Case Report

DOI: 10.7860/JCDR/2023/64879.18807

Dentistry Section

A Unique Tripod Suspension and Stabilisation Technique for the Treatment of Nasal Bone Fracture: A Case Report

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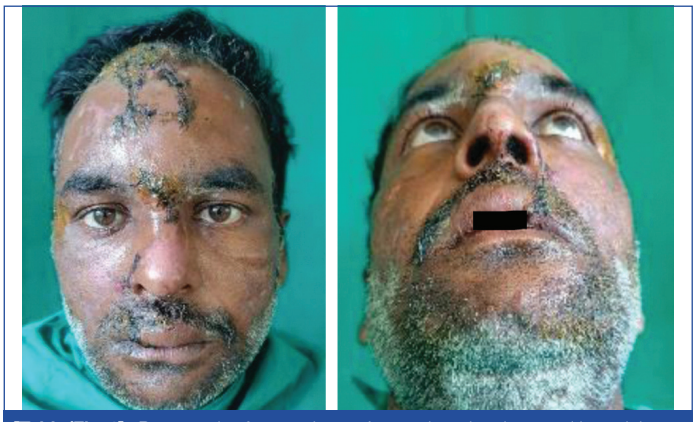
ABSTRACT

Nasal bone fracture is more common because it is a prominent structure on the face. It can occur as an isolated injury or in combination with other soft tissue and bony facial injuries. While isolated fractures are more common, they can also be associated with fractures of the zygomatic-orbital-maxillary complex and the skull base. Typically, nasal bone fractures are treated with closed reduction or open reduction and fixation. This involves internal fixation using nasal packing and external fixation using plaster splinting. However, in this technique, we utilised an internal teflon splint and an external thermoplastic splint for the fixation of comminuted nasal bone fractures. One advantage of this technique is that it keeps the nostrils open, allowing for unobstructed breathing. Additionally, the internal splint helps lift the nasal bone back into its anatomical position. The present case report presents the management of a 40-year-old male patient who sustained nasal and maxillary dentoalveolar fractures as a result of a road traffic accident. The fractures were further managed using intranasal teflon splints, an external thermoplastic splint, and Kirschner's wires. This splint pattern prevents displacement and promotes healing in the desired alignment. This technique employs a logical tripod arrangement of a rigid support system that incorporates all these elements into one interconnected unit, providing support, stability, and tension for optimal results. It focuses on the keystone area of the nose, which requires the most support.

Keywords: External thermoplastic nasal splint, Internal teflon nasal splint, Keystone area

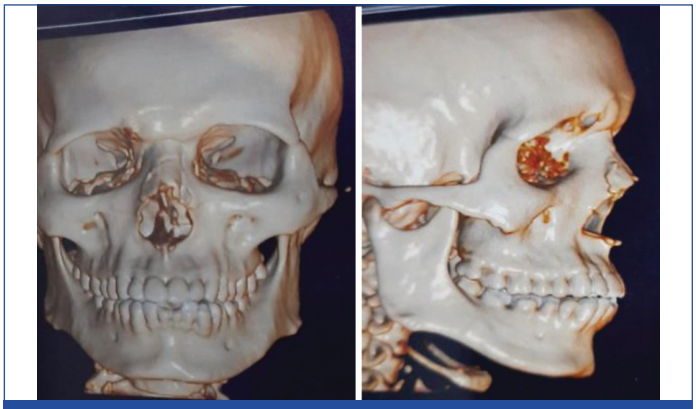
CASE REPORT

A 40-year-old male presented to the Department of oral and maxillofacial surgery with a reported history of a road traffic accident one day ago, resulting in injuries to the nasal and maxillary bones. The patient did not mention any loss of consciousness, vomiting, or seizures. During the clinical examination, lacerations were observed on the forehead, dorsum of the nose, and upper lip [Table/Fig-1]. The patient's vital signs were stable, and there were no signs of septal haematoma or postnasal bleed. Immediate evaluation for head trauma revealed no signs of injury. Due to the facial injury, a 3D Computed Tomography (CT) scan of the face was recommended. The CT scan showed a type-3 fracture of the nasal bone according to the Rene Le Fort classification [Table/Fig-2]. Routine blood investigations were conducted, and the results were within normal limits.



[Table/Fig-1]: Preoperative front and worm's-eye view showing nasal bone injury. (Images from left to right)

Based on the clinical and radiographic findings, a plan for closed reduction and tripod suspension using a 0.8 mm K wire under general anaesthesia was made.

