A scarless approach to mitigate external wound complications in Nasomaxillary fracture patients: Case report

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ABSTRACT

Nasomaxillary fractures, which involve the nasal bone, maxillary frontal process, and anterior maxilla, present both cosmetic and functional difficulties due to their central anatomical location and vulnerability to injury. Conventional method, subciliary incision, may lead to negative outcomes including scarring, dyspigmentation, and ectropion. To mitigate these issues, we utilize closed endonasal reduction with fixation of the nasal bone to the maxilla employing a straight instrument through the gingivobuccal approach, ensuring proper anatomical alignment while safeguarding the infraorbital nerve, thus enhancing results for patients who have risk factors like poor wound healing or Fitzpatrick skin type V.

Postoperative evaluations revealed a successful restoration of nasal shape, airflow, and patient satisfaction without any visible external scarring. This method underscores the importance of customized surgical planning, particularly for patients with a higher risk of scarring, and demonstrates the effectiveness of the straight instrument gingivobuccal approach as an alternative to traditional technique.

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บทคัดย่อ

กระดูกโหนกแก้มและจมูกหัก (Naso-maxillary fractures) โดยนิยามคือการหักของกระดูกจมูก (Nasal bone) กระดูกโหนกแก้มข้างจมูก (Maxillary frontal process) และกระดูกโหนกแก้มด้านหน้า (Anterior maxilla) เนื่องจากตำแหน่งทางกายวิภาคของกระดูกส่วนดังกล่าวอยู่ตรงกลางใบหน้าและมีความเปราะบาง เมื่อเกิดการหักย่อมส่งผลกระทบต่อผู้ป่วยทั้งด้านความสวยงามและการหายใจ

วิธีการลงแผลเพื่อรักษาแบบดั้งเดิม เช่น การลงแผลใต้ตา (Subciliary incision) อาจส่งผลเสียต่อผู้ป่วย เช่น การเกิดแผลเป็น (Surgical scar) การเกิดสีผิวบริเวณแผลไม่สม่ำเสมอ (Dyspigmentation)

และภาวะหนังตาล่างปลิ้น (Ectropion) เพื่อหลีกเลี่ยงปัญหาเหล่านี้ ศัลยแพทย์สามารถใช้การจัดกระดูกกลับผ่านทางรูจมูก (Closed endonasal reduction) พร้อมกับการยึดกระดูกที่หักเข้าด้วยกัน (Internal fixation) โดยใช้อุปกรณ์ยึดตรึงแบบตรง (Straight instrument) โดยลงแผลระหว่างรอยต่อระหว่างเหงือกและเยื่อบุช่องปาก (Gingivobuccal approach) ซึ่งวิธีการดังกล่าวสามารถช่วยรักษาแนวกระดูกให้ถูกต้องตามกายวิภาคเดิมได้ พร้อมทั้งป้องกันไม่ให้เกิดการบาดเจ็บต่อเส้นประสาทใต้เบ้าตา (infraorbital nerve) เมื่อผ่าตัดอย่างระมัดระวัง อีกทั้งยังทำให้เกิดผลลัพธ์ที่ดีดดยเฉพาะผู้ป่วยที่มีความเสี่ยงต่อการเกิดแผลเป็น เช่น มีประวัติแผลเป็นมาก่อน หรือผิวหนังคล้ำประเภท Fitzpatrick ชนิดที่ 5 (Fitzpatrick skin type V)

การประเมินหลังการผ่าตัดแสดงให้เห็นว่ารูปทรงจมูก การหายใจ และความพึงพอใจของผู้ป่วยนั้นได้ผลลัพธ์ที่ดียิ่ง โดยไม่มีรอยแผลเป็นที่มองเห็นได้จากภายนอก วิธีนี้จึงแถึงสดงให้เห็นถึงความสำคัญของการวางแผนการผ่าตัดที่ปรับให้เหมาะสมกับผู้ป่วยแต่ละราย โดยเฉพาะผู้ป่วยที่มีความเสี่ยงต่อการเกิดแผลเป็นสูง และแสดงให้เห็นถึงประสิทธิภาพของการลงแผลระหว่างรอยต่อระหว่างเหงือกและเยื่อบุช่องปาก (Gingivobuccal approach) แบบใช้อุปกรณ์แบบตรงในห้องผ่าตัด โดยเฉพาะในห้องผ่าตัดที่ไม่มีอุปกรณ์ผ่าตัดยึดตรึงแบบโค้งงอ เพื่อเป็นหนึ่งในทางเลือกที่มีประสิทธิภาพในการรักษาผู้ป่วย

