

Significance of Dental Archiving in Forensic Sciences: A Retrospective Study

Dental Arşivin Adli Bilimlerde Önemi: Retrospektif Bir Çalışma

Ceyda GÜRHAN^a, Elif ŞENER^b, Esin ALPÖZ^b, Ender ŞENOL^c, Nesrin DÜNDAR^b

^aDepartment of Oral and Maxillofacial Radiology, Muğla Sıtkı Koçman University School of Dentistry, Muğla, Türkiye

^bDepartment of Oral and Maxillofacial Radiology, Ege University School of Dentistry, İzmir, Türkiye

^cDepartment of Forensic Medicine, Ege University Faculty of Medicine, İzmir, Türkiye

ABSTRACT Objective: To retrospectively evaluate the forensic dental records of patients referred to our faculty and offer a standard dental record form. **Material and Methods:** All forensic odontology cases referred to the our faculty between 2011 and 2019 were evaluated. In addition to demographic findings such as age and gender, the reasons for referral (file types) and dental examination findings were recorded. Differences between the forensic file types according to years were obtained. Data were analyzed using descriptive statistics and frequency distributions. **Results:** Of 127 dental forensic files evaluated, 54% of the files were trauma, 33% were malpractice and 13% were determination of age. When referral reasons are examined according to gender, it was shown that the number of males was much higher than females in trauma cases while number of females is high in others file types. Analyzing the files according to years showed that the cases before the year 2011 were disorganized and forensic files in 2012-2014 were missing. The malpractice cases were increased while trauma cases were decreased over the years. **Conclusion:** Trauma cases were the most common reason for referral to forensic cases. However, it was observed that the forensic reports evaluated did not include parameters for the evaluation of injury crimes in terms of forensic medicine. Inadequate forensic dental records also prove the importance of archiving dental files in forensic cases. With the proposal of dental report form presented, it will be possible to standardize and improve the quality of the forensic records.

Keywords: Forensic dentistry; dental records; dental archive; trauma; malpractice

ÖZET Amaç: Bu çalışmanın amacı, fakültemize sevk edilen hastaların adli dental olgu kayıtlarını geriye dönük olarak değerlendirmek ve standardize dental kayıt formu oluşturmaktır. **Gereç ve Yöntemler:** Çalışmamız kapsamında, 2011-2019 yılları arasında fakültemize sevk edilen tüm adli olgular değerlendirildi. Yaş, cinsiyet gibi demografik verilere ek olarak, başvuru sebebi (dosya türü) ve dental muayene bulguları kaydedilerek, adli dosya türlerinin yıllara göre değişimi değerlendirildi. Veriler tanımlayıcı istatistikler ve frekans dağılımları kullanılarak analiz edildi. **Bulgular:** Değerlendirilen 127 adli dental dosyasının %54'ü travma, %33'ü malpraktis ve %13'ü yaş tayinine yönelik olduğu saptandı. Başvuru sebepleri cinsiyete göre değerlendirildiğinde; travma olgularında erkeklerin sayısı kadınların sayısından fazla iken, diğer adli olgu türlerinde kadınların sayısı fazlaydı. Adli dosyalar yıllara göre analiz edildiğinde; 2011 yılı öncesi adli dental kayıtların düzensiz olduğu, 2012-2014 yılları arasındaki dosyalara ise ulaşamadığı saptandı. Ayrıca malpraktis olgularının yıllar içinde arttığı saptanırken, travma olgularının ise azalma gösterdiği görüldü. **Sonuç:** Çalışmamızın bulguları, en sık adli vaka başvuru nedeninin travma olguları olduğunu gösterdi. Ancak değerlendirilen adli raporların, yaralama suçlarının adli tıp açısından değerlendirilmesine yönelik parametreleri içermediği saptandı. İncelenen adli dental kayıtların düzensiz ve eksik olması, adli vakalarda dental dosyaların arşivlenmesinin önemini kanıtlamaktadır. Sunulan dental kayıt formu önerisi ile dental adli kayıtların standardize edilmesinin ve bu kayıtların kalitesinin artırılmasının mümkün olacağı düşünülmektedir.

