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Case Report

Procaine Injections in Myofascial Tension Points in the Treatment of Anxiety Disorders: A Case Series

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Abstract:

This case series explored the potential therapeutic effects of 0.5% procaine injections in myofascial points for patients with severe anxiety. Anxiety disorders involve excessive fear and tension, often affecting daily activities. These disorders are linked to neurological circuits, inflammatory responses, and the sympathetic nervous system, which contribute to pain and stress. Procaine, a local anesthetic, is thought to interrupt the cycle of neurogenic inflammation and nociceptor excitation, potentially alleviating symptoms of anxiety. Six patients, assessed using the Beck Anxiety Inventory, were treated with procaine injections. Results showed significant improvement: four patients (66.7%) reduced their anxiety from severe to mild, and two patients (33.3%) from severe to minimal. The pre-treatment average Beck Anxiety Inventory score was 39, and the post-treatment average was 10. These promising results suggest procaine as a possible treatment for anxiety disorders, warranting further investigation in larger clinical studies.

Key words: anxiety disorder; myofascial tension points; sympathetic nervous system; Beck Anxiety Inventory; neural therapy, procaine

List of Abbreviations:

AD : Anxiety Disorders

BAI : Beck Anxiety Inventory

ANS : Autonomic Nervous System

LAs : Local Anesthetics

MTPs : Myofascial Tension Points

1. Introduction

Anxiety disorder (AD) represents one of the most prevalent psychiatric disorders, with a prevalence of 6.7% in Spain and 4% globally [1, 2]. This type of mental disorder is associated with a reduction in functionality and quality of life, which requires an increase in health care. An average of 4.6 workdays are estimated to be lost per month, generating a cost of more than $4 billion [3]. Obtaining information regarding patients' symptoms is the first step to achieving an initial diagnosis, which allows for the establishment of the treatment to follow. The characteristic symptoms of AD, such as worry, panic attacks, anticipatory anxiety, agoraphobia, and avoidance behaviors, are included. There are also associated physical symptoms: difficulty breathing, dizziness, or palpitations [4]. Furthermore, AD might occur or participate in the development or worsening of cardiovascular diseases, pulmonary diseases, gastrointestinal diseases, chronic pain, migraines, and cancer [4]. Screening measures applied in primary care can aid in the diagnosis of AD, such as the Beck Anxiety Inventory (BAI), which allows for the determination of the somatic symptoms of anxiety [5]. Pharmacotherapy and psychotherapy represent the first-line treatments, with serotonin and

norepinephrine reuptake inhibitors being the most common pharmacological options. Cognitive behavioral therapy is the most effective psychotherapy [6]. There is enormous variability in the treatment effectiveness, and in some cases, the condition becomes chronic. To select the proper treatment, physicians must consider current and previous treatments, age, gender, comorbid diseases, medical and personal history, patient preferences, cost, and access to treatment. The treatment of this disorder represents a real challenge that requires continuous evolution.

Neurological bases that establish a link between balance and anxiety [7, 8], show that the comorbidity between balance disorders and AD could arise from neural circuits involved in the control of vestibular processing [9], autonomic function [10–12], emotional reactions [13, 14] and anxiety [15–17]. Initially, visceral and balance-related information from vestibular, proprioceptive, interoceptive, and visual afferent pathways is processed in the brain stem and modulated by the cerebellum [18], which in turn contributes to feedback from hypothalamic components of the parabrachial network [9]. The parabrachial nucleus participates in the generation of the feeling of well-being and emotional and behavioral responses, a network of nuclei converging visceral information processing and vestibular pathways that appear to be involved in anxiety, avoidance conditioning, and conditioned fear [16, 17]. Behavioral (motor) responses are directly influenced by descending orders to the brain stem circuits and indirectly by the locus coeruleus and raphe nuclei [19, 20]. In anxiety states, monoamine pathways increase the sensitivity of vestibular reflex pathways to vestibular stimuli. This increase exacerbates an internal sense of distress, eventually producing discomfort in space and movement [20–23].

The sympathetic nervous system is the division of the autonomic nervous system (ANS) that allows adaptation to stress throughout an ergotropic reaction, corresponding to the fight-or-flight response (24), by increasing heart rate, blood pressure, and respiratory rate [25, 26]. Stress situations sustained over time, such as AD, cause deregulation of the function of the vagus nerve, preventing the reestablishment of autonomic homeostasis because an aberrant pattern of neuronal activation is established [12, 27]. In addition, hyperactivation of the ANS may lead to inflammatory processes [28]. "Sympathetic afferent coupling" is a phenomenon that can occur in pathological conditions (such as mechanical trauma, infection, or psychological stress) and is the short circuit between sympathetic efferent fibers and nociceptive afferents [12, 29, 30]. In this way, immune responses are modulated and enhance pain and inflammation, establishing a positive feedback loop that perpetuates itself [31, 32]. This alteration leads to negative physical outcomes, such as vasomotor, sudomotor, gastrointestinal, pupillomotor responses, and elevated muscle tension [11, 25, 33]. Moreover, there is an association between sustained stress over time and muscle tension [12, 34, 35]. Previous research supports the existence of positive feedback loops in pain and inflammatory pathways controlled by AD [31, 32, 36, 37].

