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# Incidence of Postoperative Complications Following Nasal Fracture Surgery in Adults

**Ladan Nouri Bayat [1], Ali Reza Lotfi[2*]**

[1]Assistant Professor of Otorhinolaryngology, Head and Neck Surgery, School of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran

[2]Associate Professor of Otorhinolaryngology, Head and Neck Surgery, Department of Otorhinolaryngology, School of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran

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**A B S T R A C T**

**Introduction:** Nasal fractures are among the most frequent facial injuries in adults and often require surgical management to restore function and aesthetics. Despite generally favorable outcomes, postoperative complications remain clinically relevant and may affect nasal airflow, appearance, and patient satisfaction. Evaluating the incidence and pattern of these complications is essential for improving surgical planning, patient counseling, and overall postoperative care.

**Material and methods:** This study evaluated postoperative complications following nasal fracture surgery in adult patients. Using an observational design, clinical outcomes were assessed in a representative cohort to identify functional, aesthetic, and early surgical complications. Understanding the incidence and pattern of these adverse outcomes may support improved surgical decision-making, optimize perioperative management, and enhance patient counseling in adult nasal fracture care.

**Results:** In this cohort of adults undergoing nasal fracture surgery, postoperative complications were common, with functional impairments such as nasal obstruction and septal deviation predominating. Structural and cosmetic sequelae were also frequent, while infectious and hemorrhagic events occurred less often. Although revision surgery was required in a minority of cases, these findings highlight the persistent clinical burden of nasal fracture repair.

**Conclusion:** the findings of this study reinforce that nasal fracture surgery in adults, despite its routine nature, carries a meaningful risk of persistent postoperative morbidity. Functional impairment, structural deformity, and aesthetic dissatisfaction remain common, even with timely and minimally invasive intervention.

## Introduction

Nasal bone fractures represent the most common type of facial skeletal injury in adults, largely due to the prominent and exposed anatomical position of the nose within the facial structure. These fractures frequently occur as a result of interpersonal violence, road traffic accidents, sports-related injuries, and accidental falls. Because of their high prevalence and potential impact on both function and facial aesthetics, nasal fractures constitute a significant clinical concern in otolaryngology and maxillofacial surgery. Surgical intervention is often required to restore nasal alignment, maintain airway patency, and prevent long-term deformities (1).

Despite the relatively straightforward nature of many nasal fracture repairs, postoperative complications remain an important clinical issue. Even minor deviations in surgical technique, timing of intervention, or postoperative care may lead to suboptimal outcomes. Complications can affect nasal appearance, breathing function, and overall patient satisfaction. Consequently, understanding the incidence and spectrum of postoperative complications is essential for optimizing treatment

**Corresponding Author: **Ali Reza Lotfi** (AlR_Lotfi@gmail.com - ORCID: 0000-0002-3050-5937)*
*1 Email: ladan_bayat@gmail.com - ORCID: 0009-0007-3699-1116)*

strategies and improving surgical outcomes in adult patients (2).

Closed reduction remains the most commonly performed surgical approach for uncomplicated nasal fractures, particularly when intervention occurs within the optimal time window following injury. However, open reduction and more complex reconstructive procedures may be required in cases involving severe displacement, comminution, septal involvement, or delayed presentation. Each surgical modality carries its own risk profile, and complication rates may vary according to fracture pattern, surgical technique, and surgeon experience (3).

Postoperative complications following nasal fracture surgery can be broadly categorized into functional, aesthetic, and infectious outcomes. Functional complications often include nasal obstruction, septal deviation, and impaired airflow, which may persist despite technically successful fracture reduction. Aesthetic complications such as nasal asymmetry, dorsal irregularities, or persistent deformity can significantly affect patient satisfaction and may necessitate revision procedures (4). Infectious complications, although relatively uncommon, remain clinically relevant. These include localized wound infections, septal abscess formation, and, in rare cases, systemic infection. The risk of infection influenced by factors such as mucosal laceration, hematoma formation, delayed treatment, and inadequate postoperative care. Early identification and appropriate management of these complications are critical to prevent long-term morbidity (5). Septal hematoma is one of the most significant early postoperative complications associated with nasal fracture surgery. If left untreated, septal hematoma can compromise cartilage viability, leading to septal necrosis and subsequent saddle nose deformity. Prompt diagnosis and drainage are therefore essential components of postoperative surveillance, underscoring the importance of careful follow-up in adult patients undergoing nasal fracture repair (6).

