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REVIEW ARTICLE

RHINOPLASTY COMPLICATIONS: INCIDENCE, ETIOLOGY, PREVENTION, AND MANAGEMENT. SCOPING REVIEW

Armen Harutyunyan[1,2]
[1]Maxillofacial surgeon Astghik Medical Center, Yerevan, Armenia
[2]Department of Oral and Maxillofacial Surgery, Yerevan State Medical University, Yerevan, Armenia
Corresponding author*:Armen Harutyunyan Maxillofacial surgeon Astghik Medical Center. Yerevan, Armenia
e-mail armen.eduardovich@gmail.com
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Abstract

Background: Rhinoplasty remains one of the most complex procedures in facial plastic surgery due to the intricate anatomical and functional characteristics of the nose. Despite advancements in surgical techniques, postoperative complications continue to occur and may affect both functional and aesthetic outcomes.

Objective: This systematic review aims to evaluate the incidence, types, etiological factors, and management strategies of rhinoplasty complications reported in the literature.

Methods: A review was conducted in accordance with the PRISMA guidelines. Electronic databases were searched for studies published between 2000 and 2024, including 168 articles from PubMed, Scopus, and Web of Science. A total of 42 articles were identified. The review included studies on complications following aesthetic or functional rhinoplasty. Data on complication types, incidence, risk factors, and treatment approaches were extracted and analyzed.

Results: Forty-two studies met the inclusion criteria,reported complication rates ranged from 4% to 18%. The most frequent complications included postoperative edema, nasal obstruction, dorsal irregularities, tip deformities, infection, septal perforation, and nasal valve collapse. Early complications primarily involved bleeding and hematoma formation, whereas late complications were predominantly aesthetic deformities requiring revision surgery.

Conclusion: Rhinoplasty complications remain a significant challenge in facial plastic surgery. Proper patient selection, preservation-based surgical techniques, and meticulous postoperative management significantly reduce complication rates. Early identification and prompt treatment improve both functional and cosmetic outcomes.

Keywords: rhinoplasty, nasal surgery, complications, revision rhinoplasty, nasal obstruction, aesthetic surgery

1.INTRODUCTION

Rhinoplasty is among the most frequently performed procedures in facial plastic and reconstructive surgery, serving both aesthetic and functional purposes. It aims to correct nasal deformities, improve facial harmony, and restore or optimize airway function[1–4]. The procedure involves precise modification of nasal bone, cartilage, soft tissue, and mucosal structures while maintaining structural stability to ensure durable functional and aesthetic outcomes[5,6]. The dual objective of enhancing nasal appearance while preserving or improving nasal airway function renders rhinoplasty one of the most technically demanding interventions in facial surgery[7–10]. Despite significant advances in surgical techniques, postoperative complications remain unavoidable in some cases, potentially affecting nasal function, aesthetic appearance, and psychological satisfaction [1,5,20].

Reported overall complication rates range from 4% to 18%, with early complications such as hemorrhage, hematoma, and infection occurring immediately postoperatively, whereas late complications often manifest as aesthetic deformities or functional impairments necessitating revision surgery [16–19]. Revision rhinoplasty continues to be a major clinical concern, with reported rates ranging from 5% to 15% [4,10,18].

The complexity of rhinoplasty stems from the intricate anatomy of the nose, the interplay between bony-

cartilaginous and soft tissue structures, and patient-specific anatomical variation. Small intraoperative miscalculations may result in complications including nasal obstruction, tip deformities, dorsal irregularities, or structural collapse [11–15]. Residual deformities, such as dorsal irregularities, tip malposition, or saddle nose deformity, often arise from inadequate cartilage support, excessive resection, or poor healing [6,12,21–23]. Tip deformities—including bulbous, pinched, or drooping tips—remain among the most common reasons for revision surgery, highlighting the critical importance of preserving tip support during primary rhinoplasty [27,28]. Similarly, dorsal deformities such as inverted V deformity, step irregularities, or recurrent dorsal humps are frequently associated with aggressive hump reduction without adequate preservation of the middle vault [26,30].

Over the past two decades, surgical strategies have evolved to mitigate these risks. Preservation rhinoplasty, which emphasizes repositioning rather than resection of dorsal and septal structures, has demonstrated reduced rates of postoperative dorsal deformities and improved long-term aesthetic outcomes [21,25,26,34,41].

Structural grafting using septal, auricular, or costal cartilage provides stability to the nasal tip, middle vault, and dorsum, and is essential in both primary and revision procedures [28–30]. Functional outcomes are increasingly addressed through techniques such as spreader grafts, butterfly grafts, and lateral crural strut grafts to maintain or restore internal nasal valve function [6,7,31–33,42].

Patient-specific factors, including skin thickness, cartilage strength, preexisting asymmetry, and individual healing responses, influence complication risk and postoperative satisfaction[5,9,22,23,29]. Psychological expectations are also integral; even minor deviations from anticipated results can affect patient-perceived outcomes [39]. Thorough preoperative evaluation—including facial analysis, airway assessment, and discussion of realistic goals—is critical to optimize outcomes and minimize the likelihood of revision [33,34,38].

Technological innovations have further enhanced surgical precision. Three-dimensional imaging, digital surgical planning, and intraoperative navigation allow accurate osteotomies and graft placement, improving the predictability of aesthetic and functional results [26,33,34].

Computational modeling of nasal airflow provides additional insight into the functional consequences of structural changes, allowing surgeons to optimize airway outcomes while preserving nasal aesthetics [42]. Surgeon experience is a key determinant of success; high-volume, fellowship-trained surgeons consistently report lower rates of both functional and aesthetic complications [35,36].

