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Forensic medical evaluation of nasal trauma cases

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Abstract

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Aim: The purpose of this study was to evaluate the cases for which a final report was made due to nasal trauma and to reveal the errors made in the diagnosis.

Materials and Methods: Among the forensic reports prepared in the Forensic Medicine Clinic of Bolu Abant İzzet Baysal University Training and Research Hospital between 2015-2019, cases with "a history of nasal trauma" were included in the study.

Results: In this study, 315 cases with a history of nasal trauma were included. Two hundred sixty-four (83.8%) of the cases were male and 51 (16.2%) are female. Two hundred thirty-one of the cases (73.3%) were injured as a result of the intentional blunt injuries. Before applying to the Forensic Medicine Clinic, 28 (8.9%) of the cases were evaluated only by physical examination, 46 (14.6%) by physical examination + direct radiography, 241 (76.5%) by physical examination + direct radiography + CT. It was evaluated that the report prepared by emergency department physicians on 203 cases (64.4%) was correct, whereas the report prepared on 112 (35.6%) cases was erroneous. It was evaluated that the reports prepared by Otorhinolaryngologists on 117 cases (80.1%) were correct, whereas the reports prepared on 29 (19.9%) cases were erroneous.

Conclusion: We believe that it is more appropriate to give the final forensic report of cases with nasal trauma by a Forensic Medicine Specialist rather than Emergency Department physicians or an Otorhinolaryngologist.



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Introduction

The nasal bone is the most common fractured facial bone in people who have been traumatized. Nasal bone fractures can occur alone or in combination with other facial bone fractures [1]. Although diagnosing nasal bone fractures seems easy in theory, some difficulties may be encountered in practice [2]. A reliable and accurate diagnosis of a newly developed fracture is crucial to prevent injustice for both the victim and the accused [3]. In addition to important functional problems such as difficulty in breathing and loss of smell in nasal bone fractures, important cosmetic problems such as septum deviation and fixed facial scars may occur [4]. Detection of nasal bone fractures may be made with the use of radiological methods together with a careful physical examination [3]. However, excessive misdiagnoses may be made in emergency departments, especially in radiological examinations [5]. This may result in loss of rights for victims or unfair punishments for perpetrators. In this study, it was aimed to retrospectively examine and discuss the "cases with a history of nasal trauma" among the forensic reports prepared

in the Forensic Medicine Clinic of Bolu Abant İzzet Baysal University Training and Research Hospital between 2015-2019.

Material and Methods

This retrospective study was carried out in Bolu Abant İzzet Baysal University Training and Research Hospital, Forensic Medicine Clinic. A total of 315 patients with nasal trauma who applied to the Forensic Medicine Clinic between 2015-2019 were included in the study. Ethics committee approval dated 19/10/2020 and numbered 425 was obtained from Bolu Abant İzzet Baysal University Clinical Research Ethics Committee for the study. This study was performed in accordance with the Declaration of Helsinki. All cases were evaluated in terms of "age, gender, and the nature of the event, physical examination findings, diagnostic tests, forensic reports, whether there is a fracture of the nasal bone, whether there is an open or closed fracture, the nature of the nasal fracture, the comparison of the Forensic Medicine Clinic - Otorhinolaryngology Clinic report, comparison of Emergency Service - Otorhinolaryngology Clinic report, comparison of direct radiography and computed tomography (CT) reports, whether the surgical intervention was performed or not, whether septum devi-

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Table 1. Characteristics of the cases.

Characteristics of the cases		n	%	Characteristics of the cases		n	%
Gender	Female	51	16.2	Nasal bone fracture	No fracture	145	46
	Male	264	83.8		Linear fracture	74	23.5
Age group	0-10 y	1	0.3	Nature of the event	Displaced - comminuted fracture	96	30.5
	11-20 y	61	19.4		Intentional blunt injuries	231	73.3
	21-30 y	86	27.3		Accidental blunt injuries	75	23.8
	31-40 y	69	21.9		Intentional sharp object injuries	8	2.5
	41-50 y	51	16.2	Intentional firearm injuries	1	0.3	
	51-60 y	33	10.5	<18 y	26	11.4	
	61-70 y	9	2.9	18-64 y	269	85.4	
	≥ 71 years	5	1.6	> 64 y	10	3.2	

ation developed or not". Study parameters were obtained retrospectively from cases' files.