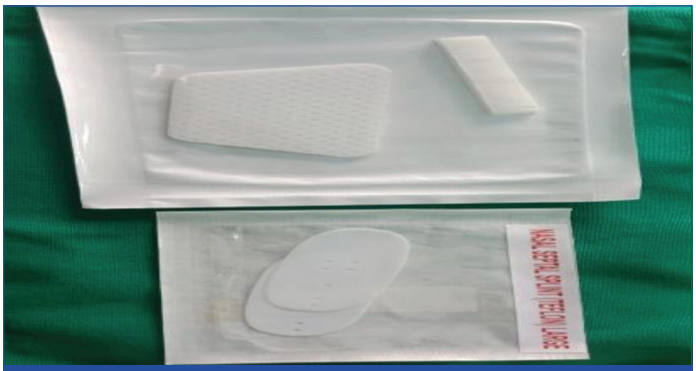


[Table/Fig-2]: Front and lateral view showing a comminuted displaced fracture of the nasal bone. (images from left to right)

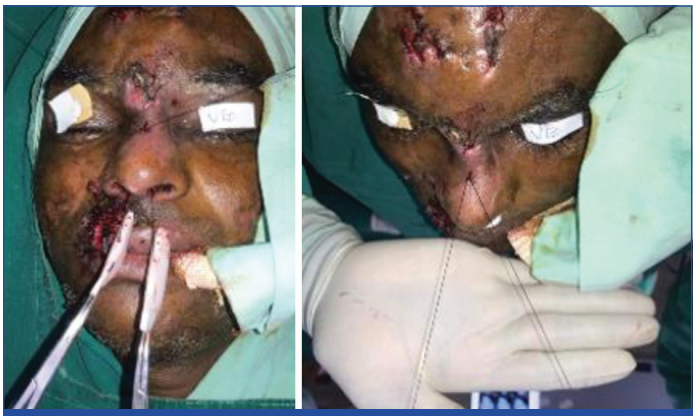
The patient was placed under general anaesthesia with orotracheal intubation. Following preoperative preparation, 2% lignocaine with adrenaline was injected into the medial and lateral walls of the nose. Using Walsham and Asch forceps, nasal bone and nasal septum reduction were performed [Table/Fig-3]. The internal nasal splint [Table/Fig-4] was checked and cut to the appropriate size for both nostrils. After achieving haemostasis, the internal nasal splint was tied with a 3-0 silk suture on the right and left sides. It was then passed through the nasal dorsum at the corner stone area from the inside-out [Table/Fig-5]. Both sutures were pulled upward and anteriorly to elevate the nasal bone [Table/Fig-5].

Next, the thermoplastic external nasal splint was softened by immersing it in hot water for two minutes. Once adequately softened, a 3-0 silk suture was passed through the upper middle hole of the external nasal splint. The external splint was placed on the dorsum of the nose, crimped firmly, and held in place while an assistant applied continuous traction on the internal nasal splint suture. This ensured that the splints pulled the dorsum upward, securing

[Table/Fig-3]: Intraoperative pictures showing nasal bone reduction with Walsham forceps on the right and left-sides, respectively. (Images from right to left)

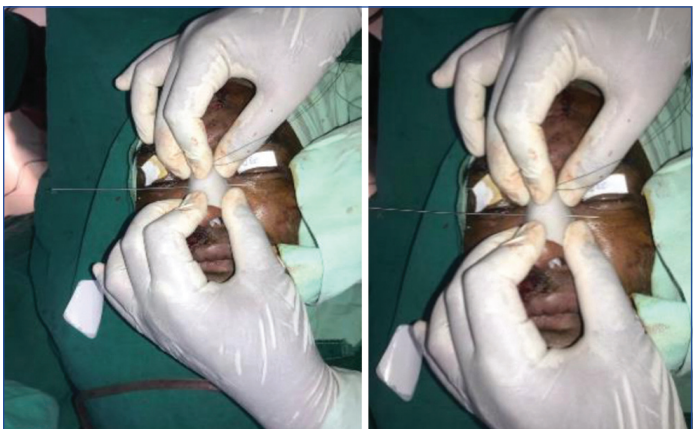


[Table/Fig-4]: External thermoplastic nasal splint and internal teflon nasal splint.



[Table/Fig-5]: Showing the 3-0 silk suture tied with teflon intranasal splint passed from the dorsum of the nose at the bony and cartilaginous junction.

it under the surface of the external nasal splint [Table/Fig-6]. The internal nasal splint was adjusted using an elevator or nasal forceps to ensure proper adaptation under the dorsum of the nose.