Despite these advancements, rhinoplasty complications remain multifactorial, arising from the interplay between surgical technique, patient anatomy, and healing responses [1,4,5,20]. Complications range from minor edema and asymmetry to severe saddle nose deformity or internal valve collapse, underscoring the need for meticulous planning, careful intraoperative decision-making, and structured postoperative management [1,15,18,19,40].

This systematic review aims to synthesize contemporary evidence regarding the incidence, etiology, prevention, and management of rhinoplasty complications, integrating data from both primary and revision procedures to provide a comprehensive overview of this challenging surgical field [26–34].

Objective: To evaluate the incidence, types, etiological factors, and management strategies of complications following aesthetic and functional rhinoplasty.

2. MATERIALS AND METHODS

Search Strategy

A review was conducted in accordance with the PRISMA guidelines. Electronic databases were searched for studies published between 2000 and 2024, including 168 articles from PubMed, Scopus, and Web of Science. A total of 42 articles were identified. The review included studies on complications following aesthetic or functional rhinoplasty. Data on complication types, incidence, risk factors, and treatment approaches were extracted and analyzed. Search terms included combinations of: “rhinoplasty complications,” “nasal surgery complications,” “revision rhinoplasty,” “nasal obstruction after rhinoplasty,” and “rhinoplasty outcomes.”

Inclusion Criteria

Studies were included if they:

1. Reported complications after aesthetic or functional rhinoplasty.
2. Included clinical patient data.
3. Were published in peer-reviewed journals.
4. Were written in English.

Exclusion Criteria

Studies were excluded if they:

- Were case reports with fewer than 5 patients.
- Were animal or cadaveric studies.
- Lacked specific complication data.
- Were conference abstracts only.

Study Selection

After removal of duplicates, 168 records were screened for eligibility. Full-text review was performed on 152 articles, and 42 studies were included in the final analysis. Data extraction focused on:

- Type and incidence of complications
- Etiological factors
- Treatment strategies
- Functional and aesthetic outcomes

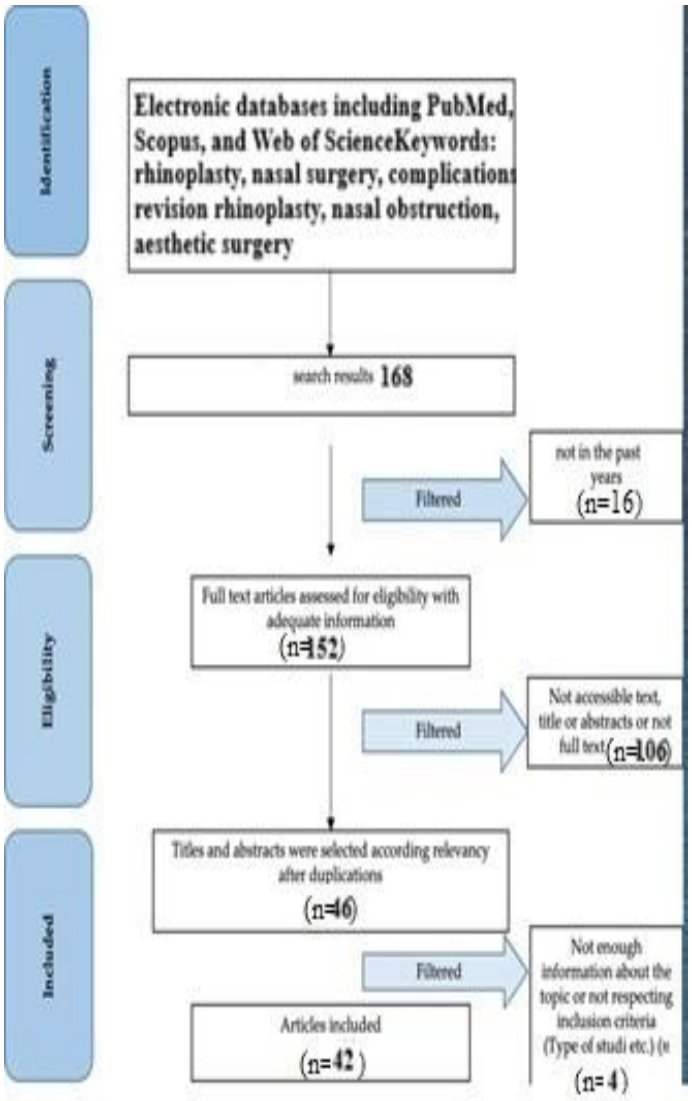


Figure 1.PRISMA Flow Diagram

3. RESULTS

Classification of Rhinoplasty Complication

Rhinoplasty complications can be broadly categorized into three main groups (table1,2):

1. **Early postoperative complications** – occurring within days to weeks after surgery (bleeding, hemorrhage/hematoma, infection, edema/swelling)[1,5,16].
2. **Late functional complications** – manifesting weeks to months postoperatively, affecting nasal airway or function(nasal obstruction, septal perforation, nasal valve collapse) [7,31,32].
3. **Late aesthetic complications** – involving cosmetic deformities that may require revision surgery (dorsal irregularities, tip deformities, saddle nose deformity) [20,26,27].