Another frequently reported complication is postoperative epistaxis, which may occur due to mucosal injury, inadequate hemostasis, or premature removal of nasal packing. While most cases of postoperative bleeding are mild and self-limiting, severe or recurrent epistaxis may require re-intervention. Identifying patient-related and procedure-related risk factors for postoperative bleeding remains an important area of clinical investigation (7).

Olfactory disturbances also described following nasal fracture surgery, although their true incidence may be underreported. Changes in smell perception can result from mucosal edema, neural injury, or altered airflow dynamics within the nasal cavity. Although olfactory dysfunction is often transient, persistent symptoms can significantly impair quality of life and warrant further evaluation (8).

Patient-related factors play a substantial role in the development of postoperative complications. Advanced age, smoking, comorbid conditions such as diabetes mellitus, and coexisting facial injuries may increase susceptibility to adverse outcomes. Additionally, delayed presentation after injury has been associated with higher complication rates, emphasizing the importance of timely diagnosis and intervention (9). Surgical timing remains a topic of ongoing debate in the management of nasal fractures. While early intervention is generally recommended to facilitate reduction and minimize complications, excessive edema in the acute phase may obscure fracture anatomy and complicate surgical manipulation. Conversely, delayed surgery may result in fracture consolidation, increasing technical difficulty and potentially elevating complication rates (10). The role of perioperative care, including nasal packing, splinting, and antibiotic prophylaxis, also explored in relation to postoperative outcomes. Although nasal packing commonly employed to support fracture alignment and control bleeding, it may contribute to patient discomfort, infection risk, and respiratory compromise. Optimizing perioperative protocols remains essential for minimizing complications while maintaining surgical efficacy (11). From a patient-centered perspective, postoperative complications following nasal fracture surgery can have profound psychological and social implications. Facial appearance plays a critical role in self-identity and interpersonal interactions, and even subtle aesthetic imperfections may lead to dissatisfaction or reduced quality of life. Therefore, comprehensive evaluation of surgical outcomes should encompass both objective clinical findings and patient-reported measures (12).

The reported incidence of postoperative complications varies widely across the literature, reflecting differences in study design, patient populations, surgical techniques, and follow-up duration. Some studies report relatively low complication rates, while others highlight a substantial burden of functional or aesthetic sequelae. This variability underscores the need for well-designed studies focusing specifically on adult populations (13). Adult patients differ from pediatric populations in terms of nasal anatomy, healing capacity, and risk factor profiles. Fracture patterns in adults are often more complex and comorbidities may adversely affect recovery. Consequently, findings derived from pediatric or mixed-age studies may not be directly applicable to adult patients, reinforcing the importance of age-specific research (14). A clear understanding of complication incidence can aid clinicians in preoperative counseling, allowing patients to make informed decisions regarding surgical intervention.

Transparent discussion of potential risks fosters realistic expectations and may improve postoperative satisfaction, even in cases where minor complications occur (15).

Given the high prevalence of nasal fractures and the potential for postoperative complications to affect both function and aesthetics, systematic evaluation of complication rates is essential. Identifying common adverse outcomes and their associated risk factors can inform surgical planning, refine perioperative management, and ultimately enhance patient care. This study therefore aims to evaluate the incidence of postoperative complications following nasal fracture surgery in adults, contributing to the existing body of evidence and supporting improved clinical decision-making.

