ORIGINAL ARTICLE

Impact of discrepancies in radiological interpretation on forensic report outcomes: A retrospective study

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ABSTRACT

BACKGROUND: In the evaluation of forensic cases, misinterpretations of radiological imaging can directly affect not only patients' diagnostic and therapeutic processes but also judicial proceedings. This retrospective study aimed to investigate the impact of radiological re-evaluations on forensic report outcomes.

METHODS: Between July 2023 and March 2025, a total of 365 forensic cases that underwent radiological evaluation were retrospectively reviewed. For radiological examinations performed in the emergency department (plain radiography or computed tomography), interpretations made by our radiology specialist and the corresponding forensic reports were reviewed retrospectively. X-ray images requested in the emergency department that lacked a radiologist report and were evaluated by emergency physicians were subsequently interpreted by our radiology specialist; this cohort was defined as an "X-ray interpretation" group. Computed tomography (CT) images requested in the emergency department that were initially reported via teleradiology were subsequently reinterpreted by our radiology specialist; this cohort was defined as the "CT interpretation" group.

RESULTS: Following interpretations performed by our radiologist, changes in the conclusion section of forensic reports were observed in 35.3% of cases. The rate of changes in forensic report conclusions was statistically significantly higher in the "CT interpretation" group (47.8%) than in the "X-ray interpretation" group (34.2%). The likelihood of modifications in forensic report outcomes was significantly greater in cases involving three or more injury sites. The most frequent cause of error was the misinterpretation of bone fractures (84.5%), predominantly affecting the craniofacial and upper extremity regions. In fracture assessment, false-positive findings were more commonly identified on plain radiographs (73.8%), whereas false-negative findings were more frequently encountered on computed tomography scans (59.5%).

CONCLUSION: These findings demonstrate that radiological misinterpretations, particularly in the assessment of bone fractures, can significantly influence forensic report outcomes and, consequently, judicial processes. This study underscores the necessity of involving trauma-experienced radiologists in forensic imaging and highlights the importance of effective interdisciplinary collaboration between radiology and forensic medicine.

Keywords: Forensic imaging; forensic reports; forensic medicine; diagnostic errors; fracture misinterpretation.

INTRODUCTION

Any incident that results in the deterioration of an individual's physical or mental health, injury, or death due to intent, negligence, or lack of precaution is defined as a forensic case. Traffic accidents, firearm injuries, stab wounds, falls, burns, electric shocks, and sexual assaults constitute the main types of forensic cases.[1,2] The initial evaluation and medical documentation of forensic cases are most commonly performed in emergency departments. By nature, emergency departments

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are fast-paced, stressful, and among the busiest units in hospitals. General practitioners and emergency medicine specialists working in emergency departments frequently make use of diagnostic radiological imaging, particularly in the assessment of trauma patients. These imaging studies (especially plain radiography) are interpreted by emergency department physicians, emergency medicine specialists, or radiology residents to obtain rapid results, often due to the unavailability of radiologists, particularly outside regular working hours.[3,4] Differences may occasionally be observed between diagnoses based on the evaluation of these images and the final radiology reports. Studies have indicated that there is a discrepancy of up to approximately 9% between the evaluations of emergency department physicians and radiology specialists.[5] In fact, even when the same images are evaluated by multiple radiologists, different reports may be produced.[6]

In Türkiye, according to Article 280 of the Turkish Penal Code, it is mandatory for physicians and healthcare personnel to report forensic cases they encounter to judicial authorities.[7] Since emergency departments are the settings in which forensic cases are most frequently encountered, these notifications are often made by general practitioners or emergency medicine specialists.[2] Emergency physicians prepare the necessary forensic documents based on anamnesis, physical examination, laboratory tests, and radiological examinations. Therefore, emergency medicine physicians and specialists must demonstrate appropriate care and attention during examinations. Unfortunately, numerous studies have shown that these prepared medical documents and forensic reports are often incorrect or incomplete for various reasons.[8-10]

Incorrect evaluations in radiological examinations not only lead to errors in the diagnosis and treatment processes of patients in the emergency department but also result in forensic medical documents prepared in emergency settings being inaccurate or incomplete. The significance of these errors can range from a minor condition (e.g., a phalanx fracture) to a potentially life-threatening situation (e.g., pneumothorax). Modern legal systems focus on the harm inflicted on the victim and establish legal sanctions accordingly to remedy victimization and protect public safety.[11] The role of forensic medicine specialists is to assess the impact of injuries on victims based on scientific principles, thereby supporting the legal process. Errors occurring during radiological evaluation can lead to the misclassification of injuries—such as categorizing a simple injury as serious, or vice versa—depending on the criminal laws of each country. Therefore, accurate and complete interpretation of radiological imaging is critically important for ensuring the accuracy of forensic reports, determining the perpetrator's responsibility, and restoring justice within the social order disrupted by the commission of a crime.

