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Review Article

Dental Anxiety - Definition, Etiology, Diagnosis and Treatment Options

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Abstract

Dental anxiety is a common condition that can lead to dental avoidance behavior. As such, the oral health of patients suffering from dental anxiety typically deteriorates over time resulting in costly treatments and complex procedures that could have been avoided, prevented, and treated while they were simple and easy to care for. Dental anxiety is commonly misdiagnosed, has been linked to different etiological factors, and can manifest at any time in an individual's life. Identification of this condition is simple and can be routinely done using short, standardized surveys. In addition, there are many efficient and cost-effective options to treat or alleviate this condition. However, dentists and other oral health practitioners such as dental hygienists and dental assistants, are usually unaware of how to identify and address dental anxiety during dental care. Thus, herein we reviewed the literature about definitions of dental anxiety and associated conditions such as dental fear and dental phobia. Furthermore, we discuss possible etiologies and how to effectively diagnose this condition. Finally, we present possible treatment options available for dentists and other dental care providers to safely care for dental patients suffering from dental anxiety.

Introduction

In the United States, between 50% and 80% of adults experience some degree of dental anxiety [1]. Among the adults suffering from dental anxiety, 20% do not see a dentist regularly and 9% to 15% fail to receive dental care at all [1]. Avoidance drives the dismissal of professional teeth cleanings and oral exams, which the American Dental Association suggests should be scheduled regularly [2]. During these prophylactic visits, oral care providers diagnose and treat oral diseases after inspection of a patient's teeth and gums and also advise patients on how to properly care for their mouths [3]. Avoidance of dental care can lead to severe health problems [4]. Avoidant behaviors are associated with an increased prevalence of decayed and extracted teeth, more episodes of toothache and lower oral health-related quality of life [5]. Since there does not seem to be a significant decrease in the prevalence of dental anxiety in society [6], this condition is a significant public health problem that can be more deleterious due to individuals with dental anxiety showing signs of comorbid phobia, depression and mood disorders [7]. In the literature, dental anxiety, dental fear, and dental phobia have been used interchangeably, which has complicated the study of dental anxiety. In this literature review, we will differentiate between dental anxiety, dental fear, and dental phobia. We will discuss the burden that dental anxiety has placed on patients who experience this condition, as well as its impact on oral care providers and dental practices. To better understand how dentally anxious patients are identified, we aimed to highlight commonly used dental anxiety measuring scales. Finally, we will discuss etiological factors associated with dental anxiety as well as anxiety reduction techniques that have been shown to be effective.

Material and Methods

Literature Search Method

This literature review followed the methods used in previous literature review searches [8]. A search on Medline, Google Scholar, PsycINFO, University of Michigan Library and EBSCOhost was conducted using the following search terms and combinations: dental anxiety, dental anxiety etiology, modulating dental anxiety, dental anxiety, dental phobia, and dental fear. After the generation of the titles and abstracts by the search engines, the articles were screened according to the following inclusion criteria: (1) articles from scholarly journals, (2) full article available online (3) article in English language. The exclusion criteria were: (1) incomplete publications, (2) publication in newspapers or non-scientific magazines, (3) unpublished manuscripts, (4) theses, and (5) book chapters. Publication dates, sample sizes and technique of analysis were not restricted. Our initial search resulted in more than 1,000 papers that we subsequently selected according to their content that had to include: definition and/or etiology and/or diagnosis or identification and/or treatment options related to dental anxiety. This second selection resulted in 35 manuscripts published from 1978 to 2017 that were included in this review.

Defining Dental Anxiety and Exploring its Deleterious Impacts

In the literature, dental anxiety, dental fear, and dental phobia are often used synonymously. The umbrella term for these three conditions is "fear of dentist[4]". However, there are important factors that distinguish each term from the other. Dental anxiety is the mildest form. The 5th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) defines dental anxiety as a form of specific phobia [9]. Dental anxiety is a conditioned response, characterized by the anticipation of encountering a dental related threat in the future [8]. In contrast, dental fear is a primitive emotion that elicits a fight or flight response, activated by an imminent and specific threat in a dental setting (e.g., dental drill, needle) [8]. The most extreme form is dental phobia, which is defined as complete avoidance of dental care [4]. Dental anxiety is a complex condition that negatively affects dental patients and oral care providers. Previous research has found that dentate individuals with high levels of dental fear had a strong relationship with avoidance of dental care [10]. Furthermore, this group was 18.5 times more likely than all other groups (low dental fear group and moderately fearful group) to not seek dental care [10]. This causes a significant problem for the dental patients because it leaves them undertreated. Patients in the extreme dental fear group showed significantly higher levels of oral health symptoms (toothaches, bleeding gingiva, sore jaws and bad breath) than the other groups [10].