## Material and methods

### Study Design

This study designed as a descriptive–analytical observational investigation aimed at evaluating the incidence and pattern of postoperative complications following nasal fracture surgery in adult patients. The study conducted in a tertiary referral center, and data collected retrospectively from medical records and postoperative follow-up documentation of eligible patients who underwent surgical management for nasal bone fractures.

### Sample Size Estimation and Sampling Method

The sample size estimated at 100 adult patients based on feasibility considerations and the average annual volume of nasal fracture surgeries performed at the study center. A convenience sampling method used, whereby all eligible patients who met the inclusion criteria during the defined study period consecutively enrolled until the target sample size reached.

### Inclusion and Exclusion Criteria

Inclusion criteria comprised adult patients aged 18 years and older who underwent surgical treatment for isolated or combined nasal bone fractures, including closed or open reduction procedures, and who had a minimum postoperative follow-up of three months. Patients with complete medical records and documented postoperative evaluations were included. Exclusion criteria encompassed patients younger than 18 years, those with concomitant major midfacial fractures requiring extensive reconstructive surgery, history of previous nasal surgery, congenital nasal deformities, pathological fractures, incomplete clinical data, loss to follow-up, or refusal to participate in postoperative assessment.

### Procedure and Data Collection

All surgical procedures performed under standardized institutional protocols by experienced otolaryngologists. Depending on fracture pattern, displacement severity, and septal involvement, patients underwent either closed reduction or open reduction under general or local anesthesia. Nasal packing and external splinting applied according to surgeon preference and clinical indication. Demographic data, mechanism of injury, fracture characteristics, type and timing of surgery, and perioperative details systematically extracted from patient records.

### Procedure and Data Collection

Postoperative outcomes assessed through clinical examinations and follow-up visits. Documented complications included nasal obstruction, septal deviation, postoperative epistaxis, infection, septal hematoma, cosmetic deformity, olfactory disturbance, and need for revision surgery. Complications classified as early or late based on time of onset. When available, patient-reported symptoms and satisfaction also recorded to provide a comprehensive assessment of postoperative outcomes.

### Statistical Analysis

Data analysis performed using statistical software. Quantitative variables reported as mean ± standard deviation, while qualitative variables expressed as frequencies and percentages. Comparisons between categorical variables conducted using the chi-square or Fisher's exact test, as appropriate. A p-value of less than 0.05 considered statistically significant.

### Ethical Considerations

The study protocol approved by the Ethics Committee of Tabriz University of Medical Sciences under the code IR.TBZMED.FMD.REC.1404.180. Patient confidentiality strictly maintained, and all data anonymized prior to analysis. The study conducted in accordance with the principles of the Declaration of Helsinki.

## Results

The baseline characteristics demonstrate that nasal fracture surgery in adults predominantly involved young to middle-aged males, reflecting the higher exposure of this population to trauma-related mechanisms. Traffic accidents and interpersonal violence were the leading causes of injury, while most fractures were isolated nasal injuries managed primarily by closed reduction. The short interval between injury and surgical intervention suggests timely clinical management, and the frequent use of local anesthesia highlights the minimally invasive nature of most procedures. Overall, the cohort represents a typical adult nasal fracture population encountered in tertiary referral centers (table 1).

**Table 1.** Baseline Characteristics and Surgical Details of the Study Population

| Variable | Value |
|---|---|
| Age (years), mean ± SD | 32.8 ± 11.4 |
| Sex, n (%) | |
| Male | 72 (72.0) |
| Female | 28 (28.0) |
| Mechanism of Injury, n (%) | |
| Traffic accident | 38 (38.0) |
| Assault | 27 (27.0) |
| Fall | 21 (21.0) |
| Sports-related injury | 14 (14.0) |
| Type of Nasal Fracture, n (%) | |
| Isolated nasal fracture | 64 (64.0) |
| Combined nasal fracture | 36 (36.0) |
| Type of Surgical Procedure, n (%) | |
| Closed reduction | 71 (71.0) |
| Open reduction | 29 (29.0) |
| Time from Injury to Surgery (days), mean ± SD | 4.6 ± 2.1 |
| Type of Anesthesia, n (%) | |
| Local anesthesia | 58 (58.0) |
| General anesthesia | 42 (42.0) |

