



Pain and Anxiety in Dentistry and Oral and Maxillofacial Surgery Focusing on the Relation between Pain and Anxiety

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Abstract

Pain is unpleasant sensory and emotional experience associated with tissue damage, and classified into nociceptive pain, neuropathic pain and their combination. It is difficult to treat chronic neuropathic pain more than acute nociceptive pain. Anxiety is a feeling of worry, nervousness or unease, which is caused by imminent events or something with an uncertain outcome, and related with pain sensation. Dental anxiety is still prevalent, despite advances in treatment, and affects the utilization of health care services. Painful experience increases the degree of anxiety, which enhances pain sensation and changes it to refractory chronic pain. Dental phobia is categorized specific phobia, and recognized a severe anxiety disorder. Intravenous sedation is useful to reduce anxiety, and often required for patients with dental phobia. In dentistry and oral maxillofacial surgery, painful experiences increase anxiety and/or fear morbidly, and make dental treatment difficult. On the other hand, control of anxiety is useful to prevent developing chronic pain from postoperative pain. Dentists should consider controlling not only pain but also anxiety.

Dental phobia: It is important for dentists to prevent suffering anxiety for dental phobia patients. This review aims to provide an overview of the current knowledge regarding the anxious patients in dental procedure.

Introduction

Pain is defined that “An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage” by the subcommittee on Taxonomy of The International Association for the Study of Pain (IASP). It is suggested that pain is the unpleasant not only from noxious stimuli caused tissue damage, but also from an emotional experience. This definition recognizes the pain perception is modulated by psychological component in the transmission.

Painful sensation is roughly classified into nociceptive pain, neuropathic pain and their combination. Nociceptive pain due to the activation of nociceptors arises from actual or threatened damage to non-neural tissue. Neuropathic pain is developed by a disturbance of function and/or pathological change in the nervous system. Neuropathic pain is refractory in comparison to nociceptive pain, since opioids and Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) are less effective. Anxiety is a feeling of worry, nervousness or unease, which is caused by imminent events or something with an uncertain outcome. In addition, anxiety is often related with fear. Fear is also an unpleasant emotion, which is caused by the belief that something is dangerous. Both feelings are strongly associated with pain experience, and frequently have an effect on our behavior abnormally. The prevalence rates of general anxiety disorder have been reported as a lifetime prevalence is 5% and an annual prevalence is 2- 3% in Western countries [1-3].

Fear and anxiety in dental treatment is a common and potentially distressing problem, both for patients and for dental clinicians. It is reported that 5-7% of people avoid dental treatment in spite of their oral problems, because of their strong anxiety and/or fear for dental procedures [4]. These behaviors are called dental phobia, which is categorized in specific phobia in DSM IV of American Psychiatric Association. Phobia includes fear for snake, injection, blood and so on. Dental anxiety is a strong negative feeling associated with dental treatments and is often confused with dental phobia in dental literatures. Dental anxiety was a state of apprehension of something dreadful in dental procedure [5]. Fear for dental treatment is a common feeling for a lot of patients. It may interfere

