

## Scientific Research Report

## Patient Safety in Dental Practice: Lessons to Learn About the Risks and Limits of Professional Liability

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## ABSTRACT

**Introduction:** Health professionals should work with the notion of risk involved in the health care process. Dental practice risk is of particular interest because it encompasses both aesthetic and functional components. Focusing on guidelines suggested by the World Health Organization and objectives on patient safety, this study has 2 objectives: to present Portuguese medicolegal data on corporal damage evaluation related to iatrogenic sequelae during dental practice and to present updated evidence on patient safety.

**Materials and methods:** A retrospective study was performed by analysing data from the database of the Laboratory of Forensic Dentistry of the Faculty of Medicine, University of Coimbra, Portugal, from 2013 to 2018.

**Results:** One hundred seven medicolegal files were selected according to the inclusion and exclusion criteria. Iatrogenic sequelae (73.8%, 79 out of 107) were categorised as risks (60 out of 79) and malpractice (19 out of 79). The risk was associated mostly with mandibular dysfunction and orthodontic treatment (62.2%). Malpractice was mostly associated with neurological deficit and implant rehabilitation (47.4%).

**Discussion and conclusion:** Greater attention to these data by professionals was emphasised, especially when considering patient safety and health care quality. This article presents the Portuguese data on professional liability in the field of dental practice, categorising iatrogenic sequelae into risks and malpractice, as well as the oral rehabilitation procedure and timeline.

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## Introduction

The World Health Organization (WHO) has established monitoring of patient safety and health systems as a priority.<sup>1</sup> Attention to the issues of malpractice and professional liability has been increasing in the scientific community worldwide.<sup>1-6</sup> Decision-making on these topics is conducted in the legal context,<sup>7</sup> taking into account the type of medical activity. In this study, we focus on oral surgery and facial aesthetics.<sup>3-5</sup>

Medicolegal evaluation aims to gather a set of data that can be related to an iatrogenic traumatic procedure.<sup>7-11</sup> The individual's integrity is analysed in the medicolegal scope and valued according to the guidelines in each country. There is a consensus that any medical or surgical procedure can lead to a change in the patient's physical or mental integrity.<sup>3-6,12-18</sup> Iatrogenic sequelae can be understood as a consequence of a correct procedure performed according to the *leges artis*, defined by the risk of the procedure.<sup>12-16</sup> In contrast, malpractice is an iatrogenic sequela caused by an incorrect or negligent procedure.<sup>7</sup> Malpractice is indeed an unnerving and sensitive topic<sup>2-7,17</sup> and has been the focus of the scientific community since 1977, with Leonard Berlin highlighting the occurrence of medical negligence as a result

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of radiographic misdiagnosis.<sup>2</sup> The presence or absence of a malpractice is a medicolegal determination, and resolution in court imposes high costs on society.<sup>4,5,18</sup>

This study aims to present medical-legal data on the exercise of oral rehabilitation in Portugal. It is intended to detail the risks and limits of professional responsibility and to thereby emphasize the importance of patient safety.

## Materials and methods

A retrospective analysis was performed using the database of the Forensic Dentistry Laboratory (FDL) between 2013 and 2018. The FDL belongs to the Faculty of Medicine (University of Coimbra, Portugal) and provides forensic medical opinions in the field of dentistry in the 3 areas of medical law (civil, labour, and criminal). The sample was selected according to the following inclusion criteria: age between 18 and 65 years, reports or files with a judicial decision in court in the field of post-traumatic body damage assessment, and oral rehabilitations performed by different health care professionals associated with the professional board.<sup>19</sup> Oncologic and genetic pathologies were excluded.

The research team comprised dentists in forensic, orthodontic, and prosthodontic practice and 8 years of practice in medicolegal evaluation and proceeded with the examination after being carefully informed about the objectives of the study. Informed consent was provided according to the Declaration of Helsinki on human subjects and in compliance with the guidelines of the Ethics Committee of Faculty of Medicine (CE-048/2017). The team performed a comprehensive secondary review of the cases between September and December 2019.

