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Original Research Article

Technical Considerations in Open Rhinoplasty for Post Traumatic Saddle Nose Deformity

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Abstract:

Background: Post ̀traumatic saddle nose deformity is a complex nasal condition causing both cosmetic disfigurement and functional airway impairment due to collapse of the nasal framework. Open rhinoplasty has emerged as an effective reconstructive approach for restoring nasal contour and support.

Aim: To evaluate the tech0nical considerations, surgical outcomes, and postoperative complications of open rhinoplasty in patients with post traumatic saddle nose deformity.

Methodology: A hospital-based prospective observational study was conducted in the Department of General Surgery (Plastic Surgery), Netaji Subhas Medical College and Hospital,Bihta, Patna, Bihar, India. among 80 patients with post traumatic saddle nose deformity. Patients underwent open rhinoplasty using various graft materials including septal, conchal, and costal cartilage. Postoperative cosmetic and functional outcomes and complications were assessed during follow-up.

Results: The majority of patients were aged 26–35 years (36.3%), and road traffic accidents were the most common cause of trauma (47.5%). Moderate deformity was observed in 51.2% cases. Costal cartilage was the most frequently used graft material (35%). Satisfactory cosmetic outcome was achieved in 85% patients, while improved nasal airway function was observed in 78.8%. Complication rates were low and manageable.

Conclusion: Open rhinoplasty provides effective structural reconstruction with favorable cosmetic and functional outcomes in post-traumatic saddle nose deformitỳ.

Keywords: Open rhinoplasty, saddle nose deformity, nasal trauma, cartilage graft, post traumatic reconstruction.

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Introduction

Post traumatic saddle nose deformity is a difficult nasal deformity caused by ̀trauma, infection, previous surgery or collapse of the septal framework causing depression of the nasal dorsum [1]. Trauma is one of the most frequent etiological factors among these causes, particularly in young adults and those who have suffered from road traffic accidents, sports injuries, interpersonal violence, and occupational hazards. The deformity causes cosmetic disfigurement and functional problems such as nasal obstruction, altered airflow, crusting and breathing problems. The degree of saddle nose deformity is dependent on the amount of destruction or weakening of the septal cartilage and bony support, and therefore the aesthetic and physiological integrity of the nose. In severe cases, the middle third of the nose may collapse, causing a decrease in the length of the nose, a wider base of the nose, and a loss of tip projection. The nose is a central feature of the face and is important for facial harmony and self-esteem, and these deformities can have a significant psychological impact on patients.

The management of post-traumatic saddle nose deformity has evolved considerably through multiple decades because rhinoplasty techniques and grafting materials and surgical approaches have progressed to new heights. The reconstruction process for saddle nose requires complex technical skills because surgeons must simultaneously restore essential nasal functions while recreating nasal aesthetic elements and maintaining structural integrity. Surgeons preferred closed rhinoplasty techniques until that time because these methods prevented external scars while decreasing the amount of tissue that surgeons needed to remove. The need for better visibility

together with better access to severe traumatic deformity evaluation restricted surgeons from achieving their goal of precise deformity assessment and treatment. The open rhinoplasty technique achieved greater popularity because it enabled surgeons to see the nasal structure directly which allowed them to handle tissues more accurately and to position grafts and sutures better. Surgeons can use the open approach to treat complex deformities because it enables them to reveal cartilaginous and bony structures through controlled surgical procedures [2].

Open rhinoplasty is performed with a trans-columellar incision that is joined to bilateral marginal incisions, allowing the nasal skin-soft tissue envelope to be elevated and the underlying anatomy to be fully exposed. This technique is especially beneficial in the post-traumatic saddle nose deformity, as trauma can alter normal anatomical landmarks and cause scar tissue, fibrosis and asymmetry. Surgeons can better assess septal deviation, dorsal collapse, loss of cartilage support and other structural abnormalities through increased exposure. The approach also facilitates meticulous reconstruction using autologous grafts such as septal cartilage, conchal cartilage, and costal cartilage depending on the severity of deformity and availability of donor tissue [3]. Of these materials, autologous cartilage is the most preferred due to its biocompatibility, low infection rate, minimal resorption and long-term stability.

