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Research Article

Finger Reduction of Nasal Bone Fracture Under Local Anesthesia and its Outcomes - A Case Series

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Abstract

Introduction: The most common type of facial bone fracture involves the nasal bones. They are often linked to physical assault, falls, sports injuries, and traffic accident. Traditionally, these fractures are treated through closed reduction under either general or local anesthesia using forceps or elevators. However, the use of general anesthesia poses risks and increases costs, while forceps or elevators may lead to various complications such as under-correction, new fractures, mucosal damage, and nasal bleeding.

To mitigate these issues, we conducted manual reduction under local anesthesia, employing the little finger. Our objective was to minimize the drawbacks associated with general anesthesia and instrument-based reduction methods. Our study aimed to evaluate both functional and aesthetic outcomes, as well as patient satisfaction with this approach.

Methods: During the period from October 2022 to October 2023, individuals (male and female of 15-65 years age group fit for surgery)who sought treatment at the E.N.T. Department for nasal bone fractures and were attended to by a singular surgeon were subject to prospective monitoring. We report our attempt to reduce unilateral or bilateral nasal bone fractures who underwent finger reduction, administered under local anesthesia and the favorable postoperative clinical course.

Results: A study was conducted on 50 patients with nasal bone fractures, who underwent bedside finger reduction under local anesthesia. All patients achieved favorable reductions, as determined by external appearance and x-ray nasal bone lateral view or CT nasal bone. The patients were aged 10-65 years, with an average follow-up period of 3 months. All patients were satisfied with their functional and aesthetic outcomes, with 90% showing good results and 10% experiencing some edema post-operatively over the nose and around which subsided in one week.

Conclusion: Under local anesthesia, finger reduction for mild unilateral or bilateral nasal bone fractures proves to be a straightforward and effective procedure, yielding high patient satisfaction and positive postoperative functional and aesthetic results.

Keywords: Finger Reduction; Nasal Bone Fracture; Local Anesthesia; Outcomes; Case Series; Closed Reduction

Introduction

Fractures of the nasal bone is one of the most frequently observed facial bone fractures and is an injury frequently encountered in daily clinical practice [1,2] and can cause nasal obstruction and often require reduction surgery at an early stage after the injury, to restore proper alignment. However, achieving precise reduction can be challenging, imprecise reduction leading to potential deformities such as slant or saddle-nose deformities [3-6].

The nose comprises both bony and cartilaginous structures. The bony section, known as the nasal pyramid, is formed by paired nasal bones and the frontal processes of the maxilla on each side. Cartilaginous components include the upper lateral cartilages, connecting with the lower edges of the nasal bones, and the lower lateral (or alar) cartilages, which shape the nasal tip. Providing support to the external nose and extending beneath the center line of the bony nasal structure is the septum, composed of both bony and cartilaginous elements, both the cartilage and the bone of the external nasal skeleton are susceptible to fracture [7].

Classification of nasal trauma

Nasal fractures can be classified on a scale that stratifies the severity of the injury [8]. An isolated nasal bone fracture is usually caused by low-velocity trauma. If the nose sustains a fracture due to high-velocity trauma, it increases the likelihood of concurrent facial fractures.

- Type I: Injury limited to soft tissue
- Type IIa: Simple, unilateral nondisplaced fracture
- Type IIb: Simple, bilateral nondisplaced fracture
- Type III: Simple, displaced fracture
- Type IV: Closed comminuted fracture
- Type V: Open comminuted fracture or complicated fracture

Nasal fractures are most typically associated with physical altercations, falls, sports injuries, and motor vehicle accidents [9]. Bony nasal trauma may present as an isolated injury or occur in combination with other soft tissue and bony facial injuries [10].

Nasal fractures occur twice as frequently in males compared to females, primarily due to the protrusion of the nasal bones from the facial plane and their central position within the face, making the nose more susceptible to injury. Although isolated nasal fractures are the most common facial fractures, they may be associated with fractures of the zygomatic-orbital-maxillary complex and fractures of the skull base; the clinician will bear this fact in mind when assessing a patient. Nasal bone fracture is one of the fractures where reduction is often difficult to achieve. Traditional methods using instruments such as forceps or elevators may not always yield optimal results and can result in complications such as mucosal damage or hemorrhage. Closed reduction, which is typically performed under either general or local anesthesia, has traditionally been the main treatment approach for these fractures. Closed reduction under general anesthesia usually requires hospital admission, preoperative testing for anesthesia, and entails extra expenses. However, these approaches may pose challenges, especially in resource-constrained settings or in cases where immediate access to specialized equipment or personnel is limited. Comorbidities related to use of general anesthesia should also be considered. Asch and walsham forceps, boies elevators, and blade handles are commonly employed during the process of realigning nasal bone fractures.. However, closed reduction using these instruments is usually conducted blindly and may lead to under-correction, new fractures, mucosal damage, and nasal hemorrhage.

