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Preventing overtreatment in dentistry: causes, types and how to be avoided

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ABSTRACT

Background and objectives. The aim of the study was to identify in the literature the potential causes of overtreatment in dentistry, the most frequent types of overtreatments and recommendations of how to avoid those issues.
Materials and methods. A literature search was carried out in the PubMed/Medline, Web of Science and ScienceDirect databases. The search used following keywords: "overtreatment" and "dentistry" for papers published in English until June 2022.
Results. 211 results were found in PubMed, 122 in Web of Science and 523 in ScienceDirect. The duplicates, the titles and the abstracts that were not related to the reviewed topic and the papers not available in full text were excluded. 27 papers were selected and included in this study. From the 27 papers selected 7 were Clinical research, 7 questionnaire-based studies, 5 case reports, 8 review articles. Conclusions: Most of the analyzed overtreatments in the literature were unintentionally performed except for those related to the financial gain and business development. The research revealed that the overtreatments or overdiagnosis were in general due directly or indirectly to the lake of knowledge of the practitioner. It is important to know and to identify the causes of possible overtreatments as early as possible and acting ethically to achieve good results in avoiding them.

Keywords: overtreatment, overdiagnosis, dentistry, treatment needs, medical malpractice, decision making, dentistry as a business

INTRODUCTION

The overtreatment represents the use of medical tests, products, and services that are not medically necessary or beneficial to the patient [1]. Any performed treatment generates the possibility of medical errors. Unnecessary treatments mean not only higher costs, but also a higher risk of malpractice because they can harm patients [2]. The positive result of any screening test should be dealt with in the same way as a presenting symptom, by carefully considering its evidence based differential diagnosis [3]. The attitude of the patients is very different: some do not want the doctor to behave like a dictator, they do not want lectures, they want someone to provide information and support [4]. Other patients do not have the patience to listen to explanations and often want the doctor just to suggest the best solution to their problem. The doctor must adapt according to the treatment needs and ethical standards. Most of the time there are multiple choices and the final decision it should be taken in agreement and in full knowledge of the facts as required by the informed consent of the patient. The informed consent is essential in the delivery of health care. It is the process by which a health care practitioner provides relevant information about diagnosis and treatment needs to a patient so he can make a volun-

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tary and educated decision to pursue or refuse care [5]. There is a moral tension often experienced by dentists between the professional desire to serve patients well and the necessity, as practice owners running a business, to survive financially [6]. However, dentists need to treat patients ethically and their business should not be in the main focus [7].

The aim of the study is to identify in the literature the potential causes of overtreatment in dentistry, the most frequent types of overtreatments and a few recommendations of how to avoid those issues.

MATERIALS AND METHODS

A literature search was carried out in the PubMed/Medline, Web of Science and ScienceDirect databases. The search used following keywords: "overtreatment" and "dentistry" for scientific papers published in English until June 2022. In the study were included articles about patients who received an oral-dental or maxillofacial diagnostic or treatment which was appreciated to see if represented or not an overtreatment. The duplicates, the titles and the abstracts that were not related to the reviewed topic and the papers not available in full text were excluded. Data about causes, types, and possible ways to avoid overtreatments were extracted from the selected articles.

RESULTS

211 results were found in PubMed, 122 in Web of Science and 523 in ScienceDirect. From the 27 selected papers according to inclusion and exclusion criteria 7 were Clinical research, 7 questionnaire-based studies, 5 case reports, 8 review articles. The following causes, types, and modalities to avoid overtreatments were identified.

Causes or situations when overtreatment and overdiagnosis can occur:

Lack of knowledge or expertise generates risk of over-detection for secondary carious lesions [8]. Also, Extraction of injured teeth was frequently reported as a treatment of choice after trauma probably because of limited knowledge of dental practitioners on treatment options, or because patients developed complications because of delaying dental consultation [9]. Another study showed that unexperienced last year students in dental medicine tended to perform unnecessary complementary diagnostic tests [10] and perform unnecessary treatments in patients with medical compromise [10]. Many times, overtreatments are unintentional due to outdated treatment techniques [11] which in fact are generated by the lack of knowledge. Unnecessary filling replacement is more likely if the dentist is younger due to the lake of experience [12]. Caries overtreatment and overmedication (antibiotics) are more encountered in younger dentists with lower professional training [13]. *Malpractice* performed deliberately or by mistake, is often represented by overtreatment. An example of the situation is periodontal surgery indication without performing the non-surgical phase one of periodontal treatment [14].