KEYWORDS

fracture, nasal, nose, treatment, approach, intraoral

INTRODUCTION

The nose, centrally situated on the face, is paramount in facial aesthetics and functional integrity. Its prominent anatomical position and thinner structure below the intercanthal line render the nasal bone susceptible to traumatic injury, hence justifying its status as the most frequently fractured facial bone.[1-5]

Nasal fracture can be limited to the nasal bone alone or involved different components of the surrounding region.[6] Certain efforts have been made to categorize various types of nasal bone fractures according to fracture patterns or the severity of injury. Nevertheless, Siriraj Hospital adopts a classification system based on treatment approaches, namely: nasonasal fracture, nasomaxillary fracture, and nasoorbitoethmoidal fracture.

The diagnosis of a nasomaxillary fracture was deemed appropriate when the fracture implicated the nasal bones, the maxillary frontal process, the anterior aspect of the maxilla, and the canine pillar, while excluding avulsion of the medial canthal tendon and medial wall of orbit.[6]

The primary treatment approach for nasomaxillary fracture involves closed endonasal reduction, with the goal of restoring the original anatomical alignment of the nasal bone. Subsequent to reduction, stabilization of the nasal bone to the maxillary bone is accomplished through the application of plates and screws. Traditional techniques typically employ a subciliary incision for fixation, which can result in undesirable outcomes including but not limited to scarring, changes in skin pigmentation, injury to lacrimal system and, ectropion.[7,8] To mitigate these complications, our approach utilizes a gingivobuccal sulcus approach, selected to minimize adverse effects.

CASE

A 37-year-old American male presents at Siriraj Hospital with a complaint of epistaxis originating from the right nasal cavity subsequent to physical assault by a punch.

The patient reported a history of being physically assaulted the night before presenting to the hospital. Following the assault, he experienced left-sided nasal pain and bleeding from the left nostril. He also complained of left nasal congestion but denied any numbness in the facial area. On examination, the patient had a normal visual field with no diplopia. He has normal vision without any double vision. He recalls the incident well, without experiencing dizziness or other areas of pain.

The patient, with no known underlying medical conditions, drug allergies, or history of anticoagulant or NSAID use, presented with a history of poor wound healing.

On physical examination, he was alert, cooperative, and afebrile, with stable vital signs (blood pressure 144/83 mmHg, heart rate 71 beats per minute, respiratory rate 18 breaths per minute, temperature 37°C) and Fitzpatrick skin type V.

The head and scalp were normal in shape and size, without external wounds. Ocular assessment revealed full extraocular movements with no diplopia, subconjunctival hemorrhage, periorbital ecchymosis, or orbital rim step-offs. Nasal examination demonstrated depression and tenderness over the left nasal bone and sidewall, mild contusion, decreased airflow on the left, swollen left nasal mucosa, and rightward septal deviation, without active epistaxis or infraorbital nerve hypoesthesia *(Figure1A, 1B).* The oral cavity and pharynx were intact, with no evidence of bleeding or dental trauma. Neck examination showed no swelling, tenderness, or external lesions.

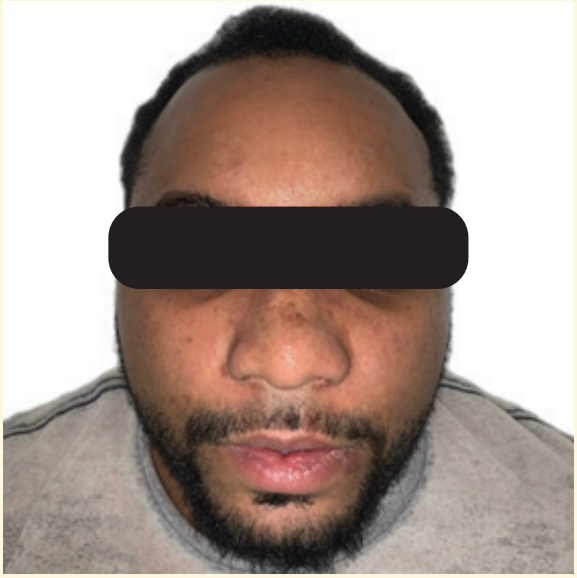

Figure 1A
shows a frontal view of the patient.