In our study, we explored an alternative approach involving manual reduction using the finger, performed under local anesthesia. While finger reduction under general anesthesia has been documented, there is limited research on its effectiveness under local anesthesia and its impact on patient-reported outcomes [11,12].

We report our attempt to reduce nasal bone fractures by inserting the little finger into the nasal cavity and the favorable postoperative clinical course.

To address this gap, we conducted a prospective cohort study to evaluate the functional and aesthetic outcomes, as well as patient satisfaction, following finger reduction under local anesthesia. By systematically documenting our experiences and outcomes, we aim to contribute valuable insights into the safety, efficacy, and feasibility of this approach in the management of nasal bone fractures.

This case series will explore various aspects of finger reduction techniques, including patient selection criteria, procedural details, perioperative management, and postoperative outcomes such as aesthetic results, functional improvement, patient satisfaction, and complication rates. Additionally, we will discuss any challenges encountered during the procedure and potential strategies for optimizing outcomes.

This approach offers potential advantages such as reduced hospitalization, cost, and anesthesia-related risks. Our findings provide valuable insights into the efficacy and patient experience associated with this technique.

Methods

We conducted a prospective cohort study of 50 patients, male and female of 15-65 years age group fit for surgery, each with a chief complaint of a fractured nasal bone, treated during the period of 1 year from October 2022 to October 2023, individuals at the E.N.T. department. Fracture diagnosis was based on clinical history, physical examination and plain radiography of the lateral view nasal bones or sometime nasal bone computed tomography (CT) (Figure A, B), and the inclusion criterion for bedside finger reduction under local anesthesia was simple unilateral or bilateral nasal bone fracture with apparent asymmetry. Patients who exhibited evident symmetry without significant fracture or deviation on both plain X-ray nasal bone lateral view or CT nasal bone and individuals with nasal bone fractures that were fragmented, involved the septum or saddle nose deformity were excluded from the study as they were scheduled for closed reduction under general anesthesia.

Operative procedure

The finger reduction method parallels conventional closed reduction techniques, the reduction is done with the physician's fingers (nails of little finger to be cut and trim to avoid trauma in the patients) but omits the use of nasal elevators, blade handles, or forceps. After a patient has been kept nil by mouth overnight, and deemed medically fit for surgery, they are taken to the operating theater. Following anesthesia clearance, the patient assumes a supine position. Premedication and sedation are administered. Nasal cavity packing is performed using gauze soaked in xylocaine and adrenaline, followed by a 15-minute wait. Additionally, bilateral infraorbital nerve blocks are administered via an intraoral approach. Subsequently, standard surgical procedure was adopted. Lidocaine jelly is applied to the little finger. Right little finger use to correct right nasal bone fracture and left little finger use to correct left nasal bone fracture. With the volar side of the finger coated, it was inserted into the nasal cavity, positioned ventrally toward the fracture site. Adjustments were made based on imaging (plain radiography or nasal bone CT) results, with the finger placed beneath the fractured nasal bone and manipulated laterally or superiorly [13]. Reduction was considered complete once the finger could detect bony continuity and symmetry was restored. If the fracture was deemed to be excessively corrected, it was adjusted by applying pressure to the raised fractured bone with the other fingers.

The key steps in the surgical procedure using the little finger were as follows:

- Lifting and repositioning of the fractured part by simple compression using the little finger
- Lifting of the fractured part by bending the distal interphalangeal joint of the little finger
- Lifting of the fractured part by rotating the little finger around the digital axis.

After the reduction was completed and nasal bleeding was evaluated, Internal fixation was performed by nasal packing with antibiotic soaked ribbon gauge and external nasal metallic splint (Denver Splint) was used for external fixation and protection (Figure E).

Within 48 hours, the nasal packing was removed, and the bleeding was assessed. On the third post-operative day, we will check for symmetry and aesthetic outcome. The patient was discharged with a prescription for antibiotics for 5 days, along with antacids, analgesics, multivitamins, and saline nasal drops.

Patients follow-up

Patients were seen for follow-up appointments in the clinic office five days later, they underwent a physical examination and x ray nasal bone lateral view plain radiography, following the evaluation of these images, the symmetry and reduction state were assessed by comparing with pretrauma photo and radiograph.