In this study, by retrospectively reviewing cases interpreted by our radiologist for the preparation of forensic medicine reports, we aimed to identify the characteristics of the incidents, discrepancies between radiology reports, the impact of newly prepared radiology reports on forensic medicine reports, and the false-negative and false-positive diagnoses responsible for these impacts.

MATERIALS AND METHODS

Study Design and Data Source

This retrospective study was conducted at a tertiary-level university hospital. Patients who were reported as forensic cases to official authorities, had their documents prepared in the emergency department of our hospital, and were subsequently referred by official authorities to the forensic medicine outpatient clinic for the preparation of forensic reports between 15/07/2023 and 15/03/2025 were retrospectively reviewed. Cases included in the study were those in which radiological evaluations (X-ray or computed tomography [CT]) were performed by the department of radiology on images obtained in the emergency department. Cases containing uncertain expressions such as "suspicious" or "?" in emergency department reports, which did not allow for comparison, were excluded from the study.

Data were obtained from the hospital information management system, emergency department records, and official forensic report forms completed in the emergency department. For each case, the following information was recorded: patient age at the time of the incident, gender, type of incident, number of injured body regions, radiological interpretation results reported by the radiologist, the impact of these evaluations on the conclusion section of the forensic report, the injured region in which misinterpretation occurred, the incorrectly evaluated pathologies, and pathologies classified as false positive or false negative.

Definitions

In our institution, plain radiographs requested in the emergency department are initially interpreted by emergency medicine practitioners or specialists, who are responsible for the diagnostic and therapeutic management of patients. These radiographs are not routinely reported by a radiologist unless a consultation is requested by the emergency department. Computed tomography images requested in the emergency department are reported within a maximum of two hours by an external provider offering teleradiology services (outsourced outside the hospital).

In this study, X-ray images requested in the emergency department that had no radiologist report and were evaluated by emergency physicians were subsequently interpreted by a radiology specialist at our institution. The group consisting of these cases was defined as the "X-ray interpretation" group. CT images requested in the emergency department that were initially reported via teleradiology were subsequently reinterpreted by our radiology specialist; these cases were defined as the "CT interpretation" group. For the "X-

ray interpretation" group, the interpretations of emergency physicians were compared with those of our radiologist. For the "CT interpretation" group, teleradiology interpretations were compared with those of our radiologist, and the impact of these comparisons on forensic report outcomes was evaluated. Evaluations at our hospital's department of radiology were performed by an academic radiologist with expertise in trauma imaging and without time constraints.

False positivity was defined as pathologies reported during the initial assessment (by emergency physicians or via teleradiology) that were not confirmed upon interpretation by our radiologist. False negativity was defined as pathologies not detected during the initial assessment (by emergency physicians or via teleradiology) but identified upon interpretation by our radiologist. In this study, the effects of inconsistencies in radiological interpretation on forensic medicine report outcomes were analyzed.

Legal and Regulatory Framework

Forensic medicine practices vary across countries globally. In Türkiye, in addition to postmortem examinations, forensic medicine specialists prepare forensic reports for individuals reported as forensic cases in emergency departments upon the request of prosecutors or courts. The degree of injury is determined within the framework of the guideline entitled Evaluation of Criminal Injuries Defined in the Turkish Penal Code in Terms of Forensic Medicine and is submitted to the court.[12] Articles 86 to 89 of the Turkish Penal Code define crimes committed against bodily integrity.[7] According to these articles, injury evaluations are primarily requested with respect to two main points, on the basis of which judicial sentences are determined. The first point involves assessing whether the injury can be treated with simple medical intervention (SMI). Soft tissue traumas, such as ecchymosis and abrasions, are classified as injuries that can be treated with SMI. In contrast, pathologies such as extremity or facial (viscerocranium) bone fractures, penetrating or cutting injuries extending into muscle tissue, and isolated rib fractures (without accompanying pneumothorax or hemothorax) are classified as injuries that cannot be treated with SMI (i.e., non-SMI). The second point concerns whether the injury causes a life-threatening condition (LTC), which constitutes the most severe injury group (12). Pathologies such as skull (neurocranium) bone fractures, pneumothorax, penetrating injuries to the abdominal or thoracic cavities, liver lacerations, and lung parenchymal contusions are classified within this group. Forensic medicine specialists evaluate forensic cases using emergency department examination notes, preliminary forensic reports prepared in the emergency department, laboratory findings, and radiological imaging. Based on these medicolegal evaluations, their reports specify whether the injury is classified as "SMI or non-SMI" and "LTC or non-LTC."