The research methodology tasks were as follows: (i) to identify the aetiology of the injury and select the iatrogenic causes; (ii) to positively identify the causal relationship between injury and sequelae; (iii) to categorise sequelae according to their clinical and judicial characteristics<sup>7,8</sup> into direct (natural course of the disease) and indirect (consequences of therapy procedure) according to the Portuguese table of damage assessment;<sup>8-11</sup> (iv) to categorise indirect sequelae into risk (inherent to the dental practice<sup>12-16</sup>) and malpractice (*leges artis* limits or those related to incorrect practice); (v) to categorise sequelae depending on oral rehabilitation procedures; and (vi) to categorise sequelae according to the oral rehabilitation timeline into preoperative, intraoperative, and postoperative. We performed a descriptive analysis of the data.

## Results

In the database records, 107 cases from 2013 to 2018 were selected for damage assessment for court decision-making. A

**Table 1 – Sequelae categorisation.**

Sequelae	N (%)	Sequelae	N (%)
Indirect	79(73.8)	Risk	60(75.9)
Direct	28(26.2)	Malpractice	19(24.1)
Total	107		

total of 79 cases (73.8%) were judged for iatrogenic sequelae, of which 19 cases (24.1%) were related to malpractice (Table 1). The mean age of patients filing a complaint was 41 years (range of 18 to 65 years). Plaintiffs were predominantly female (78%). In reference to the health care professionals, most worked in a private setting (95%) compared to academic hospitals (5%); they were board certified, and no residents were mentioned.

Concerning the correlation between sequelae and rehabilitation, the cases were categorised into 3 groups: implant rehabilitation (IR) (53.2%, 42 out of 79), orthodontic treatment (OT) (36.7%, 29 out of 79), and oral surgery (OS; tooth extraction) (8.8%, 7 out of 79).

According to the Portuguese damage assessment table in stomatology,<sup>10,11</sup> the sequelae were mandibular dysfunction (53.2%, 42 out of 79), tooth loss (6.3%, 5 out of 79), and opening deficit (1.3%, 1 out of 79). The clinical outcomes were asymmetry of lip commissures, hypoesthesia, anaesthesia, paraesthesia, or dysesthesia, absence of activity, and taste alterations (categorised as neurological deficit [39.2%, 31 out of 79]). The clinical outcomes, including temporomandibular dysfunction, maxillary atrophy, nonanatomical reduction of mandibular fractures, and invasion of the maxillary sinus with respiratory deficit (as a sequela to the implant therapy), were recorded as mandibular dysfunction (3 out of 19). These sequelae could occur simultaneously; however, the clinical findings with the highest value were considered (Tables 2 and 3).

Cases of malpractice were related to incompetency<sup>7</sup> and recurrent failure (no success), with functional and sensory losses evaluated by peers.<sup>4-6</sup> *Leges artis* limits procedures related to harmful damage to the individual resulting from an unlawful procedure, after determining the causal link between that harm and the performance of health professionals. The cases identified as malpractice were those associated with facial disharmony, early facial aging, and facial asymmetry<sup>8-11</sup> (Table 4).

We found that, employing the correlation between malpractice and rehabilitation, the cases were categorised into 3 groups: IR (63.2%, 12 out of 19), OS (21.0%, 4 out of 19), and OT (15.8%, 3 out of 19) (Table 3).

The analysis of *leges artis* limits was performed according to the 3 tasks of the rehabilitation process: preoperative, intraoperative, and postoperative (Table 4). We highlight the higher correspondence for the implant rehabilitation in the intraoperative task (87%), orthodontics in the intraoperative task (80%), followed by surgery in the follow-up or postoperative task (80%).

## Discussion

This 5-year retrospective study presents Portuguese data on professional liability assessment. It involved the application of medical knowledge to questions of law in identifying risk and malpractice procedures in dental practice. Lessons to learn about the risk and limits of professional liability can be identified in relation to the results presented and discussed according to the literature cited.

