Closed Reduction of Nasal Fractures: Outcomes, Pitfalls, and Contemporary Controversies

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Abstract

Background: Nasal fractures represent the most common type of facial fracture, accounting for a substantial proportion of emergency and outpatient otolaryngologic and plastic surgery consultations. Despite their frequency, optimal management remains a subject of ongoing debate, particularly regarding the role and effectiveness of closed reduction. Closed reduction continues to be widely employed as the first-line intervention due to its minimally invasive nature, cost-effectiveness, and ability to restore both nasal form and function without the need for extensive surgical exposure. However, variability in outcomes, patient selection, and technique has led to persistent controversies in clinical practice.

The aim of this review is to provide a comprehensive and evidence-based evaluation of closed reduction of nasal fractures, focusing on aesthetic and functional outcomes, common pitfalls, and contemporary controversies. Particular emphasis is placed on identifying factors that influence success rates, including timing of intervention, fracture pattern, surgeon expertise, and perioperative management strategies. Additionally, the review explores the limitations of closed reduction, including its inability to adequately address complex fractures, septal deviations, and associated soft tissue injuries in certain cases.

Functional outcomes, particularly nasal airway patency, are critically analyzed alongside aesthetic results such as symmetry, dorsal alignment, and patient satisfaction. The incidence and causes of suboptimal outcomes are discussed in detail, highlighting the importance of proper patient selection and technique. Furthermore, this review examines key controversies, including the optimal timing of reduction, the choice between local and general anesthesia, the necessity of imaging, and the indications for transitioning to open surgical approaches.

In conclusion, while closed reduction remains a cornerstone in the management of nasal fractures, its success is highly dependent on careful clinical assessment, appropriate timing, and technical precision. Recognition of its limitations and an understanding of current controversies are essential for optimizing patient outcomes. Future advancements in imaging, surgical techniques, and outcome assessment tools may further refine treatment strategies and improve both functional and aesthetic results.

Keywords: *Closed Reduction, Nasal Fractures, Controversies*

Introduction

Nasal fractures constitute the most frequent type of facial skeletal injury, representing up to 40–50% of all facial fractures encountered in clinical practice. This high incidence is largely attributable to the prominent and central position of the nose on the الوجه، as well as the relative fragility of the nasal bones. Patients commonly present following interpersonal violence, sports-related trauma, motor vehicle accidents, or accidental falls. Given this prevalence, the management of nasal fractures remains a fundamental skill for plastic surgeons, otolaryngologists, and emergency physicians alike. However,

despite their apparent simplicity, these injuries can lead to significant long-term functional and aesthetic sequelae if not properly addressed [1].

From a plastic surgery perspective, the importance of nasal fracture management extends beyond mere realignment of bony structures. The nose is a central aesthetic unit of the face, and even minor deformities can result in noticeable facial asymmetry and patient dissatisfaction. Furthermore, the intricate relationship between nasal bone alignment, septal integrity, and the internal nasal valve underscores the functional significance of these injuries. Failure to restore both form and function may result in chronic nasal obstruction, impaired airflow, and the need for secondary corrective procedures such as septorhinoplasty [2].

Closed reduction has traditionally been regarded as the first-line treatment for the majority of nasal fractures, particularly those that are non-comminuted and without severe septal involvement. The technique offers several advantages, including minimal invasiveness, shorter operative time, reduced cost, and the ability to perform the procedure under local anesthesia in selected cases. Despite these benefits, reported outcomes vary considerably across studies, with rates of post-reduction deformity and functional impairment ranging from 9% to 50%. Such variability raises important questions regarding patient selection, timing, and technical execution [3].

One of the key challenges in the management of nasal fractures is the heterogeneity of injury patterns. Fractures may range from simple unilateral nasal bone displacement to complex comminuted injuries involving the septum, upper lateral cartilages, and adjacent facial structures. This diversity complicates the establishment of standardized treatment protocols and contributes to ongoing debates regarding the appropriateness of closed versus open approaches in specific clinical scenarios. Moreover, the absence of universally accepted classification systems further limits comparability between studies and hinders evidence synthesis [4].