Statistical analyzes

The Statistical Package for the Social Sciences 21.0 (IBM SPSS Statistics for Window, Version 21.0, Armonk, NY: IBM Corp.) statistics program was used for data analysis of the study. Descriptive statistics; frequency, percentage, mean, standard deviation (SD), minimum (min), maximum (max) values are presented. In the comparison of categorical variables; statistical relationships between the data were investigated with the Pearson Chi-square test. P values less than 0.05 were considered statistically significant.

Results

Three hundred and fifteen cases were included in the study. Two hundred sixty-four (83.8%) cases were male and 51 (16.2%) were female. The mean age was 33.9 ± 14.6 (min:4, max:84) and 27.3% of the cases were between the ages of 21-30. Thirty-six (11.4%) of the cases were in the age group below 18 years. Two hundred thirty-one of the cases (73.3%) were injured as a result of intentional blunt injuries (Table 1). Nasal tenderness in 57 (18.1%), crepitation in 61 (19.4%) cases, epistaxis in 37 (11.7%) cases, ecchymosis in 64 (20.3%) cases, and edema in 93 (29.5%) cases, abrasion in 125 (39.6%) cases, and wound on the nose in 36 (11.4%) cases were reported on physical examination in medical documents. Before applying to the Forensic Medicine Clinic; Twenty-eight (8.9%) of cases were evaluated with physical examination, 46 (14.6%) with physical examination + direct X-ray, 241 (76.5%) with physical examination + direct X-ray + CT. We reported that 170 (54%) of the cases had fractures in the nasal bone. Of these fractures, 148 were closed and 22 were open; 74 (23.5%) were linear, 96 (30.5%) were displaced - comminuted fractures. When the reports prepared by our clinic and the reports prepared in the Emergency Service are compared; statistically significant difference was detected ($p < 0.0001$) (Table 2). Among the cases reported as no fracture by the Emergency Service physicians; Nondisplaced fractures were detected in 40 cases and displaced fractures in 46 cases. In total, the reports prepared about 203 cases (64.4%) were correct, whereas the reports prepared about 112 (35.6%) cases were incorrect. Otorhinolaryngologists prepared forensic reports on a total of

146 cases. Of these, the reports prepared for 117 cases (80.1%) were correct, whereas the reports for 29 (19.9%) cases were incorrect. When the report prepared by our clinic and the reports prepared by Otorhinolaryngologists are compared; a statistically significant difference was detected ($p < 0.0001$) (Table 2). Among the cases in which Otorhinolaryngologists reported that there were no fractures, nondisplaced fractures were detected in 13 cases and displaced fractures in eight cases. When direct radiography reports and Computed Tomography (CT) reports were compared, a statistically significant difference was between the two groups ($p < 0.01$) (Table 3). In 134 cases where no fracture was detected by direct radiography, it was reported that there were fractures with CT. It was determined that the misdiagnosis of nasal traumas by Emergency Service physicians was not related to gender, the nature of the event, and the presence of a wound in the nasal region on physical examination ($p > 0.05$). However, the rate of misdiagnosis was statistically significantly higher in patients with nasal tenderness, epistaxis, crepitation, edema, and linear and displaced - comminuted fractures ($p < 0.05$) (Table 4). The surgical procedures were performed in 31 (9.8%) cases due to nasal fracture after the event. Different degrees of septum deviation developed depending on the event in 77 (24.4%) of the cases.

