Original Article

OPEN ACCESS

Clinical Examination and Diagnosis of Nasal Bone Fracture; Is There Really a Need for X-ray Nasal Bone?

Mujahid Raza[1], Saleh Khurshied[2], Altaf Hussain[3], Nawal Khurshid[4], Ghazal Iftakhar[5], Mehr un Nisa[6]

[1]Department of Radiology,[2,4,5,6]Department of ENT Head & Neck Surgery
[3]Head Department of ENT Head & Neck Surgery
Pakistan Institute of Medical Sciences, Islamabad

Author`s Contribution

[1,2]Substantial contributions to the conception or design of the work; or the acquisition, [3]Drafting the work or revising it critically for important intellectual content [4,5]Active participation in active methodology, [6]analysis, or interpretation of data for the work,

Funding Source: None
Conflict of Interest: None

Received: Jan 21, 2024
Accepted: July 04, 2024

Address of Correspondent
Dr Saleh Khurshied
Department of ENT Head & Neck Surgery, Pakistan Institute of Medical Sciences, Islamabad
Salehkhurshied96@gmail.com

ABSTRACT

Objective: To evaluate the role of clinical examination in diagnosing nasal bone fracture.

Methodology: This Prospective Observational study was carried out in the departments of Otolaryngology-Head and Neck Surgery and Radiology at the Pakistan Institute of Medical Sciences, Islamabad, from Jan 2022 to Dec 2023. About 1000 patients of nose trauma patients coming to ENT emergency were evaluated clinically by thorough nose examination by ENT surgeon and radiologically by X-ray nasal bone both lateral and anteroposterior view. Based on examination if nasal bone fracture was suspected patient was referred to radiology department for X-ray nasal bone which was reported by radiologist if the bone is fractured or not. The clinical findings were correlated with X-ray reports to find out if there really is a need for X-ray nasal bone for diagnosing nasal bone fracture. The diagnostic accuracy of clinical examination was calculated.

Results: When clinical and radiological findings were compared regarding the diagnosis of nasal bone fracture a statistically significant association was found between the two (p=<0.001) showing patients with clinical suspicion of fracture actually had fracture on X-ray. The diagnostic accuracy of clinical examination was very high with Positive Predictive Value, Negative Predictive Value, Sensitivity, Specificity, False Negative Rate and False Positive Rate being 96.1%, 93%, 88.5%, 97.7%, 11.5% and 2.3% respectively.

Conclusion: We concluded that almost all patients with suspected nasal bone fracture actually had fractures on X-ray. Fractured nasal bone can correctly be diagnosed clinically by ENT surgeon and there is no real need for X-ray nasal bone just for diagnosing nasal bone fracture.

Key words: Otolaryngology, nasal bone, radiology, X-ray, surgeons.

Cite this article as: Raza M, Khurshied S, Hussain A, Khurshid N, Iftakhar G, Nisa M. Clinical Examination and Diagnosis of Nasal Bone Fracture; Is There Really a Need for X-ray Nasal Bone? Ann Pak Inst Med Sci. 2024;20(3):517-520.doi.10.48036/apims.v20iSUPPL-1.1147

Introduction

Nasal bone, a very small and thin bone in the center of face, is the most fractured bone in cases of facial trauma and traffic accidents.[1] It is the third most common fracture of the skeletal system of the body. Advances in technology and increased use of motor vehicles, increased violence, sports accidents, workplace accidents, falls and other circumstances have increased the prevalence of various physical injuries, including nasal trauma. CT scan is considered as gold standard for diagnosing nasal bone fractures, but clinical examination and X-ray nasal bone plays a very vital role in initial diagnosis and management. [2-4] The diagnosis of nasal bone fracture is mainly based on clinical opinion.[5] The reliability of plain X-ray is 82% in diagnosing nasal bone fractures, but it is increased by combined clinical findings and X-ray reporting.[6] X-ray is not considered necessary for diagnosis of nasal bone fracture but considered as an additional mode to confirm the clinical diagnosis where fracture is suspected.[7] Diagnosing nasal fracture is mainly clinical and clinical findings will dictate if any surgical intervention is required or not.[8] Physical examination does give very reliable information regarding the nasal

bone fracture but cannot determine the complexity of the fracture and facial trauma so if any management plan is to devised X-rays are required.[9]