The major goal of health care is the clinical improvement of individuals in a bio-psycho-functional context,<sup>19</sup> and it is related

**Table 2 – Corporal damage assessment of clinical findings, the indirect sequelae, related to dental rehabilitation (IR, OT, and OS).**

Sequelae	Corporal damage assessment												N			
	Tooth loss			Mandibular dysfunction			Opening deficit			Neurological deficit				Mutilation/ fractures	Occlusal dysfunction	
Indirect sequelae	IR	OS	OT	IR	OS	OT	IR	OS	OT	IR	OS	OT	IR			OS
Rehabilitation	2 (3.3)	—	—	—	—	37 (62.2)	—	—	1 (1.7)	9 (15.0)	11 (18.8)	—	—	—	—	60
Risk	—	—	3 (15.8)	3 (15.8)	2 (10.5)	—	—	—	—	9 (47.4)	2 (10.5)	—	—	—	—	19
Malpractice	2 (2.5)	—	3 (3.8)	3 (3.8)	2 (2.5)	37 (46.9)	—	—	1 (1.3)	18 (22.7)	13 (16.5)	—	—	—	—	79
Total	—	5 (6.3)	—	—	42 (53.2)	—	—	1 (1.3)	—	—	31 (39.2)	—	—	—	—	79

IR = implant rehabilitation; OS = oral surgery; OT = orthodontic treatment.

to all participants in this process who must deal with technological advances, complexity of processes, and multidisciplinary areas of knowledge, which implies a permanent evaluation of acts performed in the context of professional liability and management of iatrogenic sequelae.<sup>12-16</sup> Regarding professional liability issues, the approach to this theme began in 1977.<sup>2</sup> Dental and aesthetic studies were reported in 2014 by Pinchi et al<sup>18</sup> from Italy, in 2016 by Badenoch-Jones et al<sup>5</sup> from Australia, and recently, in 2019 by Bordonaba-Leiva et al<sup>4</sup> from Spain and Sarmiento et al<sup>3</sup> from the United States. In line with the study conducted by Bordonaba-Leiva et al,<sup>4</sup> orofacial reports of professional liability analysis are seventh in the order of judicial processes, after orthopaedics and trauma surgery, obstetrics and gynaecology, plastic, and aesthetic and reconstructive surgery. In the present study, 73.8% of files in dental practice were related to iatrogenic sequelae.

It should be mentioned that in the literature cited there are no standards to categorise orofacial iatrogenic sequelae; therefore, in this study it was categorised according to the medicolegal assessment and the European guidelines of corporal disability and impairment.<sup>9-11</sup> The present study emphasised the medicolegal evaluation, namely cause-and-effect relationship assumption and damage assessment, plays a relevant role in risk and malpractice identification in health care. Because of serious iatrogenic sequelae, the scientific community warns of the limits of liability potentially linked to malpractice,<sup>3-8,12-18</sup> and consequently *leges artis* evaluation. It can be emphasised that in the absence of a definition of the patterns of *leges artis*, there is no consensus on the definition of its violation in medicine.<sup>8</sup> The literature cited highlights data sharing and data analysis in malpractice topics.<sup>2,4,18</sup> Despite the importance of this topic for the dental profession, as emphasized by Sarmiento et al,<sup>3</sup> Bordonaba-Leiva et al,<sup>4</sup> Badenoch-Jones et al,<sup>5</sup> Pinchi et al,<sup>18</sup> and Almiro et al,<sup>20</sup> this subject is still sensitive.<sup>2-8</sup> The present study identified 24.1% malpractice procedures, which was higher than that reported in a similar study conducted by Bordonaba-Leiva et al (15.8%).<sup>4</sup> The limits of *leges artis* considered in this study are intended to give rise to some critical concerns that face the dental profession.

Regarding the study of D'Cruz et al<sup>12</sup> and the Portuguese Code of Ethics,<sup>19</sup> the following are general cause-and-effect assumptions of malpractice: lack of scientific qualification, violation of the guidelines of medical activity, and noncompliance with ethical standards. According to Sarmiento et al,<sup>3</sup> the lack of informed consent/coercion regarding treatment can also be included. Potential surgical risks, complication sequelae, and negligent diagnosis could be related to an absence, omission, or incorrectness in the information provided in complex treatment plans according to Sarmiento et al,<sup>3</sup> Bordonaba-Leiva et al,<sup>4</sup> Badenoch-Jones et al,<sup>5</sup> Pinchi et al,<sup>18</sup> Corte-Real et al,<sup>21</sup> and Pereira.<sup>7</sup> As explained by Delattre<sup>22</sup> in 2007 (United States and Canada, organised in different states), the diversity of practices and attitudes can be a limitation in this issue. In addition, the identification of sequelae-promoting factors (adherence, behaviour, and habits) and risk scenarios for the professional and beyond the patient must be pointed out in the health care process. As an example, according to Parks-Savage et al,<sup>17</sup> physician burnout