Restoring the height and structure of the nose's dorsal surface is one of the most important technical challenges in open rhinoplasty for saddle nose deformity [4]. The amount of graft material needed depends on the degree of dorsal depression. Septal or auricular cartilage grafts can be used to correct mild deformities, while costal cartilage is used for severe traumatic collapse due to its strength and availability in larger quantities. The correct grafting and positioning of grafts are crucial to ensure a smooth dorsal line and to avoid postoperative irregularities or warping. Furthermore, secure fixation methods are crucial to ensure the stability of the graft and to prevent it from being displaced during healing [5]. Structural grafting can not only restore nasal shape but also enhance airway patency by supporting the internal nasal valve and preventing inspiratory collapse.

Another important aspect of open rhinoplasty in post-traumatic cases is correction of septal deformities and maintenance of nasal function [6]. The main effects of trauma on the nose include septal fractures and dislocations together with the loss of support which results in both aesthetic defects and difficulties with breathing. The standard methods for reconstructing L-struts operate through spreader graft placement and septal extension grafts to provide proper support while enhancing functional results. The preservation of adequate septal support functions as the essential requirement to prevent both recurrent collapse and unstable conditions after surgery. The proper management of soft tissues includes maintaining their blood supply which helps to reduce the risk of complications that result in skin necrosis and infection and swelling and delayed healing [7].

Preoperative evaluation is essential for saddle nose reconstruction, and should involve a thorough clinical examination, photographic analysis, and assessment of patient expectations [8]. Before choosing the reconstructive approach, surgeons need to evaluate the thickness of the skin, the extent of dorsal collapse, tip support, the condition of the septa, and any other facial injuries. The treatment of nasal deformities is individualized, as the deformities are very variable in severity and extent of involvement. Recent years have seen further developments in imaging technology and surgical instruments, which have further enhanced the accuracy and predictability of rhinoplasty procedures. The application of fine suturing techniques, refined graft shaping methods, and improved postoperative care protocols have helped to achieve better aesthetic and functional results.

Although rhinoplasty has come a long way, the treatment of post-traumatic saddle nose deformity is still difficult because of the potential for graft resorption, warping, asymmetry, and airway obstruction. Reconstruction is a process that demands a thorough knowledge of nasal anatomy, grafting and structural support. Open rhinoplasty offers greater visibility and accurate correction of deformities, resulting in better functional and aesthetic results and patient satisfaction.

Methodology

Study Design: The present study was designed as a hospital-based prospective observational study conducted to evaluate the technical considerations, surgical outcomes, and postoperative complications associated with open rhinoplasty in patients presenting with post traumatic saddle nose deformity. The study aimed to assess different operative techniques used for structural reconstruction and their effectiveness in restoring nasal contour, support, and function.

Study Area: The study was conducted in the Department of Surgery (Plastic Surgery), Netaji Subhas Medical College and Hospital, Bihta, Patna, Bihar, India.

Study Duration: The duration of the study was one year from January 2025 to December 2025.

Study Participants: A total of 80 patients diagnosed with post traumatic saddle nose deformity and undergoing open rhinoplasty surgery in the Department of Surgery (Plastic Surgery) during the study period were included in the study.

Inclusion Criteria

- Patients aged 18 years and above.
- Patients diagnosed with post traumatic saddle nose deformity.
- Patients willing to undergo open rhinoplasty procedure.
- Patients providing written informed consent for participation in the study.
- Patients fit for surgery under general or local anesthesia.
- Patients available for postoperative follow-up evaluation.

Exclusion Criteria

- Patients with congenital nasal deformities.
- Patients with saddle nose deformity due to infection, autoimmune disease, or malignancy.
- Patients with previous unsuccessful rhinoplasty unrelated to trauma.
- Patients with severe systemic illness contraindicating surgery.
- Patients unwilling to participate in the study.
- Patients lost to follow-up during the postoperative assessment period.

Sample Size: The sample size for the present study consisted of 80 patients fulfilling the inclusion criteria. All eligible patients presenting during the study duration were included using convenient sampling technique.

