

# Nasal Bone Fracture: Comparison Between Diagnostic Accuracy of Conventional Radiography and Computed Tomography



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## Abstract

**Objectives:** The aim of this study is to compare accuracy of conventional radiology with computed tomography in the diagnosis of nasal bone fractures.

**Patients and Methods:** A total of 54 patients who underwent conventional radiography and CT after acute nasal trauma were included in this prospective study. Patients with nasal bone fracture evaluated by ENT specialist and imaging studies read by same senior radiologist.

**Results:** Of the 54 patients, the presence of a nasal bone fracture was confirmed in 44 (81.5%) patients. The number of non-depressed fractures was higher than the number of depressed fractures. In five (9.1%) patients, nasal bone fractures were only identified on conventional radiography, including one depressed and four non-depressed fractures. CT was more accurate as compared to conventional radiography for the identification of nasal bone fractures as determined by P value ( $P < 0.05$ ).

**Conclusion:** For the identification of nasal bone fractures, CT was significantly superior to conventional radiography.

**Keywords:** Nasal Bone; Fractures, Bone; Radiography, Computed Tomography

## Introduction

Nasal bone fracture is one of the most common fractures in patients with a maxillofacial injury [1]. It constitutes 39% of maxillofacial bone fractures and is more common in male than in female (2:1 ratio) [2,3]. Accurate diagnosis and appropriate management of nasal bone fractures are important since fractures may cause conspicuous nasal deformities and functional problems of the nasal cavity [4]. Many classifications of nasal bone fractures have been introduced; however, a standard classification has not yet been established [5,6]. Although clinical examinations are considered standard procedure in the diagnosis of nasal fractures, haematoma and oedema of adjacent tissues make it difficult to diagnose them. Imaging procedures in mid face traumas are also needed for forensic reasons [7]. Although a routine radiographic

examination is the main diagnostic tool for traumas to the nose, it is not very accurate and it is difficult to determine which side is fractured on conventional radiographs [8,9]. Previous reports show that radiographic investigations were negative in 25% of patients with nasal bone fractures who needed surgical treatment [10]. Computed tomography (CT) has been considered as a gold standard and it is the procedure of choice for diagnosing complex facial fractures, especially mid-facial fractures [11,12]. However, CT techniques are expensive, are not readily available and provide a high patient exposure dose. However, it is currently unknown if CT can accurately diagnose nasal bone fractures better than conventional radiography (CR) when they are directly compared. Therefore, the aim of our study was to directly compare the

usefulness of CR and CT for the identification of nasal bone fractures.

### Patients and Method

Between August 2024 to January 2025, we prospectively evaluated fifty patients with a history of nasal trauma who were referred to our hospital for medical or legal consultation. All patients that underwent the two diagnostic methods (CT and CR) were enrolled in the study. Patient underwent clinical examination by ENT specialist. After clinical examination (considered as

the gold standard for the diagnosis of nasal bone fracture) the patients were investigated by CR at the first step and then, for confirming diagnosis, CT was performed. We excluded from the study all patients with nasal bone manipulation, closed or open reduction of fractures before referral to our hospital, and patients with more than one week interval between trauma and radiologic investigations. All patients underwent the right and left lateral nasal view and Water's view (occipitomeatal view) of the nasal bones and all CR were interpreted by one experienced radiologist (Figure 1).



**Figure 1:** Conventional radiological image for nasal bone fracture.

CT examinations were performed with a multi-detector row CT device with 6 detectors. Axial and coronal scans were obtained separately with 3-mm-slice thickness on multi-detector row CT (Figure 2). Short lucent lines that reached the anterior cortex of the nasal bone, with or without displacement, were regarded as fractures in both imaging modalities. Radiologist classified the image findings into the following 3 groups: no fracture, depressed fracture, and non-depressed fracture. Statistical analyses were performed using SPSS 12.0 for Windows software (SPSS, Chicago, IL) and  $P < 0.05$  was considered statistically significant.