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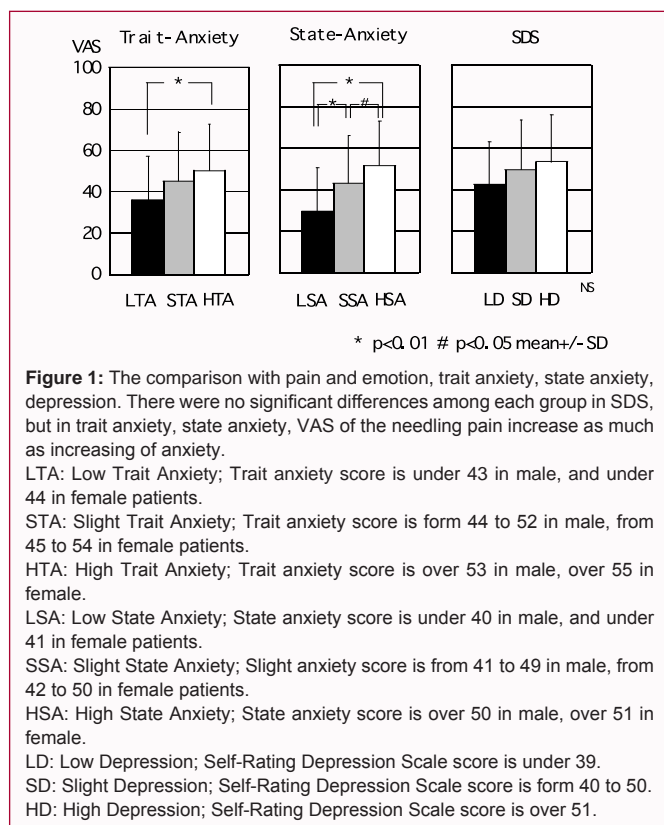
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with patients' compliance and result in deteriorating oral health [6]. Painful sensation is often induced in patients who have previous painful experiences, and they were anxious and afraid of painful treatment in dental office [7].

Anxiety activates sympathetic nervous system, and not only makes increase blood pressure, heart rate and any other vital condition, but also causes any other physical reaction including intensity of pain. The mechanism of this pain enhancement is still unknown. There was few published evidence to compare the utility of measures of pain in dental settings. The purpose of this review is to provide an overview of the current knowledge of the relation between pain and anxiety in dentistry and oral and maxillofacial surgery.

Clinical Feature of the Relationship between Pain and Anxiety

Acute pain

It is well known that transient stress and/or excitement produce antinociception. Pain perception could be suppressed under stressful and/or exciting conditions. For example, wounded soldiers felt less pain in the battle. Athletes who had injured in the game have not noticed their injury sometimes until the end of the game. These psychological factors have effect on the pain perception.

Anxiety has also been related analgesic effect in human. On the other hand, some kinds of anxiety cause an overestimation of painful sensation. Approximately 80% of patients undergoing surgical procedures experience postoperative pain [8]. Anxiety, occurring in the absence of knowledge regarding a forthcoming event, could lead to enhance the pain. It is known that the preoperative anxiety enhances postoperative pain, which is occasionally developed to chronic neuropathic pain. The memory of pain in the previous operation easily causes a feeling of fear, which is strongly related to

development of anxiety. Prevention of the pain memory is important for patients to reduce anxiety and to attenuate postoperative pain.

Chronic pain

A better understanding of the pathogenesis of chronic postsurgical pain is required in order to develop effective prevention and treatment interventions. The persistence of chronic pain after traffic accidents may be related to psychological factors such as anxiety, depression, and posttraumatic stress. Some previous studies have reported on pain and posttraumatic stress together with psychological factors such as anxiety and depression after traffic injuries [9]. Prolonged chronic pain, chronic psycho emotional stress showed a reduction in pain threshold compared to the healthy subjects [10]. Especially, anxiety increases the activity of masticatory muscles to lead abnormal muscle contraction. This abnormal masticatory muscle contraction produces the symptom of tension type headache, muscle soreness, and temporomandibular disorders [11].

Anxiety for Dentistry – Dental Phobia

Dental phobia is classified as a specific phobia, which is triggered by a specific object or situation, such as a fear of certain animals, heights, medical procedure, and blood [10]. Dental phobia is a more serious condition than usual anxiety for dentistry, and leaves people panic-stricken and terrified. People with dental phobia have an awareness that the fear is totally irrational but are unable to do much to change this. They exhibit classic avoidance behavior; that is, they will do everything possible to avoid going to the dentist. People with dental phobia usually go to the dentist only when forced to do so by extreme pain.

Pain and/or anxiety including dental phobia is assessed some tools in clinical investigation. Visual Analogue Scale (VAS) is one of the most typical instruments, which considered being a sensitive and reproducible method of expressing of pain sensation [12]. It is very simple, reliable and valid pain measurement scale evaluating pain. It is also possible to estimate to intensity of anxiety. The patients were interviewed to indicate how much pain is. Zero in scale means "no pain and discomfort" and 100 mean "the worst possible pain and discomfort".