Ethical Approval

Ethical approval for the study was obtained from the Institutional Non-Interventional Research Ethics Committee (decision dated 26.03.2025; No. 2025/437). All stages of the research were conducted in accordance with the principles of the Declaration of Helsinki.

Statistical Analysis

All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) software, version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were presented as means and standard deviations for continuous variables, and as frequencies and percentages for categorical variables. The Shapiro-Wilk and Kolmogorov-Smirnov tests were used to assess the normality of data distribution. For comparisons between two independent groups, the independent samples t-test was used for normally distributed data. Categorical variables were compared using the Chi-square and Fisher's exact tests. A p-value of <0.05 was considered statistically significant.

RESULTS

In this study, radiological evaluation was performed in an initial total of 365 cases. Interpretations were based on X-ray images in 56.2% of cases (n=205) and CT images in 43.8% (n=160). When compared with forensic report outcomes based on emergency department medical records, our X-ray or CT interpretations resulted in changes affecting the forensic report outcome in 35.3% of cases (n=129), while no change was observed in 53.4% (n=195). In 11.2% of cases (n=41), the initial evaluation was described as "suspicious," making it unclear whether a change had occurred. Cases

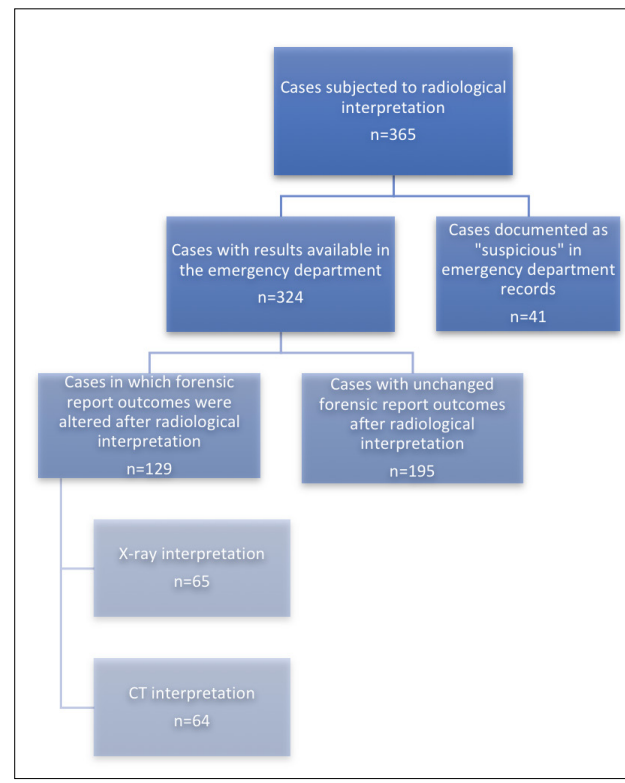

Figure 1. Flowchart of case distribution.

marked as "suspicious" were excluded from the study, and the analysis was continued with 324 cases (Fig. 1).

The characteristics of both groups, stratified according to whether a change occurred in the forensic report outcome, are presented in Table 1. Changes in forensic report outcomes occurred in 34.2% of the "X-ray interpretation" group (n=65/190) and in 47.8% of the "CT interpretation" group (n=64/134), with a statistically significant difference between the groups (p=0.014) (Table 2). The evaluations affected the determination of whether the injury was classified as "SMI or non-SMI" in 86.8% of cases (n=112) and as "LTC or non-LTC" in 13.2% of cases (n=17). The most common pathology leading to a change in the forensic report outcome was the misinterpretation of bone fractures, accounting for 84.5% of cases (n=109). This was followed by the misinterpretation of penetrating injuries involving muscle and fascia in 7% of cases (n=9) (Fig. 2). The most frequently affected injury regions were the head-face region in 31% of cases (n=40) and the upper extremity in 25.6% of cases (n=33) (Fig. 3).

