

Evaluation Of Treatment Outcomes For Nasal Bone Fractures At Binh Duong Hospital

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Background and Objectives: The treatment of nasal bone fractures and associated injuries has been practiced for many years; however, clinical practice underscores the need for a more systematic and comprehensive understanding to facilitate accurate diagnosis and optimize treatment outcomes. Based on this rationale, we conducted the study “Evaluation of Treatment Outcomes for Nasal Bone Fractures at Binh Duong Hospital.” Objective: To evaluate patients' nasal function and anatomical structural recovery outcomes following nasal closed reduction and opened reduction.

Methods: A descriptive case series study was conducted, involving patients treated at Binh Duong Hospital from November 2022 to June 2023.

Results: Over an 8-month period, 32 patients with nasal bone fractures were studied and treated at Binh Duong Hospital. Of these, 23 patients (71.9%) were treated within 1–7 days, 62.5% underwent general anesthesia, 43.8% received closed nasal reduction, and 40.6% underwent opened reduction with septoplasty. Additionally, 84.4% of patients required treatment beyond 7 days, 100% achieved bone healing after 3 months, and all 32 patients (100%) exhibited nasal bone displacement of less than 2 mm. Good outcomes were observed in 59% of patients, while 31.3% achieved satisfactory results after 3 months, with no poor outcomes reported. No postoperative complications were observed.

Conclusion: Treatment of nasal bone fractures, predominantly within 7 days, yielded optimal results. Furthermore, associated injuries require appropriate intervention to ensure favorable outcomes.

Keywords: Nasal bone fracture, treatment outcomes, closed nasal reduction, opened reduction

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1. INTRODUCTION

Nasal bone fractures represent the most common type of facial fracture in Vietnam and globally. Although rarely life-threatening, untreated or improperly managed nasal bone fractures can heal rapidly, leading to nasal pyramid deformities that impair nasal function and aesthetics, which are challenging to correct. Early and appropriate management can restore the nasal pyramid post-injury in most cases, preventing

complications such as aesthetic deformities, nasal valve dysfunction, and nasal obstruction. [1-4]

Stephen Higuera (2007). [5] noted that restoring nasal morphology and function following nasal bone fractures remains a challenge. Post-traumatic nasal deformities, often resulting from inadequately addressed structural damage, necessitate rhinoplasty or septorhinoplasty in approximately 50% of cases.

Saeid Atighechi (2009). [6] conducted clinical interventions on 330 nasal fracture cases, randomly dividing patients into two groups: an intervention group undergoing serial nasal bone reduction and a control group receiving conventional nasal bone reduction. Initial post-reduction failure rates were 14.3% in the intervention group and 14.1% in the control group, with no statistically significant difference ($P > 0.05$). However, after serial reduction in the intervention group (step 3), the failure rate decreased to 4.19%, significantly lower than the control group's 14.7% after one month of follow-up ($P = 0.001$). Thus, serial nasal bone reduction may effectively reduce failure rates.

A. Younes (2016)[7] reported that reduction using Ash forceps is the standard treatment for non-severe nasal fractures. In a study comparing 30 patients with non-occlusive septal fractures, randomly assigned to two groups—Group I treated with closed reduction (Ash forceps) and Group II with septoplasty—results showed a mean NOSE score improvement of 28.33 (from 40 to 15) in Group I and 44.33 (from 70 to 30) in Group II. Group II demonstrated significantly better nasal breathing quality (t-test, $P = 0.001$), indicating septoplasty provides superior quality-of-life outcomes compared to closed reduction for acute septal fractures.

Tran Ngoc Tuong Linh and Nguyen Thi Ngoc Dung (2013)[8] documented 559 patients diagnosed with nasal bone fractures, with assault (36.9%) and traffic accidents (29.7%)—primarily motorcycle collisions—as the leading causes. Lateral displacement fractures were the most common (71%). Of those diagnosed, 363 cases (65%) underwent nasal reduction, with 86% treated within 3 days post-injury. A satisfaction survey of 65 patients post-reduction revealed 1.5% dissatisfaction with nasal deformity and 1.5% with aesthetics, though none reported nasal breathing issues. Most patients rated outcomes as “good/as

before” or “good/better than before,” with 80% satisfaction in aesthetics and 83% in function.