Some questioner evaluating anxiety has also been established. The State Trait Anxiety Inventory (STAI) is a "gold standard" as questioner for anxiety and widely used instrument to measure patients' anxiety [13]. Both the state anxiety and trait anxiety form consists of a different set of 20 statements. State anxiety represents the patient's current anxiety level and the trait anxiety represents patient's underlying (ongoing/personality) anxiety level. Each statement is rated on a four-point scale for the subject's agreement with that statement. The total score for STAI ranges from a minimum of 20 to a maximum of 80 and approximately over 50 is high anxiety situation.

Dental anxiety has been evaluated by the questionnaire based on Corah's Dental Anxiety Scale (DAS) [14]. Each item on the DAS has multiple choices, with scores ranging from 1 (most relaxed) to 5 (most anxious). Total DAS score can be ranged between 4 and 20. Dental phobia was defined a respondent if patient scored 13 or higher on the DAS [15].

The Mechanisms of Anxiety-Induced-Hyperalgesia in Animal Models

It is well known that acute stress produces antinociception.

In contrast, several animal models showed that hyperalgesia is induced by psychological stress including anxiety. These anxiety-induced-hyperalgesia models have been reported that there are some dysfunctions of multiple neurotransmitter systems [16]. Repeated Cold Stress (RCS) or Specific Alteration of Rhythm in environmental Temperature (SART) stress induced anxiety-related behavior [17,18]. Repetitive exposure of these cold environments facilitates response to noxious stimuli in rodents [19,20]. It is observed that peripheral C-fiber activity did not change [17], but N-Methyl D-Aspartate (NMDA) or AMP receptor in Dorsal Horn in spinal nerve in RCS induced hyperalgesia [21]. These phenomena might be consistent with direct modulation of descending pathways in the Rostromedial Medulla (RVM) an area involved in nociceptive modulation [22]. Hyperalgesia can be also associated with potentiated adrenergic sensitivity of primary afferent fibers as a result of up-regulation of α_2 -adrenergic receptors and exacerbation of neurogenic inflammation by α_1 -adrenergic receptors [23].

Pain also enhances emotional discomfort. Suzuki and his colleagues reported that the anxiety and depression-related-behavior were investigated in mice after spinal nerve ligation without damaging the motor function [11]. Their results corresponded with that affective disorders, such as depression and anxiety, would be enhanced in patients suffering from chronic pain.

In relationship between pain and anxiety, the details of mechanisms are still unclear. Further studies are needed to examine the neural mechanism of affective changes, especially in hypothalamo-pituitary-adrenal axis, hippocampus and amygdala.

Management of Dental Anxiety and Pain

Dental anxiety has been shown to affect some activities in multiple systems. But, there are a few literatures about relationship between anxiety and pain. Sanikop and colleagues demonstrated to evaluate whether the dental anxiety enhances pain perception during scaling and root planning [24]. From this observation, there is significant correlation between anxiety and pain in one hundred dental patients. Furthermore, it tends to be more dental anxiety in female than in men. It has been reported that most children (85%) accurately recalled their pain. It suggested that they might negatively distort recollections of painful experiences to be anxious patient for dentists [25]. Oliveira et al also evaluated the relationship between dental anxiety and pain in 2735 children patients. It is reported that dental anxiety was related the memory of pain and/or fear of dental procedure in children especially under five years old. It is emphasized that dental pain should be controlled in pediatric dentistry since the first experience affects patients their oral health care for the long time [26].

It is recommended for patients with dental phobia to give sedation during dental treatment for both anxiety and pain management, since anxiety may enhance pain [27]. Enquist and Fischer 1997 [28] performed a study using hypnosis as an analgesic aid in dental procedures. Sixty-nine participants were randomly assigned in two groups; 33 patients received hypnotherapy (hypnosis group) and 36 patients received no form of therapy or treatment (control group). The hypnosis group listened to a self-hypnosis audio session for a week leading up to their procedure. The hypnotherapy consisted of healing suggestions and helped the patients overcome their pain and anxiety.