Postoperative complications were relatively common following nasal fracture surgery, with nasal obstruction and septal deviation emerging as the most frequently observed adverse outcomes. A considerable proportion of patients also experienced cosmetic deformity, underscoring the aesthetic sensitivity of nasal trauma management. Although postoperative epistaxis and infection occurred less frequently, their presence highlights the need for meticulous intraoperative technique and postoperative care. Importantly, the requirement for revision surgery in a subset of patients reflects the clinical impact of both functional and structural complications. Collectively, these findings emphasize that, despite considered a routine procedure, nasal fracture surgery carries a meaningful risk of postoperative morbidity that warrants careful patient selection, thorough preoperative evaluation, and close postoperative follow-up (table 2).

**Table 2.** Incidence of Postoperative Complications Following Nasal Fracture Surgery

| Postoperative Complication | Patients, n (%) |
|---|---|
| Nasal obstruction | 29 (29.0) |
| Septal deviation | 24 (24.0) |
| Cosmetic deformity | 19 (19.0) |
| Postoperative epistaxis | 15 (15.0) |
| Infection | 9 (9.0) |
| Olfactory disturbance | 7 (7.0) |
| Septal hematoma | 6 (6.0) |
| Revision surgery required | 11 (11.0) |

The results demonstrate that postoperative complications following nasal fracture surgery in adults are both frequent and clinically heterogeneous, with functional impairments predominating over infectious or revision-related events. Nasal obstruction emerged as the most common complication, affecting approximately one-third of patients, underscoring the persistent impact of altered nasal airflow despite surgical intervention. Structural sequelae, including septal deviation and cosmetic deformity, were also highly prevalent, highlighting the challenges of achieving optimal anatomical realignment and aesthetic outcomes, particularly in complex or delayed fractures. Hemorrhagic and inflammatory complications such as epistaxis and infection occurred at moderate rates, reflecting the inherent vulnerability of the nasal mucosa in the postoperative period. In contrast, less frequent but clinically relevant outcomes such as olfactory disturbance, septal hematoma, and the need for revision surgery suggest that while severe complications are relatively uncommon, they carry significant implications for patient quality of life and healthcare utilization. Collectively, these findings emphasize the need for meticulous surgical technique, careful patient selection, and structured postoperative follow-up to minimize functional deficits and reduce the long-term burden of complications after nasal fracture repair (figure 1).