Lack of standardized protocols leads in many situations to overtreatment. Improve and standardize treatment methods are necessary to reduce extraction and antibiotics after dental injuries [9]; unclear diagnostic criteria may lead to errors in treatment decisions [11]. *Patient's requests* are very important, but when are used *as the single criteria in designing the treatment plan* they lead to overtreatment and malpractice. This may occur when cosmetic dentistry changes the dentist–patient relationship into one of commercial exchange [11,15]. *Caries diagnosis techniques or products* may induce overtreatment. Conventional caries detecting liquid tends to penetrate dentin too deeply. This can lead to overtreatment, generating excessive healthy tissue removal [16]. The visual criteria used on the restoration's assessment directly influences the treatment decision to intervene or not on the restoration [17]. *Incorrect diagnosis* may lead to over treatment. Nodular fasciitis is a rare and often misdiagnosed tumor of the soft tissues. Incorrect malignant diagnoses may lead to excessive treatment, potentially causing disturbed orofacial development in growing children, after surgery [18]. Another example is neonatal oral aphthous ulceration of the palate known as Bednar's aphthae. Despite is not rare, clinicians are often met with a diagnostic dilemma due to the alarming clinical presentation of this condition [19]. Pseudo lesions are defined as physiological or para physiological changes of the oral normal anatomy that can easily be misdiagnosed for pathological conditions such as potentially malignant lesions, infective and immune diseases, or neoplasms [20]. Not only mucosal lesions but also false-positive diagnoses of secondary (or recurrent) caries, lead to costly and invasive overtreatment [8]. Initial biopsies may be often misclassified and could result in under- or overtreatment [21]. In a previous study about the impact of ICDAS training on occlusal caries treatment recommendations, two dentists out of five viewed ICDAS code 2 as caries lesions involving dentin and decided to provide operative treatment generating an overtreatment decision [22]. Plain reliance on radiographs, without using visual and palpatory diagnosis criteria, leads to considerable overtreatment of carious lesions [23]. *Early diagnosis* is crucial in case teeth having vertical root fractures. Not having an early diagnosis could generate

not only to overtreatment but also to extensive bone loss [24]. *Inadequate anamnesis*: obtaining a detailed clinical history is important to establish a proper diagnosis and proper patient education to prevent future injuries from inappropriate self-treatment [25]. *Business purposes, economic reasons*: frequently business survival and financial gain is a main intentional cause [11]; the payment of medical services through public or private insurance through a delivery system developed to maximize the autonomy of physicians and hospitals may led to for-profit incorporation and overtreatment [26]. Financial targets and pressure from practice owners to provide high-cost treatments represent challenges for the professionalism of the employed dentists [27]. Fee-for service leads to overtreatment, which might explain to some extent the rise in caries rates of 1.5, while capped-fee might lead to adverse selection [28]. Money-hungry dentists indicating excessively ceramic veneers give in to one of the biggest threats in esthetic dentistry: economic purposes over patient's interest [29]. Another study showed that in a busy practice, having higher fees or advertised the chances for the patient to receive an unnecessary replacement of restorations are higher [12]. *Currently not enough scientific data*: one clinical research showed that 1 in 5 teeth with successful root channel treatment, based on conventional periapical imaging, without having any clinical symptoms, will have a CBCT radiolucency measuring more than 1 mm. Because currently, there is no information to determine whether these radiolucencies represent incomplete healing, persistent disease, or fibrous scar tissue the dentist should be cautioned in retreatments to avoid overtreatment [30]. Epstein-Barr virus (EBV)-positive mucocutaneous ulcers are recognized as pseudo malignant lesions because they spontaneously regress without anti-cancer treatment. Clinicians need to be able to distinguish them from EBV-positive diffuse large B-cell lymphomas and classic Hodgkin lymphomas based on their clinicopathological findings [31]. Overall, there is sparse data towards the nature of secondary caries and how to control, detect, and treat it [8].