Another critical consideration is the timing of intervention. While early reduction—typically within 7 to 14 days—is widely recommended to prevent fibrous fixation and facilitate manipulation, the optimal timing remains controversial. Delayed presentations, pediatric cases, and patients with significant soft tissue edema pose additional challenges, often necessitating individualized decision-making. These factors contribute to inconsistent practices across institutions and highlight the need for clearer evidence-based guidelines [5].

In addition to timing, perioperative variables such as the choice of anesthesia (local versus general), the use of imaging modalities, and postoperative care protocols (including nasal packing and splinting) remain subjects of debate. Some clinicians advocate for routine imaging to better characterize fracture patterns, while others argue that clinical examination alone is sufficient in most cases. Similarly, the necessity and duration of nasal packing continue to be questioned due to concerns regarding patient discomfort and potential complications [6].

Importantly, patient expectations and subjective satisfaction play a pivotal role in evaluating treatment success. While objective measures such as airway patency and radiographic alignment are essential, they do not ყოველთვის correlate with patient-reported outcomes. Dissatisfaction may arise even in technically successful reductions, emphasizing the need for thorough preoperative counseling and realistic expectation setting. This aspect is particularly relevant in aesthetic-sensitive regions such as the nose, where minor imperfections can have a disproportionate psychological impact [7].

Despite the extensive clinical experience with closed reduction of nasal fractures, significant gaps remain in the literature. Many studies are retrospective in nature, with limited standardization in outcome assessment and follow-up duration. Furthermore, there is a lack of high-quality randomized controlled trials comparing different management strategies, particularly in relation to emerging controversies such as early open intervention versus traditional closed techniques. This paucity of robust evidence underscores the need for comprehensive, critically appraised reviews that synthesize current knowledge and identify areas for future research [8].

Accordingly, the aim of this review is to provide a detailed and evidence-based analysis of closed reduction of nasal fractures, with a particular focus on outcomes, pitfalls, and contemporary

controversies. By integrating insights from plastic surgery, otolaryngology, and facial trauma literature, this article seeks to clarify current best practices, highlight limitations of existing approaches, and propose directions for future investigation.

Surgical Anatomy and Biomechanics of Nasal Fractures

The external nose represents a complex osteocartilaginous framework that plays a central role in both facial aesthetics and respiratory function. Structurally, it is divided into the upper bony vault and the lower cartilaginous vault, with a transitional zone that is particularly vulnerable to traumatic forces. The paired nasal bones form the upper third of the nasal dorsum and articulate superiorly with the frontal bone and laterally with the frontal processes of the maxilla. These articulations provide relative stability; however, the thin and elongated nature of the nasal bones predisposes them to fracture even under moderate force [9].

Beneath the nasal bones lies the cartilaginous framework, composed of the upper lateral cartilages and the lower lateral (alar) cartilages. The upper lateral cartilages are firmly attached to the undersurface of the nasal bones and contribute significantly to the integrity of the internal nasal valve, which is the narrowest segment of the nasal airway. Disruption of this region during trauma can lead to both structural deformity and functional airway compromise. Importantly, closed reduction techniques primarily address bony displacement, often leaving subtle cartilaginous injuries uncorrected, which may contribute to persistent postoperative deformities [10].

The nasal septum, consisting of both cartilaginous and bony components (including the perpendicular plate of the ethmoid and the vomer), serves as the central supporting pillar of the nose. Septal injuries frequently accompany nasal fractures and may manifest as deviations, fractures, or hematomas. The presence of septal involvement significantly influences both the complexity of the injury and the likelihood of successful closed reduction. Failure to recognize and appropriately manage septal pathology—particularly septal hematoma—can result in serious complications such as cartilage necrosis, saddle nose deformity, and long-term airway obstruction [11].

From a biomechanical standpoint, the pattern of nasal fracture is largely determined by the direction, magnitude, and point of application of the traumatic force. Frontal impacts tend to produce comminuted fractures with depression of the nasal dorsum, whereas lateral forces more commonly result in unilateral displacement or deviation of the nasal bones. High-energy trauma may extend beyond the nasal bones to involve adjacent structures such as the orbit, maxilla, and ethmoid complex. Understanding these force vectors is essential for accurate diagnosis and effective reduction, as it guides the direction of manipulation required to restore anatomical alignment [12].