Among the most frequently misinterpreted bone fracture cases, 61.5% (n=67) were false-positive evaluations. Within this group, the most common false positives were nasal bone fractures (25.4%, n=17), metacarpal fractures (16.4%, n=11), and radius fractures (11.9%, n=8). False-negative evaluations accounted for 38.5% of cases (n=42), most frequently involving nasal bone fractures (31.0%, n=13), followed by rib

Table 1. Comparison of characteristics between study groups

Variable	All Cases (n=324) n (%)	Cases With Changes in Report Outcome (n=129) n (%)	Cases With Unchanged Report Outcome (n=195) n (%)	P value*
Sex				
Male	246 (75.9)	101 (78.3)	145 (74.4)	0.417§
Female	78 (24.1)	28 (21.7)	50 (25.6)	
Age (years)				
<18	29 (8.95)	14 (10.9)	15 (7.7)	0.621#
18-64	272 (83.95)	106 (82.1)	166 (85.1)	
≥65	23 (7.1)	9 (7)	14 (7.2)	
Type of injury				
Assault	190 (58.6)	67 (51.9)	123 (63.1)	0.129#
Traffic accident	97 (29.9)	44 (34.1)	53 (27.2)	
Other[µ]	37 (11.5)	18 (14.0)	19 (9.7)	
Number of injured areas				
Mean±SD[ǂ]	3.01±2.01	3.4±2.1	2.7±1.8	0.003[ǂ]
<3	165 (50.9)	53 (41.1)	112 (57.4)	0.004§
3≥	159 (49.1)	76 (58.9)	83 (42.6)	

*p<0.05 was considered statistically significant. §χ^2 test. #Fisher's exact test. µIncludes falls, firearm injuries, and stab/cut injuries. [ǂ]Independent samples t-test.

Table 2. Rates of changes in forensic report outcomes

	All Cases (n=324) n (%)	Cases With Changed Report Outcomes (n=129) n (%)	Cases With Unchanged Report Outcomes (n=195) n (%)	OR	95% CI	P value*
Type of Evaluation						
X-ray interpretation	190 (58.6)	65 (50.4)	125 (64.1)	1.758	1.118-2.764	0.014
CT interpretation	134 (41.4)	64 (49.6)	70 (35.9)			
Total	324 (100)	129 (100)	195 (100)			

*p<0.05 was considered statistically significant.

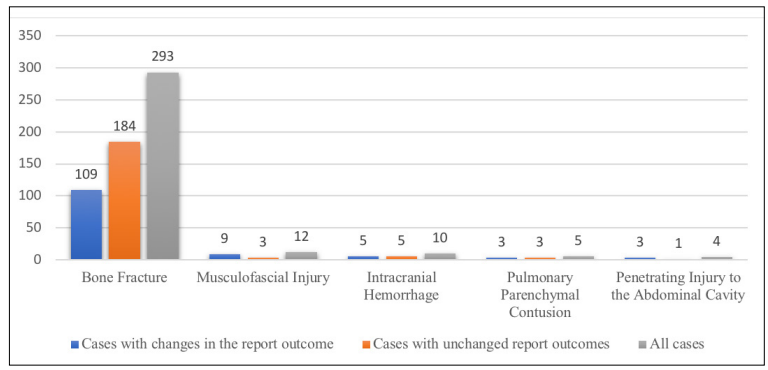

Figure 2. Distribution of injury types among the study groups.

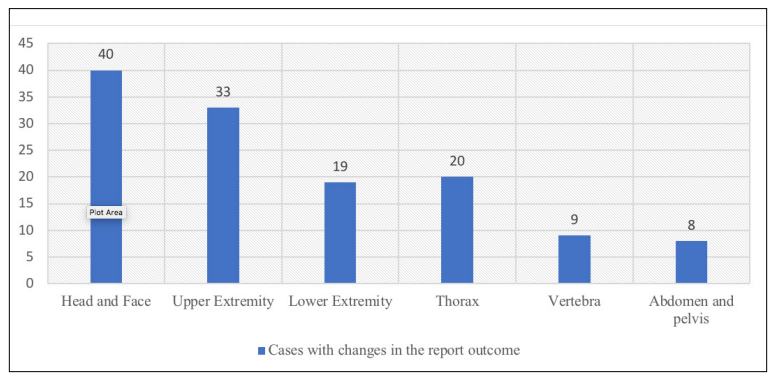

Figure 3. Distribution of cases with changes in forensic report outcomes according to injury regions.