Types of overtreatments and overdiagnosis:

Many times, overtreatments are due to patient's requests without a treatment need according to diagnosis: *teeth whitening, removal of amalgam fillings, closing diastema, veneers, dental extractions, root canal treatment, dental implants or fixed orthodontic appliances* [7,11]. *Cosmetic dentistry procedures* generate excessive and invasive treatments when occurs effacement of self□interest through exploitative advertising [15].

Root channel retreatment in case of vertical root fracture or small periapical CBCT radiolucencies [24,30], twenty percent of teeth with successful root canal treatment based on conventional periapical imaging had CBCT radiolucencies measuring greater than 1 mm [30]. Root canal treatment indication when a carious lesion extension just surpassed the external third of the dentin [10]. *Unnecessary fixed prosthesis*: small filling restoring only one surface of the tooth being expanded unnecessarily into a crown (whereby most of the tooth's structure is surgically removed and replaced with metal or porcelain) would cause harm to the patient and for the dentist's financial benefit. Also, root canal treatments and crowns for superficial and medium carious lesions [27]. Ceramic veneers under the guise of minimally invasive esthetic dentistry are many times excessively indicated [29]. *Surgical interventions*: Performing full-mouth periodontal surgery without having undergone any phase one non-surgical therapy (root planning) [14], like surgical or medical approach to pseudo lesions [20] represents unnecessary interventions. *Hematological investigations and nasogastric feeding* are indicated generating over investigation and overtreatment due to deficiencies in the diagnostic process of the neonatal aphthous ulceration or Bednar's aphthae [19]. *Unnecessary complementary diagnostic tests* like radiographs upon occlusal carious lesions [10]. *Unnecessary restorations/fillings* representing an invasive treatment of false-positive diagnosticated carious lesions [8]. Placing a resin composite restoration because of an inactive carious lesion categorized as ICDAS II [10]. Replacement or new restorations in case of marginal discolorations without secondary carious lesions [12]. *Overmedication* especially antibiotic medication administrated after dental and soft tissue injuries [9,13] or in case of periapical lesions, endodontic treatment, and retreatment [13]. One study from 2019 showed that dentists in Italy on a large scale prescribe antibiotic prophylaxis in conjunction with oral implant surgery among healthy patients [32]. Excessive antifungal medication in case of Denture-related erythematous stomatitis [33].

How to avoid overtreatment:

Good professional training, continuing education: It is strictly fundamental for dentists to know and to distinguish oral pseudo lesions from pathological conditions [9,20] or to avoid overtreatment of carious lesions and overmedication in case of endodontic treatment, retreatment or periapical lesions, implant placement among healthy patients [13,32]. Improving professional knowledge is necessary to increase the quality of the medical act. *Early diagnosis*: Knowing the clinical and radiographic signs suggesting vertical root fractures is important: pain on percussion and/or palpation, presence of a deep iso-

lated periodontal pocket (bone loss), presence of one or multiple sinus tracts, and halo or J-type radiolucency around the corresponding tooth on the periapical radiograph [24]. The use of CBCT scans for the detection of vertical root fractures in endodontically treated teeth showed very good results compared to gold standard ortho-grade retreatment, endodontic microsurgery, or extraction [24]. Sometimes methods for early diagnosis can be misunderstood and without a proper training may generate overtreatment. An example is the case of ICDAS cod 2 lesions perceived like dentin carious lesions [22]. *Anamnesis*: The practitioners should take into consideration the importance of clinical history to avoid overtreatment or mistreatment of the patience [25]. *Minimally invasive approach*: a minimally invasive based approach for assessing secondary caries may prevent overtreatment [17,34]. *High quality of diagnosis*: Detected fillings having secondary caries using specific methods, especially in low-risk populations can be replaced or, if partially defective, also considered for repair or reseal to increase the longevity of the restoration [8]. The digital radiographic imaging plate system can be recommended for dentin carious lesions detection and can potentially help prevent overtreatment thanks to its high specificity values [35] discouraging the use of explorers in tactile examinations may be effective mechanisms for reducing overtreatment of incipient carious lesions diagnosticated only because explorer sticks [12]. The criteria employed in the visual–tactile caries examination should focus on two aspects: activity status and cavitation status [23]. *The best ethical approach*: treating according to treatment needs without interfering with the financial needs of the business [11,26,36–38]; exploitative advertising and defacement of the dentist–patient relationship into one of commercial exchange [15]. *Understanding limitations of fee-for service and capped-fee payment models* for procuring dental care [28] will lower over or undertreatment. *Patient demanded for unnecessary treatment* is destructive, non-beneficial for his/her health and contrary to the ethical principles of our profession. The best attitude towards this situation is more information about alternative treatments and patient informed consent, explaining the reasons and offering diverse alternatives to solve his/her problem/s [10]. *Guidelines* based on last published evidence and focused on the indications for prophylactic antibiotics among healthy patients are required to lower overmedication [32]. Also, the gaps in practice guidelines for clinicians should be addressed, to improve the standard of care for millions of edentate people wearing dental prostheses and to avoid antifungal overmedication [33].