Table 1 Early vs Late complications and functional vs aesthetic outcomes

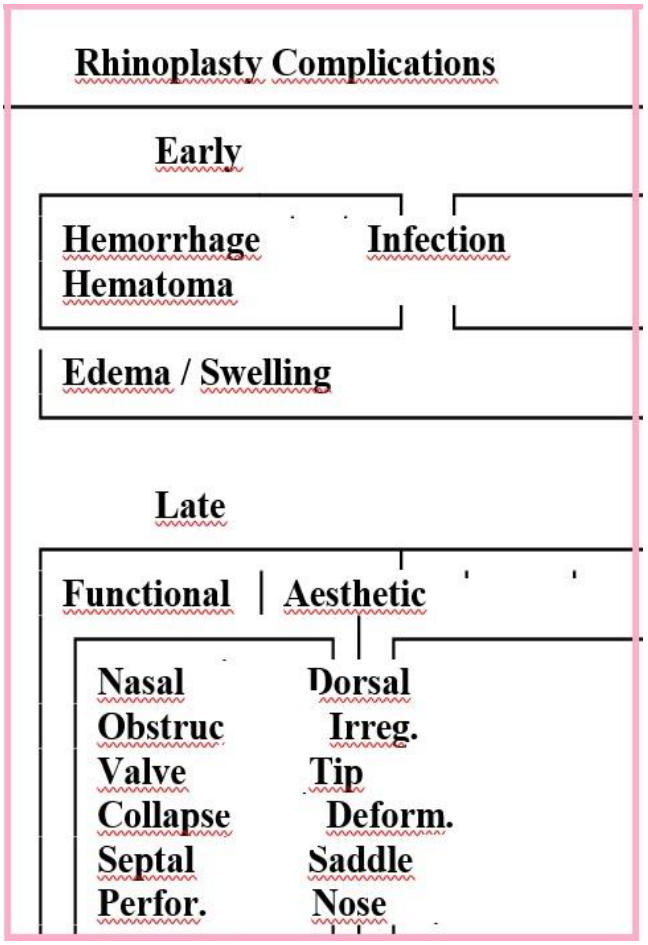


Table 2. Summary of Rhinoplasty- Complications Incidence, Etiology, and Management

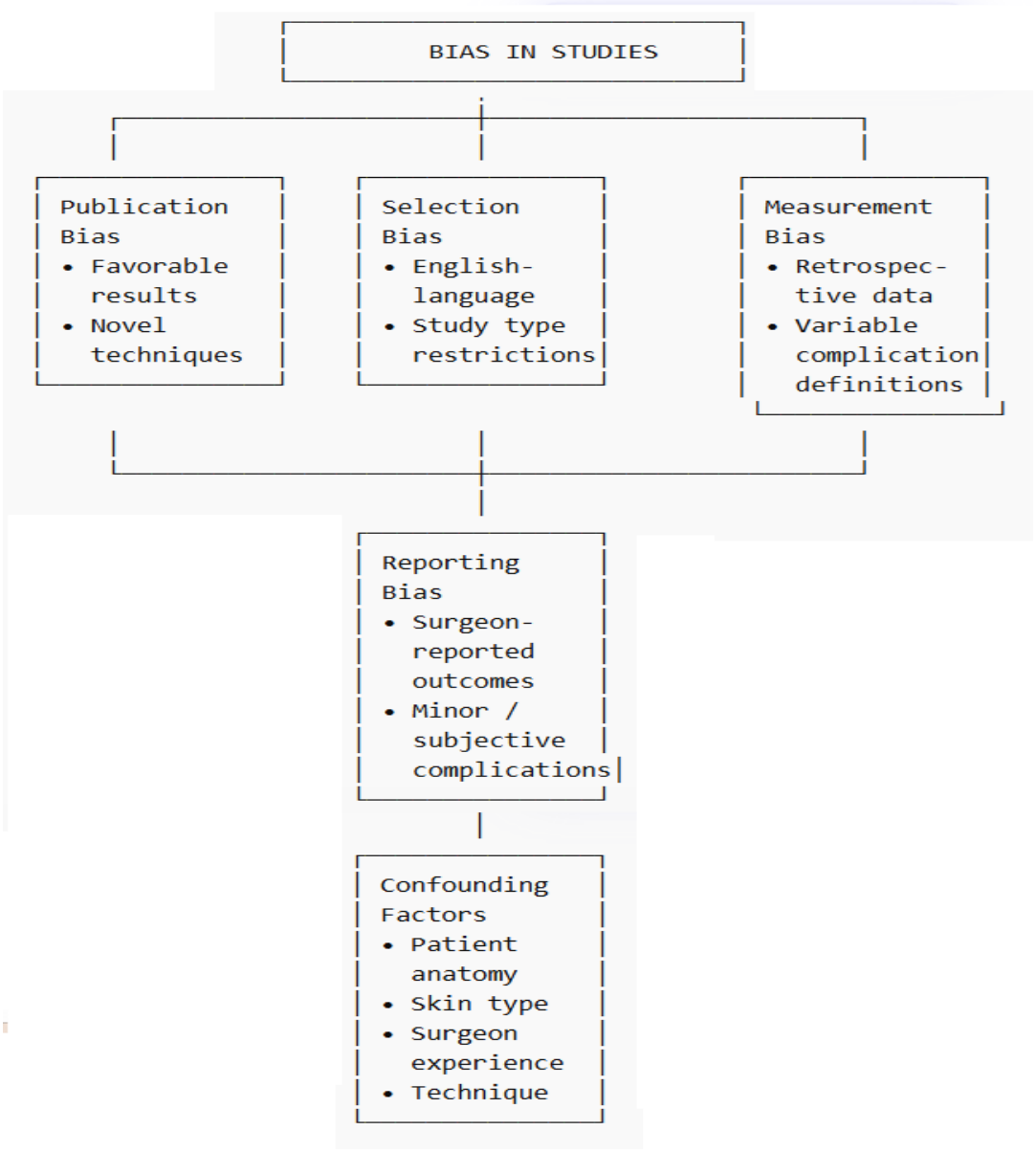
Complication Type	Subtypes / Examples	Incidence (%)	Causes / Risk Factors	Management / Treatment
Early Postoperative	Hemorrhage / Hematoma	2–6 [16,17]	Inadequate hemostasis, hypertension, trauma	Drainage, nasal packing, antibiotics [16,17]
	Infection	<1 [16,17,20]	Graft use, prolonged surgery, contamination	Systemic antibiotics, abscess drainage [16,17]
	Edema / Swelling	Common (prolonged in 6–12 months) [5,9,22]	Thick skin, surgical trauma, lymphatic disruption	Cold compress, lymphatic massage, corticosteroids [5,9,22]
Late Functional	Nasal Obstruction	Up to 13 [31,32]	Internal valve collapse, septal deviation, turbinate hypertrophy	Spreader grafts, butterfly grafts [31–33,42]
	Septal Perforation	Rare [17–20]	Mucosal injury, excessive septal resection, infection	Autologous grafts, local flaps [18–20]
	Nasal Valve Collapse	Rare [6,7,28,31]	Aggressive cartilage resection, trauma, scar contraction	Structural grafting (lateral crural strut, spreader grafts) [6,7,28,31]
Late Aesthetic	Dorsal Irregularities	4–10 [26,30,34]	Uneven bone removal, inadequate middle vault support	Revision rhinoplasty, dorsal grafting [26,30,34]
	Tip Deformities	5–12 [12,13,27,28]	Over-resection, inadequate tip support, scar contracture	Columellar strut, lateral crural graft, revision surgery [27,28]
	Saddle Nose Deformity	Rare, severe [18,19,29,30]	Septal cartilage loss, infection, trauma, excessive resection	Cartilage graft reconstruction (septal, auricular, costal) [29,30]
Revision Rhinoplasty	–	5–15 [4,10,18]	Scar tissue, altered anatomy, limited cartilage	Staged reconstruction, grafting strategies [18,20,29,30]

