicone sheets were carved on a Miller cartilage grid to create two septal spreaders and a tip support. The dimensions of the septal spreaders were 3–4 cm in length, 4 mm in width and 2 mm in thickness. The tip support had the following measurements: 3–4 cm in length, 4 mm in width and 2 mm in thickness. It should be noted that these measurements were approximate, as the skin phenotype of each patient was taken into account when carving the silicone. Subsequently, a V-shaped incision resembling the Cadillac emblem was made at the columellar-labial angle, taking great care to avoid injuring the medial crura. Using very fine skin hooks, the thickest possible skin flap was lifted, progressing upwards to expose the tip and dorsum. The cartilaginous and bony hump was then resected, revealing the quadrangular cartilage (Figure 2).

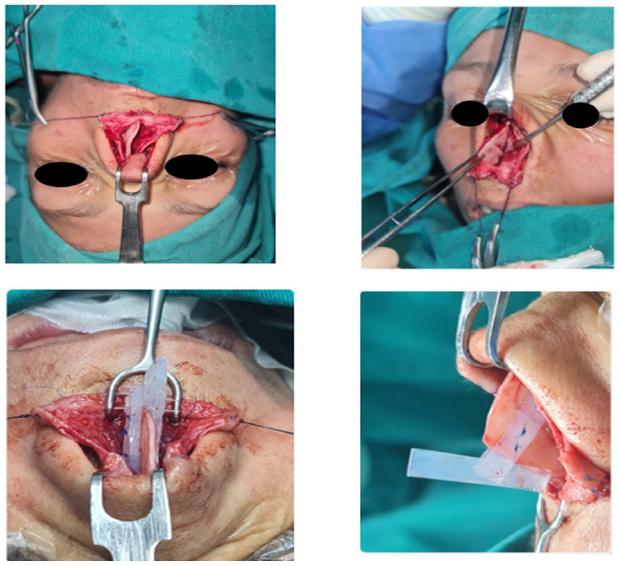

Figure 2. V-shaped incision resembling the Cadillac emblem at the columellar-labial angle

Figure 3. Secondary rhinoplasty technique using silicone graft in a 30-year-old patient

Finally, after forming the new domes, the two septal spreaders and the tip support were positioned and secured using 6-0 polypropylene sutures. In some cases, it was necessary to disarticulate and reposition the septal cartilage to correct the deviation.

A further case involved a 30-year-old patient who underwent secondary rhinoplasty using a silicone graft as tip support and a cartilage spreader. The septal spreaders were completely covered by mucosa, and the tip support was placed in the space between the medial crura. Throughout the procedure, the integrity of the nasal mucosa was maintained. Before closure, the skin was checked to ensure minimal tension prior to suturing (Figure 3).

During the study period, 22 aesthetic and functional rhinoplasties were performed. The used surgical technique resulted in minimal bleeding, which subsided within minutes with the application of pressure and cold compresses. The hematomas resolved within a week, coinciding with the first post-operative control visit (Table 1).

At the three-month follow-up, relative changes were observed in 25 % of the participants. Notably, the nasal tip descent was almost imperceptible for improving facial harmony, although it provided an aesthetically balanced appearance. Follow-up evaluations were conducted at one, three, six and twelve months to confirm the absence of significant changes [11,12].

Table 1. Measurement of nasal height and its evolution over time: summary of cases

		PREOPERATIVE PERIOD	POSTOPERATIVE PERIOD			
		Before surgery (mm)	1 month (mm)	3 months (mm)	6 months (mm)	12 months (mm)
1	TIP	33	31	31	31	29
2	TIP	42	41	41	41	40
3	TIP	45	43	43	43	41
4	TIP	35	37	37	37	37
5	TIP	31	28	28	28	28
6	TIP	45	43	43	43	42

		PREOPERATIVE PERIOD	POSTOPERATIVE PERIOD			
		Before surgery (mm)	1 month (mm)	3 months (mm)	6 months (mm)	12 months (mm)
7	TIP	39	37	37	37	36
8	TIP	32	30	30	30	30
9	TIP	36	34	34	34	34
10	TIP	46	44	44	43	42
11	TIP	45	43	42	42	42
12	TIP	34	31	31	31	30
13	TIP	40	37	37	37	36
14	TIP	41	39	39	39	38
15	TIP	35	33	33	33	31
16	TIP	42	39	39	39	38
17	TIP	34	32	32	32	30
18	TIP	43	40	40	40	41
19	TIP	40	37	37	37	37
20	TIP	45	43	43	43	43
21	TIP	33	31	31	31	30
22	TIP	47	45	45	45	44

Tables 1 and 2 present the variations in average nasal height during monthly follow-ups. Before surgery, the patients had an average nasal height of 39.23 mm. After the twelve-month follow-up, the average decreased to 36.32 mm. Statistical analysis revealed highly significant changes when comparing the baseline measurement with follow-up measurements at one, three, six and twelve months ($p < 0.001$).