Anahtar Kelimeler: Adli diş hekimliği; dental kayıt; dental arşiv; travma; malpraktis

Forensic dentistry is a forensic science branch that involves archiving and evaluation of dental data for the benefit of justice. This branch serves in fields such as identification in natural disasters and other

mass accidents, age and gender estimation with data obtained from teeth, bite mark assessment, medicolegal cases (MLC), dental and maxillofacial trauma. It also establishes scientific communication between

Correspondence: Ceyda GÜRHAN

Department of Oral and Maxillofacial Radiology, Muğla Sıtkı Koçman University School of Dentistry, Muğla, Türkiye

E-mail: cydgrhn@gmail.com



Peer review under responsibility of Türkiye Klinikleri Journal of Dental Sciences.

Received: 17 Mar 2022

Received in revised form: 07 May 2022

Accepted: 12 May 2022

Available online: 25 May 2022

2146-8966 / Copyright © 2022 by Türkiye Klinikleri. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

legal professionals and dentists who are the members of forensic investigation team.¹

A dental record includes detailed information about the anamnesis, physical examination, diagnosis, treatment, and management of a patient.² Taking accurate information is an essential skill for physicians. Every dentist has a legal duty to keep record of each patient provided with dental care.³ Dental records can also be used for forensic purposes and play an important role especially in identification of a person whose body integrity damaged. The teeth are one of the most resistant structures of the human body and are frequently found to be well preserved after death. This uniqueness of the teeth gives an advantage for identification of the victim in both criminal or MLC.⁴⁻⁶ In addition to the characteristics of teeth such as being resistant to physical and external factors for a long time, many dental factors such as localization, shape, form anomalies, restorations and lack of teeth play important roles in identification of the person in both criminal or MLC.^{1,4-7}

The number of dental professionals educated in forensic dentistry is limited in our country, thus each general dental practitioner can act as an expert in forensic cases when requested by judicial authorities.² Even though maintenance of dental record is legally mandatory in our country, awareness and knowledge of the dentists regarding the maintenance of dental records accurately for medico-legal purposes is insufficient. It is well known that the quality of records is extremely important in forensic sciences. However, the number of the retrospective and descriptive studies related to dental records in forensic dentistry cases in our country is limited.⁸

The aim of this study was to retrospectively evaluate forensic dental records archived in Ege University, Faculty of Dentistry and to develop a standard dental record form acceptable for medico-legal purposes in forensic dentistry.

MATERIAL AND METHODS

The study protocol received ethical approval from the Human Research Ethics Committee of the Medical Faculty of Ege University (date: September 09, 2016, no: 16-5.2/6). The research was carried out in

accordance with the conditions of the Declaration of Helsinki.

Documents archived as forensic cases were evaluated retrospectively by examining the dental charts, anamnesis and radiographs. Patients demographic findings such as age, gender were recorded. Also the reason for referral (file types) and findings of dental examination were also obtained. Quantitative data were analyzed using the mean±standard deviation, and qualitative variables were presented as frequency distributions and percentages.

RESULTS

As a result of retrospective evaluation, it was determined that forensic dental records in our faculty archive were regularly organized only for the last 8 years (2011-2019). Because the cases before the year 2011 were disorganized and forensic files in 2012-2014 were missing, they were not included to the present study. Analysis of the forensic dental records showed that total number of forensic odontology cases referred to our faculty between 2011 and 2019 was 127. Of 127 dental forensic cases evaluated, it was determined that 40% of the patients were female, while 60% were male. The mean age of the patients was 36.24±0.68 years.

Distribution of file types in the present study is shown in [Table 1](#). The most common reason for referral (case type) was trauma (54%), while 33% of cases were malpractice and 13% were determination of age ([Table 1](#)). When the cause of referral was analysed according to the gender, it was shown that the number of males was much higher than female in trauma cases, whereas the number of females was much higher than males in other cases ([Table 1](#)). The distribution of referral reasons according to the years was presented in [Table 2](#). It was detected that the malpractice cases increased, while trauma cases decreased over the years.

TABLE 1: Distribution of file types according to gender.

Case type (n, %)	Male	Female	Total
Trauma	50 73%	19 27%	69 54%
Malpractice	16 37%	26 63%	42 33%
Age determination	3 21%	13 79%	16 13%

TABLE 2: The distribution of cases according to the years.

Years	Reasons for application (n, %)					
	Trauma		Malpractice		Age determination	
2011	3.2	34%	1.0	78%	1.0	78%
2012-2014	N/A		N/A		N/A	
2015	11.8	58%	3.2	34%	0	
2016	11.8	58%	4.3	12%	0	
2017	20.15	6%	8.6	24%	7.5	46%
2018	14.10	92%	10.7	8%	4.3	12%
2019	10.7	8%	16.12	48%	4.3	12%

Not available: N/A

Among all the trauma cases evaluated, the most prevalent type of trauma was reported as an assault (n: 50, 74%). Furthermore, there were 15 (21%) traffic accident cases, 2 (2.5%) cases with firearm injury and 2 (2.5%) cases with cutter tool injury as trauma case.