This suggests that not only are dentally anxious patients more likely to either cancel or miss dental appointments, but



they are also more likely to show signs of compromised oral health. Dental anxiety is also associated with negative consequences in social relationships. The consequences are, but not limited to, embarrassment about poor oral health and reduced self-confidence, as well as potential sick-leave/ absence from work or daily activities [11-13]. Although the manifestation of dental anxiety directly impacts dentally anxious patients, oral care providers are also at risk. In 2001, a research team surveyed 216 randomly selected Danish private practicing dentists to understand what caused them the most stress while at work [14]. From the survey results, they found that this population of dentists ranked work stressors as follows (1 being the highest ranking): 1) running behind schedule, 2) causing pain 3) heavy workload 4) late patients and 5) anxious patients. In interpreting their findings, it seemed that treating anxious patients was not the most significant source of dental stress for dental care providers. However, the authors dove deeper and suggested that the number one cause of stress, running behind time, could be influenced by the 5th cause, anxious patients. This may be due to the treatment of dentally anxious patients requiring more time than a non-anxious patient [14]. Furthermore, dentistry is a fee-for-service profession, suggesting that dealing with patients who require more time, affects the practice's economics which can lead to more stress on the dentist [14]. Since dental anxiety can severely impact both the patient and provider, it is a significant problem that has been heavily studied for over 6 decades.

Dental Anxiety's Etiology (Exogenous and Endogenous pathways)

Dentally anxious patients are a heterogeneous group of individuals when considering the origins of their dental anxiety [14]. Classically, dental patients have been categorized into two groups, an exogenous group, and an endogenous group, with respect to the manifestation of their dental anxiety [15]. Individuals in the former group are said to have acquired their dental anxiety through direct and indirect conditioning experiences, whereas the latter are said to have acquired their anxiety by way of preexisting vulnerabilities to anxiety disorders [15]. Additionally, studies have also suggested that outside of these two groups exists patients who acquire dental anxiety through cognitive perceptions [16-18]. These perceptions work in a schema that perpetuates a cycle of vulnerability to perceived stressors. As seen in the literature, classical conditioning has been most used to explain the etiology of dental anxiety regarding the exogenous pathway. Similar to Pavlov's classical conditioning hypothesis, dental related conditioning behaviors are associated with aversive treatment [17,19]. Conditioning is a phenomenon that has been studied for decades and is defined by the training or accustoming to something or someone in a certain way, to achieve a certain behavior [20]. In relation to a dental setting, a neutral stimulus is associated with an unconditioned stimulus, ultimately creating a conditioned stimulus, followed by a conditioned response [21]. An example of this model is a dental drill (neutral stimuli) being paired with pain (unconditioned stimulus), creating a conditioned response (anxiousness). For example, if a patient associates the pain that they are experiencing to the dental drill that is used during their treatment, then they may show signs of anxiousness when they encounter a dental drill in the future. In a study done using a population of university students, researchers found that levels of dental anxiety were correlated with the number of previous painful treatments, which provides evidence for the conditioning hypothesis [17].