Figure 1B
shows an overhead view of the patient.

Computed tomography (CT) scan Facial bone, 3 Dimension (3D) CT Facial bone: There is a displaced fracture involving the nasal bone extending to the frontal process of the maxilla bone. There are no fractures observed at the ethmoid bone, nasal septum, or medial wall of the orbit. *(Figure 2A-2D)*

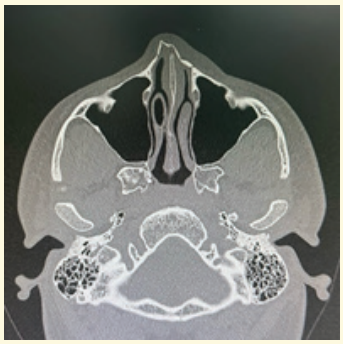

Figure 2A- displays an axial view of the CT scan.

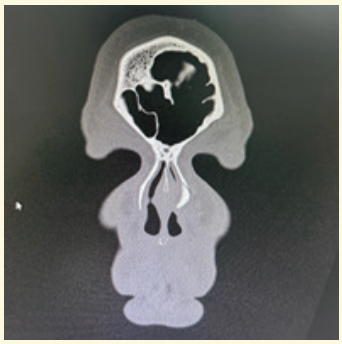

Figure 2B- displays a coronal view of the CT scan.

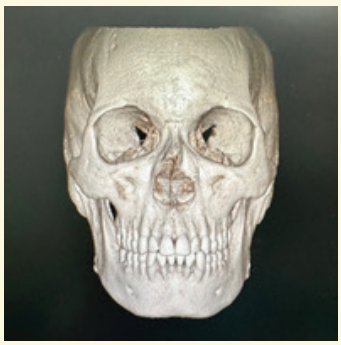

Figure 2C- displays a 3-D CT scan. (Frontal view)

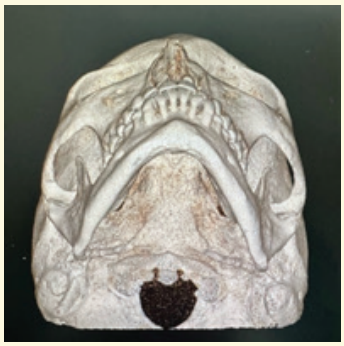

Figure 2C- displays a 3-D CT scan. (Basal view)

TREATMENT

Following the incident, the patient sought medical attention at Siriraj Hospital on February 21st, 2024. Thereafter, we scheduled the surgical intervention for endonasal reduction with open reduction and internal fixation (ORIF) employing plates and screws via the gingivobuccal sulcus approach on February 22nd, 2024.

Presented below is a detailed description of the surgical procedure.

1.The patient was placed in the supine position.

2. Following sedation under general anesthesia, Endotracheal tube No. 7 was inserted and secured on the site opposite to the fracture.

3. The patient's face was prepped and draped with sterile surgical cloth.

4. 0.2% sterile carbomer gel was applied to the patient's conjunctiva to protect the cornea.

5. A 0.5% chlorhexidine gluconate in sterile water was applied around the patient's face to sterilize the surgical area prior to the procedure.

6. 1% lidocaine with adrenaline was infiltrated into the left upper gingivobuccal sulcus.

7. Nasal cleansing was performed using gauze soaked in 70% alcohol.

8. Nasal packing was inserted into the right nostril to provide support to the nasal pyramidal structure. Subsequently, nasal packing with gauze was utilized to elevate the depressed frontal process of the maxillary fracture site to its original position.

9. A left upper vestibular incision was made between the canine and 2nd premolar using blade No.15, approximately 2 mm above the gingivobuccal sulcus to preserve the mucosal flap. *(Figure 3)*

10. A tunnel was created by dissecting upward along the piriform aperture in the subperiosteal plane while preserving the nasal mucosa. A navy-army retractor was utilized to assist in elevating the surgical plane.