According to the results, malpractice cases were the secondly encountered forensic case type and an increase in the number of malpractice cases according to years was determined (Table 2). In malpractice group, improper implant treatment (29%) and improper prosthetic treatment (24%) were the most commonly encountered cases (Table 3). Improper surgical intervention cases, endodontic treatment cases and improper ortodontic treatment cases were the other reasons of forensic cases that were frequently encountered (Table 3). The frequency distribution of malpractice cases revealed an interesting finding; before the year 2016; only 23% of malpractice cases were improper implant treatments; while all of malpractice cases (100%) after 2016 were improper implant treatment.

TABLE 3: Classification of the malpractice cases.

Case type	Total (n, %)	
Improper implant treatment	13	29
Improper prosthetic treatment	10	24
Improper surgical intervention	9	22
Improper endodontic treatment	3	8
Improper orthodontic treatment	2	5
Other cases	5	12

DISCUSSION

With the technological advancements, digital systems have taken the place of traditional forensic investigation methods in the field of forensic dentistry. Some advanced techniques such as digital forensic radiography and photography, intraoral 3-dimensional optical scanners, computerized facial reconstruction and 3-dimensional printing and artificial intelligence algorithms have improved forensic odontology dramatically in recent years.⁹ It is important that most of the studies using advanced technological techniques involve the development of methods for the detection and classification of existing/absent teeth in order to get dental records accurately.^{10,11} Although improvements in forensic odontology are promising, digital/non-digital forensic dentistry requires accurate and reliable archiving and storage of dental records. At this point, the results of our study showed that only 8-year of forensic dental cases of our faculty were regularly organized, while the forensic dental records for 2012-2014 could not be obtained. These findings proved the importance of regular storage and archiving as well as the standard preparation of forensic files.

The results of the present study revealed that 40% of the patients were female, while 60% were male. The possible reason for this finding, which was found to be compatible with similar previous studies, is thought to be due to the high rate of crime and the high motivation of men to use their judicial rights as compared with women.¹²⁻²³

When referral reasons for forensic odontology cases were evaluated according to gender, it was shown that the number of males was much higher than females in trauma cases.

This finding is in accordance with many studies report the prevalence of cranio-maxillofacial trauma is high among male populations compare with female groups.²⁴⁻²⁶ This could be attributed to the fact that male's heavy/dangerous working conditions, their crime profile, driving behaviour in traffic and deficit of male about observance of traffic rules.

Considering the malpractice and age determination cases, which are the most frequently observed

forensic cases, after trauma cases, the number of females were higher than males ($p < 0.05$). Forensic cases for age determination often include women in childhood with illegal marriages, this may be the possible reason of large portion of age determination cases are female. When malpractice cases were evaluated according to the gender, our study revealed that 63% of all the cases were female and this finding is compatible with previous studies on the professional liability and medical/dental malpractice.^{27,28} Because females attach importance to the oral&dental care and expect high quality aesthetic appearance from dental treatments, it has been considered that medical malpractice claims have surge especially among female patients.^{27,28}

Our findings regarding distribution of forensic cases according to years revealed that malpractice cases increase over the years. Likewise in current literature there are studies which demonstrate increase of malpractice claims.^{28,29} In our opinion, the main causes of growing malpractice claims include that individuals become aware about patients' rights in recent years and lawyers are often guiding in this topic. Apart from malpractice cases which the treatment is really failed, some patients with financial problems and personal debts have had numerous false dental/treatment complaints against the dentist.²⁷ This may be another reason for the increase in malpractice files.

In accordance with literature, the most frequent dental specialties involved in lawsuits were prosthodontics and implantology in our study.²⁹ In recent years, missing teeth have been generally resolved with implant-supported prosthesis instead of unstable removable prosthesis owing to advanced technological developments in dentistry. Because implant treatment is preferred by many dentist who is or is not a specialist in implantology, this current treatment approach may increase the number of malpractice cases, when implant treatment is failed.