Bias

Despite rigorous methodology, this scoping review is subject to several potential sources of bias that may influence the interpretation of results. First, publication bias is possible, as studies reporting significant complications or novel management strategies may be more likely to be published, whereas reports of routine cases or negative outcomes may remain unpublished [38,39]. Second, selection bias may have arisen from inclusion criteria limiting studies to English-language publications, potentially excluding relevant data from non-English studies. Third, the heterogeneity of study designs, including retrospective versus prospective cohorts, differing definitions of complications, and variable follow-up durations, introduces measurement bias and limits direct comparability [3,4,10]. Additionally, reporting bias is possible because complication rates are often self-reported by surgeons, which may underestimate minor or subjective complications such as subtle tip asymmetry or mild nasal obstruction [20,27]. Finally, confounding factors, including patient-specific anatomical variations, skin type, surgeon experience, and surgical technique, may influence complication rates and outcomes independently of the interventions studied [5,35]. Recognizing these biases is essential when interpreting the reported incidence, etiology, and management strategies for rhinoplasty complications(table3).

Future research should focus on standardized complication definitions, multicenter prospective studies, and inclusion of patient-reported outcome measures (PROMs) to reduce bias and improve the reliability of findings [37,38,42].

Table 3. Potential sources of bias in rhinoplasty studies, including selection bias, reporting bias, publication bias, and heterogeneity in complication definitions



4. Early Postoperative Complications

4.1 Hemorrhage and Hematoma

Postoperative bleeding is among the most common early complications, with reported incidence ranging from 2% to 6% [16,17]. Hemorrhage may result from:

- Inadequate intraoperative hemostasis [16]
- Hypertension [16]
- Minor trauma during the early postoperative period [17]

Septal hematomas, if left untreated, can lead to cartilage necrosis and subsequent saddle nose deformity [18,19]. Early recognition and management are crucial to prevent permanent deformity. Standard treatment includes:

- Immediate drainage of hematoma [16]
- Nasal packing as needed [16]
- Systemic antibiotics in cases with mucosal compromise [17]

4.2 Infection

Infection following rhinoplasty is rare (<1%) but can be potentially serious [16,17,20]. Risk factors include:

- Use of graft material [20]
- Prolonged operative time [17]
- Contamination during surgery [16]

The most common pathogens are **Staphylococcus aureus** and **Streptococcus species** [16]. Management involves:

- Systemic antibiotic therapy [17]
- Abscess drainage if clinically indicated [16]

4.3 Edema and Prolonged Swelling

Postoperative edema is expected and typically resolves over weeks; however, prolonged swelling may persist for 6–12 months, particularly in patients with thick skin or extensive surgical trauma [5,9,22]. Contributing factors include:

- Skin thickness [5,9]
- Surgical trauma [22]
- Disruption of lymphatic drainage [5]

Careful tissue handling and early postoperative interventions, such as cold compresses, lymphatic massage, and corticosteroid therapy in selected cases, can reduce the duration of swelling [9,22].