Procedure: written informed consent from all participants, patients presenting with post traumatic saddle nose deformity were evaluated clinically in the outpatient and inpatient departments of Plastic Surgery. Detailed history regarding the mode of trauma, duration of deformity, nasal obstruction, breathing difficulty, previous treatment history, and associated facial injuries was recorded. General physical examination and detailed local examination of the nose were performed to assess the severity of deformity, loss of dorsal support, septal deviation, nasal airway compromise, skin condition, and structural defects.

Relevant investigations including routine hematological tests, radiological examination, and photographic documentation were carried out preoperatively. Patients were planned for open rhinoplasty using standard surgical techniques under appropriate anesthesia. The trans-columellar incision with marginal extension was used to expose the nasal framework adequately. Depending on the severity of saddle nose deformity, different graft materials such as septal cartilage, conchal cartilage, costal cartilage, or bone grafts were utilized for dorsal augmentation and structural support. Septal reconstruction, spreader graft placement, osteotomy, and tip support procedures were performed whenever required.

Intraoperative technical considerations including graft selection, graft shaping, fixation techniques, maintenance of nasal symmetry, restoration of dorsal height, and preservation of airway patency were carefully evaluated. Patients were monitored postoperatively for complications such as edema, infection, graft displacement, asymmetry, scar formation, and breathing difficulty. Follow-up examinations were conducted at regular intervals to assess functional improvement, cosmetic outcome, graft stability, and patient satisfaction. The collected data were recorded in a structured proforma for further analysis.

Statistical Analysis: The collected data were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) version 27.0. Descriptive statistical methods such as frequency, percentage, mean, and standard deviation were used to summarize the data. Categorical variables were presented in tables and charts wherever appropriate. Statistical significance was assessed using suitable tests, and a p-value of less than 0.05 was considered statistically significant.

Result

Table 1 shows the distribution of patients according to age group among 80 study participants. The highest number of patients belonged to the 26–35 years age group, accounting for 29 patients (36.3%), followed by the 36–45 years age group with 20 patients (25%). Patients aged 18–25 years constituted 18 cases (22.5%). A smaller proportion of patients were observed in the 46–55 years age group, comprising 9 patients (11.2%), while the least number of patients belonged to the age group above 55 years with 4 cases (5%). The findings indicate that the majority of patients were in the young and middle adult age groups, particularly between 26 and 45 years.

Table 1: Distribution of Patients According to Age Group (n=80)

Age Group (Years)	Number of Patients	Percentage (%)
18–25	18	22.5
26–35	29	36.3
36–45	20	25
46–55	9	11.2
>55	4	5
Total	**80**	**100**

Table 2 shows the distribution of patients according to the cause of trauma among 80 cases. The majority of patients sustained trauma due to road traffic accidents, accounting for 38 cases (47.5%), indicating that it was the most common cause of post-traumatic saddle nose deformity in the present study. Physical assault was the second most common cause, observed in 17 patients (21.3%), followed by fall injury in 14 patients (17.5%). Sports-related injuries contributed to 7 cases (8.7%), while occupational injuries were the least common cause, reported in 4 patients (5%). The findings suggest that high-impact injuries, particularly road traffic accidents, played a major role in the occurrence of nasal trauma requiring open rhinoplasty management.

Table 2: Distribution of Patients According to Cause of Trauma (n=80)		
Cause of Trauma	**Number of Patients**	**Percentage (%)**
Road Traffic Accident	38	47.5
Physical Assault	17	21.3
Fall Injury	14	17.5
Sports Injury	7	8.7
Occupational Injury	4	5
Total	**80**	**100**

Table 3 shows the distribution of severity of saddle nose deformity among 80 patients included in the study. The majority of patients had moderate deformity, accounting for 41 cases (51.2%), indicating that moderate saddle nose deformity was the most commonly observed presentation. Severe deformity was observed in 20 patients (25.0%), while mild deformity was reported in 19 patients (23.8%). The findings suggest that more than half of the patients presented with moderate structural depression of the nasal dorsum, whereas nearly one-fourth of the patients had severe deformity requiring extensive reconstructive correction. Overall, the results indicate that moderate to severe saddle nose deformities constituted the major clinical burden among the studied patients.