According to the results of the present study, trauma is the most common reason for forensic cases. However, it was observed that evaluated files and reports did not contain any injury crime parameters for the evaluation of forensic medicine. The maxillofacial region, which is frequently exposed to trauma in

cases of battery-violence and accident, comprises many organs that are extremely important to daily functions such as chewing, talking, breathing. In Türkiye, the degree of attenuation or loss of these organ functions related to trauma impact directly the type of punishment that be given by judicial authority. In our study, the majority of traumatic MLC occurred due to assault ($n=50$, 74%), followed by the traffic accident ($n=15$, 21%). In contrast to our study, a wide range of studies have reported a significant proportion of MLC to be road traffic accidents.³⁰⁻³³ The findings of study performed by Madadin et al in Saudi Arabia (fights or physical assault and battery, 83%- road traffic accident, 9.3%) are similar with our results.³⁴ In this study, low traffic accident rates are associated with accident report, because all traffic accidents are not reported as MLC in Saudi Arabia. Because our faculty is the biggest institution in region, many forensic cases from neighbouring provinces admit to the our faculty. The high nature of the assault rate in our study can be explained by the prevalent regional factors and sociocultural structure of these provinces.

Considering the results of the study; it was seen that standardization of previous forensic records in our faculty is insufficient and this records did not include evaluation parameters declared for the maxillofacial trauma cases in the Guideline for Assessment of Injury Crimes Defined in the Turkish Penal Code (TPC). In order to correctly canalize the judiciary, a standard forensic dental form including these main parameters in the Guideline for Assessment of Injury Crimes was created especially for trauma cases with the contribution of Department of Forensic Medicine of Ege University Faculty of Medicine.³⁵ The proposal forensic dental form created according to these paramaters is presented at the end of the manuscript (Table 4).

The first part of the proposal dental form consisted of the demographic information of the patient and the reasons for referral. The medical history of the patient as well as the history of the forensic case and the patient's complaints was included in the 2nd part, whereas the 3rd part composed of extraoral, intraoral, radiological examination findings and consultations. While the first 3 parts were based on

TABLE 4: Dental report.

Name/surname		Date:																																																																													
Date of birth																																																																															
ID number																																																																															
Gender																																																																															
Address/telephone																																																																															
Guardian information																																																																															
Referred institute																																																																															
Previous dental records																																																																															
History of forensic circumstance																																																																															
Complaint of patient																																																																															
Medical history																																																																															
Ekstraoral examination findings																																																																															
Intraoral examination findings																																																																															
Radiological examination																																																																															
<table border="1" style="width: 100%; border-collapse: collapse; margin: 10px 0;"> <tr> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> </tr> <tr> <td style="text-align: center;">18</td> <td style="text-align: center;">17</td> <td style="text-align: center;">16</td> <td style="text-align: center;">15</td> <td style="text-align: center;">14</td> <td style="text-align: center;">13</td> <td style="text-align: center;">12</td> <td style="text-align: center;">11</td> <td style="text-align: center;">21</td> <td style="text-align: center;">22</td> <td style="text-align: center;">23</td> <td style="text-align: center;">24</td> <td style="text-align: center;">25</td> <td style="text-align: center;">26</td> <td style="text-align: center;">27</td> <td style="text-align: center;">28</td> </tr> <tr> <td style="text-align: center;">48</td> <td style="text-align: center;">47</td> <td style="text-align: center;">46</td> <td style="text-align: center;">45</td> <td style="text-align: center;">44</td> <td style="text-align: center;">43</td> <td style="text-align: center;">42</td> <td style="text-align: center;">41</td> <td style="text-align: center;">31</td> <td style="text-align: center;">32</td> <td style="text-align: center;">33</td> <td style="text-align: center;">34</td> <td style="text-align: center;">35</td> <td style="text-align: center;">36</td> <td style="text-align: center;">37</td> <td style="text-align: center;">38</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>																																18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28	48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38																
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28																																																																
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38																																																																
Nose-mouth-tongue-mucosal lesions																																																																															
<ul style="list-style-type: none"> • Nasal cartilage and concha lesion • Simple tongue injury • Deep and wide laceration of the tongue, rupture • Mucosal injury • Stenon duct injury • Tooth or implant loss (including milk teeth) • Subluxation of teeth (including implant) • Fractures of all permanent teeth (enamel, dentin, pulp) 																																																																															
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%;"></td> <td style="width: 16.6%;">Treated with basic medical intervention</td> <td style="width: 16.6%;"></td> <td style="width: 16.6%;"></td> </tr> <tr> <td></td> <td colspan="3">Not treated with basic medical intervention</td> </tr> </table>																	Treated with basic medical intervention				Not treated with basic medical intervention																																																										
	Treated with basic medical intervention																																																																														
	Not treated with basic medical intervention																																																																														
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%;"></td> <td style="width: 16.6%;">Mild</td> <td style="width: 16.6%;">Middle</td> <td style="width: 16.6%;">Severe</td> </tr> </table>																	Mild	Middle	Severe																																																												
	Mild	Middle	Severe																																																																												
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%;"></td> <td style="width: 16.6%;">Attenuation</td> <td style="width: 16.6%;"></td> <td style="width: 16.6%;">Loss of function</td> </tr> </table>																	Attenuation		Loss of function																																																												
	Attenuation		Loss of function																																																																												
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%;"></td> <td style="width: 16.6%;">Yes- not treated with implant or prosthesis</td> <td style="width: 16.6%;"></td> <td style="width: 16.6%;"></td> </tr> <tr> <td></td> <td colspan="3">No-treated with implant or prosthesis</td> </tr> </table>																	Yes- not treated with implant or prosthesis				No-treated with implant or prosthesis																																																										
	Yes- not treated with implant or prosthesis																																																																														
	No-treated with implant or prosthesis																																																																														