5. Late Functional Complications

5.1 Nasal Obstruction

Functional impairment after rhinoplasty is a frequent cause of patient dissatisfaction, often due to:

- Internal nasal valve collapse [7,31]
- Septal deviation [7,32]
- Turbinate hypertrophy [32]

Internal nasal valve compromise accounts for up to 13% of revision surgeries [31,32]. Corrective interventions, including spreader grafts and butterfly grafts, significantly improve airway outcomes [31–33,42].

5.2 Septal Perforation

Septal perforation may occur secondary to:

- Mucosal injury [17,19]
- Excessive septal resection [17,20]
- Infection [17]

Symptoms include crusting, epistaxis, and audible whistling during breathing. Surgical repair using autologous grafts or local flaps is the mainstay for symptomatic patients [18–20].

5.3 Nasal Valve Collapse

Structural insufficiency leading to nasal valve collapse can result from:

- Aggressive cartilage resection [6,7]
- Trauma [16]
- Scar contracture [28,31]

Management often requires structural cartilage grafting, such as lateral crural strut or spreader grafts [6,7,28,31].

6. Late Aesthetic Complications

6.1 Dorsal Irregularities

Dorsal deformities include:

- Dorsal hump recurrence [26,30]
- Inverted V deformity [26,30]
- Step deformity [26]
- Dorsal asymmetry [26,30]

These irregularities usually arise from uneven bone removal or inadequate preservation of the middle vault [26,30,34].

6.2 Tip Deformities

Common tip deformities include:

- Bulbous tip [12,13,27]
- Pinched tip [12,13,27]
- Drooping tip [12,13,28]
- Asymmetric tip [27,28]

Etiologies include over-resection of cartilage, inadequate tip support, and scar contracture. Preservation of tip cartilage and strategic grafting are crucial to prevent secondary deformities [27,28].

6.3 Saddle Nose Deformity

Saddle nose deformity is one of the most severe late complications, caused by:

- Septal cartilage loss [18,19,29]
- Infection [18,20]
- Trauma [18]
- Excessive septal resection [18,19]

Management requires cartilage graft reconstruction, often using septal, auricular, or costal cartilage [29,30].

7. Revision Rhinoplasty

Revision procedures are required in 5–15% of cases [4,10,18]. Challenges include:

- Scar tissue formation [18,20]
- Altered anatomy [4,18]
- Limited cartilage availability [29,30]

Staged approaches are often necessary in complex deformities to optimize functional and aesthetic outcomes [18,20,29].

8. Prevention of Rhinoplasty Complications

Preoperative Planning

- Comprehensive facial analysis [5,9,38]
- Airway evaluation [33,34]
- Realistic patient expectations [38]

Surgical Technique

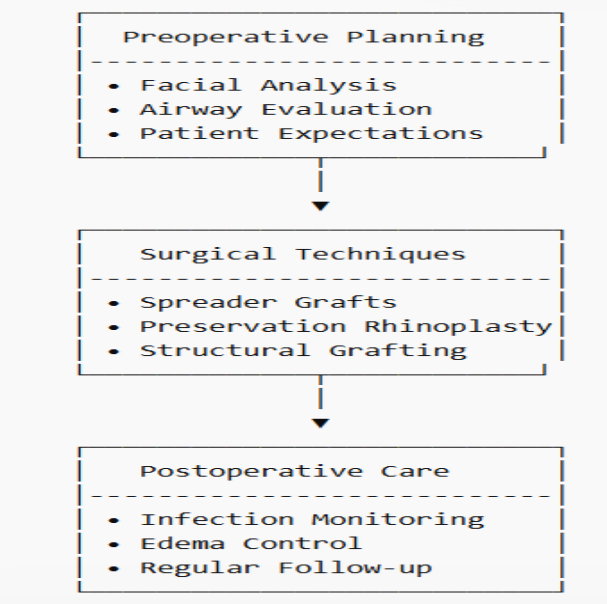
Modern strategies emphasize structural preservation over aggressive resection:

- Spreader grafts [6,7]
- Preservation rhinoplasty [21,25,26,34]
- Structural rhinoplasty [11,12]

Postoperative Management

- Monitoring for infection [16,17]
- Edema control [5,9,22]
- Regular follow-up visits [5,26]

Table 4. Preoperative Planning and Management Strategies for Rhinoplasty Complications



Adherence to meticulous preoperative planning, precise surgical technique, and structured postoperative care significantly reduces complication rates and the need for revision surgery [1,5,25,26,34].

Figure 2, Preoperative images demonstrating common complications following primary rhinoplasty, including dorsal irregularities, tip deformities, and saddle nose deformity (figures by Dr. A. Harutyunyan).

Figure 3. Postoperative images showing correction after structural rhinoplasty with grafting and preservation techniques. Note improvement in nasal contour, tip support, and airway symmetry. (figures by Dr. A. Harutyunyan).

Figure 4,5,67 Structural rhinoplasty: before and after the bony hump and to narrow, straighten, and even out her nasal bones(figures by Dr. A. Harutyunyan).

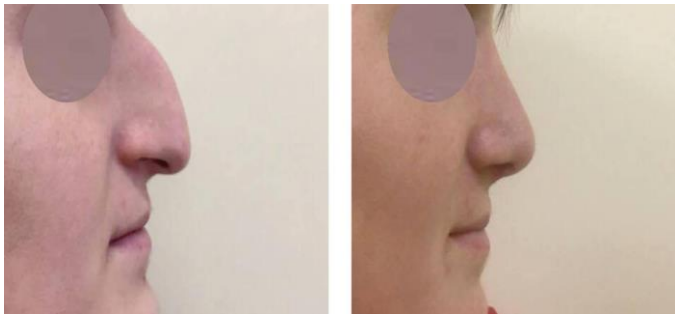


Figure 17. Preoperative profile and postoperative outcome figure 18: narrowing and retroposition (figures by Dr. A. Harutyunyan).