If the outcome was deemed poor or unchanged, characterized by asymmetry and inadequate reduction or a collapsed nasal vault, it was categorized as "poor," and the patient was scheduled for closed reduction under general anaesthesia.

In cases where the outcome was fair, indicating symmetry but insufficient reduction, inadequate nasal vault shape, or unsatisfactory alignment observed on radio-graphs, it was classified as "mild," and the patient was discharged after reapplication of the Denver splint along with application of saline nasal drop and routine medications.

When the outcome was considered good, with appropriate correction of the overall nasal vault, normal to suboptimal alignment and evident symmetry, it was labelled as "good," and the patient was discharged following Denver splint reapplication along with application of saline nasal drop and routine medications.

Alignment and symmetry were evaluated for three weeks following nasal reduction. Once optimal results were achieved, the Denver splint was removed after the three weeks. Patients were subsequently monitored for a minimum of three months (Figure D).

After three months, patient satisfaction was assessed through the presentation of preoperative and postoperative photographs and radiographs, as well as by evaluating any external deformities and nasal obstructions.

Results

We performed reduction of nasal bone fractures using the present method in 50 patients who visited our E.N.T. department presenting with a nasal bone fracture met the inclusion criterion and underwent finger reduction under local anesthesia, occurring during 1 year from October 2022 to the end of October 2023. In all of the patients, favorable reduction was obtained as determined from the external appearance and by x ray nasal bone lateral view or CT nasal bone. Follow-up was carried out for a minimum of 3 months following nasal reduction.

Regarding patient demographics, 20 patients (40%) were male and 30 (60%) were female (chart 1). Patients were aged 15-65 years (average, 30 years) (chart 2). Patients presented to our unit on an average of 5 days (range, 1 to 10 days) (chart 3) following injury. After treatment and postoperative follow-up, 45 patients (90%) showed good results and five patients (10%) showed mild results, no patient (0%) had a poor result or rescheduled for closed reduction (chart 4). Postoperative, 45 patients (90%) had no bleeding and no edema, while five patient (10%) had minimal bleeding and edema over nose (chart 5). All 50 patients (100%) were satisfied with their functional outcome and 50 patients (100%) were satisfied with their aesthetic result (chart 6).

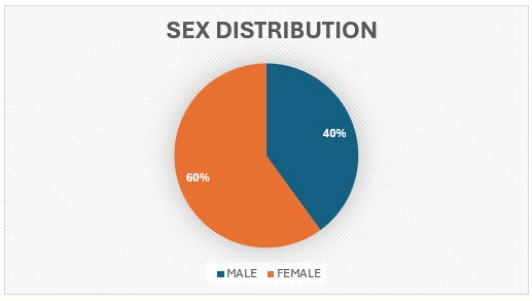

Chart 1: Sex distribution

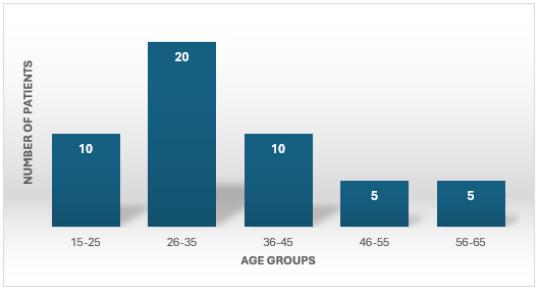

Chart 2: Age distribution

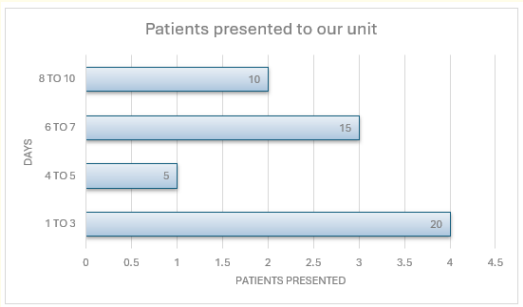

Chart 3: Patients presented to our unit on an average number of days.

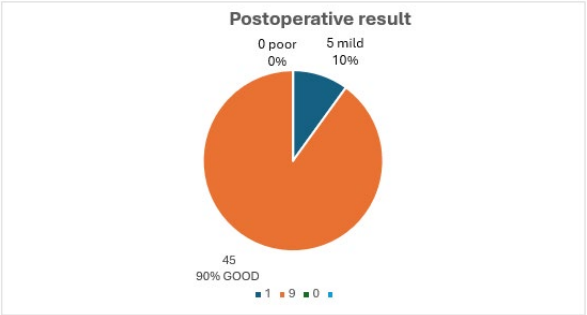

Chart 4: Postoperative result.