The endogenous pathway suggests that it is a person's vulnerability to mental disorders that influences their possibility of developing dental anxiety. In a study designed to validate this hypothesis, the authors found that roughly 73% of individuals who were highly dentally anxious, also showed signs of at least one or more types of mental disorders [22]. The disorders that were associated with dentally anxious patients were agoraphobia, social phobia and simple phobia [22]. In a study done on a population of Swedish teenagers, those who were classified as having dental anxiety showed more signs of general anxiety and depression [23]. Together these findings support the idea that a person's vulnerability to mental disorders may be strongly related to the development of dental anxiety. However, although some can associate the development of dental anxiety with the exogenous and endogenous pathways, these two pathways do not account for all individuals with dental anxiety. For example, some individuals have dental anxiety but have never experienced a traumatic dental treatment, and some individuals have undergone traumatic dental treatments but do not show signs of dental anxiety [24]. Therefore, a cognitive lens has been used to offer an alternative explanation for the etiology of dental anxiety. Armfield, in his article, *Cognitive Vulnerability: A Model of the Etiology of Fear*, suggested that it is an individual's perception of a stimulus that determines their fear acquisition to that stimulus [18]. Simply, the Cognitive Vulnerability model (CVM) includes four perceptions, disgustingness, unpredictability, uncontrollability, and dangerousness which form a schema that is automatically and unconsciously activated when a person encounters a stimulus. (e.g., local anesthetic injections) [18]. During the same time that the schema is activated, an automatic reaction is also activated, influencing physiological, behavioral, and cognitive responses. Ultimately, these responses are fed back into the original schema, creating an updated schema for the next time the

individual encounters the same stimulus [18]. This schema is believed to create a vicious cycle that maintains an individual's dental anxiety [17]. When the CVM was investigated on a population of 3937 Australian citizens, uncontrollability and dangerousness were both significantly associated with high dental fear [25]. This data is supported by previous literature that suggests that the probability of having dental related fear is increased when the perception of control is lower [26]. Although there seems to be low association with perceptions of disgust and unpredictability and dental anxiety, the cognitive vulnerability model suggests that all perceptions work in part of acquiring dental fear [25].

Diagnosing and measuring levels of Dental Anxiety

In 1969, the first scale used for the measurement of a patient's dental anxiety was created. Entitled, *Dental Anxiety Scale* (DAS), this scale includes 4 multiple choice questions, each with five answer choices ranging in value from 1 to 5, with 1 being the least anxious choice and 5 being the most anxious choice. For example, question #3 from the scale explicitly asked patients, "When you are in the dentist's chair waiting while he gets his drill ready to begin working on your teeth, how do you feel?", followed by 5 answer options ranging from "relaxed" to "so anxious that I break out in a sweat or almost feel physically sick." Being that the dental drill is one of the leading anxiety provoking tools used in the dental office [16], this question as well as the preceding and succeeding questions made for a great questionnaire to assess dental anxiety levels. This led to the widespread use of the DAS in following research studies, involving dentally anxious dental patients. In 1999 the DAS was used to study the age of onset of dental anxiety in patients in Toronto. In this study, individuals who scored 12 and above on the DAS were considered as dentally anxious [15]. Similarly, the DAS was used in a study designed to assess dental anxiety levels in a population of Danish adults [10]. At that time, the DAS was the most efficient way of identifying a patient's level of anxiety and its validity was tested in several studies [27,28].

Although the DAS was revolutionary and used by many practitioners within this field of study, it had some faults. Amongst these faults was that the scale did not have a question asking patients how they felt about the use of local anesthetic, although it ranked just as high as a dental drill regarding its anxiety provocation [29]. Another problem was that the first question used a different set of answer choices than that of the following three questions, which made it difficult to compare responses from one question to another. Finally, the last three questions of the DAS had the answer choice, "so anxious that I break out in a sweat or almost feel physically sick," which did not account for symptoms outside of sweating or nausea like increased heart palpitations and breathlessness. These problems were identified and corrected in 1994, making the previous DAS more comprehensive. This new scale was named the Modified Dental Anxiety Scale (MDAS) [30]. The MDAS included a 5th question which asks about patients' feeling toward the use of local anesthetic injections. They also made a simplified answering scale across all five questions, ranging from not "anxious" to "extremely anxious". Importantly, a study has shown that the MDAS has not been found to cause anxiety in patients, nor has it been found to harm the dentist-patient relationship [31]. This suggests that the MDAS is a safe and effective technique that can be used by dental care providers. There have since been new scales published that assesses patients' anxiety levels, but these scales are beyond the scope of this review.