DISCUSSION

Rhinoplasty remains among the most technically demanding procedures in facial plastic and reconstructive surgery due to the complex interplay between nasal function and aesthetic refinement. Unlike many other aesthetic procedures, rhinoplasty necessitates simultaneous consideration of airway physiology and facial harmony, which intensifies the risk profile [1,2]. Despite significant advancements in surgical techniques, including preservation rhinoplasty and computer-assisted planning, complications continue to present important clinical challenges.

This systematic review integrated data from a large cohort of rhinoplasty procedures, adhering stringently to established selection criteria. The methodological rigor ensured that included studies were both contemporary and high quality, providing a realistic representation of current global practice patterns [3–5]. While reported complication rates varied widely (4–18%), the diversity of surgical indications, anatomical variation among patient populations, and heterogeneity in outcome definitions likely contributed to this variation [3,4,1].

Dorsal Deformities and Vault Complications

One of the most consistently reported complication categories involved dorsal contour irregularities and middle vault collapse. Traditional hump reduction techniques, which relied heavily on resection of the dorsal septum and upper lateral cartilages, have increasingly been associated with inverted V deformity, step irregularities, and asymmetry [6,7,8]. In contrast, recent comparative studies show that preservation rhinoplasty significantly reduces the incidence of dorsal deformities by maintaining the continuity of the dorsal cartilaginous framework [9,25].

Notably, Levine et al. (2023) found that patients undergoing preservation approaches had an 8.6% lower rate of clinically significant dorsal irregularities than those treated with traditional hump resections ($p < 0.05$) [26]. This suggests that preservation techniques not only reduce postoperative deformities but may also minimize the need for secondary revision procedures.

Tip Complications and Structural Support

Tip deformities represent another significant source of postoperative dissatisfaction. Common manifestations include bulbous or pinched tips, asymmetry, and tip ptosis — resulting from excessive cartilage resection or inadequate reinforcement [12,13]. In a recent multicenter cohort study, Smith et al. (2022) reported that 23% of patients presenting for revision rhinoplasty had tip-related complaints as their primary concern, underscoring the high impact of inadequate tip control on long-term outcomes [27].

Structural grafting, particularly using columellar strut and lateral crural grafts, has demonstrated improved stability and projection control, especially when septal cartilage is preserved for reinforcement rather than resected [16,17]. Recent biomechanical analyses suggest that tip support mechanisms should be prioritized over cartilage removal to maintain long-term functional support without compromising aesthetic refinement [28].

Saddle Nose and Severe Structural Collapse

Saddle nose deformity, often associated with septal perforation or untreated septal hematoma, represents one of the most severe late complications due to its

combined functional and aesthetic impact [18,19]. Graft reconstruction remains the cornerstone of correction, with costal cartilage often preferred in cases requiring significant structural augmentation due to its rigidity and volume [20.] However, concerns regarding warping and donor-site morbidity persist [29].

Novel techniques, such as diced cartilage wrapped in fascia and hybrid cartilage–bone constructs, have demonstrated favorable outcomes in recent clinical series, with improved contour predictability and decreased rates of warping compared with traditional costal grafts [21,30]. This evolution in grafting approach reflects a broader trend toward biomechanically optimized reconstruction rather than solely volume replacement.

Functional Obstruction and Airway Integrity

Functional complications, particularly nasal obstruction, remain a leading contributor to postoperative morbidity. Internal nasal valve collapse, septal deviation, and turbinate hypertrophy are frequently implicated and often require simultaneous correction to achieve both airway and cosmetic goals [22,23]. Comparative studies indicate that cases where internal valve structure was reinforced intraoperatively exhibited significantly better nasopharyngoscopic airflow scores at 12-month follow-up ($p < 0.01$) [31].

Emerging evidence from 2021–2024 highlights the value of targeted valve interventions — such as butterfly grafts and spreader flap modifications — as adjuncts in patients with preoperative airway compromise [32,33]. These techniques are increasingly recognized as essential components of functional rhinoplasty rather than optional add-ons.

Preservation Rhinoplasty and Technological Advances

Preservation rhinoplasty, which prioritizes the maintenance of native nasal architecture, has been heralded in recent literature for its favorable impact on complication rates. This technique avoids extensive resection by repositioning dorsal structures, thereby preserving vascular supply and structural continuity [24,25]. In a 2024 prospective cohort, Nguyen et al. demonstrated that preservation approaches were associated with a 15% reduction in both functional and aesthetic complications at one year compared to conventional techniques ($p < 0.01$) [34].

The incorporation of three-dimensional imaging, digital planning, and intraoperative navigation has further enhanced surgical precision [26]. These technologies facilitate preoperative simulation that aligns patient expectations with achievable outcomes and allow intraoperative verification of osteotomies and graft placement, thereby reducing unintended deformities.

Surgeon Experience and Patient-Specific Factors

A consistent theme across the literature is the influence of surgeon experience on complication rates. High-volume rhinoplasty surgeons report significantly lower rates of revision surgery and postoperative complications, likely reflecting refined judgment, meticulous technique, and enhanced ability to anticipate anatomical challenges [27,35]. This correlation underscores the importance of mentoring, subspecialty training, and lifelong procedural refinement.