Table 2. Evolution of nasal tip height

	n	Minimum	Maximum	Mean	SD	*p*
Before surgery (mm)	22	31	47	39.23	5.218	0.000
1 month (mm)	22	28	45	37.18	5.243	0.000
3 months (mm)	22	28	45	37.14	5.194	0.000
6 months (mm)	22	28	45	37.09	5.135	0.000
12 months (mm)	22	28	44	36.32	5.259	0.000

The data demonstrate that the technique maintains consistent results over time. Among the 22 study participants, one experienced extrusion of the silicone sheet as a complication (due to an accidental fall), which required removal of the silicone nasal implant [13,14].

It was further demonstrated that silicone is appropriate for selected cases of lengthening surgery because of its moldability with heat, carvability and biocompatibility. Additionally, silicone pieces can be sutured or screwed as needed. Its hardness is comparable to that of cancellous

bone at room temperature, exhibiting thermoplastic properties that make it easily moldable after immersion in high-temperature saline solution. Silicone also achieves optimal fixation in the growing tissue to the underlying bone when implanted in the subperiosteal pocket [15-17].

Rhinoplasty in patients with cartilage deficiency remains a complex and technically challenging procedure. However, in a significant percentage of cases, the aesthetic and functional improvements achieved with carved silicone are long-lasting. Grafts are tissues used to replace lost or defective structures, restoring both nasal aesthetics and function [6,18].

DISCUSSION

Autologous costal cartilage grafts have been used for years to provide nasal tip projection and stability due to their characteristics, including biocompatibility and very low rates of rejection and extrusion. For these reasons, alternative materials have been explored to offer sustained nasal tip stability, one of which is silicone. Silicone has the necessary properties to provide adequate tip support, particularly in cases where the nose has limited projection and thick skin, which are common characteristics in our population [19-21].

In their study, Erlich M et al. reported that silicone nasal augmentation is both safe and effective for moderately increasing nasal height, with no associated risk of infections. Furthermore, they highlighted the importance of molding silicone to match the skin phenotype, reducing the risk of extrusion. Our study included participants with thick skin, which likely contributed to the low incidence of complications [22].

Jung DH et al. demonstrated that implants cause long-term capsular calcification, potentially leading to morphological changes [23]. In our study, one participant exhibited such changes, resulting from the extrusion of the silicone sheet, which caused a decrease in nasal height and retraction of the surrounding mucosa. This underscores the importance of ensuring complete coverage of the silicone sheet, whether by mucosa or adjacent tissue, and avoiding excessive skin tension. No morphological changes attributed to capsular contraction of the silicone sheet were observed within the evaluated time frame, as such changes typically occur after five to six years [23].

In conclusion, autologous costal cartilage grafts have been used for years to provide nasal tip projection and stability due to their characteristics, including biocompatibility and very low rates of rejection and extrusion. For these reasons, alternative materials have been explored to offer sustained nasal tip stability, one of which is silicone. Silicone has the necessary properties to provide adequate tip support, particularly in cases where the nose has limited projection and thick skin, which are common characteristics in our population [24,25].

The use of carved silicone provides long-lasting nasal tip support. It is a viable alternative for patients who do not have autologous cartilage or where the use of an alternative to costal cartilage is sought. The choice of material for tip projection should be guided by the patient's specific needs and conditions, as well as the surgeon's expertise [26,27].

Silicone, as an available synthetic material that is easily moldable and non-resorbable, presents a useful alternative that shortens operative time and maintains tip projection. All materials used as structural supports in rhinoplasty have particular benefits. Efforts continue to identify the ideal alloplastic graft for augmentation rhinoplasty [28,29].

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BIBLIOGRAPHIC REFERENCES

1. Lozano Ruiz EA, Malagón Hidalgo HO, Pérez Dosal MR. Revisión sistemática de modelos de entrenamiento en rinoplastia. Cir plást iberolatinoam [Internet]. 2019;45(3):285-94.
2. Abarca A, Naser Alfredo G, Pardo JJ. Aplicaciones de materiales aloplásticos en rinoplastia. Rev Otorrinolaringol Cir Cabeza Cuello [Internet]. 2010;70:259-64.
3. Morena Serna M, Barberá MT. Cirugía plástica y reconstructiva facial [Internet]. España: Ponencia Oficial de la Sociedad Española de Otorrinolaringología y Patología Cérvico-Facial, 2012. Available from: https://seorl.net/PDF/ponencias%20oficiales/2012%20Cirug%C3%ADa%20pl%C3%A1stica%20y%20reconstructiva%20facial.pdf
4. Olsoff Pagovich PJ, Ochoa Gómez JR, Cedillo Ley MP, Valle Aguilar CF, Cárdenas Salomón CM. Reconstrucción nasal con materiales autólogos y alóplásicos. An Med (Mex) [Internet]. 2009;54(1):32-9.
5. Alvo A. Rinoplastía y rinoseptoplastia funcional: Mejorando la función nasal más allá de la cirugía del tabique y los cornetes nasales. Rev Otorrinolaringol Cir Cabeza Cuello [Internet]. 2020;80(3):360-6.
6. Vallarta-Rodriguez A, Chávez-Osorio FD, Rojas-García P, Gonzáles-Alvarado C, Vallarta-Compeán S. Rinoplastia funcional y estética, fusionando conceptos. Cir plást iberolatinoam [Internet]. 2018;44(4).
7. Canto Vidal B, Canto Vigil T. Rinoplastia en la nariz mestiza y negroide: una preocupación de todos. Medisur [Internet]. 2010;8(1):26-31.
8. Colombo C, Gutierrez A, Aponte C. Manejo de la proyección de la punta nasal con injerto autólogo tipo extensor septal caudal. Seguimiento a un año. Cir plást iberolatinoam [Internet]. 2018;44(4):363-75.
9. Soria JH, Conde GC, Tuero A, Cachay-Velásquez H. Abordaje de la punta nasal problemática. Cir plást iberolatinoam [Internet]. 2013;39(4):333-9.