information received from the routine forensic patient, the 4th part of the proposal form included the expressions and judgments that were frequently requested to be clarified by judicial units, especially in cases of trauma origin.

Four main judgments were declared for the maxillofacial trauma cases in the Guidelines for Assessment of Injury Crimes Defined in the TPC in terms of Forensic Medicine:³⁵

Influence of the bone fracture on life function (mild/middle/severe)

1. Condition of dental tissues (attenuation or loss)
2. Treatment of injury with “Basic Medical Intervention (BMI)”/or not.
3. The assesment of anterior tooth loss as Permanent Scar on the Face

INFLUENCE OF THE BONE FRACTURE ON THE LIFE FUNCTION

Especially in trauma cases, the main judgment to be determined in a forensic report was the effect of any bone fracture on life functions. Based on the declaration prepared by the Forensic Medicine Institute of Türkiye, influence rate of the maxillofacial bone fracture on the life function was scored as 1 (mild), 2-3 (middle), 4-6 (severe). For example; Le Fort 1 fracture (score 2) is mild fracture however, compound (open) or comminuted mandibular fractures (score 4) are severe fracture (Table 5). Table 5 shows the influence rate scores of the different bone fractures on the life function especially for maxillofacial region.

1. Condition of Dental Tissues (*Attenuation or Loss*)

The 2nd parameter to be determined is whether it is an *attenuation* of traumatized teeth or *loss* of teeth. These judgments are particularly important as they will affect the penalty to be imposed on the accused. Based on the declaration parameters, each teeth group was scored according to type and different functions such as aesthetic appearance, chewing and speech. When the sum of points is higher than 30 points it was considered as tooth *loss*, while it was considered as *attenuation* of traumatized tissue if it is between 15-30. The scores for different tooth types were presented below.

Incisors	4
Canine	4.5
Premolar	3
1 st and 2 nd molar	3
3rd molar	0.5

2. Treatment of Injury with “BMI”/or Not

The third parameter is whether the condition that occurred after the trauma could be solved with a BMI. Accordingly, loss of tooth (including primary teeth) or implant, subluxation of teeth, complicated teeth fracture and deep and wide laceration of tongue cannot be treated with BMI and such injuries were evaluated as complicated. However, simple injuries on the tongue and mucosal injuries were evaluated as mild injury and classified as not treated with BMI (Table 6).

TABLE 5: The influence rate scores of the different bone fractures on the life function.³⁵

Maxilla fracture (close) (2)
Maxilla fracture (open) (3)
Le fort I (2)
Le fort II (3)
Le fort III (4)
Mandibular fracture (3)
Mandibular segmental fracture (4)
Temporo-mandibular joint dislocation (1)

TABLE 6: BMI scores of nose-mouth-tongue-mucosal lesions.³⁵

Nose-mouth-tongue-mucosal lesions	
Simple tongue injury	Treated with BMI
Deep and wide laceration of tongue	Not treated with BMI
Mucosal injury	Treated with BMI
Loss of tooth	Not treated with BMI
Luxation of teeth, complicated crown fracture	Not treated with BMI

BMI: Basic medical intervention.