Pham Ngoc Tuan et al. (2023)[9] studied 30 patients with isolated nasal bone fractures primarily caused by traffic accidents (40%) and assault (33.3%). All patients exhibited pain and epistaxis (100%), with nasal obstruction at 76.7%, nasal deformity at 86.7%, periorbital ecchymosis/swelling at 73.3%, tenderness on palpation at 70%, crepitus at 16.7%, and open wounds in 20%. Type IIB fractures were predominant (53.8%), followed by Type IIA (26.9%). Postoperative hospitalization lasted 3 days for 63.3% of patients and 4–7 days for 36.7%. After 1 month, 92.9% reported good breathing and olfaction, with 71.4% aesthetic satisfaction. By 3 months, 100% achieved functional recovery, and 89.7% reported good aesthetic outcomes.

At the Ear-Nose-Throat Department of Binh Duong Hospital, the diagnosis and treatment of nasal bone fractures and associated injuries have been performed for many years. However, there has been no comprehensive report summarizing the functional outcomes, nasal aesthetics, and treatment methods or fully addressing complications over time to identify better treatment approaches. This is the reason we undertook this study.

Objective: To evaluate the nasal function and anatomical structural recovery outcomes of patients following nasal closed reduction and opened reduction

2. MATERIALS AND METHODS

2.1. Study Design

Descriptive case series study.

2.2. Study Population

Patients diagnosed with nasal bone fractures due to trauma were treated at the Department of Otorhinolaryngology, Binh Duong Hospital, from November 2022 to June 2023.

Inclusion Criteria: Based on prior studies by Bui Duy Vu [10], Weitao Wang [11], and Michael P. Ondik [12], patients

with confirmed nasal bone fractures via lateral nasal X-ray and/or maxillofacial CT scan, treated at Binh Duong Hospital during the study period, with or without associated maxillofacial injuries, and who consented to participate (along with their families).

Exclusion Criteria: Pre-existing nasal sequelae prior to trauma; patients with nasal trauma accompanied by severe injuries (e.g., coma, traumatic brain injury, abdominal or thoracic trauma requiring emergency intervention or monitoring); congenital nasal deformities unrelated to trauma; and incomplete follow-up or re-examination during the study period.

Sample Size: All patients presenting for treatment with an indication for nasal bone reduction surgery from November 2022 to June 2023, averaging 3–4 eligible patients monthly, resulting in a minimum sample size of 32 patients. Thus, 32 patients were included.

2.3. Study Variables

Demographic Variables: Age, gender, cause, time of onset.

Clinical Variables: Epistaxis, epistaxis management, head/face pain, nasal obstruction, reduced/loss of smell, blurred vision, nasal dorsum collapse, nasal deviation, open wounds, orbital injuries, and other organ injuries.

Paraclinical Variables: Nasal bone fracture, fracture segment distance, fracture pattern, septal injury, sinus involvement.

Preoperative Nasal Endoscopy: Blood clots in nasal cavity, septal morphology.

Surgical Treatment: Methods (closed nasal bone reduction, open nasal bone reduction with septoplasty, nasal bone reduction with septoplasty and wound suturing), septal fixation, nasal bone fixation, and postoperative fixation duration.

Postoperative and Pre-Discharge Assessment: Lateral nasal X-ray (no displacement, fracture segment distance

<2 mm or >2 mm), postoperative pain (VAS score), nasal obstruction post-fixation removal (NOSE score), postoperative nasal endoscopy, bone healing after 3 months.

2.4. Surgical method

a/ Research Instruments

- Standard ENT examination tools.
- Diagnostic endoscopy equipment: endoscope machine; 4mm and 2.7mm optics.
- Surgical instruments and equipment: sinus surgery instrument, nasal reduction instrument, Nasal reconstructive surgery instrument.
- Anesthesia: Local or general anesthesia can be applied.

b/ For nasal closed reduction

- Place a gauze soaked with local anesthetic and vasoconstrictor into the superior nasal meatus, then remove it after 10 minutes. Inject local anesthetic into both sides of the nasal septum.
- Remove the gauze, hold the nasal speculum with the left hand, use an elevator with the right hand to lift the bone close to the superior meatus, then slowly reposition the fractured bone to its original place.
- Insert a gauze soaked in paraffin oil close to the superior meatus to support the bone and prevent it from collapsing.
- While inserting the gauze, use the bone elevator to realign the nasal septum for symmetry.
- Create an external nasal support using plaster and gauze (or fast-hardening plastic) shaped according to the nasal contour. This plaster splint is kept for one week and then removed. The nasal gauze is taken out after 2 - 4 days.

c/ For opened reduction

- Reposition the fractured bones to their original alignment.
- Insert Merocele or gauze to support the inside of the nose.