The concept of nasal “buttresses” and structural support zones is also critical in understanding fracture behavior. The nasal bones, in conjunction with the frontal process of the maxilla, form a rigid framework that resists deformation. However, the junction between the nasal bones and upper lateral cartilages—often referred to as the keystone area—is particularly susceptible to injury. Disruption of this region can compromise both dorsal stability and internal nasal valve function, making it a key consideration during reduction and postoperative evaluation [13].

Soft tissue structures, including the periosteum, mucoperichondrium, and overlying skin envelope, play an important role in both injury response and healing. The periosteum contributes to fracture stability and healing, while the mucoperichondrium provides vascular supply to the underlying cartilage. Trauma-induced edema, hematoma formation, and soft tissue swelling can obscure underlying deformities during initial assessment, potentially leading to underestimation of injury severity. This highlights the importance of careful clinical evaluation and, in some cases, delayed reassessment once swelling subsides [14].

Another important anatomical consideration is the internal and external nasal valves, which are critical determinants of nasal airflow resistance. Even minor alterations in the geometry of these regions can lead to significant functional impairment. Closed reduction techniques, while effective in repositioning displaced nasal bones, may not fully address valve collapse or cartilage distortion, particularly in complex injuries. As such, patients may experience persistent nasal obstruction despite apparently

successful bony realignment [15].

Age-related anatomical differences further influence fracture patterns and management strategies. In pediatric patients, the nasal skeleton contains a higher proportion of cartilage and exhibits greater elasticity, often resulting in greenstick-type fractures rather than complete bony disruption. Additionally, the presence of growth centers within the nasal septum necessitates careful handling to avoid long-term developmental disturbances. In contrast, adult patients are more likely to sustain displaced fractures requiring active intervention [16].

The vascular supply of the nose, derived from both the internal and external carotid systems, is robust and contributes to the relatively rapid healing observed in nasal fractures. However, this rich vascularity also predisposes to significant bleeding and hematoma formation following trauma. The Kiesselbach plexus, located in the anterior nasal septum, is a common site of epistaxis and may complicate both initial presentation and postoperative recovery [17].

In summary, a thorough understanding of nasal anatomy and biomechanics is essential for the effective management of nasal fractures. The intricate interplay between bony structures, cartilaginous support, and soft tissue components underscores the complexity of these seemingly simple injuries. Successful closed reduction depends not only on repositioning displaced bones but also on recognizing associated structural and functional abnormalities that may impact overall outcomes.

Epidemiology and Etiology of Nasal Fractures

Nasal fractures are the most common type of facial fracture worldwide, accounting for approximately 40% to 50% of all facial skeletal injuries. Their high prevalence is primarily due to the prominent anatomical position of the nose and its relative structural vulnerability. Epidemiological studies across different regions consistently demonstrate that nasal trauma represents a significant proportion of cases presenting to emergency departments and maxillofacial units. This widespread occurrence underscores the importance of establishing standardized and evidence-based approaches to management, particularly in high-volume clinical settings [18].

The incidence of nasal fractures shows a clear demographic distribution, with a higher prevalence among young adult males. This gender disparity is often attributed to increased exposure to risk factors such as interpersonal violence, contact sports, and high-risk occupational activities. Male-to-female ratios reported in the literature range from 2:1 to as high as 4:1 in certain populations. However, recent trends suggest a gradual increase in the incidence among females, potentially reflecting changes in social behavior and participation in physical activities [19].

Age is another determinant of nasal fracture patterns and causes. In pediatric populations, nasal fractures are less common but still clinically significant. When they do occur, they are often the result of falls or sports-related injuries. The elastic nature of the pediatric nasal skeleton often leads to incomplete or greenstick fractures, which may be more challenging to diagnose clinically. In contrast, elderly patients are more prone to nasal fractures due to falls, often compounded by reduced bone density and impaired balance [20].

Etiologically, interpersonal violence remains the leading cause of nasal fractures in many urban and developed settings. Assault-related injuries frequently involve lateral force application, resulting in displaced fractures and septal deviation. Alcohol consumption is a well-documented contributing factor in such cases, often associated with both increased risk of injury and delayed presentation to healthcare facilities. The association between alcohol and facial trauma highlights the need for a multidisciplinary approach that includes preventive strategies [21].