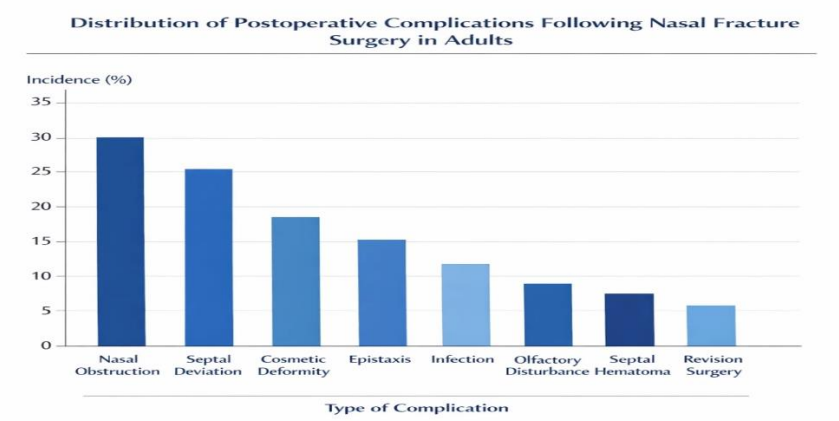


**Figure 1.** Distribution of Postoperative Complications Following Nasal Fracture Surgery in Adults

The results illustrated in Figure 2 depict a graded decline in the incidence of postoperative complications following nasal fracture surgery in adults, highlighting a clear predominance of functional and structural sequelae over severe adverse outcomes. Nasal obstruction remains the most frequently reported complication, reinforcing its role as the principal postoperative concern and suggesting incomplete restoration of nasal airflow despite surgical correction. Septal deviation and cosmetic deformity follow closely, indicating that residual anatomical irregularities and aesthetic dissatisfaction continue to affect a substantial proportion of patients. Moderate incidences of epistaxis and infection reflect the expected postoperative vulnerability of the nasal mucosa and soft tissues, particularly in the early healing phase. In contrast, olfactory disturbances, septal hematoma, and the need for revision surgery occur less commonly, suggesting that although serious complications are relatively infrequent, they represent clinically meaningful events with potential long-term consequences. Overall, this distribution underscores the necessity of precise fracture reduction, careful intraoperative handling of septal structures, and vigilant postoperative monitoring to reduce persistent functional impairment and improve overall surgical outcomes (figure 2).

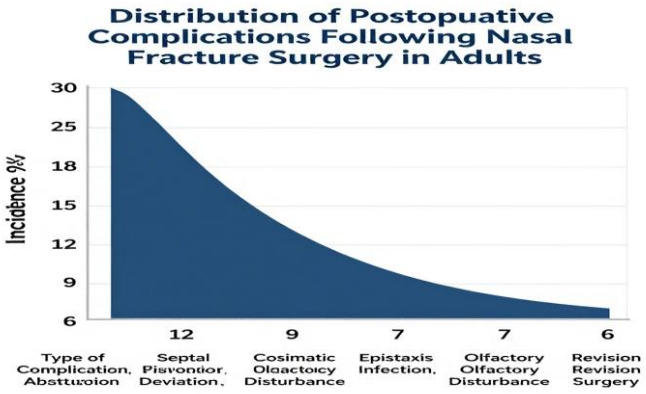


**Figure 2.** Distribution of Postoperative Complications Following Nasal Fracture Surgery in Adults

**Discussion**

The present study demonstrates that nasal fracture surgery in adults is associated with a substantial burden of postoperative morbidity, with functional and structural complications clearly outweighing infectious or revision-related outcomes. The affected population largely reflects trauma-prone demographics, and despite timely intervention and predominantly minimally invasive management, a wide spectrum of postoperative sequelae persists. These findings highlight that nasal fracture repair, although often regarded as routine, entails complex anatomical and functional challenges that may compromise long-term outcomes and patient satisfaction.

The predominance of young to middle-aged male patients observed in this cohort is consistent with established epidemiological patterns of facial trauma. Higher exposure to traffic-related injuries, interpersonal violence, and occupational or recreational risks among men in this age group likely explains this distribution. Sociobehavioral factors, including greater participation in high-risk activities and delayed use of protective measures, further contribute to this trend. Similar demographic profiles consistently reported across trauma

registries, reinforcing the notion that nasal fractures are a reflection of broader injury patterns rather than isolated clinical events (16).

The high proportion of isolated nasal fractures managed with closed reduction underscores the tendency toward conservative surgical approaches in adult nasal trauma. Closed reduction is often favored due to its simplicity, shorter operative time, and lower immediate morbidity, particularly when fractures are non-comminuted and diagnosed early. However, reliance on this technique may partially explain the persistence of postoperative functional and aesthetic complaints, as subtle septal deviations or cartilaginous injuries can be difficult to fully correct without direct visualization. Previous studies have noted that closed techniques, while effective in acute stabilization, may be insufficient for achieving optimal long-term alignment in select patients (17).

The short interval between injury and surgical intervention observed in this study reflects prompt clinical management, which is widely regarded as a key determinant of favorable outcomes. Early reduction minimizes fibrosis, edema-related distortion, and malunion, theoretically reducing complication rates. Nevertheless, the persistence of postoperative morbidity despite timely intervention suggests that factors beyond surgical timing such as fracture complexity, septal involvement, and pre-existing nasal anatomy play a substantial role in determining outcomes. This aligns with prior evidence indicating that early treatment alone does not guarantee functional restoration (18).