- Suture the torn layers in sequence: mucosa, muscle, and skin.
- Apply nasal support using plaster (or fast-hardening plastic).

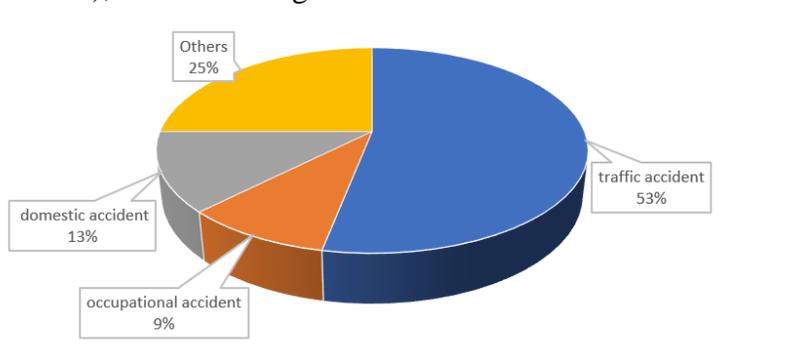
2.5. Research process diagram (Appendix)

3. RESULTS

Characteristics of subject

The mean patient age was 29.3 ± 8.08 years (range: 19–51), with the highest

proportion (90.6%) under 40 years. Males outnumbered females (male-to-female ratio: 5.4:1). Traffic accidents were the leading cause (53.1%, 17 patients), followed by domestic accidents (13%), with occupational accidents being the least common (9%, three patients). Other causes accounted for 25%.



Graph 1. Cause of nasal fracture

Clinical Feature

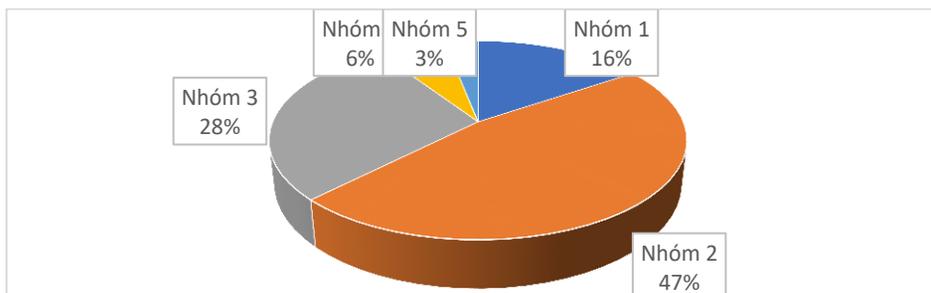
Postoperative epistaxis occurred in 81.3% of patients, with 56.3% requiring nasal hemostasis. Nasal obstruction post-trauma was reported in 90.6%. Associated nasal bone fracture injuries included nasal dorsum deformity (100%), septal deformity/fracture (65.6%), temporary anosmia (40.6%), columellar injury (40.6%), and alar injury (28.1%). Combined injuries included maxillary fractures (34.4%), periorbital edema (25%), and limb injuries (18.8%).

Imaging results

Lateral nasal X-rays confirmed nasal bone fractures in 100% of patients, all with displacement >2 mm and multiple fragments. Classical fracture classification

showed Group 2 as the most common (46.9%), with Groups 4 and 5 being the least frequent (6.3% and 3.1%, respectively). Concomitant sinus injuries included sinus opacity (62.5%). Septal injuries observed via endoscopy included mucosal damage and bleeding (62.5%), with moderate deviation most prevalent (34.4%), followed by severe (15.6%) and mild (12.5%) deviation.

Endoscopic findings revealed blood clots in all patients (100%), with septal deviation, mucosal tearing, and edema in 63.6% (severe deviation in 40.6%). Mucosal tears in the nasal cavity (septum, inferior/middle turbinates) were noted in 62.5%.