Society's expectations

There are many aspects to be considered making the final decision regarding treatment: the recovery period, how long and how hard it is to get to recovery, long-term prognosis, quality of life after treatment, possible side effects or complications of the intervention, the costs etc. A study that included 249 patients in New Zealand showed that the most important trait a dentist can demonstrate is to discuss treatment options with them before any treatment [39]. The health system is far from being perfect even in highly developed countries. Over 18.000 Americans die prematurely annually because the lack of health insurance [2]. A pervious study showed that American consumers have rated hospitals, doctors, and insurance as the lowest values for the money among the many goods and services they purchase [4]. This industry often offers excessively expensive services. The reduction of costs would mean affecting the manufacturers of the equipment and consumables, the employees, the builders of the necessary infrastructure [2,26]. Patient-centered care includes not only clinical efficacy and patient safety, but most importantly, ethical decisions regarding treatment options based on the preferences of patients who are consumers of healthcare services. Patients expects from dentists a high level of professionalism (ie acting ethically, both in terms of competence and conduct), in contrast to the models and motivations of the business environment. Therefore, the most important challenge of professional dental ethics continues to be to prioritize patient well-being and make the right decisions ethically, while trying to maintain a successful business [40]. However, society is confident that their professionals will put the benefits of those they serve above their own interests [11]. Debts accumulated during studies and internships can negatively affect the professional behavior of young dentists, while general dentists may give in to the financial rewards offered by specialists. Specialists may also fail to inform patients of inadequate or poor-quality treatment by the referring general practitioner, fearing the loss of sent patients [41]. Out of a desire for financial gain, many dentists continue to be fed an aggressive restorative approach, which can lead to unnecessary treatment and should be seen as inappropriate [42]. Appropriately mediated advertising from an ethical point of view can be easily done by promoting the patient's education, without putting the personal interests of the dentist before the patient. Through this approach, dentistry can continue to be one of the most reliable professions [38]. There should be standards and protocols, especially for internal monitoring of ethical decisions, not only for large offices or groups of hospitals that usually have them, but also in small offices [36].

Limitations of the study: A limitation of this literature review is in comparing different studies as they often did not analyze data using the same criteria such as age of the practitioner, specialization of the practitioner, type of treatment, patients' diseases. Another limitation was the diverse methodology used to highlight overtreatments for example questionnaires-based studies versus observational clinical trials. However, this did not weaken the findings because the purpose was to identify in the literature potential causes of overtreatment in dentistry and a few recommendations of how to avoid those issues, not a quantitative evaluation related with a specific and restrictive topic regarding overtreatments.

We consider that the aim of this integrative literature review was achieved identifying 10 possible causes of overtreatments in dentistry and 9 recommendations to avoid them presented in 27 different peer reviewed scientific papers. The study's contribution is to systematize and facilitate the identification of the types of problems that may occur in current practice related to overtreatment.

CONCLUSIONS

It is important to know and to identify the causes of possible overtreatments as early as possible and acting ethically to achieve good results in avoiding them. Most of the analyzed overtreatments in the literature were unintentionally performed except for those related to the financial gain and business development. Being a good professional means good training and putting the patient's well-being first. The research revealed that most of the overtreatments or overdiagnosis was due directly or indirectly to the lake of knowledge of the practitioner. This systematization of the potential causes, types and the possible ways of avoiding overtreatment aimed to improve knowledge in order to be much easier to keep it away from the daily practice. The research studies on this topic are far from being sufficient and future guidelines about of how to avoid overtreatment are needed to lower their percentage.

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