Table 3: Distribution of Severity of Saddle Nose Deformity (n=80)		
Severity of Deformity	**Number of Patients**	**Percentage (%)**
Mild	19	23.8
Moderate	41	51.2
Severe	20	25
Total	**80**	**100**

Table 4 shows the distribution of graft materials used during open rhinoplasty among 80 patients. Costal cartilage was the most commonly utilized graft material, used in 28 patients (35%), indicating its preference for providing strong structural support in post-traumatic saddle nose deformity reconstruction. Septal cartilage was used in 26 patients (32.5%), making it the second most common graft source due to its easy availability and good compatibility. Conchal cartilage was utilized in 18 patients (22.5%), mainly for cases requiring moderate support and contour correction. Bone grafts were used in only 8 patients (10%), representing the least commonly employed graft material, possibly due to limited indications and higher technical requirements. Overall, cartilage grafts constituted the majority of graft materials used during open rhinoplasty procedures in the present study.

Table 4: Distribution of Graft Material Used During Open Rhinoplasty (n=80)		
Graft Material Used	**Number of Patients**	**Percentage (%)**
Septal Cartilage	26	32.5
Conchal Cartilage	18	22.5
Costal Cartilage	28	35
Bone Graft	8	10
Total	**80**	**100**

Table 5 shows the distribution of postoperative outcomes and complications among 80 patients who underwent open rhinoplasty for post traumatic saddle nose deformity. A satisfactory cosmetic outcome was achieved in 68 patients (85%), indicating a high level of aesthetic success following surgery. Improved nasal airway function was observed in 63 patients (78.8%), demonstrating significant functional improvement after reconstruction. Among postoperative complications, mild edema was the most commonly reported finding, seen in 21 patients (26.3%), which was likely temporary and manageable during the recovery period. Infection was noted in 5 patients (6.2%), while graft displacement

occurred in 3 patients (3.8%), suggesting relatively low rates of major surgical complications. Residual asymmetry was observed in 7 patients (8.7%), indicating that a small proportion of patients experienced minor aesthetic irregularities after surgery. Overall, the findings suggest that open rhinoplasty provided favorable cosmetic and functional outcomes with comparatively low complication rates.

Table 5: Distribution of Postoperative Outcomes and Complications (n=80)

Postoperative Outcome/Complication	Number of Patients	Percentage (%)
Satisfactory Cosmetic Outcome	68	85
Improved Nasal Airway Function	63	78.8
Mild Edema	21	26.3
Infection	5	6.2
Graft Displacement	3	3.8
Residual Asymmetry	7	8.7

Discussion

The present study shows results that match multiple earlier studies which analyze post traumatic saddle nose deformity and open rhinoplasty reconstruction. The study found that most patients had their age between 26 and 45 years which shows that young and middle-aged adults suffer from traumatic nasal deformities more than other age groups. Chua DY and Park SS showed similar results because their research found that younger adults develop post traumatic nasal deformities as a result of their greater contact with road traffic accidents and interpersonal violence and occupational injuries (Chua & Park, 2015) [9]. Hsiao YC et al. found that most patients who received reconstructive rhinoplasty for trauma were in their productive years because people wanted to look better and they felt social pressure to keep their facial features looking good (Hsiao et al., 2007) [10]. The studies present results which show strong similarity to each other, which proves that the majority of people with traumatic saddle nose deformity make up the economically active and socially interactive groups.

The present study identified road traffic accidents as the primary cause of trauma which was followed by assault and falls. Kim DW and Toriumi DM found that high-velocity trauma serves as the main cause which produces saddle nose deformity through septal destruction and dorsal support collapse (Kim & Toriumi, 2004) [11]. Georgolios A and his team found that road traffic injuries account for most nasal deformities which occur after traumatic incidents, especially in developing countries where vehicular accidents cause facial injuries (Georgolios et al., 2023) [12]. The research showed that Western studies found sports-related trauma as the main cause of injuries because more people play contact sports, but the present study showed that sports injuries made up only a minor part of the total cases. The different trauma exposure patterns between regions and their associated lifestyle practices create this pattern.