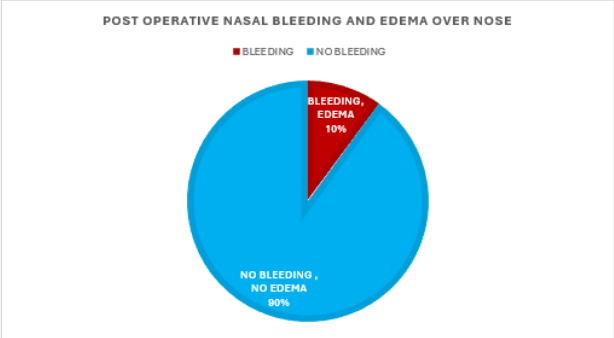

Chart 5: Post operative nasal bleeding and edema over nose.

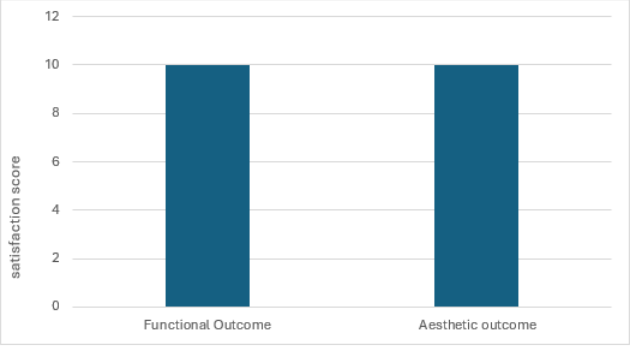

Chart 6: Patient satisfaction for functional and aesthetic result.

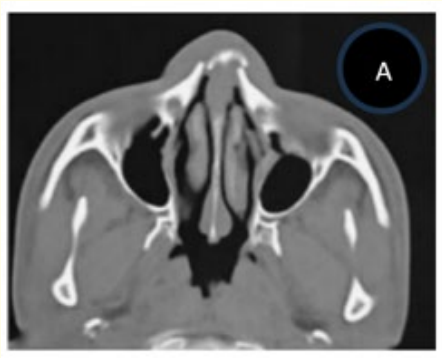

Figure A: Three-dimensional reconstruction model of fracture before treatment.

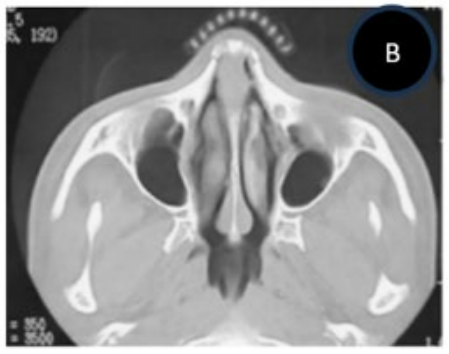

Figure B: Three-dimensional reconstruction model of fracture 5 days after treatment.

Figure C: A 27-year-old female visited the clinic with a right unilateral nasal bone fracture 4 days after trauma.

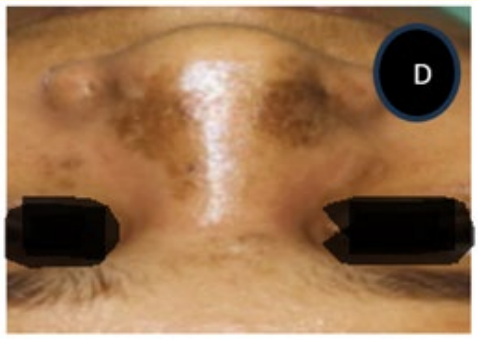

Figure D: Symmetry is seen on the photograph taken 21 days after treatment and satisfactory reduction was seen.

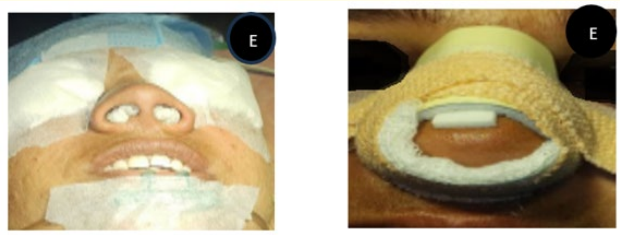

Figure E: Nasal packing was done with antibiotic soaked ribbon gauge and external fixation by external nasal metallic splint (Denver splint).