Graph 2. Classify nasal fracture

Surgery

The mean pre-surgical hospital stay was 4.2 days (range: 5–15 days), with 71.9% of patients admitted for 1–7 days and 15.6% undergoing reduction within 24 hours post-trauma. All patients were approached intranasally, with 5 (16%) also receiving wound exploration, reduction, and suturing. Reduction primarily involved closed techniques with septoplasty, assessed intraoperatively via endoscopy. All patients underwent reduction with Martin forceps, with nasal dorsum alignment measured from the mid-brow, lateral canthus, nasal tip, and chin perpendicular to the lip plane. Columellar injuries (skin/mucosal tears, deviation) were addressed by wound separation, columellar cartilage suturing, and skin/mucosal closure for stability. All columellar repairs used autologous cartilage, with five patients utilizing fractured septal cartilage for fixation. Fixation typically involved Merocel, with torn septa sutured. Mean blood loss was 67.6 mL (30–125 mL), and mean operative time was 38.4 minutes (15–70 minutes).

Postoperation and complication

Postoperative bone healing was successful in 100% of patients after 3 months. Pain decreased over time, with a mean VAS score of 5.47 (4–7) on day 1, dropping to 2.44 (2–4) by day 5. The mean NOSE score improved from 9.06 (5–12) at discharge to 2.63 (0–5) after 3 months. Endoscopy showed 81.3% of patients had clearer nasal cavities post-discharge, with 18.8% experiencing mild mucus or minimal obstruction. X-ray evaluations indicated anatomical success rising from 68.7% at discharge to 93.8% after 3 months. Aesthetically, 90.6% of patients were satisfied with nasal appearance post-surgery. No complications (e.g., adhesions, septal perforation, dorsum collapse, or anosmia) were recorded, reflecting the safety and efficacy of the intervention and postoperative care.

4. DISCUSSION

Our study found a mean patient age of 29.3 years, with 90.6% aged 18–<40 years, consistent with Bui Viet Tuan [13] (51.8% aged 15–29) and Bui Duy Vu [10] (68.6% aged 16–29, $P < 0.05$). Males predominated (84.4%, male-to-female ratio 5.4:1), higher than Bui Duy Vu [10] (72.5%) but comparable to Bui Viet Tuan [13] (83.3%) and Phung Minh Hoang Anh [14] (79.5%), reflecting higher male exposure to trauma from traffic, labor, and sports.

Traffic accidents were the primary cause (53.1%), exceeding assault (25%), aligning with Bui Viet Tuan [13] (46.3%) but surpassing rates in developed countries (27.6%, Ogawa, Suzuki [15]). In Ho Chi Minh City, motorcycles accounted for 86% of accidents, largely motorcycle collisions, compounded by poor traffic awareness and alcohol use among young males. All patients were alert with no consciousness impairment or infection. Epistaxis at admission occurred in 81.3%, lower than Phung Minh Hoang Anh [14] (90.4%) and Bui Viet Tuan [13] (88.9%), likely due to prior first aid. Nasal dorsum deformity was universal (100%), exceeding Bui Duy Vu [10] (62.7%). Soft tissue injuries (septal/alveolar tears, 28.1%) aligned with traffic accident mechanisms. Anosmia (40.6%) was notably higher than prior studies. Septal deviation occurred in 65.6%, similar to Bui Viet Tuan [13] (64.8%) but lower than Phung Minh Hoang Anh [14] (85.2%). Mucosal tears (62.5%) exceeded both, while late epistaxis (14.8%) was reduced from 88.9% at injury, likely due to timely first aid. CT scans confirmed fractures in 100% of patients, aligning with Bui Viet Tuan [13], with superior detection of associated injuries compared to X-rays.

Fracture classification showed Group 2 as most common (46.9%), followed by Group 3 (28.1%) and Group 1 (15.6%), typically less displaced with mild septal damage, managed effectively with closed reduction for faster healing. Group 3

posed a higher septal hematoma risk, requiring careful preoperative assessment. Compared to Bui Viet Tuan [13] (Type IIBs, 59.3%) and Hwang (18%), our findings suggest increasing trauma severity from traffic, sports, and violence. Groups 4 and 5 (6.3% and 3.1%) were complex, necessitating open surgery for septal/nasal fixation and more prolonged recovery, consistent with Hwang [16] (4.3%). Nguyen Huu Khoi [17] reported 89% isolated fractures and 11% combined, with 19% open fractures, highlighting the predominance of closed fractures but the need to address associated injuries. Septal deformity with nasal fractures occurred in 62.5%, while mild deviation without fracture was not trauma-related, emphasizing displacement assessment for optimal surgical planning.