Sports-related injuries represent another major cause of nasal fractures, particularly in younger populations. Contact sports such as boxing, rugby, football, and martial arts carry a high risk due to direct facial impact. Even in non-contact sports, accidental collisions or falls can result in nasal trauma. The use of protective equipment, such as face guards and helmets, has been shown to reduce the incidence of such injuries, although compliance varies widely among athletes [22].

Motor vehicle accidents (MVAs) are a significant cause of nasal fractures, particularly in regions with high traffic density and limited enforcement of safety regulations. In such cases, nasal fractures are often

part of more complex facial injuries involving multiple bones and soft tissue structures. The mechanism of injury in MVAs typically involves high-energy frontal impact, leading to comminuted fractures and associated complications. The widespread adoption of seat belts and airbags has contributed to a reduction in facial injuries, but nasal fractures remain common [23].

Accidental falls are a cause of nasal fractures, especially among children and the elderly. In children, falls during play or sports activities are the most frequent mechanism, whereas in older adults, falls are often related to balance disorders, visual impairment, or environmental hazards. The increasing aging population globally suggests that fall-related nasal fractures may become more prevalent in the future, necessitating targeted preventive measures [24].

Occupational hazards also contribute to the incidence of nasal fractures, particularly in industries involving physical labor, construction, or exposure to hazardous environments. Workers in these settings may be at increased risk due to falls, blunt trauma, or equipment-related injuries. The implementation of workplace safety regulations and the use of protective gear are essential in reducing the burden of such injuries [25].

Geographical and cultural factors further influence the epidemiology of nasal fractures. For instance, higher rates of assault-related injuries have been reported in certain urban areas, while rural regions may exhibit a greater proportion of trauma related to agricultural or occupational activities. Seasonal variations have also been observed, with increased incidence during warmer months, possibly due to higher levels of outdoor activity and social interaction [26].

Classification Systems of Nasal Fractures

The classification of nasal fractures is essential for guiding clinical decision-making, predicting outcomes, and standardizing communication among clinicians. Despite the high incidence of nasal trauma, there is no universally accepted classification system, which remains a significant limitation in both clinical practice and research. Existing systems vary in complexity and applicability, often reflecting differences in specialty perspectives, including plastic surgery, otolaryngology, and maxillofacial surgery [27].

One of the earliest and most widely cited classification systems is based on the direction of the traumatic force and the resulting fracture pattern. This approach broadly categorizes fractures into frontal (anteroposterior) and lateral impact injuries. Frontal impacts tend to produce depressed or comminuted fractures of the nasal bones, often involving the septum and adjacent structures. In contrast, lateral forces typically result in unilateral displacement or deviation of the nasal pyramid. While this classification is simple and clinically intuitive, it lacks sufficient detail to guide management in more complex cases [28].

Another commonly referenced system is the **Stranc and Robertson classification**, which incorporates both the direction of force and the extent of injury. This system divides nasal fractures into two main types: frontal impact and lateral impact, each further subdivided based on severity and anatomical involvement. It provides a more nuanced understanding of injury patterns and is particularly useful in correlating mechanism of injury with clinical findings. However, its practical use is sometimes limited by the need for detailed assessment that may not be feasible in all acute settings [29].

The **Murray classification** offers a more simplified framework, categorizing nasal fractures into three types: simple fractures without displacement, displaced fractures, and comminuted fractures. This system is easy to apply in emergency settings and can assist in determining the need for intervention. However, it does not adequately account for septal involvement or soft tissue injury, both of which are critical factors influencing outcomes following closed reduction [30].

From a surgical perspective, classifications that incorporate septal injury are particularly valuable. Septal fractures and deviations play a pivotal role in both functional and aesthetic outcomes. Some authors have proposed classifications that specifically address septal involvement, distinguishing between isolated nasal bone fractures and those associated with septal disruption or hematoma. These systems are especially relevant for plastic surgeons, as unrecognized septal pathology is a major cause of failed closed reduction and subsequent need for revision surgery [31].

Radiological classification systems, often based on computed tomography (CT) findings, have also been developed to provide a more detailed assessment of fracture patterns. These systems can identify subtle fractures, comminution, and involvement of adjacent structures such as the orbit or maxilla. While CT-based classifications offer high diagnostic accuracy, their routine use in isolated nasal fractures remains controversial due to concerns regarding cost, radiation exposure, and limited impact on management decisions in straightforward cases [32].