11. The fracture site and the depressed frontal process of the maxillary fragment were visualized *(Figure 4).*

12. A titanium 2.0 miniplate was bent to properly fit the frontal process of the maxillary bone and nasal bone.

13. A straight drill was used to create a hole (1 hole on the nasal bone, 2 holes on the frontal process of the maxillary bone).

14. A straight screwdriver was used to insert and secure a screw in its position.

15. Satisfactory contour was achieved.

16. The nasal packing at the nostrils was removed before further reducing the nasal septum.

17. Closed reduction of the nasal bone was accomplished using a Boies periosteal elevator.

18. Septal correction was performed utilizing a Boies periosteal elevator.

19. Bilateral insertion of manufactured sponge nasal packing was carried out to control bleeding and provide support to the nasal pyramid structure.

20. Bleeding in the pre-nasal area was evaluated, and no hemorrhage was detected.

21. Bleeding in the intraoral area was evaluated and addressed by irrigation with 0.9% normal saline solution.

22.The intraoral wound was meticulously sutured with fast-absorbing coated polyglactin 910 size 4-0.

23. A thin application of tincture benzoin was administered around the nose and forehead to facilitate the adherence of tape and the aluminum splint.

24. An external aluminum splint was meticulously applied and secured in place with tape.

25. The patient was extubated and transferred to the recovery room in a stable condition.

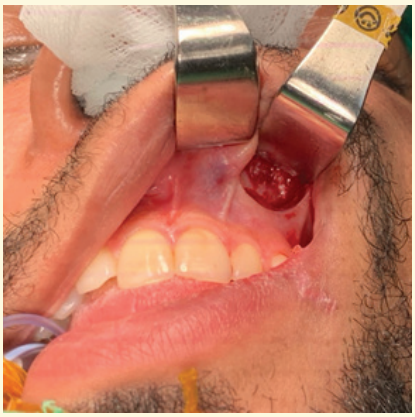

Figure 3- shows a gingivobuccal incision for approaching the fracture site.

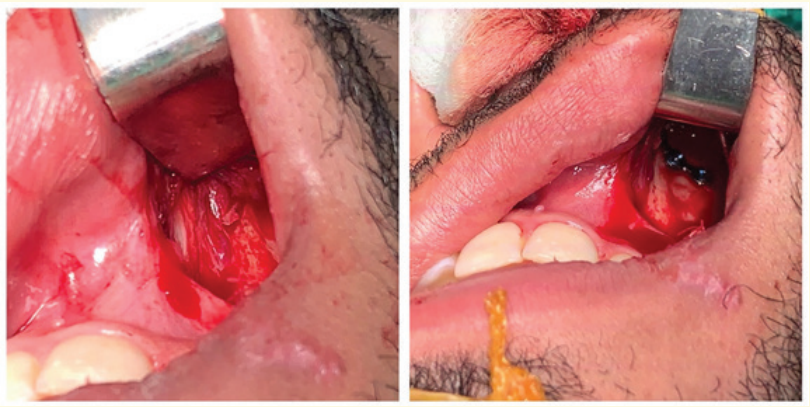

Figure 4- The left panel illustrates a depressed fracture of the frontal process of the left maxilla. The right panel depicts the postoperative outcome following plate and screw fixation, showing proper alignment between the frontal process of the maxilla and the nasal bone without any visible step-off.

During the follow-up visit, one week later, the patient reported a favorable outcome. He experienced normal nasal breathing and remained free from epistaxis. Following the removal of the aluminum splint, the nasal shape had fully returned to its pre-injury state. Then, we reassured the patient by conducting a Waters' view X-ray to confirm that the plate and screws are in their desired positions. *(Figure 5)*

Following the surgical procedure, a one-month postoperative follow-up was conducted with the patient. No external deformities were observed. Bilateral airflow symmetry was confirmed, and olfactory function was found to be intact. No septal deviation was detected. The patient reported satisfaction with the aesthetic and functional outcomes of the nasal surgery. *(Figure 6)*