3. The Assessment of Anterior Tooth Loss as Permanent Scar on the Face

According to Guideline on the Evaluation of Injury Crimes defined in TPC in terms of Forensic Medicine, it has been evaluated as “Permanent Scar on the Face” if maxillary and mandibular anterior tooth loss cannot be treated with implant or prosthetic treatment (crown or bridge). As a matter of fact, tooth loss decided in this judgement is considered within the scope of serious injury, especially as a result of intentional injuries in the TPC. However, at this point, parameters such as pre-existing tooth fractures and losses, former/natural condition of oral tissue of the patient before trauma should also be taken into account in the forensic assessment. This also shows the importance of maintaining accurate dental records containing all the relevant details.

The main limitation of the present study is the lack of standardization in forensic dental records of our faculty. Accordingly, because of our study's retrospective nature, maxillofacial trauma cases could not be evaluated with above-mentioned parameters. Moreover, since our study was conducted in a single center, outcomes of the study revealed only a limited

population. Therefore it is suggested that further prospective studies of forensic cases, conducted on larger study populations using standardized dental forms will contribute more to current literature.

CONCLUSION

Every dental professional has the legal obligation for both to prepare forensic dental form and to keep dental record for medico-legal cases. Considering that the majority of the forensic archive of our faculty with a history of 50 years was disorganized, the importance of record keeping and archiving becomes clear for judicial cases. In line with our findings using a standard forensic dental report form for dental practices especially in trauma cases, will be beneficial for archiving and standardization.

Source of Finance

During this study, no financial or spiritual support was received

neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: Elif Şener, Ceyda Gürhan; **Design:** Elif Şener, Ceyda Gürhan, Esin Alpöz, Nesrin Dündar; **Control/Supervision:** Elif Şener, Ceyda Gürhan; **Data Collection and/or Processing:** Elif Şener, Ceyda Gürhan; **Analysis and/or Interpretation:** Elif Şener, Ender Şenol, Ceyda Gürhan; **Literature Review:** Ceyda Gürhan; **Writing the Article:** Elif Şener, Ceyda Gürhan, Esin Alpöz, Nesrin Dündar; **Critical Review:** Esin Alpöz, Nesrin Dündar; **Materials:** Ceyda Gürhan.

REFERENCES

- Shanbhag VL. Significance of dental record in personal identification in forensic sciences. *J Forensic Sci Med.* 2016;2(1):39-43. [Crossref]
- Charangowda BK. Dental records: an overview. *J Forensic Dent Sci.* 2010;2(1):5-10. [PubMed] [PMC]
- Ray AE, Staffa J. The importance of maintaining adequate dental records. *N Y State Dent J.* 1993;59(9):55-60. [PubMed]
- Lawney M. For the record. Understanding patient recordkeeping. *N Y State Dent J.* 1998;64(5):34-43. [PubMed]
- Astekar M, Saawarn S, Ramesh G, Saawarn N. Maintaining dental records: are we ready for forensic needs? *J Forensic Dent Sci.* 2011;3(2):52-7. [Crossref] [PubMed] [PMC]
- Shetty P, Raviprakash A. Forensic odontology in India, an oral pathologist's perspective. *J Forensic Dent Sci.* 2011;3(1):23-6. [Crossref] [PubMed] [PMC]
- Yesilova E, Irmak Ö, Kılıçaslan MA. Panoramik radyografi üzerinden yaygın görülen dental durumların yaş ve cinsiyetle ilişkisinin değerlendirilmesi [Evaluation of relationship between frequently observed dental conditions and age/gender on panoramic radiographs]. *Selcuk Dent J.* 2018;5(3):239-45. [Crossref]
- Kocaelli H, Karaman F. İstanbul Üniversitesi Diş Hekimliği Fakültesi adli dosya arşivi inceleme raporu: adli dental rapor formu önerisi [Investigation report of forensic file archives of İstanbul University Faculty of Dentistry: forensic dental report form proposal]. *J Istanbul Univ Fac Dent.* 2009;43(3-4):75-80. [Link]
- Nagi R, Aravinda K, Rakesh N, Jain S, Kaur N, Mann AK. Digitization in forensic odontology: a paradigm shift in forensic investigations. *J Forensic Dent Sci.* 2019 ;11(1):5-10. [Crossref] [PubMed] [PMC]
- Miki Y, Muramatsu C, Hayashi T, Zhou X, Hara T, Katsumata A, et al. Classification of teeth in cone-beam CT using deep convolutional neural network. *Comput Biol Med.* 2017;80:24-9. [Crossref] [PubMed]
- Tuzoff DV, Tuzova LN, Bornstein MM, Krasnov AS, Kharchenko MA, Nikolenko SI, et al. Tooth detection and numbering in panoramic radiographs using convolutional neural networks. *Dentomaxillofac Radiol.* 2019;48(4):20180051. [Crossref] [PubMed] [PMC]
- Gök Y, Balcı Y, Göçeoğlu ÜÜ, Ersoy B. Adli rapor düzenlenen erişkin olgularda cinsiyet farklılığının değerlendirilmesi [Evaluation of gender differences in adults forensic cases]. *Türkiye Klinikleri J Foren Sci Leg Med.* 2020;17(2):133-41. [Crossref]
- Altun G, Azmak AD, Yılmaz A, Yılmaz G. Trakya Üniversitesi Tıp Fakültesi acil servisine başvuran adli olguların özellikleri [The characteristics of the cases which admitted to Emergency Department of Trakya university Medical Faculty]. *Adli Tıp Bülteni.* 1997;2(2):62-6. [Crossref]
- Yavuz MS, Özgüner İF. Süleyman Demirel Üniversitesi Tıp Fakültesi Acil Servisi'ne 1999-2001 yılları arasında müracaat eden adli olguların değerlendirilmesi [Evaluation of forensic cases applied to Emergency Department of Süleyman Demirel university Medical School Hospital between 1999-2001]. *Adli Tıp Derg.* 2003;17(1):47-53. [Link]
- Türkmen N, Akgöz S, Çoltu A, Ergin N. Uludağ Üniversitesi Tıp Fakültesi Acil Servisine başvuran adli olguların değerlendirilmesi [Evaluation of legal cases admitted to Uludağ University Medical School Emergency Department]. *Uludağ Üni Tıp Fak Derg.* 2005;31(1):25-9. [Link]
- Korkmaz T, Kahramansoy N, Erkol Z, Sarıçel F, Kılıç A. Acil servise başvuran adli olguların ve düzenlenen adli raporların değerlendirilmesi [Evaluation of forensic cases applied to the emergency department and prepared forensic reports]. *Med Bull Haseki.* 2012;50(1):14-20. [Link]