Our recent scoping review [38] documents the therapeutic applications of local anesthetics (LAs) in treating various clinical conditions beyond pain. The review consolidates existing scientific insights into using low-dose LAs for purposes extending beyond their conventional role as anesthetics. The evidence supports the use of LAs in managing pain, anxiety, and depression, but they also show promise in other areas. LAs play a role in reducing both acute and post-traumatic stress, in line with the principles of what is known as neural therapy. This therapeutic approach emphasizes the regulatory functions of the ANS. By selectively targeting specific neural regions with LAs, a regulatory response is initiated, which can enhance physical, mental, and emotional well-being.

It has been possible to verify the convergence of visceral and somatic nociceptive fibers in multi-receptive neurons of the spinal cord. These pathways project to higher brain structures [39], sympathetic and parasympathetic nuclei [40], and the innervation of skeletal muscles [37]. Consequently, this might increase peripheral myofascial tone with turgor in the skin, which produces an amplification in nociception [32]. The reciprocal action between peripheral and central mechanisms forms a positive feedback loop [37] however, LAs could transiently alter these reflex pathways, facilitating a reversion to physiological homeostasis [31, 37, 41].

This study aimed to examine the effects of 0.5% procaine injections in myofascial tension points (MTP) in six patients who had severe anxiety as the main factor according to the BAI.

2. Methodology

The BAI is the self-report inventory for measuring anxiety severity used as the primary measure in this study. The BAI has proven to be a valid instrument for discriminating and detecting patients with anxiety-related pathology. The questionnaire was conducted before the first session of neural therapy and after the last session. Participants were instructed to respond to the question based on how they had felt during the previous week, including the day of assessment. The BAI consists of 21 items, each representing a symptom of anxiety. Respondents score each symptom on a scale from 0 (Not at all) to 3 (Severely). The total score, which sums all item scores, ranges from 0 to 63, with higher scores indicating greater anxiety. Anxiety levels are categorized into four groups: minimal (0—7 points), mild (8—15 points), moderate (16—25 points), and severe (26—63 points) [42].

Subcutaneous/intramuscular injections of 0.5% procaine into myofascial tension points (MTPs) were administered. Therapist considered palpation and muscle tender sites reported by the patient to guide the injection points. The most frequent puncture sites were MTPs in the diaphragmatic, sternal, and occipital areas and near the cervical sympathetic chain. The puncture points are specified in each of the cases presented below. The sessions were spaced 2 weeks apart for the first and second sessions and 4 weeks for the successive sessions (Figure 1).

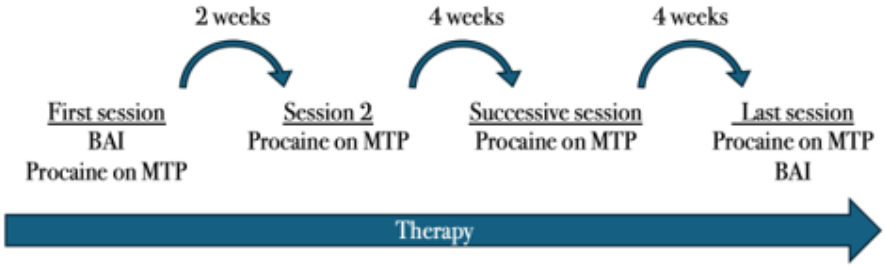

Figure 1: Experimental design of therapy with LAs used-on patients with severe level of anxiety. The BAI score results were collected in the first session, and treatment began with procaine injections in the MTP. The time between sessions was two weeks between the first and second sessions and four weeks between successive sessions. In the last one, the BAI questionnaire was also tested. Depending on the patient's needs, the number of sessions ranged between 3 and 6. BAI (Beck Anxiety Inventory), MTP (Myofascial tension points).

3. Case presentation

All patients were users of the Institute of Neural Therapy in Sabadell (Barcelona, Spain). The treatment involved 6 patients: 5 women and 1 man, aged from 18 to 68 (average = 45 years old ± 20.7), all with severe AD.

Data was collected, and all information was anonymized. Therefore, institutional review board approval was optional for this study. All patients provided verbal and written informed consent for this minimally invasive treatment modality and the publication of this study. The reporting of this study conforms to the CARE guidelines [43].

Table 1 summarizes the clinical symptomatology, the evolution of the patients before and after the intervention and their comorbidities.

The initial BAI score showed severe symptomatology in all six patients (100%). After the intervention, all of them (100%) showed a clinically significant improvement. Four patients (66.7%) went from severe to mild anxiety, and two patients (33%) went from severe to moderate. The mean BAI score before the intervention was 39 (±10.3), and after the intervention, 10 (±3.7), resulting in a difference of 29 (±4,5) points (mean ± SEM) (Figure 2). The average number of neural therapy sessions was 3.83 (±1.17), ranging from 3 to 6. Patients exhibited a good tolerance to the intervention, with no adverse effects detected.