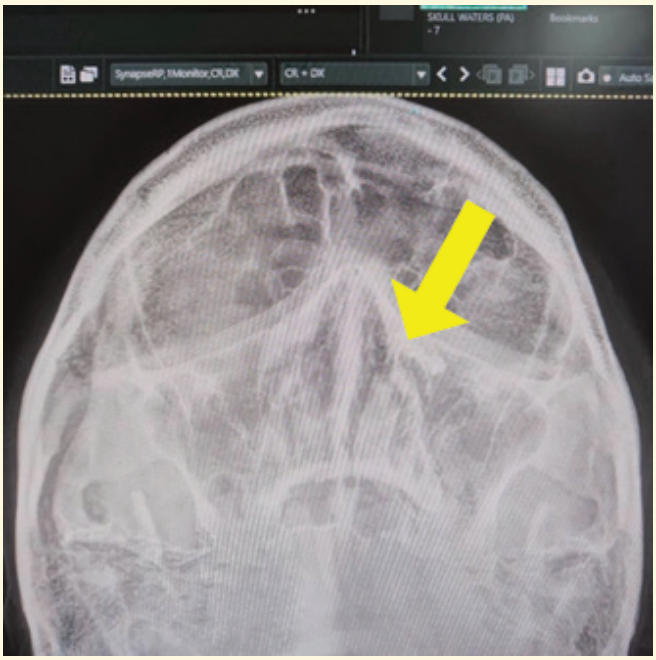

Figure 5- shows that the plate and screws are in their desired positions.

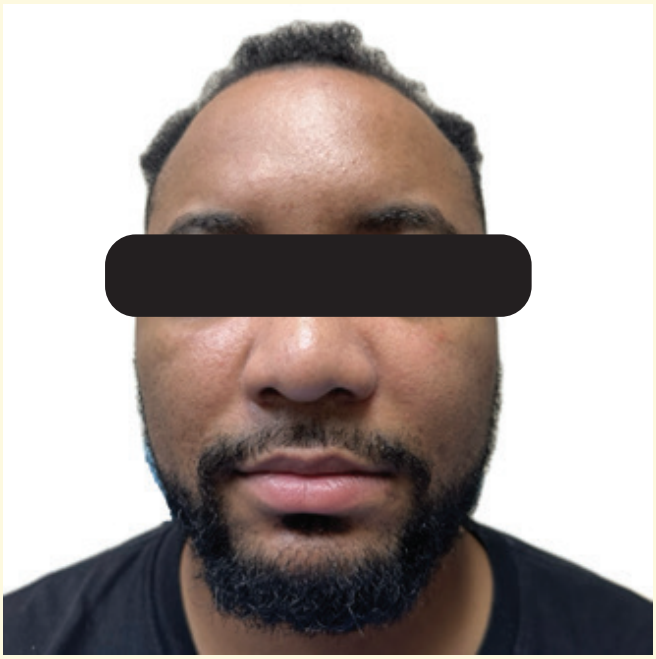

Figure 6- shows the condition one-month post-surgery.

DISCUSSION

Nasal bone fracture represents the most common facial fracture and are frequently encountered in emergency departments. This prevalence is primarily attributable to the prominent, midline positioning, and thin nature of the bone. This anatomical characteristic renders it particularly vulnerable to injury upon external force impact directed towards the facial region. Injuries to the nasal bone are categorized into three types according to the treatment principles of Siriraj Hospital, where the treatment approach varies for each type of injury.

For nasomaxillary fracture, which involve not only the nasal bone but also the maxillary frontal process, inferior orbital rim, anterior part of the maxilla, and canine pillar, surgical intervention is necessary.[9]

In addition to reducing the nasal bone, surgery is required to stabilize it with the frontal process of the maxilla. This is necessary to prevent the collapse of the nasal bone, which can lead to significant deformities and obstruction of nasal airflow.

Following systematic data collection at the Facial Fracture Clinic of Siriraj Hospital (Trauma center level1) spanning from January 1, 2018, to December 31, 2020, and subsequent exclusion of nasal fractures with concomitant fractures such as Le Fort II fractures, zygomaticomaxillary complex fracture, fracture of maxillary antrum, a total of 251 cases of isolated nasal bone fractures were identified. Among these cases, 227 (90.4%) involved isolated Nasonasal bone fractures, 20 (8%) involved isolated Nasomaxillary bone fractures, and 4 (1.6%) involved isolated Nasoorbitoethmoidal bone fractures.