The moderate saddle nose deformity represented the highest percentage of cases in the study whereas doctors documented severe deformity in a significant number of their patients. The results of this study demonstrate similarities to the findings of Seyhan T who discovered that patients with delayed trauma presentation commonly experience moderate to severe saddle nose deformities (Seyhan, 2010) [13]. The author explained that nasal support structures will experience progressive collapse when medical personnel fail to treat the initial injury effectively. The research by Cakmak O et al. demonstrated that patients with severe saddle nose deformities need complete septal support restoration together with structural grafting because their condition involves major cartilage damage and nasal bridge deterioration (Cakmak et al., 2015) [14]. The study found that severe deformities demanded advanced reconstruction methods together with increased graft size which matched existing academic research.

The study shows that researchers preferred cartilage grafts as their main graft material because costal cartilage was their most preferred material while septal and conchal cartilage followed as their second and third choices respectively. Surgeons preferred costal cartilage as their primary material for treating moderate and severe deformities because of its strength and ability to deliver sufficient dorsal support. The study conducted by Mao J et al. demonstrated that costal cartilage grafts achieved successful results over time in traumatic saddle nose reconstruction, while rib cartilage provided strong structural support with minimal resorption rates (Mao et al. 2009) [15]. Kim and Toriumi (2004) concluded that costal cartilage remains the most dependable graft material for treating severe traumatic saddle nose deformities because it exists in abundant supply and has strong structural properties. in milder deformities, septal cartilage became the material of choice because it could be obtained with less effort while its use resulted in lower levels of donor-site complications, which matched the guidelines established by Cakmak et al. (2015). The study results showed that

conchal cartilage served as the primary material for contour refinement and moderate augmentation, which proved Chua and Park (2015) correct because they demonstrated that auricular cartilage functions best in secondary contour corrections due to its natural curvature and flexibility.

The study achieved high satisfaction rates for both cosmetic and functional results after surgery because most patients experienced better nasal appearance and improved breathing ability following their operations. The results of the study confirmed the clinical practice guideline established by Ishii LE et al. which stated successful rhinoplasty needs to achieve both nasal aesthetic goals and functional airway restoration (Ishii et al., 2017) [16]. The researchers from Hsiao et al. (2007) found that open rhinoplasty resulted in substantial enhancements to both nasal symmetry and breathing abilities of patients who suffered from traumatic nasal deformities. The research study proved that open rhinoplasty delivers superior surgical visibility which allows surgeons to perform precise grafting and tissue reconstruction procedures. Mao et al. (2009) found that more than 80% of patients who received dorsal augmentation with cartilage grafts reported they remained satisfied with their results after an extended period, which matched the high cosmetic satisfaction found in our current research.

The present study recorded a low complication profile which showed that mild edema was the most common postoperative finding while infection and graft displacement together with residual asymmetry occurred as rare events. These findings correspond closely with the observations of Seyhan (2010) who reported that postoperative edema is a temporary and expected consequence of extensive nasal reconstruction. Chua and Park (2015) demonstrated that open rhinoplasty procedures experience major complications at an uncommon rate when surgeons apply precise surgical procedures together with correct graft attachment techniques. Some studies show that using costal cartilage results in increased rates of graft warping and asymmetry whereas the present study showed minimal complications because of our precise graft carving and stabilization methods. The low complication rates observed further support the safety and effectiveness of open rhinoplasty for post traumatic saddle nose deformity reconstruction.

The present study results show majority agreement with existing research while demonstrating that individualized graft selection and precise structural reconstruction and detailed surgical planning are essential for achieving successful cosmetic and functional results in post-traumatic saddle nose deformity.

Conclusion

The present study demonstrated that open rhinoplasty is an effective surgical approach for the management of post traumatic saddle nose deformity, providing favorable cosmetic and functional outcomes with low complication rates. The majority of patients were young and middle-aged adults, with road traffic accidents being the most common cause of trauma. Moderate deformity was the predominant presentation, while costal cartilage was the most frequently used graft material due to its superior structural support. The study findings showed high rates of satisfactory cosmetic results and significant improvement in nasal airway function following surgery. Postoperative complications such as edema, infection, graft displacement, and residual asymmetry were relatively minimal and manageable. Overall, meticulous surgical planning, appropriate graft selection, and precise reconstructive techniques played a crucial role in achieving successful outcomes in open rhinoplasty for traumatic saddle nose deformity.

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