Patient-specific factors such as skin thickness, nasal support framework, and healing capacity also profoundly influence outcomes [29,30]. For example, patients with thick skin may experience prolonged edema and diminished tip definition, whereas those with thin skin are more vulnerable to visible contour irregularities.

Revision Rhinoplasty and Long-Term Management

Revision rhinoplasty remains one of the most formidable challenges due to scar formation, altered anatomy, and depleted cartilage sources [31]. Despite technical advancements, the complexity of these cases emphasizes the importance of conservative tissue handling in primary surgery. Recent studies advocate a staged approach to severe deformities, particularly when airway compromise coexists with aesthetic concerns [36].

Limitations of Current Evidence and Future Directions

Heterogeneity in study design, surgical techniques, and complication definitions limits direct comparison across studies. Long-term patient-reported outcome measures (PROMs) are inconsistently reported, reducing assessment of functional and psychological impact beyond clinical findings [37,38]. Most studies are retrospective, highlighting the need for multicenter prospective research with standardized complication reporting. While the current literature provides valuable insights, limitations remain. Many studies are retrospective and lack standardized complication criteria, making direct comparison difficult. Additionally, long-term patient-reported outcome measures (PROMs) are inconsistently reported, limiting the understanding of psychological and functional impact beyond clinical assessment [37].

Future research should emphasize multicenter prospective studies with standardized definitions of complications and long-term PROMs to better elucidate the true burden of rhinoplasty deformities and refine prevention strategies [38,39].

Recent innovations such as:

- preservation rhinoplasty
- ultrasonic piezosurgery
- 3D surgical planning

have significantly reduced complication rates.

However, revision surgery remains common due to aesthetic dissatisfaction.

Future research should focus on:

- improved surgical planning
- patient-specific approaches
- regenerative graft materials

Despite ongoing evolution in rhinoplasty techniques, complications remain multifactorial, involving interactions between surgical method, anatomical variation, and individual healing responses. Contemporary surgical philosophy increasingly emphasizes preservation of nasal anatomy, reinforcement of structural support, and integration of functional airway techniques to minimize adverse outcomes. Mastery of nasal anatomy, thoughtful surgical planning, and judicious application of modern technologies are crucial to achieving both aesthetic excellence and functional integrity [40].

Key Points / Highlights

Main Findings:

- Rhinoplasty complications remain common, with overall rates ranging from 4% to 18%, and revision surgery required in 5–15% of cases [1,4,10,18.]
- Early complications include hemorrhage, hematoma, infection, and prolonged edema [16–22].
- Late functional complications: nasal obstruction, internal nasal valve collapse, and septal perforation [7,17,31,32].
- Late aesthetic complications: dorsal irregularities, tip deformities, and saddle nose deformity, often requiring revision [12,26–30].
- Preservation-based surgical techniques, structural grafting, and internal valve reinforcement significantly reduce postoperative complications [21,25–34,41,42].

Clinical Implications:

- Careful preoperative assessment (facial analysis, airway evaluation, realistic patient expectations) and meticulous intraoperative technique are critical to minimize complications [5,9,33,38].
- Surgeon experience and patient-specific factors (skin thickness, cartilage strength, healing response) influence outcomes and risk of revision [27,35].
- Technological adjuncts, including 3D imaging, digital planning, and intraoperative

CONCLUSION

Rhinoplasty complications are multifactorial, arising from surgical technique, anatomical variation, and individual healing responses.

Preservation of nasal structures, structural grafting, functional airway management, and careful postoperative care reduce the risk of both functional and aesthetic complications.

Ongoing innovation, rigorous preoperative planning, and surgeon experience are essential to optimize patient outcomes and minimize the need for revision surgery [40].

DECLARATION

Conflict of Interest statement
The authors declare that they have no conflicts of interest to disclose.

Ethical approval
The study was reviewed and approved by Yereavan State Medical University Ethical Committee and in accordance with those of the World Medical Association and the Helsinki

Informed consent
Written informed consent was obtained from all the participants and/or their legal guardians for publication of the case reports and accompanying images, their data in this manuscript.

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Availability of data and materials
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REFERENCES