Clinical examination is a diagnostic method in nasal trauma and X-rays are usually performed in legal cases. Clinical examination can be difficult in the cases of hematoma and oedema of nose.[10]

The rationale of our study was to evaluate the role of X-ray nasal bone in diagnosing nasal bone fracture whether there is a need for X-ray or clinical diagnosis is enough for diagnosis. This will save patient and health care system from unwanted cost or X-rays as well as saves patient from unwanted radiation exposure.

The objective of our study was to evaluate the role of clinical examination in diagnosing nasal bone fracture. Does we really need X-ray nasal bone in each, and every case or clinical examination is enough to make a diagnosis.

Methodology

This Prospective Observational study was carried out Departments of Otolaryngology-Head and Neck Surgery and Radiology at the Pakistan Institute of Medical Sciences, Islamabad. This institute is categorized as a tertiary care hospital in Islamabad, Pakistan. After taking formal ethical approval from the Ethics Research Review Board Pakistan Institute of Medical Sciences, Islamabad with reference to letter no: F.3-1/2023(ERRB)/Chairman. The study duration was from Jan 2022 to Dec 2023.

All the patients coming to ENT emergency with trauma to nose were included in the study if fulfilling the inclusion and exclusion criteria by convenient consecutive sampling technique.

About 1000 patients visited the ENT emergency during the study duration. After taking demographic details on a proforma and written consent these patients were evaluated clinically by thorough nose examination by ENT surgeon by using 8 clinical criteria[11] which include epistaxis, periorbital and/or perinasal ecchymosis, nasal wound or laceration, airway obstruction, nasal inflammation, lateral deviation, irregular nasal dorsum, and acute septal injury. A positive ASI was a tear, laceration, hematoma, or fracture. When at least 3 of the above criteria were positive, the patient was suspected of having a nasal bone fracture and was referred to radiology for X-ray for confirmation. These patients were then evaluated radiologically radiologically by X-ray nasal bone both lateral and anteroposterior view. Based on examination if nasal bone fracture was suspected patient was referred to radiology department for X-ray nasal bone. X-rays were taken by radiology technician using standard technique in anteroposterior and lateral view of nasal bone. The X-rays were evaluated and reported by consultant radiologist if the bone is fractured or not. The clinical findings were correlated with X-ray reports to find out if there really is a need for X-ray nasal bone for diagnosing nasal bone fracture.

The inclusion criteria include patients with nasal trauma aged between 10- 60 years including both genders. Those patients who did not consent for the study, had previous nasal surgery, or had any deformity or acute condition for which emergency intervention or surgery was required were excluded from the study.

The suspected nasal fractures on ENT examination were correlated with X-ray reporting to see if patients had fracture or not. The data were entered and analyzed statistically using SPSS v 29 Frequencies, percentages, mean values were calculated and presented in the form of tables and graphs where applicable and Chi-square test was applied for calculating P values where required.

Results

A total of 1000 consecutive patients were included in the study. A total of 821 (82%) patients were male and 179 (18%) were female. The mean age ± SD was 23 ± 9.34. The age ranged between 10 to 56 years with 639 (64%) patients falling between 20 to 35 years of age. Of total, 361(36%) patients who were suspected as fractured nasal bone clinically by ENT surgeon based on examination and send to radiology department for X-ray nasal bone with X-ray findings reported by radiologist it was found that 347 (96.12%) actually had fracture on X-ray while 14(3.88%) didn't had any fracture. The remaining 639 (64%) patients who were not suspected as having fractured nasal bone but still sent to radiology department for X-ray to confirm clinical diagnosis when they were compared with radiologist's reporting it was found that 594 (93%) didn't had any fracture while 45 (7%) had fracture. (Table I) When clinical and radiological findings were compared between the two groups a statistically significant association was found between the two ($p=<0.001$) showing a very strong association between the two. The diagnostic accuracy of clinical examination is shown in Table II with Positive Predictive Value, Negative Predictive Value, Sensitivity, Specificity, False

Negative Rate and False Positive Rate being 96.1%, 93%, 88.5%, 97.7%, 11.5% and 2.3% respectively.