Nasal bone elevation with septoplasty was performed in 40.6% of patients—the highest proportion—compared to 50% in Bui Viet Tuan [13]. Closed reduction with Ash forceps was used in 43.8%, which is more convenient than elevators, similar to Bui Duy Vu [10] (5.9%). Open reduction without grafts occurred in 40.6%, while Bui Duy Vu [10] reported 47.5% of open incisions for nasal pyramid deformities. Varied approaches shared the goal of stabilizing the nasal pyramid and septum.

In the acute phase following trauma, closed nasal reduction, opened reduction, and septoplasty were performed at the ENT Department of Binh Duong Hospital with effective surgical approaches. All patients were accessed via the nasal cavity, ensuring direct fracture site evaluation using intraoperative endoscopy and enhancing repositioning accuracy. Closed nasal reduction using Martin forceps effectively restored nasal bridge structure, with 100% of patients repositioned based on standardized measurements from the midline of the eyebrow, outer canthus, to the nasal tip and chin. This technique was suitable for simple fractures, with an average surgical time of 38.4 minutes

(range: 15–70 minutes) and average blood loss of 67.6 ml (range: 30–125 ml), indicating low invasiveness and rapid recovery. Opened reduction was applied in more complex cases, particularly in 5 patients (16%) with associated injuries such as skin tears, mucosal damage, or columellar deviation. This technique allowed for open wound separation, suturing of columellar cartilage and mucosa, reinforcing columellar stability, and using fractured septal cartilage for fixation without foreign grafts. Aesthetic and functional outcomes in these cases significantly improved, though surgical time could be longer. Septoplasty was performed concurrently in cases with septal deviation or tears, using suturing techniques and merocele for structural stabilization. This approach improved respiratory function and reduced postoperative complications like nasal obstruction. However, complex columellar injuries required meticulous handling to prevent recurrent deviation or abnormal scarring. Overall, surgical methods in the acute phase yielded favorable functional and aesthetic outcomes, but long-term follow-up is needed to assess sustained efficacy and optimize treatment protocols.

After 3 months, the pain subsided significantly, with no epistaxis or dorsum collapse. X-rays confirmed 100% healing, aligning with Bui Viet Tuan [13] (79% good outcomes). Aesthetic satisfaction was 59.4%, lower than Bui Viet Tuan [13] (83.3%). Breathing improved (NOSE: 9.06 to 2.62), comparable to 88.9% normal breathing in controls. No anosmia or serious complications occurred, affirming treatment efficacy and postoperative care.