### Results

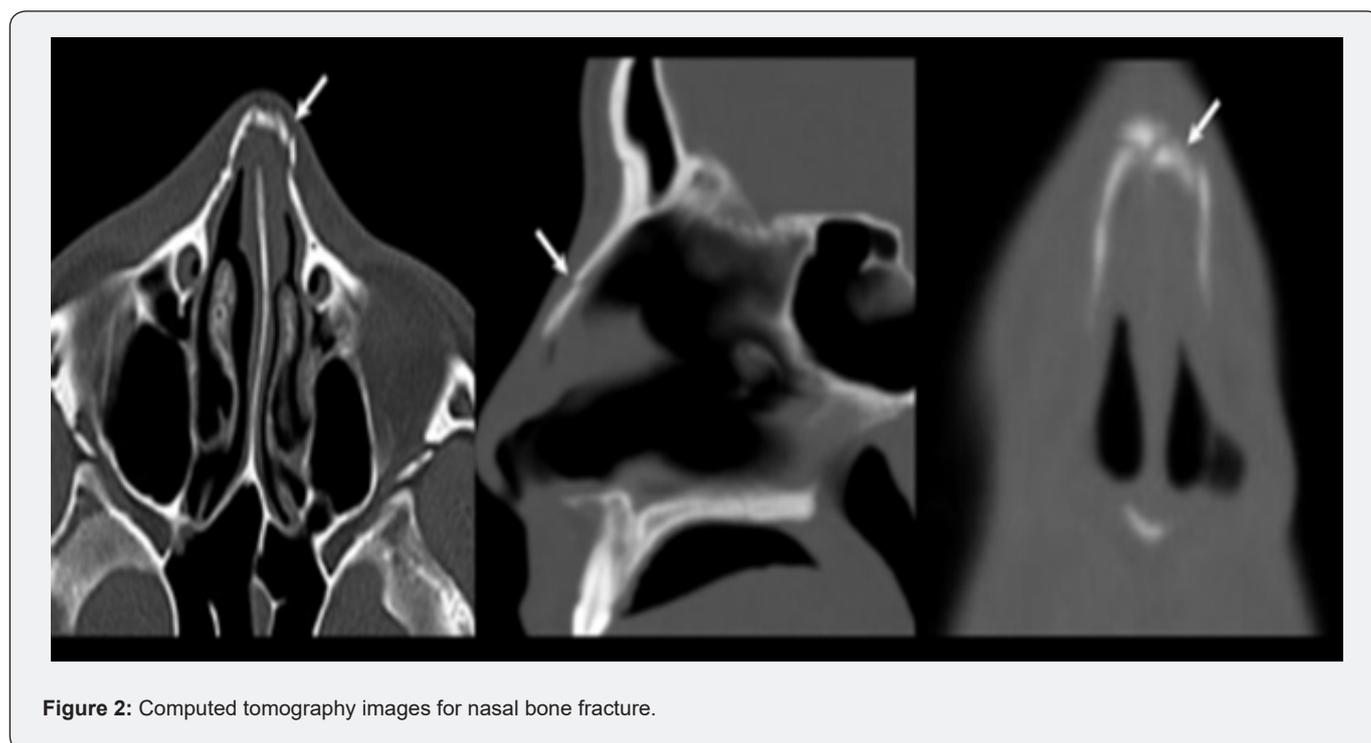
Of the 54 patients, 44 (81.5%) were diagnosed with nasal bone fracture (36 men, 8 women; mean age, 34.7 years; age range, 16-60 years). A fracture line was found in at least one site of the nasal pyramid of all patients. The causes of nasal bone fractures were punches ( $n=15$ , 34.1%), traffic accidents ( $n=12$ , 27.3%), a slip or fall ( $n=4$ , 9.1%), sports injury ( $n=10$ , 22.7%), and work-related injuries ( $n=3$ , 6.8%) (Table 1).