Ideal perioperative drug for dental phobia might be required

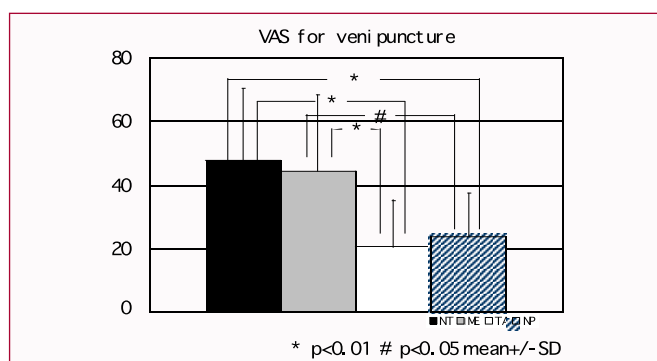


Figure 2: The reduction of state anxiety attenuates needling pain (derived from reference #30).

Subjects were divided into four groups as follows: no treatment group (NT: n = 25, 11 males, 14 females); Mecobalamin group (ME: n = 25, 12 males, 13 females); Tandospirone group (TA: n = 22, 10 males, 12 females); and no dental phobia group (NP: n = 20, 10 males, 10 females). All of subjects were assessed the anxiety with STAI (STAI-1). The subjects in the ME and TA groups were given 1.5 mg of Mecobalamin or 30 mg of Tandospirone, respectively, and anxiety was examined sixty minutes after the medication was administered (STAI-2). The second evaluation was followed immediately by venipuncture, and pain caused by the needle was assessed. There was no significant change for trait anxiety in either STAI-1 or STAI-2 in the four groups. In contrast, the state anxiety increased significantly in the NT or ME, but not the TA or NP groups. The needling pain was significantly lower in the TA group as much as NP group. This result suggested that anxiety amplifies pain on dental phobia patients and the suppression of patient anxiety could also lead to the reduction of pain.

both an anti-nociception and an anxiolytic property. Pregabalin, is a Gamma-Amino-Butyric Acid (GABA) analogue, could be an attractive drug for perioperative analgesia. Pregabalin possesses an anxiolytic property and has been effective for anxiety. White et al. has reported that preoperative administration of pregabalin exerted both anxiolytic and an analgesic effect [29]. Gabapentin should be beneficial as an analgesic agent for the dental phobia patients.

We evaluated that relationship between anxiety and painful sensation in dental phobia patients [30]. In this study, 71 males, 107 females were enrolled. Anxiety was evaluated using the STAI and depression was evaluated using the Zung Self-Rating Depression Scale (SDS). In all subjects, a same operator performed venipuncture and cannulation on the median cubital vein with a 22-gauge needle. Pain caused by the needle was measured immediately after the puncture using the Visual Analogue Scales (VAS). The patients were divided into three groups. VAS-score in painful sensation for each group increased significantly with regards to degree of trait anxiety and state anxiety, but not with depression (Figure 1). In subjects with increased anxiety before venipuncture, VAS-score for needling-pain was higher than that in unchanged anxiety subjects. The preoperative administration of tandospirone, which is 5HT_{1A} agonist and has anxiolytic property, significantly suppresses the pain sensation (Figure 2).

Conclusions

Preoperative situation enhanced patients' anxiety leading to increase in pain intensity. Although the details of mechanism are still unclear, anxiety might be affected on central nerves system. Anxiety suppresses the descending inhibition systems to enhance pain perception. Dentists should consider to reducing both pain and anxiety that related to dental procedure, since anxiety enhances painful sensation and makes it to refractory chronic pain. In Dentistry and Oral and Maxillofacial Surgery, the 3 ideal conditions are to block

acute nociceptive pain, not to form a painful memory, and to control anxiety for dental treatments.

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