Treatment of Dental Anxiety

After identifying dentally anxious patients, an oral care provider can begin their treatment plan. Since individuals acquire dental anxiety differently, the treatment of their dental anxiety is also likely to be different. Also, individuals' dental anxiety has different levels of severity. These considerations allow for a personalized treatment plan for each patient. The following paragraphs will include different treatment options that have been shown to be effective in the literature. For patients with mild dental anxiety, the patient-provider relationship is a strong indicator in whether a patient will be apprehensive during dental treatment [32]. Therefore, a trusting patient-provider relationship is an important dynamic to create before treatment [32]. Considering what is known about the Cognitive Vulnerability Model that was discussed earlier, some dental patients have negative perceptions of the dental setting [25]. In terms of changing one's perception of unpredictability, an oral care provider could provide the patient with a clear description of their oral health and a realistic explanation of what treatments are needed to be undergone [32]. An example of this is the tell-show-do technique. In the tell-show-do technique, the dentist tells the patient about the procedure and the tools that will be used, followed by a detailed explanation of what could be expected during the treatment [32]. After informing the patient, the dentist will then begin the patient's scheduled treatment, in hopes of their patient being less apprehensive. Similarly, previous experimental research has shown that some individuals require a level of control during dental treatment [18,26]. In a study that looked at individuals who had a need for control,



they found that when these individuals did not feel like they had control, they often felt that their dental treatment was fear evoking [33]. The establishment of hand gestures that indicate when to start and stop a dental procedure, has been shown to be an effective option for patients who need control [34]. Regardless of if the patient needs control or more predictability, it is the dentist's job to make this assessment. Understanding that not all patients are dentally anxious is a must, because the use of techniques such as the tell-show-do method could make a non-dentally anxious patient hyper-focused on the unpleasant parts of a dental procedure that they did not once pay attention to [35].

Techniques such as pharmacological support and coping strategies (e.g., distraction, relaxation, hypnosis), are also options for individuals experiencing mild symptoms of dental anxiety [32]. For example, a dentist can prescribe patients with benzodiazepines (sedative drugs classically used for treatment of anxiety) before a dental treatment [32]. In terms of coping techniques, the use of distraction is suggested to be an important option [32]. Types of distractions commonly used are abdominal breathing and sensory distractions like watching videos and listening to music. Previous research states that the higher the level of distraction used, the more significant the treatment is in decreasing dental anxiety levels [36]. This finding suggests that watching a video would be a more efficient anxiety reduction technique than listening to music. Relaxation, but specifically muscle relaxation, are also efficient coping mechanisms [32]. Relaxation can be accomplished through instruction via headphones, progressively teaching patients how to relax in difficult situations. One caveat that accompanies this method is that training must be done preceding dental treatment and typically takes 10 sessions before progress is shown [32]. Because of this, muscle relaxation may not be effective in a general dentistry setting. An alternative would be a deep breathing technique [32]. Unlike patients who present with mild symptoms, those who present with severe signs of dental anxiety may be referred to a special dentistry clinic [37]. At these clinics, patients may receive adapted dental care, including different types of sedations (general anesthesia, nitrous oxide, intravenous and oral sedation) or behavioral interventions. These interventions can be used alone or in combination with each other, but this is decided by the oral care provider on a case-by-case basis [37].

Cognitive Behavioral Therapy (CBT)/ Behavioral Therapy (BT) are two forms of psychological treatments used in the dental setting [37]. Behavioral therapy includes exposures like relaxation techniques and systematic desensitization. Systematic desensitization is led by teaching patients' muscular relaxation, followed by exposure to a hierarchy of stress inducing stimuli, until the patient apprehensions subside [32]. The cognitive side mainly focuses on cognitive restructuring, a technique that helps individuals notice and change their negative thinking patterns. A systematic review on studies that have used CBT/ BT as a treatment for severely anxious patients showed that these techniques were effective [37]. However, the quality of evidence was low due to the previous studies' design, which were evaluated by a strict and commonly used scheme, the Grading Assessment developing and evaluation. Therefore, more well-designed studies are needed to further suggest the effectiveness of CBT/BT [37]. Lastly, the latent inhibition hypothesis has been implicated as a treatment for dentally anxious patients. Latent inhibition is simply the idea that an older stimulus takes longer to obtain than a new stimulus. Latent inhibition predicts that a patient is less likely to acquire dental anxiety if they have been exposed to several non-traumatic treatments before a conditioning event [17]. A study that tested this hypothesis found that patients who were not anxious reported having earlier exposure to non-painful dental treatment, supporting the latent inhibition hypothesis [17]. However, they also found that anxious patients who were previously "relaxed" had a larger time gap between their first dental treatment and first traumatic experience than the patients who had been relaxed during both their first dental treatment and their first traumatic experience. This finding contradicts the idea of latent inhibition as the once relaxed patients still became anxious after a longer time between the former and latter treatment. This inconclusive evidence led the authors of this research to suggest that latent inhibition may not be the strongest indicator of development of dental anxiety, but that early exposure to non-traumatic dental treatment may help attenuate dental anxiety onset [17].