5. CONCLUSIONS

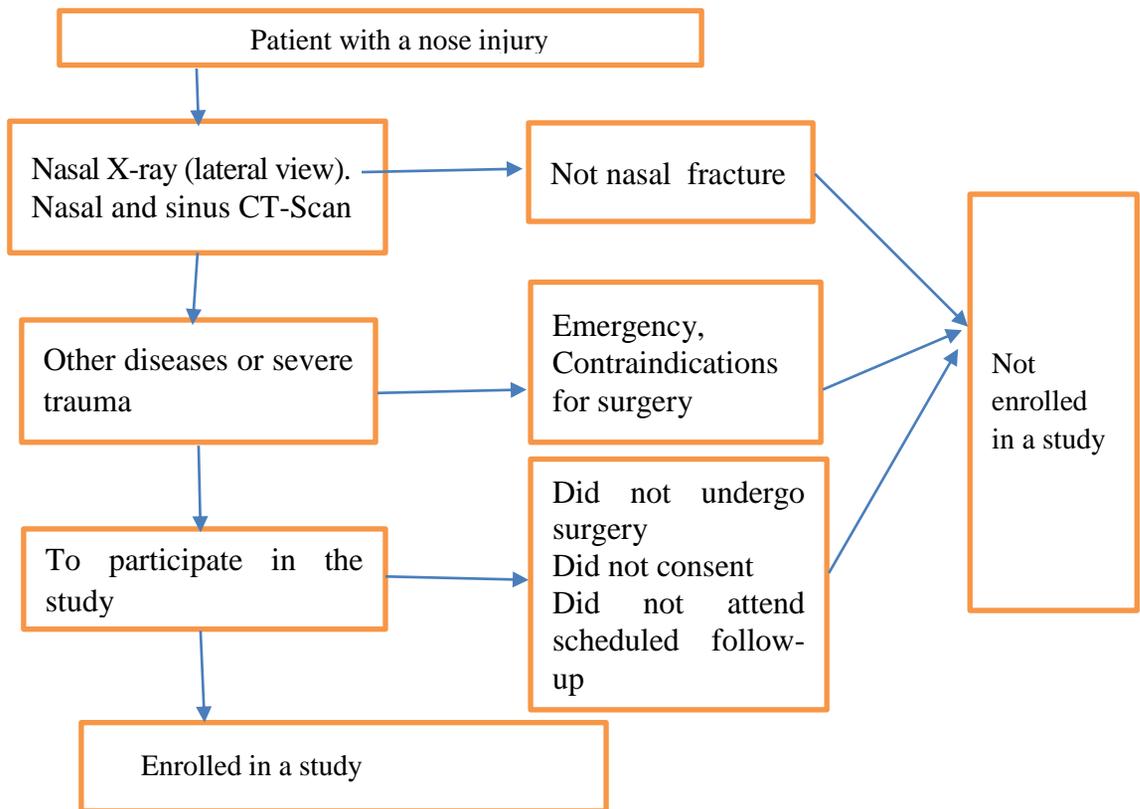
Patients with simple nasal bone fractures or those with associated displaced injuries should undergo early intervention to improve function and aesthetics, reduce the need for multiple surgeries, minimize infection risks, and optimize treatment outcomes in a single procedure.

6. ABBREVIATIONS

List of Abbreviations	English / French	Vietnamese
CT-Scan	Computed Tomography Scan	Chụp cắt lớp vi tính
CHVN		Chỉnh hình vách ngăn
GXCM		Gãy xương chính mũi
NOSE	Nasal Obstruction Symptom Evaluation	Chỉ số đánh giá triệu chứng tắc nghẽn mũi
VAS	Visual Analog Scale	Thang điểm đánh giá trực quan
XCM		Xương chính mũi

7. APPENDIX

7.1. Research process diagram



7.2. Classification of Nasal Bone Fractures

Table 7. Classification of Nasal and Septal Fractures
 “Sources: Jonas T. Johnson, Clark A. Rosen (2014)”(18)

Type	Description	Characteristics
I	Simple straight	Unilateral or bilateral displaced fracture without resulting midline deviation
II	Simple deviated	Unilateral or bilateral displaced fracture with resulting midline deviation
III	Comminution of nasal bones	Bilateral nasal bone comminution and crooked septum with preservation of midline septal support; septum does not interfere with bony reduction

IV	Severely deviated nasal and septal fractures	Unilateral or bilateral nasal fractures with severe deviation or disruption of the nasal midline, secondary to either sewer septal fracture or septal dislocation. It may be associated with the comminution of the nasal bones and septum, which interfere with the reduction of fractures
V	Complex nasal and septal fractures	Severe injuries, including lacerations and soft tissue trauma, acute saddling of nose, open compound injuries, and avulsion of tissue

7.3. Symptoms

Symptoms	Percentage %
Nasal bleeding	81.3
Delayed nasal bleeding	14.8
Nasal bridge deformity	100
Tear of nasal cavity mucosa	62.5
Tear of nasal septum, inferior turbinate	28.1
Loss of smell	40.6
Septum deviation	65.6