10. Shubailat G. Secondary Rhinoplasty. IJPS [Internet]. 2008;41(3):80-7.
11. Frame JD. New concepts in nasal tip rhinoplasty. Oral Maxillofac Surg Clin North Am [Internet]. 2021;33(1):71-82.
12. Perkins S, Patel A. Endonasal suture techniques in tip rhinoplasty. Facial Plast Surg Clin North Am [Internet]. 2009;17(1):41-54.
13. Sabry H, Salem I, Ghozlan NA, Zedan AA. Evaluation of different techniques in management of secondary rhinoplasty cases. Clin Case Studi Rep [Internet]. 2020;3(1):1-4.
14. Casanueva FL. Injertos de punta nasal en rinoplastia primaria. Rev Otorrinolaringol Cir Cabeza Cuello [Internet]. 2016;76(1):21-30.
15. Deva A, Merten S, Chang L. Silicone in nasal augmentation rhinoplasty: a decade of clinical experience. Plast Reconstr Surg [Internet]. 1998;102(4):1230-7.
16. Koen I, Kadir S. Measurement of preoperative and postoperative nasal tip projection and rotation. Arch Facial Plast Surg [Internet]. 2006;8(6):411-5.
17. Rohrich RJ, Kurkjian TJ, Hoxworth RE, Stephan PJ, Mojallal A. The effect of columellar strut graft on nasal tip position in primary rhinoplasty. Plast Reconstr Surg [Internet]. 2012;130(4):926-32.
18. Gálvez Chávez JC. Rinoplastia abierta, experiencias en el Hospital Clínicoquirúrgico Hermanos Ameijeiras (1977-2005). Rev Cubana Cir [Internet]. 2005;44(4):12.
19. Canto VB, Viera DÁ, Aguilar CD, Aguilar Colina D, Mesa BR, Gil EO. Resultados de rinoplastia abierta en pacientes portadores de deformidades nasales. Medisur [Internet]. 2017;15(1):126-33.
20. Mottura A, Cremona P. Rinoplastia estética primaria cerrada. Revisiones durante tres años. Cir plást iberolatinoam [Internet]. 2020;46(3):283-9.
21. Turrubiates Calcaneo EM, Revilla Macías DA, Vera Domínguez J, Telles Galicia DM, Marín Méndez H, Gómez Brito E. Análisis costo-efectividad de la rinoplastia y rinoseptoplastia con anestesia local en el Hospital Central Militar. Rev Sanid Militar Mex [Internet]. 2009;63(2):47-55.
22. Erlich Mark A, Parhiscar A. Nasal Dorsal Augmentation with silicone implants. Facial Plast Surg [Internet]. 2003;19(4):325-30.
23. Jung DH, Kim BR, Choi JY, Rho YS, Park HJ, Han WW. Gross and pathologic analysis of long-term silicone implants inserted into the human body for augmentation rhinoplasty: 221 revision cases. Plastic and reconstructive surgery. 2007;19(7):1997-2003.
24. Farfán J, Cubillos J, Parentini F, Fernández F. Rinoplastia de preservación dorsal, una nueva filosofía: Experiencia en el Hospital Naval Almirante Nef. Rev Otorrinolaringol Cir Cabeza Cuello [Internet]. 2022;82(1):33-40.
25. Patel PN, Abdelwahab M, Most SP. A review and modification of dorsal preservation rhinoplasty techniques. Facial Plast Surg Aesthet Med [Internet]. 2020;22(2):71-9.
26. Lohuis PJFM, Hakim S, Duivesteijn W, Knobbe A, Tasman AJ. Benefits of a short, practical questionnaire to measure subjective perception of nasal appearance after aesthetic rhinoplasty. Plast Reconstr Surg [Internet]. 2013;132(6):913e-923e.
27. Lavareda-Santana MA, Verdezoto-Gaibor KJ. Reducción de base nasal con disección subperióstica de tercio medio en rinoplastia primaria. Cir plást iberolatinoam [Internet]. 2023;49(1):25-34.
28. Rodríguez-Camps S. Rinoplastia leporina en paciente adulto: reconstrucción base nasal. Caso clínico. Cir plást iberolatinoam [Internet]. 2021;47(4):383-8.
29. Mottura A, Cremona P. Rinoplastia estética primaria cerrada. Revisiones durante tres años. Cir plást iberolatinoam [Internet]. 2020;46(3):283-9.

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