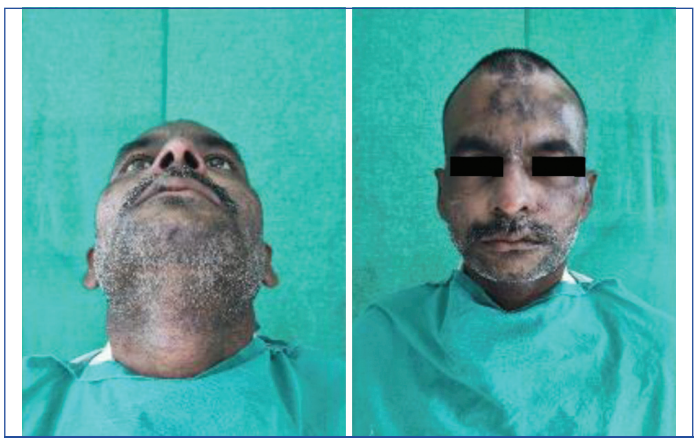


[Table/Fig-6]: Image showing the securing of the thermoplastic external splint. A silk suture is passed through the splint, adapted, and crimped over the nose. Additionally, a 0.8 mm Kirschner's wire is passed through the lateral surface of the nose and the splint. (Images from left to right)

After achieving proper alignment and traction, a 0.8 mm Kirschner's wire was passed across the nose, from one side to the other, through the lateral hole of the external splint, the upper lateral cartilage, and the nasal septum. It was then passed through the upper lateral cartilage on the opposite side and finally through the lateral splint holes of the external splint on the other side. The internal splint sutures were fastened with the Kirschner's wire, forming a tripod arrangement to support the nasal framework. With the internal nasal splint now securely in place, holding up the nasal dorsum from its undersurface, silk sutures were wrapped around the Kirschner's wire in a figure-of-eight manner and tied onto the external nasal splint. Any excess Kirschner's wire was cut and bent to reduce the chances of injury and suture slippage [Table/Fig-7]. Haemostasis was achieved naturally due to the compressive pressure applied by the splint. No nasal packing was necessary. The patient was extubated without complications and transferred to the postoperative recovery room.

[Table/Fig-7]: The right image shows a silk suture wrapped around a Kirschner's wire in a figure-of-eight manner, securing it to achieve a tripod suspension. The left image shows an intranasal splint in place with an open nasal airway space.

The splint was kept in place for two weeks, and the patient was comfortable with the splints as they were able to breathe well through the nostrils, despite the internal nasal splint remaining intact. After two weeks, the splint and sutures were removed. Following splint removal, the nasal shape was examined and palpated to check for any crepitation or step deformity. No crepitation or step deformity was detected, and the nose appeared normal [Table/Fig-8].

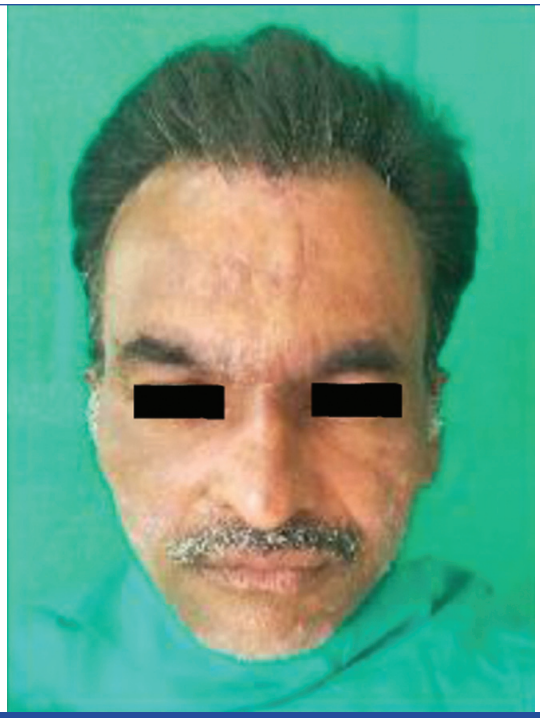


[Table/Fig-8]: Showing images taken 2 weeks postoperative after splint removal.

The patient was scheduled for follow-up appointments at one week, two weeks, one month, three months, and six months. During these follow-up visits, the patient's nose shape was assessed, and the airway was checked. Each time, the nose appeared normal, and the airway remained patent [Table/Fig-9].

DISCUSSION

The nose, being the most prominent part of the face, is composed of thin and delicate bones, making it highly susceptible to facial trauma [1,2]. Nasal bone fractures often occur due to road traffic



[Table/Fig-9]: Showing images taken 3 months postoperative.

accidents, sports-related injuries, and assaults. Diagnostic features of nasal bone fractures include swelling, epistaxis, deformity upon inspection, and bony crepitus upon palpation [3]. Most nasal bone fractures occur at the transition zone between the thinner distal fragment and the thicker proximal fragment in the lower one-third of the nasal bone [4].