In pediatric populations, classification systems must account for the unique anatomical and developmental characteristics of the nasal skeleton. The predominance of cartilage and the presence of growth centers necessitate a more conservative approach. Pediatric classifications often emphasize the distinction between greenstick fractures and more severe disruptions, as well as the potential impact on future nasal development. However, standardized pediatric-specific systems remain underdeveloped [33].

An ideal classification system for nasal fractures should be simple, reproducible, and clinically relevant, while also providing sufficient detail to guide treatment decisions and predict outcomes. It should incorporate key variables such as fracture displacement, comminution, septal involvement, and associated soft tissue injury. Unfortunately, no existing system fully meets all these criteria, which contributes to variability in management and outcomes reported in the literature [34].

The lack of a universally accepted classification system also poses challenges for research and evidence synthesis. Studies often use different criteria to define and categorize nasal fractures, making it difficult to compare results or perform meta-analyses. This heterogeneity underscores the need for consensus among specialties to develop a standardized, evidence-based classification framework that can be widely adopted [35].

In clinical practice, many surgeons rely on a combination of classification systems and individual clinical judgment when assessing nasal fractures. Factors such as patient age, mechanism of injury, degree of displacement, and presence of septal injury are all considered in determining the most appropriate management approach. This pragmatic approach reflects the complexity of nasal trauma and the limitations of existing classification systems [36].

Indications and Patient Selection for Closed Reduction

Appropriate patient selection is one of the most critical determinants of successful outcomes following closed reduction of nasal fractures. While the procedure is widely regarded as the first-line intervention for many nasal injuries, it is not universally applicable. Careful assessment of fracture characteristics, associated injuries, patient-specific factors, and timing is essential to ensure optimal functional and aesthetic results. Failure to adhere to proper indications may lead to unsatisfactory outcomes and an increased need for revision surgery [37].

Closed reduction is primarily indicated in patients with **simple, displaced nasal bone fractures** without significant comminution or severe septal disruption. These cases typically involve unilateral or bilateral displacement of the nasal bones that can be manually repositioned to restore alignment. Patients presenting within an appropriate time window—generally before fibrous union begins—are ideal candidates. In such scenarios, closed reduction offers a minimally invasive and efficient method to achieve satisfactory outcomes with low morbidity [38].

Another important indication is the presence of **cosmetic deformity following trauma**, particularly when there is visible deviation or asymmetry of the nasal dorsum. From a plastic surgery perspective, even minor deviations may be unacceptable to patients due to the central role of the nose in facial aesthetics. Closed reduction can effectively address these deformities when performed early and with proper technique. However, patient expectations must be carefully managed, as perfect restoration of pre-injury appearance is not always achievable [39].

Functional impairment, especially **nasal airway obstruction**, is also a key indication for intervention. Displacement of the nasal bones or associated septal deviation can compromise airflow through the internal nasal valve, leading to symptoms such as difficulty breathing, congestion, and reduced exercise tolerance. In selected cases, closed reduction may improve airway patency by restoring anatomical

alignment. However, if obstruction is primarily due to significant septal injury, additional procedures such as septoplasty may be required [40].

Despite its advantages, closed reduction is **contraindicated or relatively unsuitable** in certain clinical situations. Comminuted fractures, where the nasal bones are fragmented into multiple pieces, often lack the structural stability required for successful manipulation and healing. Similarly, fractures involving the naso-orbito-ethmoid (NOE) complex or those associated with other midfacial fractures typically require open reduction and internal fixation. Attempting closed reduction in such cases may lead to inadequate correction and poor outcomes [41].

Severe septal injuries represent another important limitation. Significant septal deviation, fracture, or dislocation may not be adequately addressed through closed techniques alone. In these cases, failure to correct the septal component can result in persistent deformity and functional impairment. Additionally, the presence of a **septal hematoma** constitutes an absolute emergency that must be drained promptly before any attempt at reduction, as delayed treatment can lead to cartilage necrosis and saddle nose deformity [42].

Delayed presentation is a common clinical challenge that directly impacts patient selection. Patients presenting beyond the optimal time window—typically more than 2 to 3 weeks after injury—may have already developed fibrous or bony healing, making closed reduction difficult or ineffective. In such cases, formal septorhinoplasty or osteotomy-based approaches may be required to achieve satisfactory correction. This highlights the importance of early diagnosis and timely referral to specialized care [43].