Table 3. Distribution of false-negative and false-positive bone fracture evaluations

False-Negative Interpretations (n=42)			False-Positive Interpretations (n=67)		
	n	%		n	%
Nasal bone	13	31.0	Nasal bone	17	25.4
Rib	11	26.1	Metacarpal	11	16.4
Vertebra	5	11.9	Radius	8	11.8
Metacarpal	3	7.1	Phalanx	7	10.4
Metatarsal	3	7.1	Rib	4	6.0
Skull	2	4.8	Metatarsal	4	6.0
Phalanx	1	2.4	Vertebra	3	4.5
Calcaneus	1	2.4	Skull	3	4.5
Coccyx	1	2.4	Talus	2	3
Scaphoid	1	2.4	Calcaneus	2	3
Sacrum	1	2.4	Humerus	1	1.5
			Coccyx	1	1.5
			Sacrum	1	1.5
			Tibia	1	1.5
			Patella	1	1.5
			Scaphoid	1	1.5
Total	42	100	Total	67	100

Table 4. Distribution of bone fracture interpretations

	All Cases (n=109) n (%)	False-Positive Interpretations (n=67) n (%)	False-Negative Interpretations (n=42) n (%)	OR	95% CI	P value*
Type of Evaluation						
X-ray interpretation	65 (59.6)	48 (71.6)	17 (40.5)	3.715	1.647-8.381	0.001*
CT interpretation	44 (40.4)	19 (28.4)	25 (59.5)			
Total	109 (100)	67 (100)	195 (100)			

*p<0.05 was considered statistically significant.

fractures (23.8%, n=10) and vertebral fractures (9.5%, n=4) (Table 3).

It was determined that 73.8% of false-positive bone fracture assessments (n=48/67) occurred in the X-ray interpretation group. In contrast, 59.5% of false-negative assessments (n=25/42) occurred in the CT interpretation group, and this difference between the groups was statistically significant (p=0.001) (Table 4).

DISCUSSION

The number of radiological examinations performed worldwide is increasing steadily. This increase has led to a growing workload for radiologists.[13,14] Increased workload, an insufficient number of radiology specialists, the lack of radiologist interpretation of radiographs in emergency departments—particularly outside regular working hours—and the interpretation of CT scans by radiologists outside the hospital with insufficient clinical information about the patient (such as in teleradiology) result in errors and incomplete assessments in radiology reports. Such errors not only affect patient diagnosis and treatment, but, in forensic cases, also influence the forensic documentation prepared for the individual.[15,16] Errors that affect the determination of injury severity may result in either a loss of rights for the victim or unjust gain, thereby altering the judicial process of the forensic case.[17]

A review of the literature shows that evaluations of medicolegal errors occurring in clinical cases remain limited. Most studies have focused on radiological diagnostic and clinical management errors made by emergency departments, clinical specialties, and radiology residents. Mattsson et al.[18] reported a discrepancy rate of 20.35% between initial and final radiological evaluations. Nogueira et al.[19] found a 27% discrepancy in their study of trauma patients, the majority of whom underwent thoracic CT scans. Robinson et al.[20] reported a discordance rate of 35.3% in CT imaging of patients referred to the emergency department, while Eurin et al.[21] identified a 47% rate of missed diagnoses in CT scans among trauma patients. Other studies have reported error rates below 20%.[22-24] Most studies state that incorrect or incomplete evaluations have a low clinical impact on patients or do not significantly affect patient mortality or morbidity.[25,26] However, it is observed that the error rates reported in these studies are inconsistent with each other. Differences in the specialties compared, the inclusion of non-trauma patients in some studies, the use of different radiological imaging techniques, the exclusion of overdiagnoses in certain studies, and heterogeneity in professional experience have led us to believe that these factors may account for the inconsistent results. However, forensic cases need to be evaluated separately from clinical effects. In forensic cases, the severity of the injury sustained by an individual is of significant importance. For example, if a non-displaced phalangeal or metacarpal bone fracture that was not diagnosed in the emergency department results in splinting and immobilization of the patient's finger or hand, with orthopedic outpatient follow-up recommended, no issues would typically arise regarding clinical management. Nevertheless, the presence or absence of a bone fracture constitutes a pathological condition that must be clearly established from a medicolegal perspective, as it directly influences the assessment of injury severity. In this study, the impact rate of radiological interpretations on forensic report outcomes was found to be 35.3%. Although this rate approaches the upper limit of misdiagnosis rates reported in the literature, it is markedly higher than the reported impact of erroneous radiology reports on patients' clinical management. Therefore, these findings demonstrate that, in forensic cases, radiological examinations should always be evaluated by radiology specialists with expertise in trauma to ensure the accurate administration of justice.

One important aspect of our study that should not be overlooked is the impact of teleradiology. In the CT interpretation group, the initial reports used for comparison were teleradiology reports. Although studies in the literature have reported discrepancy rates of up to approximately 6% between teleradiology interpretations and those of in-hospital radiologists,[27] Vendrell et al.[28] reported a discrepancy rate of 21.4% in their double-reading study. In the CT interpretation group of our study, misinterpretations affecting the forensic report outcome were identified in 47.7% of cases.