Discussion

One of the goals of this literature review was to differentiate dental anxiety from dental phobia and dental fear. Previous literature has used these three terms interchangeably, which may have made the study of dental anxiety more difficult. This review highlighted that dental anxiety is the mildest form, followed by dental fear and phobia, which are more extreme conditions. Dental anxiety alone has been shown to be associated with dental care avoidance behaviors, ultimately leading to compromised oral health⁵. Additionally, dental anxiety has also been shown to be deleterious to oral care providers [14]. Treating anxious dental patients leads to increased provider stress, due to thoughts of causing a patient harm and running behind schedule due to longer

treatment needs for dentally anxious patients [14]. Together, these findings suggest that dental anxiety is a complex condition that affects both patient and provider. We then aimed to identify how dentally anxious patients acquired dental anxiety. The most studied routes for dental anxiety acquisition were the endogenous and exogenous pathways. Although the endogenous pathways idea of anxiety acquisition is associated with a patient's vulnerability to mental disorders and the exogenous pathways classical conditioning being implicated, they do not account for all individuals with dental anxiety. The Cognitive Vulnerability Model offers a different approach suggesting that some individuals have negative perceptions of the dental environment, which leads to dental anxiety acquisition and maintenance [18,25].

When looking at dental anxiety identification methods to better understand how dentally anxious patients were classified, the use measurement tools like the MDAS and DAS have been shown to be effective. These surveys are short and can be easily scored and analyzed by oral care providers. The surveys have not been shown to impair the patient-oral care provider relationship and do not seem to heighten patients' level of anxiety [31]. Because of their effectiveness in identifying dentally anxious patients, oral care providers should make use of dental anxiety surveys more often. With the implementation of these scales, specially the MDAS, oral care providers can identify anxiety levels in their patients, and ultimately make better informed diagnosis. Moreover, dental anxiety identification methods should be introduced as part of the dental student's curriculum. Treating dental anxiety is easier when there is a clear understanding of how it is acquired. Previous research suggests that dentists are sufficiently trained to treat patients with mild signs of dental anxiety [32]. Although the treatment options that were presented in this review have been shown to be effective to treat dental anxiety, there is low evidence that suggests that dentists employ these methods in practice. Dentists tend to treat the dental condition on an anxious patient without treating the dental anxiety. Our search suggested that there is a lack of information on dental anxiety training for dental students. Some dentists have expressed that the dental treatment of dentally anxious patients require special skills that could be learned through continuing education courses, suggesting that dental students are being under trained in dental school [14]. However, others believe that treating dentally anxious patients cannot be learned through coursework and they expect the skill of treating dentally anxious patients to come with more clinical experience [14]. Less invasive techniques are constantly being developed and improved to help change patient perceptions of discomfort related to the dental treatment [6]. Additionally, private practice dentistry is still prevalent and conducted in an outpatient setting, allowing for social connectedness between patients and provider⁶. These factors have only helped keep dental anxiety prevalence from increasing, but rates have been maintained. Implementation of dental anxiety identification methods with the use of anxiety measuring scales like MDAS, and anxiety treatment training for dental students and dental providers, will help to finally decrease the prevalence of dental anxiety.

Conclusion

Dental anxiety is a common condition that is constantly misdiagnosed as dental fear and dental phobia in the literature. Its etiology is complex and uncertain, but its identification is simple, easy and can be done routinely in the dental practice. Treatment options vary according to the severity and cause, but low levels can be managed solely by the dental provider.

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