Table I: Clinical and radiological results crosstabulation.

			Radiologically fractured		
			Yes	No	Total
Clinical nose examination	Fractured	Count	347	14	361
		Clinically fractured	96.1%	3.9%	100.0%
		Radiologically fractured	88.5%	2.3%	36.1%
	Not fractured	Count	45	594	639
		Clinically fractured	7.0%	93.0%	100.0%
		Radiologically fractured	11.5%	97.7%	63.9%
Total		Count	392	608	1000
		Clinically fractured	39.2%	60.8%	100.0%
		Radiologically fractured	100.0 %	100.0 %	100.0%

Table II: Diagnostic accuracy of clinical examination.

Positive Predictive Value	96.1% (347/361)
Negative Predictive Value	93% (594/639)
Sensitivity/True Positive Rate	88.5% (347/392)
Specificity/True Negative Rate	97.7% (594/608)
False Negative Rate	11.5% (45/392)
False Positive Rate	2.3% (14/608)

Discussion

We evaluated the accuracy of clinical examination with respect to X-ray findings and it was found that most of the times clinical diagnosis was correct and was validated by X-ray. Clinal examination had high Positive Predictive Value, Negative Predictive Value, Sensitivity, Specificity and low False Negative and False Positive Rate. Pérez-Guisado J et al.[11] in their study found that when 3 clinical criteria are present the clinical examination had 100% specificity and 100% PPV and concluded when 3 or more clinical criteria are present, clinical examination helps in accurate diagnosis of nasal fracture in the emergency department. These results were comparable to our study where specificity and PPV was 97.7% and 96.1% respectively. The study by Oluwasanmi and pinto[12] stated that X-ray in nasal trauma causes waste of money and time and is not useful, which was also validated by our results. The study[13] showed that 74.7% of their patients were male which was close to our population including 82% males. In the study[4] which include 1,010 X-rays reported that 60.4% had a positive finding of fracture while 39.6% were negative which was close to our findings when both groups combined.

Davari R et al.[14] found that out of total patients presented with nasal trauma 76.9% of the patients were male and 23.1% were female which was closer to our results. Fornazieri et al.[15] in their study showed that 80% of patients were male and their average age was 26 years old which was like our findings.

Limitations of our study was consecutive sampling and objective clinical assessment of patients by ENT surgeon and X-ray reporting by radiologist. The strengths of our study were a very large sample size based on our inclusion/ exclusion criteria and linear comparison between clinical and X-ray findings The study has a huge impact on our daily practice. By minimizing unjustified use of X-ray for nasal trauma we can save resources, wealth, time and radiation exposure.

Conclusion

Clinical evaluation can strongly suggest the possibility of fracture nasal bone and has high Positive Predictive Value, Negative Predictive Value, Sensitivity, Specificity and a low False Negative and False Positive Rate. X ray Nasal bone should only be done when clinically suspected and in complicated cases. There is no role of X-ray for nasal bone fracture clinically normal patients and should be avoided.