**Table 1:** Etiology for nasal bone fracture.

Etiology of nasal bone fracture	Number	%
Punches	15	34.1
Traffic accidents	12	27.3
Sports injury	10	22.7
Slip or fall	4	9.1
Work-related injuries	3	6.8
Total	44	100

The nasal bone fracture associated with another facial bone fracture (n = 12), and nasal bone fracture associated with skull fracture (n=2). The main sites of associated facial bone fractures

were the orbit (n=3), maxilla (n=2), zygoma (n=2), and mandible (n=3). The incidence of non-depressed fractures (30/44, 68.2%) was higher than that of depressed fractures (14/44, 31.8%). The distal portion of the nasal bone was the most common fracture site (n=30, 68.2%). The 44 cases were categorized as follows: simple fracture without displacement (n=7, 15.9%); simple fracture with displacement (n=30, 68.2%), including unilateral fracture without septal fracture (n=5); unilateral fracture with septal fracture (n=4); bilateral fracture without septal fracture (n=15); bilateral fracture with septal fracture (n=9); and comminuted fracture (n=7, 15.9%). Of the 44 patients with a nasal bone fracture, 34 (77.2%) underwent surgery for nasal reduction.



**Figure 2:** Computed tomography images for nasal bone fracture.

**Table 2:** Diagnostic Indices of Conventional Radiography and CT for Overall Nasal Bone Fracture.

Modality of diagnosis	Sensitivity, (%)	Specificity, (%)	Accuracy, (%)
Conventional Radiography	33/44(76.1)	2/10(20)	35/54(65.7)
Computed Tomography	40/44(89.8)	9/10(90)	49/54(89.8)

The remaining patients did not undergo surgical intervention because of the patient refusal or the presence of only a minimal fracture without a significant nasal deformity, which did not require operative correction. Out of 44 patients, 40 (90.9%) had nasal bone fractures which were detected on CT, and 29 patients (65.9%) showed fractures on both CT and conventional radiography. In 5 (9.1%) patients, nasal bone fractures were identified on only conventional radiography, including one depressed and four non-depressed fractures. This result indicated that conventional radiography detected fractures that were missed by CT imaging.

For the overall detection of nasal bone fractures, all values indicated the significant superiority of CT over conventional radiography (P<0.05) Table 2.

**Discussion**

In addition to the clinical examination (crepitation, deviation from the midline and dislocated fracture), the nasal bone fracture is often diagnosed by radiography. Conventional radiographs do not demonstrate the line of fractures of nasal bone well [7]. Nasal bone fracture has two peaks, the first between 15–25 years and the second after 60 years of age. Generally young people are

more susceptible to fractures and displacement and the elderly develop comminuted fractures [2]. Almost 80% of nasal bone fractures occur between the middle third and the inferior part of the nose [13]. Due to possible legal matters accurate imaging of nasal fractures in many circumstances is critical. For many years the standard imaging modality for the diagnosis of a nasal bone fracture was considered to be CR, until some reports showed a negative CR in 25% of patients with a nasal bone fracture who required surgical intervention [10].

Due to the low sensitivity of CR, its efficacy in clinical decision-making is controversial [14]. Hwang et al. [7] reviewed 503 cases by analyzing nasal bone fractures by conventional radiography in both lateral and Waters views, as well as by CT. Only 82% of nasal bone fractures were identified by conventional radiography vs. 100% by CT. In this study, diagnostic accuracy of facial CT was superior to that of conventional radiography in the detection of nasal bone fracture. In particular, facial CT showed a high positive predictive value unlike conventional radiography. Plain films were deemed unreliable for the diagnosis of nasal bone fractures. In our study, conventional radiography showed limited diagnostic accuracy of nasal bone fractures because of the presence of several pseudolesions, such as prior nasal bone fracture, angulation deformity, anatomical variation, fracture of ossified cartilage, midline nasal suture or nasomaxillary suture, a thin nasal wall, and Mach band artifact (eyelid or vascular marking). However, for five (9.1%) patients, including one patients with simple depressed fracture and four with non-depressed fracture, the fracture was identified only on a conventional radiograph. Although conventional radiography should not be used as the sole diagnostic tool, it is a useful complementary imaging tool for the detection of transverse fractures of the nasal bone. Nevertheless, facial CT using 1.5 mm or less slice thickness may detect non-depressed nasal fracture, and further studies are required. Several studies have suggested that CT is very useful for the diagnosis of nasal bone fracture [15-17]. In our study, CT was significantly superior to conventional radiography for the detection of nasal bone fractures.