Nasomaxillary fracture results from an impact at a lower and more lateral site, at the junction of the nasal bone, inferior orbital rim, and nasomaxillary buttress. At this site, the thicker bone requires a higher energy trauma to fracture compared to the nasal bone.[6] Patients with nasomaxillary bone fracture may exhibit signs and symptoms shared with other types of nasal bone fracture, including but not limited to epistaxis, nasal obstruction, tenderness at the fracture site, or palpable step-off deformity. However, an additional sign of nasomaxillary fracture includes a step-off and tenderness at the base of the nasal sidewall (frontal process of the maxilla). Misdiagnosis resulting in failure to properly realign the fracture site can indeed lead to long-term complications, including external nasal deformity and nasal airflow obstruction.

While the diagnosis of nasal bone fracture can be primarily made through physical examination, it is common practice to utilize plain film imaging to confirm the diagnosis. The most commonly used plain films to confirm the diagnosis of nasal bone fracture are the lateral nasal view and the Waters' view. Although the plain film lateral nasal view is commonly utilized to confirm a nasal bone fracture, this imaging modality provides only a two-dimensional image, which may not always be sufficient for accurate diagnosis. Additionally, plain film alone is insufficient for distinguishing between nasonasal and nasomaxillary fracture and may not provide useful guidance for treatment decisions. In contrast, J.adnot et al.[6] has described that the Waters' view can depict not only a nasal bone fracture characterized by an interruption in the contour of the piriform aperture, but also two additional findings. These include an air-fluid level in the sinus, indicative of the presence of blood, which is consistently observed in patients with nasomaxillary fracture. Another significant finding is the loss of continuity of the McGrigor–Campbell line, which is not discernible on other views.

These findings raise suspicion for a nasomaxillary fracture and, consequently, prompt the need for a CT scan. However, in cases involving more severe trauma and when physical evidence of other facial fractures is present, CT scan should be used to assess the extent of bony injury.[1]

ORIF is considered the gold standard for treating nasal bone fractures involving the maxilla. The selection of a surgical approach may vary depending on the specific advantages and disadvantages of each technique. Common options include the more favorable lower eyelid incisions—such as the subciliary or transconjunctival approaches—or the less commonly used gingivobuccal sulcus incision.

In Thai patients, the subciliary approach is often preferred to minimize visible scarring, as it is located near the fracture site and offers a relatively sterile operative field compared to the gingivobuccal approach. However, this method carries risks of potential complications, including ectropion, lagophthalmos, injury to the lacrimal system, and noticeable scarring.

Although the transconjunctival approach is also more sterile than the gingivobuccal route for nasomaxillary fractures, it poses technical challenges. These include limited surgical exposure and greater distance from the fracture site, which can hinder effective fracture reduction.

In this case, the patient—a Fitzpatrick skin type V American man with a history of unfavorable scarring—prompted a strategic decision to mitigate potential complications associated with external scarring. Recognizing the risk of ectropion consequent to scarring along the lower lid margin, we opted for the gingivobuccal sulcus approach to minimize the likelihood of this adverse outcome. Despite the potential distance between the incision and fracture site, careful dissection along the surgical plane and creation of a sizable tunnel for clear visualization facilitate the use of straight drill and screwdriver for plate and screw fixation after repositioning the fractured bone, while preserving the infraorbital nerve. Although utilizing straight instruments poses increased difficulty, especially without angled alternatives, this procedure remains feasible, particularly when visualization is optimal.

In general, fixation of the nasal bone and frontal process of the maxilla typically employs 1.5 mm plates. However, 2.0 mm plate were utilized in this patient due to the unavailability of 1.5 mm miniplate in the facial fracture's equipment set of Siriraj Hospital.

CONCLUSION

In patients with nasomaxillary fractures who are at risk of complications related to skin incisions, such as those with a history of poor wound healing or susceptibility to surgical scarring, fixation of the nasal bone with the maxilla via the gingivobuccal approach using straight instruments can be considered. Although utilizing straight instruments for plate fixation may present challenges, meticulous dissection and careful elevation of the cheek flap, while preserving the infraorbital nerve, can significantly enhance the visual field and contribute to a successful operation.

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