7.4. Treatment algorithm based on the fracture classification

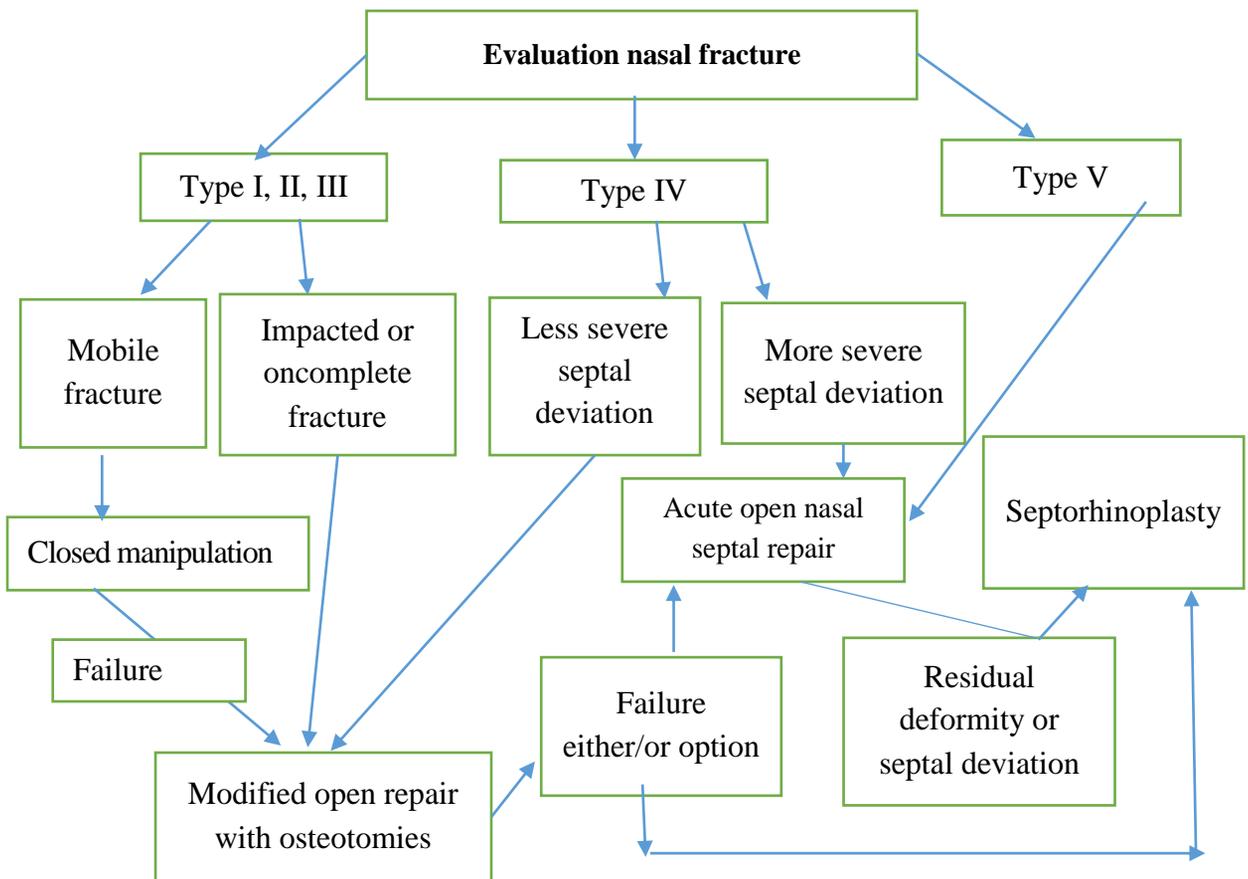


Figure 1. Treatment algorithm based on the fracture classification

“Sources: Jonas T. Johnson, 2014”[18]

7.5. NOSE Score

NOSE Score	3 Months	At Discharge
1. Nasal congestion	0.53 (0-1)	2.09(0-3)
2. Nasal obstruction	0.50 (0-2)	1.88(1-3)
3. Trouble breathing through nose	0.50 (0-2)	1.41(1-3)
4. Trouble sleeping	0.53(0-1)	2.06(1-3)
5. Difficulty breathing during exercise	0.56(0-1)	1.56(1-3)

7.6. Endoscopy

Endoscopy		At Discharge	3 Months
Cavity	Normal	15 (46.9%)	26 (81.3%)
	Obstruction	17 (53.1%)	6 (18.7%)
Septum	Not deviation	20 (62.5%)	20 (68.7%)
	Less deviation	12 (37.5%)	12 (37.5%)
Middle meatus	Normal	19 (59.4%)	26 (81.2%)
	Edematous/ mucous	13 (40.6%)	6 (18.8%)

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