Discussion

Mandible and nasal bone fractures are the most common fractures in maxillofacial traumas [6]. Nasal bone fractures are frequently observed in male cases [7-9]. In this study, most of the cases (83.8%) were male. More nasal fractures in men are associated with a greater propensity for violence [10]. Nasal bone fractures are often seen in the age of twenties (7). In studies conducted in our country, it has been reported that the mean age of patients with nasal bone fractures is between 28.4 and 35.5, and 21.4-27.9% of the patients are under the age of 18 [8, 9]. In this study, the mean age of the cases was 33.9 ± 14.6 (min:4, max:84) and 27.3% of the cases were between the ages of 21-30. In addition, 36 (11.4%) of the cases were under the age of 18. Physical violence is the most common cause of nasal fractures overall [7]. Fights are the most common cause of nasal bone fracture in Asia (36.7%), South America (46.5%), and Europe (40.8%), while traffic accidents are the most common cause in North America [11]. In our country, the most common cause of nasal bone fractures

Table 2. Comparison of the last report prepared by our clinic with the reports prepared by Emergency Service physicians and Otorhinolaryngologists.

		The Last Report Prepared by Forensic Medicine Clinic						χ^2	p*
		No fracture		Linear fracture		Displaced - comminuted fractures			
		n	%	n	%	n	%		
Report prepared by Emergency Service Physicians	No fracture	144	45.7	40	12.7	46	14.6	121.938	0.000000
	Linear fracture	-	-	9	2.9	-	-		
	Displaced - comminuted fractures	1	0.3	25	7.9	50	15.09		
Report prepared by Otorhinolaryngologists	No fracture	31	2.1	13	8.9	8	5.5	146.631	0.000000
	Linear fracture	3	2.1	29	19.8	3	2.1		
	Displaced - comminuted fractures	-	-	2	1.4	57	39		

*Pearson Chi-Square test

Table 3. Comparison of direct radiography and CT reports

		Fracture on direct radiography				χ^2	p*
		No		Yes			
		n	%	n	%		
Fracture on CT	No	90	37.3	-	-	10.901	0.001
	Yes	134	55.6	17	7.1		

*Pearson Chi-Square test

(37.2% -73%) is intentional injuries [8, 9, 12]. Consistent with the literature, in our study, the majority of the cases (73.3%) were injured as a result of intentional blunt injuries (Table 1). Baek et al. detected linear fractures of the nasal bone in 67% of the cases they presented [13]. Linear fractures constitute 35.3% to 65.7% of nasal bone fractures in our country [8, 9, 12]. Of 170 (54%) patients who were reported to have nasal bone fractures by our clinic, 74 (23.5%) linear, 96 (30.5%) displaced – comminuted fractures were detected. In the study of Sener et al., 535 cases with nasal trauma evaluated in the emergency department over a 10-year period were re-evaluated by a council that included a Radiology Specialist, a Forensic Medicine Specialist, and an Otorhinolaryngologists [4]. The diagnosis was missed in 1.9% of the cases, and overdiagnosis was given in 25.2% of the cases. In addition, it was stated that general practitioners and Emergency Medicine Specialists working in the Emergency Department tended to report 19.7-fold and 3.4-fold soft tissue lesions as linear fractures, respectively. In the current study, a statistically significant difference was found between the report prepared by our clinic and the reports prepared by the Emergency Service physicians and Otorhinolaryngologists (Table 2). Among the cases reported as no fracture by the Emergency Service physicians; nondisplaced fractures were detected in 40 cases and displaced fractures in 46 cases. Among the cases in which Otorhinolaryngologists reported that there were no fractures, nondisplaced fractures were detected in 13 cases and displaced fractures in eight cases (Table 2). CT is superior to X-ray and high-resolution ultrasonography in detecting nasal bone fractures [3,13,14]. Hwang