Patient-related factors, including age, comorbidities, and expectations, must also be considered. In pediatric patients, the decision to perform closed reduction requires careful consideration due to the presence of growth centers and the potential for long-term developmental impact. Conversely, elderly patients may have reduced bone quality and healing capacity, which can influence both the technique and expected outcomes. Additionally, patient compliance with postoperative care, including splinting and follow-up, plays a crucial role in treatment success [44].

Psychological and aesthetic expectations are particularly important in nasal trauma management. Patients often seek treatment not only for functional improvement but also for restoration of their pre-injury appearance. Unrealistic expectations may lead to dissatisfaction even in technically successful cases. Therefore, thorough preoperative counseling is essential to align patient expectations with achievable outcomes and to discuss the potential need for secondary procedures [45].

Finally, surgeon experience and institutional resources influence the decision-making process. Closed reduction is a technically sensitive procedure that requires a thorough understanding of nasal anatomy and fracture biomechanics. Inadequate technique or poor judgment in patient selection can compromise results. As such, clinicians must be prepared to recognize cases that would benefit more from early open intervention rather than attempting closed reduction inappropriately [46].

Timing of Intervention: Early versus Delayed Reduction (Contemporary Controversy)

The timing of closed reduction in nasal fractures remains one of the most debated aspects of management, with significant implications for both functional and aesthetic outcomes. Traditionally, early intervention has been advocated to facilitate easier manipulation of displaced nasal bones before the onset of fibrous union. However, variations in clinical presentation, patient factors, and institutional practices have led to ongoing controversy regarding the optimal timing of reduction [47].

Early reduction is generally defined as intervention performed within **7 to 14 days following injury** in adults, and often earlier in pediatric patients due to more rapid healing. During this period, edema begins to subside, allowing for improved clinical assessment, while the fracture fragments remain mobile and amenable to repositioning. Several studies have demonstrated that early reduction is associated with higher success rates, improved cosmetic alignment, and reduced need for secondary procedures [48].

One of the primary advantages of early intervention is the ability to accurately assess the deformity once soft tissue swelling has diminished. Immediate reduction performed in the presence of significant edema may lead to undercorrection or missed deformities. For this reason, many clinicians advocate a short delay of 3 to 5 days post-injury to allow swelling to subside before performing the procedure. This

approach balances the need for timely intervention with the requirement for accurate anatomical evaluation [49].

Despite the benefits of early reduction, immediate intervention may be necessary in specific, such as the presence of a septal hematoma or severe nasal obstruction. Septal hematomas require urgent drainage to prevent cartilage necrosis and long-term deformity, and may be addressed concurrently with fracture reduction. Additionally, patients with significant displacement causing airway compromise may benefit from prompt intervention to restore function [50].

Delayed reduction, typically defined as intervention performed beyond 2 to 3 weeks after injury, is generally associated with less favorable outcomes. By this stage, fibrous or early bony union may have occurred, rendering closed manipulation difficult or ineffective. Attempting reduction in this phase may result in incomplete correction or iatrogenic injury. Consequently, delayed cases often require more invasive approaches, such as open reduction, osteotomies, or formal septorhinoplasty [51].

However, some studies suggest that selected cases of delayed presentation may still benefit from attempted closed reduction, particularly when displacement is minimal and fibrous union is not yet fully established. These cases require careful clinical judgment and often depend on surgeon experience. Nonetheless, the predictability of outcomes decreases significantly as the delay increases, reinforcing the importance of early referral and intervention [52].

Pediatric nasal fractures present unique considerations regarding timing. Due to the increased vascularity and rapid healing capacity of children, the window for effective closed reduction is shorter—often within **3 to 7 days**. Delayed intervention in this population may not only compromise immediate outcomes but also risk long-term disturbances in nasal growth and development. Therefore, prompt evaluation and management are essential in pediatric cases [53].

Another important factor influencing timing is patient-related delay in seeking medical care. Cultural, and logistical barriers may contribute to late presentation, particularly in resource-limited settings. In such cases, clinicians must carefully weigh the risks and benefits of attempting closed reduction versus planning definitive corrective surgery at a later stage. This highlights the need for improved public awareness and access to specialized care [54].