This high rate suggests that, in forensic cases, interpretations performed by in-hospital radiologists—who are more likely to work in close coordination with clinicians, have access to complete emergency department records, and engage in direct consultation with clinicians when necessary—would ensure a more accurate and appropriate workflow.

When examining factors influencing forensic report outcomes in our study, age, gender, and type of incident were found to have no significant effect. Consistent with our findings, several studies have reported that gender is not a contributing factor to radiological assessment errors.[29,30] However, there is no clear consensus regarding the impact of age. While our results align with some studies,[29,30] Banaste et al.[22] reported that age over 30 years, and Mattsson et al.[18] reported that age over 65 years, were significant factors associated with radiological diagnostic errors. With respect to the type of incident, Şener et al.[29] similarly reported no statistically significant difference, in line with the findings of our study.

In this study, the number of injured regions was significantly higher in the group in which the forensic report outcome was affected. Similarly, Banaste et al.[22] reported that having more than two injured body regions was a contributing factor to missed diagnoses. In addition, studies that evaluated the Injury Severity Score (ISS) have shown significantly higher ISS values in groups with missed or misinterpreted diagnoses.[21,31,32]

Although the ISS was not calculated in our study, the significantly higher number of injured regions demonstrates a similar pattern. This finding suggests that factors such as physicians prioritizing severe injuries requiring urgent treatment, thereby overlooking moderate or minor injuries, or the presence of multiple injured regions diverting the physician's attention may have contributed to this outcome.

Previous studies have indicated that radiological errors occur more frequently in the evaluation of CT images. Gergenti et al.[33] reported that the most frequent radiological inconsistencies were observed in CT images (59.8%), followed by radiography (25.3%). Mattson et al.[18] identified inconsistencies in 17.91% of radiographic images and 25.29% of CT images, while Tomich et al.[34] reported that 58% of errors occurred in CT images and 39% in radiographic images. Although other radiological evaluations (such as ultrasonography and magnetic resonance imaging [MRI]) were not included in our study, the error rate in CT evaluations was found to be significantly higher. Multislice radiological imaging modalities such as CT appear to be associated with more frequent misinterpretations than radiography due to anatomical coverage, greater anatomical complexity, motion artifacts, and image distortion caused by prior surgical materials.

In this study, the anatomical regions most commonly associated with diagnostic errors were the head-face region and the upper extremity, respectively. Kim et al.[35] reported that diagnostic errors most frequently occurred in the extremities, whereas Selçuk et al.[36] identified thoracic CT images as the most common site, and Yang et al.[37] reported the extremity and pelvic regions as the most frequently affected areas. Taken together, the lack of a consistent pattern suggests that the use of heterogeneous study populations and different imaging techniques contributes to variability in reported results.

In emergency departments, fracture detection using radiography is a commonly employed method in trauma patients with either high- or low-energy mechanisms of injury, particularly in cases involving the extremities.[38] CT examinations, on the other hand, are more frequently used for injuries involving the skull, thorax, or pelvis.[36] According to the literature, approximately 80% of diagnostic errors in emergency departments are attributable to failures in diagnosing fractures.[39] Similarly, missed fractures on radiographs are considered the most common cause of diagnostic discrepancies between initial interpretations by emergency department personnel or radiology residents and final interpretations by radiologists.[21,33,39] In a large-scale teleradiology study, bone fractures and dislocations were identified as the most common traumatic interpretation errors.[40] Consistent with these findings, the most frequent misdiagnosis affecting forensic report outcomes in our study involved bone fractures. In parallel with these bone fracture misinterpretations, the forensic medicine specialists' decisions regarding whether the injury involved SMI were the most frequently subject to change.

With respect to diagnostic errors related to bone fractures, the literature presents varying results. While some studies report no clear predominance of a specific anatomical region,[30] others indicate that the upper extremity,[3] lower extremity,[41] or facial bones[33] are more frequently subject to misinterpretation. When examining which bone fractures were most commonly misinterpreted, Geyer et al.[42] reported that missed fractures most frequently involved the ribs, vertebrae, and nasal bones. Tomich et al.[34] stated that, on radiographs, hand bone fractures were the most commonly misinterpreted, whereas on CT scans, craniofacial fractures were most frequently misinterpreted. In the present study, the most frequently misinterpreted fracture involved the nasal bone, followed by the ribs and metacarpal bones. The anatomical regions or bones involved vary across studies, and one factor influencing this variability appears to be the distribution of case types within each study. Studies with a higher prevalence of assault cases are more likely to evaluate the nasal region or hand bones, whereas studies with a higher incidence of motorcycle or non-vehicle traffic accidents more frequently assess lower extremity bones due to the nature of the injury mechanisms. This may cause certain bones to be more prominent in misinterpretation analyses. Another contributing factor is the type of radiological imaging used. In the cases included in this study, plain radiography was predominantly used for evaluating the nasal region and extremities. According to the literature, although nasal bone assessments are frequently performed using CT, nasal radiographs are still