et al., stated that the reliability of direct X-ray was 82%, therefore, they recommended CT scan in the diagnosis of nasal bone fracture [15]. Before applying to the Forensic Medicine Clinic; twenty-eight (8.9%) of cases were evaluated with physical examination, 46 (14.6%) with physical examination + direct X-ray, 241 (76.5%) with physical examination + direct X-ray + CT. When direct radiography reports and Computed tomography (CT) reports were compared, a statistically significant difference was found between the two groups ($p < 0,01$) (Table 3). In 134 cases where no fracture was detected by direct radiography, it was reported that there were fractures with CT. Pérez-Guisado and Maclellan reported that the mean sensitivity and negative predictive value for any of epistaxis, ecchymosis, abrasion, airway obstruction, inflammation, deviation, and irregular nasal dorsum were very low (<35) in terms of defining nasal fracture [16]. However, in the same study, it was stated that the co-occurrence of more than one of these lesions increased the sensitivity and positive predictive value. Moreover, Gharehdagni, reported that physical examination findings were nine times more accurate than direct nasal radiographs in detecting new isolated nasal bone fractures [3]. However, Timashpolsky et al., showed that the only physical examination finding associated with nasal bone fractures was “tenderness”, with a sensitivity and specificity of 88% [17]. In this study, the rate of preparing false reports by the Emergency Service physicians was statistically significantly higher in cases with tenderness - epistaxis - crepitation - edema in a physical examination and in cases with linear or displaced - comminuted fractures ($p < 0.05$) (Table 4). This situation was thought that it would be more beneficial for Emergency Department physicians to evaluate nasal fracture in forensic cases with nasal trauma, not only by physical examination and direct radiological examination but also by CT in cases where both conditions are negative. Septal fractures often accompany nasal bone fractures [18]. Mladina et al. proposed the Mladina classification to evaluate the nasal septum deformity detected in forensic cases [19]. According to this classification, nasal septum deformities are divided into 6 types. Types 1, 2, and 4 are associated with trauma. There must be a definite nasal bone fracture in the same direction to be associated with a fracture in type 3, otherwise, it is unrelated to the fracture. Types 5 and

Table 4. The relationship of diagnostic errors in nasal bone fractures with gender, event, radiological method, and clinical examination findings in reports prepared by Emergency Service physicians (ESP).

		Reports prepared by Emergency Service physicians (ESP)					
		True diagnosis		Misdiagnosis		χ^2	P*
		n	%	n	%		
Gender	Male	166	52.7	98	31.1	1.744	0.187
	Female	37	11.7	14	4.5		
Event	Accidental injuries	48	15.2	27	8.6	0.008	0.927
	Intentional injuries	155	49.2	85	27		
Nasal tenderness	Yes	30	9.5	27	8.6	4.238	0.040
	No	173	54.9	85	27		
Crepitation	Yes	30	9.5	31	9.8	7.692	0.006
	No	173	54.9	81	25.8		
Epistaxis	Yes	16	5.1	21	6.6	8.224	0.004
	No	187	59.4	91	28.9		
Wound in the nose area	Yes	24	7.6	12	3.8	0.088	0.767
	No	179	56.8	100	31.8		
Abrasion	Yes	97	30.8	28	8.9	15.653	0.000076
	No	106	33.7	84	26.6		
Nasal edema	Yes	52	16.5	41	13	4.191	0.041
	No	151	47.9	71	22.6		
Ecchymosis	Yes	53	16.8	11	3.5	11.826	0.001
	No	150	47.6	101	32.1		
Fracture	No fracture	144	45.7	1	0.3	142.541	0.000000
	Linear fracture	9	2.9	65	20.6		
	Displaced - comminuted fractures	50	15.9	46	14.6		

*Pearson Chi-Square test

6 are congenital and unrelated to trauma. In our study, in 77 (24.4%) cases with nasal fracture, septum deviation of different intensities, which was not seen in the previous photographs, was determined to have developed after the event.

Conclusions

In this study, it was determined that serious errors can be in the forensic reports prepared by Emergency Service physicians and Otorhinolaryngologists. Considering that physicians working in the Emergency Department can make a lot of mistakes in this regard, we think that it is more appropriate to issue a temporary report instead of a definitive report in patients who come to the Emergency Departments with nasal trauma. This study also shows that direct X-rays may be insufficient to evaluate nasal bone fractures, and CT scans will give better results to rule out nasal bone fractures in forensic cases. In order to establish a causal relationship between trauma and septum deviation, besides the evaluation of the victim's pre-event photographs, the classifications developed for septum deviation can also be used. However, further studies with more case series are needed for this. As a result; in our opinion, it is more appropriate for the forensic report of the cases with nasal trauma to be given by the Forensic Medicine Specialist instead of the Emergency Service physicians or Otorhinolaryngologists.

Ethics approval

Ethics committee approval dated 19/10/2020 and numbered 425 was obtained from Bolu Abant İzzet Baysal University Clinical Research Ethics Committee for the study.

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