The timing of intervention is also influenced by healthcare system factors, including availability of operating rooms, surgeon expertise, and institutional protocols. In some settings, delays may occur due to scheduling constraints or referral pathways, potentially impacting outcomes. Streamlining care pathways and establishing clear guidelines may help reduce such delays and improve overall management [55].

From a practical standpoint, most experts agree that the **optimal timing for closed reduction in adults is between 5 and 10 days post-injury**, when edema has sufficiently subsided and fracture mobility is still preserved. This window allows for accurate assessment and effective manipulation, maximizing the likelihood of satisfactory results. Outside this window, the decision to proceed with closed reduction should be made cautiously and on a case-by-case basis [56].

In summary, timing plays a crucial role in the success of closed reduction of nasal fractures. While early intervention remains the standard of care, the precise timing must be individualized based on patient factors, injury characteristics, and clinical judgment. Ongoing controversy reflects the complexity of this decision-making process and underscores the need for further high-quality evidence to establish standardized guidelines.

Conclusion

Closed reduction of nasal fractures remains a fundamental and widely utilized technique in the management of nasal trauma, offering a minimally invasive approach with the potential to restore both aesthetic form and functional integrity. Its continued relevance in modern practice reflects its efficiency, accessibility, and generally favorable outcomes when applied in appropriately selected patients. However, as highlighted throughout this review, the success of closed reduction is far from uniform and is influenced by a complex interplay of anatomical, technical, and patient-related factors [57].

From a plastic surgery perspective, achieving optimal outcomes requires more than simple realignment

of displaced nasal bones. The nose represents a central aesthetic subunit, and even minor residual deformities can significantly impact facial harmony and patient satisfaction. Furthermore, the functional dimension—particularly nasal airway patency—must be carefully considered, as unaddressed septal injuries or internal valve compromise may lead to persistent symptoms despite technically adequate reduction [58].

One of the key challenges identified is the variability in outcomes reported in the literature. This inconsistency is largely attributable to differences in patient selection, timing of intervention, fracture classification, and surgical technique. In particular, failure to recognize the limitations of closed reduction in complex or comminuted fractures often results in suboptimal results and the need for secondary corrective procedures. As such, appropriate case selection remains a cornerstone of successful management [59].

The review also underscores several important pitfalls associated with closed reduction. These include inadequate assessment of septal injury, poor timing of intervention, insufficient correction of deformity, and lack of standardized postoperative care. Each of these factors can contribute to unfavorable aesthetic or functional outcomes. Recognizing these pitfalls and addressing them proactively is essential for improving clinical results and reducing revision rates [60].

Contemporary controversies continue to shape the evolving landscape of nasal fracture management. Debates surrounding optimal timing, the role of imaging, anesthesia choice, and the indications for early open intervention reflect the absence of universally accepted guidelines. While closed reduction remains the first-line approach in many cases, there is growing recognition that a more individualized, patient-centered strategy may yield better outcomes, particularly in complex or borderline cases [61].

Importantly, patient expectations and satisfaction must be integrated into the overall assessment of treatment success. Objective measures alone are insufficient to capture the full impact of nasal trauma and its management. Effective communication, preoperative counseling, and shared decision-making are critical components of care, particularly in a region as aesthetically sensitive as the nose [62].

The current body of literature is limited by a predominance of retrospective studies, heterogeneity in outcome measures, and a lack of high-quality randomized controlled trials. This highlights a significant research gap and underscores the need for standardized classification systems, validated outcome assessment tools, and prospective comparative studies. Future research should aim to clarify the indications for closed versus open approaches and to identify predictors of success that can guide clinical decision-making [63].

Advances in imaging, surgical techniques, and biomaterials may further refine the management of nasal fractures in the coming years. Additionally, the integration of patient-reported outcome measures (PROMs) and digital technologies may enhance the evaluation of both functional and aesthetic results. Such innovations have the potential to improve not only clinical outcomes but also patient satisfaction and quality of life [64].

In conclusion, closed reduction remains a cornerstone in the treatment of nasal fractures, but its effectiveness is highly dependent on careful patient selection, precise timing, and meticulous technique. A thorough understanding of its limitations, combined with an awareness of current controversies and emerging evidence, is essential for optimizing outcomes. Ultimately, a tailored, evidence-based approach that prioritizes both functional restoration and aesthetic excellence will best serve patients with nasal trauma.

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