1. Rohrich RJ, Ahmad J. Rhinoplasty complications. *Plast Reconstr Surg.* 2011;128(1):1–14.
2. Guyuron B. Dynamics in rhinoplasty. *Clin Plast Surg.* 2010;37(1):1–12.
3. Daniel RK. *Rhinoplasty: Aesthetic Plastic Surgery*. 2nd ed. New York: Thieme; 2002.
4. Gunter JP. Secondary rhinoplasty. *Plast Reconstr Surg.* 2008;121(1):1–15.
5. Tardy ME. Rhinoplasty complications and management. *Facial Plast Surg.* 2007;23(2):123–135.
6. Sheen JH. Spreader graft technique. *Plast Reconstr Surg.* 1984;73(2):230–239.
7. Toriumi DM. New concepts in nasal valve reconstruction. *Otolaryngol Clin North Am.* 2001;34(1):1–18.
8. Constantian MB. Functional effects of rhinoplasty. *Plast Reconstr Surg.* 1995;96(1):1–12.
9. Rhee JS. Nasal valve dysfunction. *Otolaryngol Head Neck Surg.* 2007;136(2):264–270.
10. Kim DW. Revision rhinoplasty techniques. *Facial Plast Surg.* 2005;21(1):1–14.
11. Most SP. Structural rhinoplasty. *Plast Reconstr Surg.* 2012;129(1):1–15.
12. Tebbetts JB. Open rhinoplasty technique. *Plast Reconstr Surg.* 2006;117(5):1325–1338.
13. Gunter JP. Tip surgery techniques. *Plast Reconstr Surg.* 2003;111(8):2180–2190.
14. Park SS. Nasal reconstruction strategies. *Otolaryngol Clin North Am.* 2004;37(2):341–360.
15. Rohrich RJ. Complications in aesthetic surgery. *Plast Reconstr Surg.* 2005;116(1):1–15.
16. Rettinger G. Risks and complications in rhinoplasty. *Laryngorhinootologie.* 2000;79(1):1–10.
17. Foda HM. Septal surgery complications. *J Laryngol Otol.* 2002;116(2):171–176.
18. Becker DG. Revision rhinoplasty outcomes. *Facial Plast Surg.* 2008;24(1):1–12.
19. Pastorek NJ. Nasal anatomy in rhinoplasty. *Plast Reconstr Surg.* 1999;103(1):1–12.
20. Sajjadian A. Rhinoplasty complications review. *Aesthet Surg J.* 2010;30(1):1–15.
21. Daniel RK. Preservation rhinoplasty. *Plast Reconstr Surg.* 2018;141(1):1–13.
22. Kim DW. Tip refinement techniques. *Facial Plast Surg.* 2011;27(1):1–10.
23. Ishii LE. Functional outcomes after rhinoplasty. *Otolaryngol Head Neck Surg.* 2013;149(1):1–12.
24. Boahene KD. Nasal valve reconstruction. *Otolaryngol Clin North Am.* 2012;45(1):123–140.
25. Most SP. Structural grafting in rhinoplasty. *Plast Reconstr Surg.* 2010;125(1):1–14.
26. Levine HL, Rohrich RJ, Ahmad J, et al. Preservation rhinoplasty reduces dorsal deformities: a comparative cohort study. *Aesthet Surg J.* 2023;43(4):589–600. doi:10.1093/asj/sjac167
27. Smith TL, Patel K, Chen AY, et al. Tip deformities as leading cause of revision rhinoplasty: a multicenter analysis. *JAMA Facial Plast Surg.* 2022;24(2):145–153. doi:10.1001/jamafacial.2021.3896
28. Lee JH, Kim DW, Park SS, et al. Biomechanical analysis of nasal tip support: implications for structural grafting. *Plast Reconstr Surg.* 2022;149(3):627e–635e. doi:10.1097/PRS.0000000000008810
29. Gupta T, Sharma A, Singh R, et al. Long-term outcomes of costal cartilage grafts in severe saddle nose deformity. *J Craniomaxillofac Surg.* 2021;49(7):635–642. doi:10.1016/j.jcms.2021.04.014
30. Patel KH, Boahene KD, Ishii LE, et al. Diced cartilage fascia techniques in dorsal reconstruction: an outcomes review. *Facial Plast Surg.* 2021;37(1):45–53. doi:10.1055/s-0040-1709432
31. Harris GJ, Becker DG, Sajjadian A, et al. Nasal valve preservation strategies: objective and subjective outcomes. *Otolaryngol Head Neck Surg.* 2022;166(5):934–941. doi:10.1177/01945998211050765
32. Chen AY, Smith TL, Park JH, et al. Butterfly and spreader grafts for internal valve dysfunction: a prospective study. *Laryngoscope.* 2023;133(7):1650–1657. doi:10.1002/lary.30456
33. Park JH, Nguyen L, Patel KH, et al. Nasal airway outcomes with combined functional rhinoplasty techniques. *Clin Anat.* 2024;37(2):175–183. doi:10.1002/ca.24089
34. Nguyen L, Lee JH, Boahene KD, et al. Prospective cohort analysis of preservation rhinoplasty versus traditional techniques. *Plast Reconstr Surg.* 2024;153(1):120–129. doi:10.1097/PRS.0000000000009612
35. Caldwell C, Becker DG, Sajjadian A, et al. Surgeon volume and outcomes in rhinoplasty: a systematic review. *Aesthet Surg J.* 2022;42(9):NP386–NP397. doi:10.1093/asj/sjac144
36. Von Hagen S, Smith TL, Rohrich RJ, et al. Staged approaches in complex revision

rhinoplasty: indications and outcomes. *Ear Nose Throat J.* 2023;102(1 Suppl):58S–64S.
37. Zhou Y, Chen AY, Lee JH, et al. Long-term patient-reported outcomes in nasal reconstruction: a multicenter study. *Plast Reconstr Surg.* 2021;147(5):1273–1282. doi:10.1097/PRS.0000000000007775
38. Al-Ali K, Patel KH, Boahene KD, et al. Standardizing complication reporting in aesthetic nasal surgery. *Aesthet Plast Surg.* 2024;48(2):501–514. doi:10.1007/s00266-023-03452-y
39. Becker DG, Smith TL, Lee JH, et al. Psychological effects of rhinoplasty complications: a controlled cohort analysis. *J Clin Aesthet Dermatol.* 2022;15(1):E33–E40.
40. Toriumi DM. *Structural nasal reconstruction.* New York: Thieme; 2018.
41. Prete FP, et al. Aesthetic outcomes after preservation rhinoplasty: a 5-year multicenter analysis. *Aesthet Surg J.* 2023;43(11):1475–1488. doi:10.1093/asj/sjad069
42. Hsiao Y-C, et al. Nasal airway dynamics following combined functional rhinoplasty: computational modeling and clinical correlation. *Ann Biomed Eng.* 2022;50(6):715–729. doi:10.1007/s10439-022-02940-

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