Various techniques have been described to achieve and maintain alignment of the different components of the nose following traumatic or iatrogenic injury (such as during septoplasty and rhinoplasty) [5]. This is particularly relevant in cases involving disruption of the keystone area of the nose, which can lead to a collapsed nasal dorsum and a saddle nose [6]. There are two main reduction techniques: closed reduction, which has been used for many years, and indirect open reduction, introduced by Burm JS and Oh SJ in 1998 [7].

Different types of splints are commonly used, including plaster of Paris, self-adhesive padded aluminium (Denver) splint, thermoplastic splint, and other custom-made splints with internal nasal packing. While all splints are effective, they have disadvantages such as increased bulk, time required for application, and potential loosening over time [8]. Plaster of Paris splint often becomes loose soon after the oedema subsides and can be cumbersome to apply due to increased bulk. Nasal packing can lead to breathing difficulties, hypoxia, ulcerations, sinusitis, synechiae, and hypoxaemia [9].

Plaster of Paris is commonly used as an external splint; however, securing it with a headband can lead to undesired shifts in position. The main issue is that the internal and external splints function independently, allowing nasal fragments to displace both inward and outward due to splint movement, unsupported fragments shifting under gravity, or even minor injuries [2].

This new technique addresses all of these concerns by establishing a logical tripod arrangement for a rigid support system that combines these elements into a single interconnected unit. This approach offers the necessary support, stability, and controlled stretching precisely at the keystone area of the nose. Internal nasal splints are used to provide support to the undersurface of the keystone area, extending from the attachment of the nasal bones to the upper frontal and the undersurface of the upper laterals below, effectively guiding them forward onto the undersurface of the external nasal splint. This method significantly improves the likelihood of achieving a smooth and straight nasal dorsum [2].

Furthermore, this technique includes splinting the perpendicular plate of the ethmoid and the junction of the septal cartilage, while also applying a stretching force to align these components in the critical area. Internal splints also help keep the internal nasal valve open and prevent adhesions in this crucial region. Additionally, the fixation technique effectively controls bleeding without the need for nasal packs. The external splint serves as an external fixator and load-bearing framework for the maxillary bone, evenly distributing the load over a broad area and determining the contour of the nasal dorsum [2].

By using Kirschner's wire and sutures tied to them, this technique ensures that the intranasal and external nasal splints function as a single unit in a rigid tripod arrangement, increasing the likelihood that the various nasal components will remain in the intended alignment [2].

A skin-periosteal/skin-perichondrial envelope and a mucosa periosteal/mucosa perichondrial envelope firmly hold the nasal bony-cartilaginous framework in place on the inside and outside, respectively. In the majority of nasal traumas, this envelope remains attached and the fracture involves atleast one surface. Each fragment has a specific position, similar to pearls on a string [2]. Joshi SJ et al., demonstrated that by stretching this envelope, enough space can be created for the fragments to naturally align themselves, resulting in positive outcomes. In their technique, the nasal manipulation and intranasal support push the fragments, referred to as pearls, to their proper locations, while the splint prevents displacement and aids in healing in the desired alignment. The purpose of the external splint is to reduce oedema, provide external support, shape the nose, and protect it from displacement caused by external forces, although it may accidentally shift itself [2].

The various materials commonly used often rely on adhesives and adhesive tapes to stay in position, which can become dislodged due to sweat and body fluids, especially in hot and humid regions [2].

A closed reduction of a nasal fracture is a relatively simple procedure that involves manipulating the nasal bones in three directions: elevating depressed bones, lowering elevated bones, and restoring symmetry to the nasal pyramid, aligning it in the midline [10].

CONCLUSION(S)

This technique addresses the issues of splint displacement and displacement of unsupported fragments caused by gravitational pull or minor injuries. It achieves this by establishing a logical tripod arrangement using an internal nasal splint, external nasal splint, and Kirschner's wire, which create a rigid support system that combines all these elements into one interconnected unit. This system provides the necessary support, stability, and stretch for optimal results, particularly in the keystone area of the nose where support is most needed. In this technique, nasal packing is not performed, allowing for open nasal passages and ensuring that patients do not experience difficulty in breathing, resulting in improved patient compliance.

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PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Apr 22, 2023
- Manual Googling: Jul 22, 2023
- iThenticate Software: Nov 03, 2023 (10%)

ETYMOLOGY: Author Origin

EMENDATIONS: 8

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Apr 20, 2023**
Date of Peer Review: **Jul 15, 2023**
Date of Acceptance: **Nov 06, 2023**
Date of Publishing: **Dec 01, 2023**