**Table 3 – Corporal damage assessment of malpractice sequelae related to dental rehabilitation (IR, OT, and OS).**

Damage assessment	Tooth loss			Mandibular dysfunction			Opening deficit			Neurological deficit		
	IR	OS	OT	IR	OS	OT	IR	OS	OT	IR	OS	OT
Facial Disharmony	—	—	—	—	—	—	—	—	—	x	x	—
Early Facial Aging	—	—	x	x	—	—	—	—	—	—	—	—
Facial Asymmetry	—	—	x	x	—	—	—	—	—	—	x	—

IR = implant rehabilitation; OS = oral surgery; OT = orthodontic treatment.

and the implementation of strategies that promote physician resilience are factors reducing malpractice.<sup>17</sup>

In the context of damage assessment, in the present study the clinical outcomes identified as indirect sequelae were related to anatomical or functional changes, of which the mandibular dysfunctions stand out because of its high prevalence (53.2%). This is in line with the study published by Manfredini et al<sup>23</sup> emphasising the relevant correlation between temporomandibular dysfunction with the risk of sequelae and orthodontic rehabilitation (46.9%). It corresponds to the highest value of the disability range according to the European tables of impairment evaluation (Mandibular dysfunctions, up to 30 points).<sup>9-11</sup> This medical-legal approach should be considered when compensating for disabilities related to temporomandibular diseases in a professional liability context.<sup>23</sup> Furthermore, many orofacial neurological deficits with sensory or functional loss (39.2%) were related to surgical procedures (IR and OS), followed by tooth loss (6.3%) and opening deficit (1.3%). Dental practice involves mechanical (ostectomy and tooth sectioning), chemical (high doses of articaine and prilocaine), and thermal (inadequately irrigated use of high-speed handpieces during tooth sectioning or ostectomy) pathogenic mechanisms. In addition, according to Pippi et al<sup>24</sup> nerve anatomy and topography can be related to iatrogenic neurological sequelae. Overall, oro-dento-facial sequelae were analysed in relation to the complex biopsychosocial nature of the individual, socio-professional interactions, and interpersonal relationships. In this sense, the aesthetic disability highlighted in studies by Bordonaba-Leiva et al<sup>4</sup> and Thiesen et al<sup>25</sup> correlated with facial disharmony, facial aging, and facial asymmetry (Table 3). These medicolegal parameters used in evaluation of permanent impairment and recorded in sample files are conditions that significantly interfere with the quality of life and individual self-esteem, such as the inability to keep food or liquid in the oral cavity and difficulties in chewing and speaking.<sup>8,19,22-25</sup> In

the present study, new data on the clinical outcomes and the oral rehabilitation procedures highlighted the contributions of IR in disharmony, notably OS and OT in aging and asymmetry. Sarmiento et al<sup>3</sup> highlight the rising patient expectations in the aesthetic context, increasing emphasis on clinical outcomes. According to the authors, the patients that bring malpractice lawsuits are displeased with the results, and their overall satisfaction was not achieved.<sup>3</sup> In this study, there were more female plaintiffs than male (78%) in line with the results (73.6%) of the study conducted by Pinchi et al.<sup>18</sup>

In addition, the data support that there are 3 major areas of oral rehabilitation with significant expression in the expert evaluations of indirect sequelae: OT in 51.9% of files, followed by IR in 29.1% in line with Bordonaba-Leiva et al<sup>4</sup> (34.7%) and Pinchi et al<sup>18</sup> (25%), ending with OS. This data identified patterns and opportunities to address common errors as the gap highlighted in the study by Sarmiento et al.<sup>3</sup> In the risk group of sequelae, OT was the most prevalent (63.4%), followed by OS and OT with a similar value. It should be highlighted that the malpractice group had a different distribution, with IR being the most prevalent (63.2%), followed by OS and OT. The complexity of the surgical procedures during IR and long-term rehabilitation highlighted by Bordonaba-Leiva et al<sup>4</sup> and Pinchi et al<sup>18</sup> can explain these results. The risk group in OT was mostly related to temporomandibular disorders, and it was in line with the findings reported in literature.<sup>14,23</sup> The malpractice OT group was related to tooth loss. External apical root resorption (EARR) can explain this result because it can lead to a permanent apical loss of root structure.<sup>26-28</sup> In most cases of mild external apical root resorption, the normal function and longevity of the tooth are unaffected, but in some severe cases, OT should be stopped to avoid tooth loss.<sup>28</sup>