used to a considerable extent.[43] The limited number of views available in plain radiography can be misleading for inexperienced physicians. Therefore, this study demonstrates the need for emergency department personnel to enhance their knowledge and experience in interpreting direct radiographs, as well as for forensic medicine specialists to collaborate with radiologists in the evaluation of such cases. Moreover, artificial intelligence (AI) technology offers an alternative approach. Previous studies have shown that AI-based systems used in the evaluation of bone fractures provide highly sensitive and specific results.[44,45] Such systems may offer additional support for emergency physicians, particularly in situations where a radiologist is not readily available.

In CT image interpretation, radiologists may focus on clinically more significant findings, such as epidural or subdural hemorrhage or hemothorax, which can result in missed diagnoses of relatively minor findings, including non-displaced nasal bone fractures or rib fractures located away from the suspected area of bleeding. Consistent with this observation, our study identified a false-negative interpretation rate of 56.8% in the CT interpretation group. Similarly, Nogueira et al.[19] reported a false-negative rate of 59.9% in CT imaging, and McCreadie et al.[46] found that 61% of CT interpretation errors were due to false-negative findings. These rates are similar in CT image evaluations.

In contrast to CT, 73.8% of the errors in plain radiographs that affected forensic report outcomes in our study were attributable to false-positive interpretations. The literature reports substantial variability in false-positive rates for plain radiography, with some studies identifying predominantly false-positive errors,[3] while others report a higher prevalence of false-negative errors.[24,30] Kinnersley et al.[47] found that emergency department personnel interpreting plain radiographs made 47% false-positive and 53% false-negative errors. The high rate of false-positive interpretations observed in our study suggests that this finding may be related to a tendency among younger and less experienced emergency department physicians to overdiagnose, possibly due to concerns about missing injuries or facing potential malpractice allegations. If these patients present to outpatient clinics (such as orthopedics or neurosurgery) after their emergency department visit, the correct diagnosis can be clarified. However, if no follow-up care is sought, the only means of determining the actual diagnosis is through the medical documentation and radiology reports prepared in the emergency department. This underscores the critical importance of accurate radiological evaluation. The false-positive interpretations of bone fractures on plain radiographs observed in this study may be attributable to the misinterpretation of normal anatomical variants or prior surgical procedures (such as suture lines and previous rhinoplasty in the nasal region, as well as unfused epiphyseal plates or old fractures in the extremities). These images, when combined with physicians' fear of missing a diagnosis, appear as misleading findings. Şener et al.[29] reported that emergency department physicians missed nasal bone fractures at a rate of 1.9% while producing false-positive interpretations at a rate of 24.5%. These findings support our perspective by indicating that overdiagnosis occurs at a rate approximately 12 times higher, particularly in evaluations of the nasal region. Although overdiagnosis was not identified as one of the most common radiological errors in the study by Kim and Mansfield,[48] the present study suggests that this may not apply to the evaluation of certain bone fractures, highlighting the need for increased caution when assessing these specific anatomical regions.

Limitations

First, this study is inherently limited by its retrospective design. Additionally, being conducted in Türkiye at a single center may limit the generalizability of the findings because of differences in legal frameworks and forensic reporting practices across countries; nevertheless, the study clearly demonstrates the potential impact of radiological interpretation quality on the accuracy of forensic medical reports. The single-center design likely influenced the distribution of forensic case types, reflecting the regional characteristics of the study setting. Because the evaluations were based on radiological imaging requested in the emergency department, patients for whom no imaging was obtained during their emergency visit, as well as those who underwent radiological examinations at another institution after discharge, were not included in the analysis. Furthermore, the use of a single radiologist experienced in forensic radiology for image interpretation constitutes a limitation, as interobserver variability could not be assessed. Detailed information regarding the years of radiological experience of the initial readers (emergency physicians or teleradiology radiologists) was not available, which precluded comparisons aimed at elucidating potential causes of the observed findings. In addition, the absence of objective data on influential factors, such as the professional experience of emergency physicians performing the initial evaluation and the emergency department workload on the day of presentation, further limits interpretation of the underlying causes of these findings.