17. Karasu M, Isır BA, Aydın N, Dülger HE. Acil servise başvuran adli olguların ve düzenlenen adli raporların değerlendirilmesi [Assessing the forensic reports documented by Forensic Medicine Department of Medicine Faculty of Gaziantep University between 1998 and 2005 years]. *Gaziantep Med J.* 2009;15(1):10-5. [\[Link\]](#)
18. Kukul Güven FM, Bütün C, Yücel Beyaztaş F, Eren ŞH, Korkmaz İ. Cumhuriyet Üniversitesi Tıp Fakültesi Hastanesine başvuran adli olguların değerlendirilmesi [Evaluation of forensic cases admitted to Cumhuriyet University Hospital]. *ADÜ Tıp Fak Derg.* 2009;10(3):23-8. [\[Link\]](#)
19. Tıraşçı Y, Durmaz U, Altın A, Bulut K, Özdemir Y, Cengiz D, et al. Dicle Üniversitesi Adli Tıp Anabilim Dalınca 2012-2015 yılları arasında düzenlenen adli raporların retrospektif olarak değerlendirilmesi [Retrospective evaluation of forensic reports drafted between 2012-2015 by Dicle University Forensic Medicine Department]. *Dicle Med J.* 2016;43(3):424-30.
20. Koşlu S, Karbeyaz K. Eskişehir Osmangazi Üniversitesi Tıp Fakültesi Adli Tıp Anabilim Dalı'na başvuran adli nitelikli olgular ve alkol ilişkisinin değerlendirilmesi [The Evaluation of the relationship between alcohol and forensic cases admitted to Eskişehir Osmangazi university Faculty of Medicine Department of Forensic Medicine]. *Osmangazi J Med.* 2018;41(3):216-25. [\[Crossref\]](#)
21. Karanfil R, Zeren C. Kahramanmaraş Sütçü İmam Üniversitesi Tıp Fakültesi Adli Tıp Anabilim Dalına 2009-2010 yıllarında başvuran olguların retrospektif olarak değerlendirilmesi [Retrospective evaluation of cases referred to Forensic Medicine Department of Kahramanmaraş Sütçü İmam University Medical Faculty between 2009-2010]. *Adli Tıp Dergisi.* 2011;25(3):183-90. [\[Link\]](#)
22. Ketenci Hç, Kır MZ, Başbulut AZ, Beyhun NE. Erzurum Adli Tıp Şube Müdürlüğü'ne müracaat eden olguların değerlendirilmesi [Evaluation of cases referred to division of council of forensic medicine in Erzurum]. *Adli Tıp Dergisi.* 2013;27(2):87-93. [\[Crossref\]](#)
23. Uluçay T, Ziver A, Zeyfeoğlu Y, Yavuz MS, Aşirdizer M. Celal Bayar Üniversitesi Tıp Fakültesi Adli Tıp Polikliniği'ne başvuran olguların değerlendirilmesi [The evaluation of cases which applied to Forensic Medicine Polyclinic of Medical Faculty of Celal Bayar University]. *Adli Tıp Dergisi.* 2006;20(2):22-9. [\[Link\]](#)
24. Gassner R, Tuli T, Hächl O, Rudisch A, Ulmer H. Cranio-maxillofacial trauma: a 10 year review of 9,543 cases with 21,067 injuries. *J Cranio-maxillofac Surg.* 2003;31(1):51-61. [\[Crossref\]](#) [\[PubMed\]](#)