## Conclusion

Computed tomography is superior to conventional radiography for the detection of nasal bone fractures, assessment of the type of nasal bone fracture, for combined injuries, and for decision-making in therapeutic planning. However, although conventional radiography is not the first choice as a diagnostic tool, it may be useful for the detection of transverse and non-depressed nasal bone fractures.

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## References

1. Hwang K, You SH, Kim SG, Lee SI (2006) Analysis of nasal bone fractures; a six-year study of 503 patients. *J Craniofac Surg* 17(2): 261-264.
2. Mohammadi A, Javadrashid R, Pedram A, Masudi S (2009) Comparison of ultrasonography and conventional radiography in the diagnosis of nasal bone fractures. *Iran J Radiol* 6: 7-11.
3. Fraioli RE, Branstetter BF (2008) Facial fractures: beyond Le Fort. *Otolaryngol Clin North Am* 41(1): 51-76.
4. Tremolet de Villers Y (1975) Nasal fractures. *J Trauma* 15(4): 319-327.
5. Ziccardi VB, Braidly H (2009) Management of nasal fractures. *Oral Maxillofac Surg Clin North Am* 21(2): 203-208.
6. Yabe T, Ozawa T, Sakamoto M, Ishii M (2004) Pre- and postoperative x ray and computed tomography evaluation in acute nasal fracture. *Ann Plast Surg* 53(6): 547-553.
7. Hong HS, Cha JG, Paik SH, Park SJ, Park JS, et al. (2007) High resolution sonography for nasal fracture in children. *Am J Roentgenol* 188(1): 886-892.
8. Nigam A, Goni A, Benjamin A, Dasgupta AR (1993) The value of radiographs in the management of the fractured nose. *Arch Emerg Med* 10(4): 293-297.
9. Logan MO, Driscoll K, Masterson J (1994) The utility of nasal bone radiographs in nasal trauma. *Clin Radiol* 49(3): 192-194.
10. Damman F (2007) Imaging of paranasal sinuses today. *Radiologe* 47(7): 576,578-583.
11. Friedrich RE, Heiland M, Bartel-Friedrich (2003) SPotentials of ultrasound in the diagnosis of midfacial fractures. *Clin Oral Investig* 7(4): 226-229.
12. Jank S, Emschhoff R, Etzelsdorfer M, Strobl H, Nicasi A, et al. (2004) Ultrasound versus computed tomography in the imaging of orbital floor fractures. *J Oral Maxillofac Surg* 62(2): 150-154.
13. Piliija V, Buljck M, Mihalj M, Savovic S, Stojilkovic G (2005) Classification and qualification of nose injuries - clinical and forensic aspects. *Med Pregl* 58(1-2): 33-36.
14. Gurkov R, Clevert D, Krause E (2008) Sonography versus plain X-rays in diagnosis of nasal fracture. *Am J Rhinol* 22(6): 613-616.
15. Ziccardi VB, Braidly H (2009) Management of nasal fractures. *Oral Maxillofac Surg Clin North Am* 21(2): 203-208.
16. Yabe T, Ozawa T, Sakamoto M, Ishii M (2004) Pre- and postoperative x ray and computed tomography evaluation in acute nasal fracture. *Ann Plast Surg* 53(6): 547-553.
17. Som PM, Curtin HD 9 (2011) Elsevier - Health Sciences Division; Head and Neck Imaging: Expert Consult- Online and Print.



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