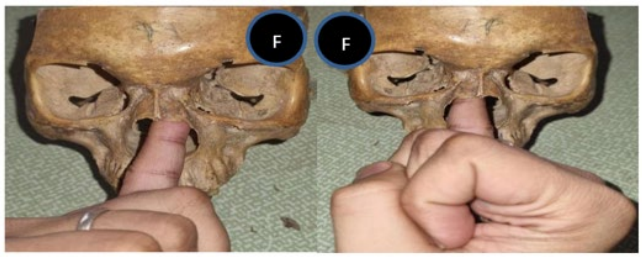

Figure F: Lifting of the dorsal part of the nose using the force of the entire arm on bone specimen.

Discussion

In our study, after treatment postoperative follow-up, 45 patients (90%) showed good results and five patients (10%) showed mild results, no patient (0%) had a poor result, while in other study conducted by Young-Jae Lee, Kyeong-Tae Lee., *et al*. twenty-three patients (85.2%) showed good results and three (11.1%) showed mild results one patient (3.7%) had a poor result and was rescheduled for closed reduction under general anesthesia [16].

In other study conducted by B Nithya and MK Rajasekar success rate was 60% to 90% [17].

In our study, postoperatively 45 patients (90%) had no bleeding and no edema, while five patient (10%) had minimal bleeding and edema over nose while in other study conducted by Young-Jae Lee, Kyeong-Tae Lee., *et al*. there is no bleeding in 24 patients (88.9%) and bleeding in 3 patients (11.1%) [16].

In our study, all 50 patients (100%) were satisfied with their functional outcome and 50 patients (100%) were satisfied with their aesthetic result, while in other study conducted by Young-Jae Lee, Kyeong-Tae Lee., *et al*. all 27 patients (100%) were satisfied with their functional outcome and 25 patients (92.6%) were satisfied with their aesthetic result [16].

One of the most common fractures of the face bones, nasal bone fractures have been documented in a number of case reports [1-3]. Even though "manual reduction" is the reduction technique most frequently employed for this kind of fracture.

The majority of reduction procedures described in the literature have involved the use of tools like a scalpel handle or Asch and Walsham forceps [4-6]. According to certain findings in the literature, a broken bone can be relocated with the help of tools and then fine-tuned externally by hand [3]. The main benefit of utilizing instruments is that, with a strong enough power, an instrument-based approach can cause existing subnasal fractures to refracture [14].

On the other hand, using instruments also frequently results in nearby bone fractures. While this condition is occasionally thought to facilitate relocation, we believe it is most likely the main cause of postoperative edema [3]. Furthermore, because this technique involves blind surgery, it is thought that it could easily result in needless harm to the intranasal mucosa and create a new deformity as a result of mucosal contracture following surgery [14,15].

Our current method's fundamental tenet is "finger" fracture reduction. Here are a few benefits of employing this approach.

First, we verified that the little finger can actually be placed sufficiently and readily under the nasal bone using a bone specimen, bone dummies, or a bone model (Figure f).

The nasal mucosa is thin and strongly linked to the bone, thus even though the current method may appear extremely basic, it provides for a more precise feeling of the fractured section than external palpation from the skin. As a result, it is easy to identify the exact state of the fracture and the portion that was actually raised during surgery. We think this approach will significantly lessen mucosal injury, minimize bleeding during and after surgery, and reduce the incidence of bone fractures in locations other than the fracture site. Furthermore, it would be uncommon for the technique to generate significant edema during surgery [3].

This study does not in any way conflict with other instrument-based reduction techniques. we think that attempting to reduce a fracture by first inserting the little finger will allow for accurate feeling of the fractured part and a good assessment of the fracture's condition, thereby facilitating more precise reduction. Furthermore, individuals undergoing a reduction treatment at an day care clinic under local anesthesia will experience a significant degree of psychologic dread related to the placement of devices into their noses. The patients appeared to experience comparatively less pain or fear as a result of the current approach.

Conclusion

Nasal bone fractures are common and often treated through reduction techniques. While manual reduction is frequently used, many procedures in the literature involve tools like killian elevator or Asch and Walsham forceps. However, these instrument-based methods can lead to nearby bone fractures and postoperative complications like edema and mucosal damage, under-correction, new fractures and nasal bleeding. Our current method focuses on "finger" fracture reduction, which offers several benefits. By using the little finger, surgeons can accurately feel the fractured section, reducing mucosal injury, bleeding, and the risk of additional fractures. This approach also minimizes patient discomfort and fear associated with instrument insertion. Overall, while our method doesn't conflict with instrument-based techniques, it provides a more precise and patient-friendly alternative for nasal bone fracture reduction. Reduction of a nasal fracture using the little finger was associated with low invasiveness and was considered to be the initial method of choice for correcting simple nasal bone fractures for immediate diagnosis and treatment.

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