CONCLUSION

This study demonstrates that, unlike in routine medical practice, the most critical element in forensic cases is the establishment of an accurate diagnosis. The findings emphasize that radiological images in all forensic cases should be evaluated by in-hospital radiologists with expertise in trauma imaging and that close interdisciplinary collaboration between radiologists and forensic medicine specialists can reduce errors in forensic reporting. The presence of three or more injured regions was identified as a factor influencing forensic report outcomes in radiological evaluations. The most common errors in the radiological assessment of forensic cases were related to the evaluation of bone fractures. These errors affect not only patients' diagnosis and treatment processes but also the out-

comes of forensic reports. This issue does not arise solely from false-negative assessments; false-positive evaluations are also frequently observed, particularly in plain radiographs. Accordingly, this study recommends that emergency physicians and radiologists interpreting radiological images in forensic cases exercise increased caution, especially when evaluating the nasal region and hand bones, and further enhance their knowledge and experience in these areas.

Ethics Committee Approval: This study was approved by the Buca Seyfi Demirsoy Hospital Ethics Committee (Date: 26.03.2025, Decision No: 2025/437).

Peer-review: Externally peer-reviewed.

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ORİJİNAL ÇALIŞMA - *ÖZ*

Radyolojik yorumlamadaki farklılıkların adli rapor sonuçları üzerindeki etkisi: Retrospektif bir çalışma

AMAÇ: Adli vakaların değerlendirilmesinde, radyolojik görüntülemedeki yanlış yorumlamalar yalnızca hastaların tanı ve tedavi süreçlerini değil, aynı zamanda adli süreçlerini de doğrudan etkilemektedir. Bu retrospektif çalışma, radyolojik yeniden değerlendirmelerin adli raporlar üzerindeki etkisini araştırmayı amaçlamıştır.

GEREÇ VE YÖNTEM: Temmuz 2023 ile Mart 2025 tarihleri arasında, radyolojik değerlendirmeye tabi tutulan toplam 365 adli vaka retrospektif olarak incelenmiştir. Acil serviste yapılan radyolojik incelemeler (düz röntgen veya bilgisayarlı tomografi) için, radyoloji uzmanımızın yaptığı yorumlar ve vakaların adli raporları geriye dönük olarak incelenmiştir. Acil serviste istenen ve radyolog raporu bulunmayan, acil servis hekimleri tarafından değerlendirilen röntgen görüntüleri daha sonra radyoloji uzmanımız tarafından yorumlanmıştır. Bu grup 'X-ray yorumlaması' olarak tanımlanmıştır. Acil serviste istenen ve başlangıçta teleradyoloji yoluyla raporlanan BT görüntüleri daha sonra radyoloji uzmanımız tarafından yeniden yorumlanmıştır. Bu grup 'BT yorumlaması' olarak tanımlanmıştır.

BULGULAR: Radyoloğumuz tarafından yapılan yorumlamalar sonucunda, vakaların %35.3'ünde adli raporların sonuç bölümünde değişiklik meydana gelmiştir. 'BT yorumlama' grubunda (%47.8), 'X-ray yorumlama' grubuna (%34.2) kıyasla istatiksel olarak anlamlı olarak daha yüksek oranda adli rapor sonucunda değişiklik meydana gelmiştir. Yaralanma bölgesi sayısı üç ve üzerinde olan olgularda adli rapor sonucunun değişme olasılığı anlamlı düzeyde yüksek bulunmuştur. En sık görülen hata nedeni, özellikle kraniyofasiyal ve üst ekstremite bölgelerinde gözlemlenen kemik kırıklarının yanlış yorumlanmasıdır (%84.5). Kemik kırığı değerlendirmesinde yanlış pozitif sonuçlar daha çok direkt grafilerde (%73.8), yanlış negatif sonuçlar ise bilgisayarlı tomografilerde (%59.5) ortaya çıkmıştır.

SONUÇ: Bu bulgular, özellikle kemik kırıklarının değerlendirilmesinde radyolojik yanlış yorumlamaların, adli raporların sonuçlarını ve dolayısıyla adli süreçleri önemli ölçüde etkileyebileceğini göstermektedir. Çalışma, adli görüntülemede travma konusunda deneyimli radyologların dahil edilmesinin gerekliliğini vurgulamakta ve radyoloji ile adli tıp disiplinleri arasında etkili işbirliğinin önemini ortaya koymaktadır.

Anahtar sözcükler: Adli görüntüleme; adli raporlar; adli tıp; kırık yanlış yorumlaması; tanı hataları.

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