References

1. Ziccardi VB, Braidy H. Management of nasal fractures. Oral Maxillofac Surg Clin North Am. 2009;21(2):203-vi. doi:10.1016/j.coms.2008.12.011 https://doi.org/10.1016/j.coms.2008.12.011
2. Flint P, Haughey B, Valerie L. St. Saunders: Elsevier; 2015. Cummings Otolaryngology. Head and neck surgery. 6th ed.
3. Jalali M, Heidarzadeh A, Alvai N.Evaluation of Satisfaction Rate of Patients and Physician from Closed Reduction of Nasal Fracture J Guil Uni Med Sci 2009186947-52.
4. Gharehdaghi J, Samadi Rad B, Ghatreh Samani V, Kolahi F, Khatami Zonoozian A, Marashian SM. Comparison of physical examination and conventional radiography in diagnosis of nasal fracture. Indian J Otolaryngol Head Neck Surg. 2013;65(Suppl 2):304-307. doi:10.1007/s12070-011-0453-x https://doi.org/10.1007/s12070-011-0453-x
5. Ashoor AJ, Alkhars FA. Nasal bone fracture. Saudi Med J. 2000;21(5):471-474.
6. Hwang K, You SH, Kim SG, Lee SI. Analysis of nasal bone fractures; a six-year study of 503 patients. J Craniofac Surg. 2006;17(2):261-264. doi:10.1097/00001665-

200603000-00010
https://doi.org/10.1097/00001665-200603000-00010
7. Leapo L, Uemura M, Stahl MC, Patil N, Shah J, Otteson T. Efficacy of X-ray in the diagnosis of pediatric nasal fracture. Int J Pediatr Otorhinolaryngol. 2022;162:111305. doi:10.1016/j.ijporl.2022.111305 https://doi.org/10.1016/j.ijporl.2022.111305
8. Dogan S, Kalafat UM, Yüksel B, Karaboğa T, Basturk M, Ocak T. Use of radiography and ultrasonography for nasal fracture identification in children under 18 years of age presenting to the ED. Am J Emerg Med. 2017;35(3):465-468. doi:10.1016/j.ajem.2016.11.056 https://doi.org/10.1016/j.ajem.2016.11.056
9. Hong HS, Cha JG, Paik SH, Park SJ, Park JS, Kim DH, et al. High-resolution sonography for nasal fracture in children. AJR Am J Roentgenol. 2007;188(1):W86-W92. doi:10.2214/AJR.05.1067 https://doi.org/10.2214/AJR.05.1067
10. Rebours C., Glatre R., Plaisance P., Dohan A., Truchot J., Chauvin A. Diagnostic errors of nasal fractures in the emergency department: a monocentric retrospective study. World J Emerg Med. 2022;13(2):120-123. doi: 10.5847/wjem.j.1920-8642.2022.014 https://doi.org/10.5847/wjem.j.1920-8642.2022.014
11. Pérez-Guisado J, Maclennan P. Clinical evaluation of the nose: a cheap and effective tool for the nasal fracture diagnosis. Eplasty. 2012;12:e3.
12. Oluwasanmi AF, Pinto AL. Management of nasal trauma--widespread misuse of radiographs. Clin Perform Qual Health Care. 2000;8(2):83-85. doi:10.1108/14664100010343872 https://doi.org/10.1108/14664100010343872
13. Allareddy V, Itty A, Maiorini E, Lee MK, Rampa S, Allareddy V, et al. Emergency department visits with facial fractures among children and adolescents: an analysis of profile and predictors of causes of injuries. J Oral Maxillofac Surg. 2014;72(9):1756-1765. doi:10.1016/j.joms.2014.03.015 https://doi.org/10.1016/j.joms.2014.03.015
14. Davari R, Pirzadeh A, Sattari F. Etiology and Epidemiology of Nasal Bone Fractures in Patients Referred to the Otorhinolaryngology Section, 2019. Int Arch Otorhinolaryngol. 2023;27(2):e234-e239. Published 2023 Apr 28. doi:10.1055/s-0043-1768208 https://doi.org/10.1055/s-0043-1768208
15. Fornazieri M A, Yamaguti H Y, Moreira J H, Navarro P L, Heshiki R E, Takemoto L E. Fracture of Nasal Bones: An Epidemiologic Analysis. Int Arch Otorhinolaryngol. 2008;12(04):498-501.