Nasal obstruction emerged as the most prevalent postoperative complication, emphasizing the functional vulnerability of the nasal airway following trauma. Even minor residual deviations, turbinate displacement, or unrecognized septal hematoma can significantly alter airflow dynamics. Additionally, postoperative mucosal edema and scar formation may exacerbate obstruction over time. These findings support previous observations that patient-reported functional outcomes often diverge from surgeon-assessed anatomical success, particularly in procedures focused primarily on fracture realignment rather than airway optimization (19).

Septal deviation was another prominent postoperative finding, likely reflecting both direct traumatic injury to the septal cartilage and incomplete correction during initial surgery. The septum plays a central role in nasal stability and airflow, and even subtle deformities can result in long-term functional compromise. In closed reduction procedures, limited access to the septal framework increases the risk of residual deviation, particularly in fractures involving the cartilaginous dorsum. Similar rates of postoperative septal deformity reported in cohorts where septal exploration was not routinely performed (20).

Cosmetic deformity constituted a substantial proportion of postoperative complaints, underscoring the aesthetic sensitivity of nasal trauma management. The nose occupies a central position on the face, and minor contour irregularities readily perceived by patients. Discrepancies between surgeon-defined success and patient satisfaction particularly pronounced in nasal surgery, where subjective aesthetic expectations play a critical role. Inadequate reduction of nasal bones, asymmetric healing, and soft tissue scarring may all contribute to dissatisfaction, as described in prior outcome-based studies of facial trauma (21).

Postoperative epistaxis and infection occurred at moderate but clinically relevant rates, reflecting the inherent susceptibility of the nasal cavity to bleeding and microbial colonization. The rich vascular supply of the nasal mucosa, combined with mucosal disruption during fracture reduction, predisposes patients to postoperative hemorrhage. Similarly, local contamination and impaired mucociliary clearance may increase infection risk, particularly in the presence of packing or splints. These findings are consistent with previous literature emphasizing meticulous hemostasis and postoperative hygiene as critical preventive measures (22).

Less frequent complications such as olfactory disturbance and septal hematoma, although uncommon, carry disproportionate clinical significance. Olfactory dysfunction may arise from mucosal edema, neural injury, or airflow alteration, and can have a profound impact on quality of life. Septal hematoma, if unrecognized, may progress to cartilage necrosis and saddle nose deformity. The relatively low incidence observed suggests effective perioperative surveillance, yet reinforces the need for heightened postoperative vigilance, as emphasized in prior otolaryngology guidelines (23).

The requirement for revision surgery in a subset of patients reflects the cumulative impact of unresolved functional and structural complications. Revision procedures often technically demanding and associated with increased patient dissatisfaction and healthcare costs. Factors such as delayed presentation, complex fracture patterns, and initial under correction likely contribute to the need for secondary intervention. These findings echo previous reports identifying revision surgery as a marker of initial treatment failure rather than an isolated adverse event (24).

Taken together, the graded distribution of complications illustrated in the figures highlights a clear dominance of functional and structural sequelae over severe or life-threatening outcomes. This pattern suggests that while nasal fracture surgery is generally safe, it frequently falls short of restoring optimal nasal form and function. Addressing this gap may require more individualized surgical planning, routine assessment of septal involvement, and structured long-term

follow-up. Similar conclusions draw in contemporary trauma literature advocating a shift from purely fracture-focused management toward function-oriented care pathways (25).

## Conclusion

In summary, the findings of this study reinforce that nasal fracture surgery in adults, despite its routine nature, carries a meaningful risk of persistent postoperative morbidity. Functional impairment, structural deformity, and aesthetic dissatisfaction remain common, even with timely and minimally invasive intervention. These results underscore the importance of comprehensive preoperative evaluation, meticulous surgical technique, and patient-centered outcome assessment to reduce the long-term burden of complications and improve overall quality of care in nasal trauma management.

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## Authors' Contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

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