It should be clarified, regarding the technical and clinical procedure in the fields of orthodontics and implantology, the

**Table 4 – Descriptive statistics regarding the timeline of procedures of dental rehabilitation (preoperative, intraoperative and postoperative).\***

Rehabilitation	N (%)	
Implant Rehabilitation	Preoperative	2 (8.7)
	Intraoperative	20 (87)
	Postoperative	1 (4.3)
Oral Surgery	Preoperative	1 (7.7)
	Intraoperative	2 (13.3)
	Postoperative	12 (80)
Orthodontic Treatment	Preoperative	3 (8)
	Intraoperative	33 (80)
	Postoperative	5 (12)

\* Categorical variables are reported as frequencies and percentages of indirect and total sequelae.

higher incidence of malpractice files in the intraoperative task is in agreement with the scientific community.<sup>2-6,18,27</sup> Pinchi et al<sup>18</sup> highlights that in the majority of the cases, the technical errors, were committed during implant insertion. It is up to the dentist to perform the procedure within the accepted bounds of treatment.<sup>12-16</sup> Despite the guidelines and recommendations of the international scientific community, there is a need to reinforce the monitoring of complex technical procedures to correct their performance. The postoperative task had a major incidence in OS rehabilitation. According to Almiro,<sup>20</sup> from diagnosis to follow-up or postsurgery, active patient participation in therapeutic adherence can contribute greatly to the optimisation of rehabilitation and interpersonal relations to prevent unlawful acts. Communication with the patient in the intraoperative phase is an excellent way to manage dental risks and prevent negligence,<sup>2-6,23,24,27</sup> allowing them to be pointed out as a measure for patient safety.

At last, it should be stressed that the fundamental definitions of patient safety and risk or malpractice can be linked, regarding the Raeissi study.<sup>6</sup> Patient safety can be interpreted as safeguarding a constitutional legal good that includes efficiency of the health care under the protection of the physical and moral integrity of the person and the right to life (European Charter of Patients' Rights). The patient safety definition (WHO) emphasises learning from accidental or preventable injuries and errors in line with medical care.<sup>1</sup> This includes the identification of the risk and malpractice, injury or sequela, and its clinical evidence, aetiology, and type of rehabilitation according to the procedure to be performed. The evidence was summarised in risk and malpractice, emphasising that the oral health professional role is in the key position to improve patient safety through prevention of unintended damage. The WHO report highlights the importance of the European policy for health and well-being to achieve patient safety and quality of health.<sup>1</sup> It will be challenging for health professionals, societies, and boards to study a model of equity health care with high-quality evidence in health services delivery. The General Dental Council Guidelines<sup>29</sup> and the Dental Portuguese Board<sup>19</sup> highlight continuous education and training for all professionals.

The major limitation of this study could be the identification of compromised patients. This was addressed Chandler-Gutierrez et al.<sup>30</sup>

## Conclusion

This study presents Portuguese data on professional liability in the field of dentistry, categorising iatrogenic sequelae into risks and malpractice. This occurs in 3 major areas of expertise namely implantology, orthodontics, and surgery. Greater attention to these data by professionals is emphasised, especially when taking into account the prevalence of malpractice associated with implant rehabilitation, orthodontic treatment, and the timeline for oral rehabilitation.

## Conflicts of interest

None disclosed.

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## Author contributions

Ana Corte-Real, Catarina Caetano, and Duarte Nuno Vieira conceived and designed the present research. Catarina Caetano collected samples and data. Ana Corte-Real, Catarina Caetano, Salomão Rocha, Sónia Alves, André Dias Pereira, and Duarte Nuno Vieira analysed and interpreted the data. Ana Corte-Real and Duarte Nuno Vieira drafted the manuscript and revised it for intellectual content. All the authors wrote the paper, and they approved the final version.

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