25. Bonitz L, Wruck V, Peretti E, Abel D, Hassfeld S, Bicsák Á. Long-term evaluation of treatment protocols for isolated midfacial fractures in a German nation-wide craniomaxillofacial trauma center 2007-2017. *Sci Rep.* 2021;11(1):18291. [\[Crossref\]](#) [\[PubMed\]](#) [\[PMC\]](#)
26. Al-jubory AJ. Effect of gender and cause of injury on incidence of cranial nerves injuries in maxillofacial trauma; a clinical study. *Iraq Medical Journal.* 2020;4(1):11-5. [\[Link\]](#)
27. Requena Calla S, Alvarado Mu-oz E. Professional liability: assessment of court sentences for lawsuits against dentists in Peru. *J Forensic Odontostomatol.* 2021;2(39):15-20. [\[PubMed\]](#)
28. Zanin AA, Herrera LM, Melani RF. Civil liability: characterization of the demand for lawsuits against dentists. *Braz Oral Res.* 2016;30(1):S1806-83242016000100276. [\[Crossref\]](#) [\[PubMed\]](#)
29. Manca R, Bruti V, Napoletano S, Marinelli E. A 15 years survey for dental malpractice claims in Rome, Italy. *J Forensic Leg Med.* 2018;58:74-7. [\[Crossref\]](#) [\[PubMed\]](#)
30. Aktas N, Gulacti U, Lok U, Aydın İ, Borta T, Celik M. Characteristics of the traumatic forensic cases admitted to emergency department and errors in the forensic report writing. *Bull Emerg Trauma.* 2018;6(1):64-70. [\[PubMed\]](#) [\[PMC\]](#)
31. Demircan A, Keleş A, Guerbuez N, Bildik F, Aygencel ŞG, Doğan NÖ, et al. Forensic emergency medicine-six-year experience of 13823 cases in a university emergency department. *Turk J Med Sci.* 2008;38(6):567-75. [\[Link\]](#)
32. Seviner M, Kozacı N, Ay MO, Açıkalin A, Çökük A, Gülen M, et al. Acil tıp kliniğine başvuran adli vakaların geriye dönük analizi [Analysis of judicial cases at the emergency department]. *Cukurova Med J.* 2013;38(2):250-60. [\[Link\]](#)
33. Gürbüz N, Saygı Ş, Cila E, Demircan A, Keleş A. Gazi Üniversitesi Tıp Fakültesi acil tıp anabilim dalı erişkin acil servise başvuran adli vakaların analizi [Analysis of the medico-legal cases admitted to Gazi University Hospital's Adult Emergency Service]. *GMJ.* 2004;15(4):139-44. [\[Link\]](#)
34. Madadin M, Alqarzaie AA, Alzahrani RS, Alzahrani FF, Alqarzaie SM, Alhajri KM, et al. Characteristics of medico-legal cases and errors in medico-legal reports at a teaching hospital in Saudi Arabia. *Open Access Emerg Med.* 2021;13:521-6. [\[Crossref\]](#) [\[PubMed\]](#) [\[PMC\]](#)
35. Balcı Y, Çolak B, Gürpınar K, Anolay NN. Türk Ceza Kanunu'nda Tanımlanan Yaralama Suçlarının Adli Tıp Açısından Değerlendirilmesi Rehberi, 2019. Erişim linki: [\[Link\]](#)