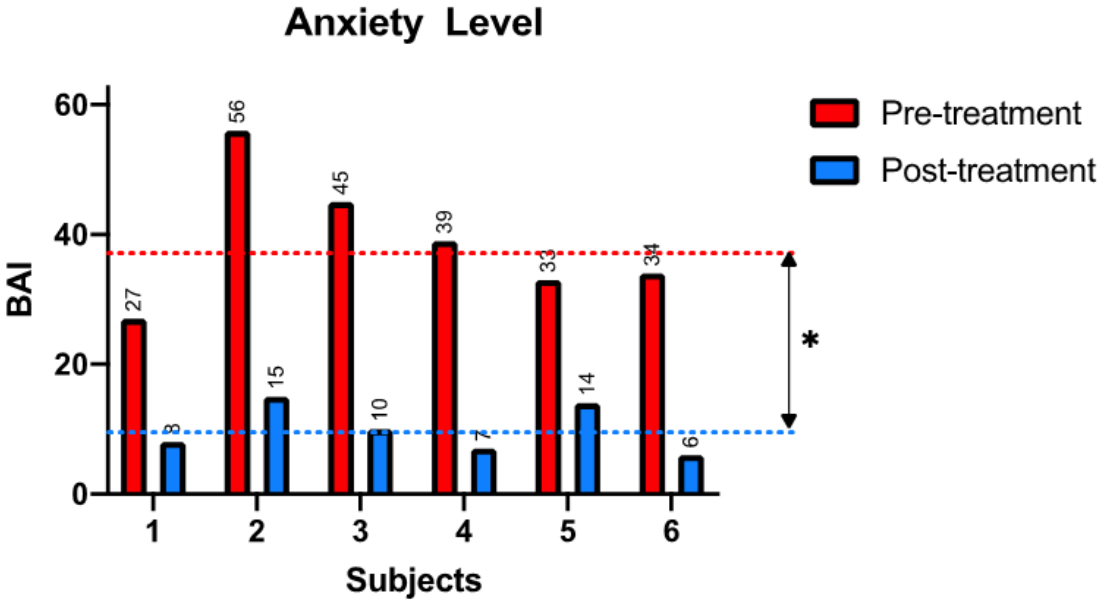

Figure 2: Effects of therapy with 0,5% procaine on patients with severe anxiety. The anxiety level of 6 patients was measured by BAI scale pre-treatment (red columns) and post-treatment (blue columns). The mean BAI score before the intervention was 39 (±10,3) (red lines), and after the intervention, 10 (±3,7) (blue lines), with differences between means of 29 (±4,5) points of difference (mean ± SEM).

Patients			BAI score		Neural Therapy sessions			
Case	Sex	Age	Initial	Final	Number of interventions	Myofascial Tension Points	Main reason for consultation	Comorbidities
1	M	18	27	8	3	Scalp, occipital, trapezius, lumbar and forehead scar areas	Anxiety, agoraphobia and insomnia	Low back pain
2	F	19	56	15	4	Subdiaphragmatic, trapezium, pre-thyroid, muco-oral and suboccipital	Anxiety and agoraphobia	Tachypnoea, choking, auditory hypersensitivity, hyperhidrosis, nausea and fainting sensation
3	F	68	45	10	5	Suboccipital, temporal, trapezius, pectoral, chest, epigastrium and scars	Anxiety	Choking sensations, claustrophobia, insomnia and cervical pain
4	F	57	39	7	4	Subdiaphragmatic, suboccipital, cervical and lumbar	Anxiety and dizziness	Feeling of tension in the epigastric, cervical and suboccipital area
5	F	67	33	14	5	Subdiaphragmatic, thoracic, suboccipital and oral	Anxiety and depressed mood	Chronic obstructive pulmonary disease, chronic pharyngitis and cervical pain
6	F	42	34	6	6	Subdiaphragmatic, suboccipital, thoracic and trapezius	Anxiety and social agoraphobia	Pressure behind the eyes, blurred vision, tremors, chest pressure and suffocation
BAI: Beck Anxiety Inventory								

Table 1: Patient's demographic, clinical characteristics, treatment and clinical evolution.

3.1. Case 1

An 18-year-old male patient presented with anxiety, agoraphobia, and insomnia since his parents' divorce 2 years earlier. He had quit studying due to difficulties with concentration. He reported tension in the epigastric and thoracic areas, which increased with anxiety, and had experienced low back pain for months.

Psychopharmacological treatment: The patient dropped out due to drowsiness.

Medical history: He had numerous episodes of tonsillitis in childhood.

Dental history: He had undergone several root canals.

Physical examination: A scar on his forehead caused by a fall from a bicycle.

Initial BAI: patient scored 27 points (severe anxiety).

Treatment and evolution: At the first control, we injected procaine 0.5% into the MTPs located in the scalp, occipital, trapezius, lumbar area, and forehead scar. The patient reported an immediate feeling of relaxation and a reduction in lower back pain. At the second session, two weeks later, the patient reported overall improvement, feeling a reduced sense of general fear and anxiety, and a marked decrease in referred discomfort in epigastrium, chest, and lumbar areas. On the third visit, one month later, the patient felt free of tension, experiencing self-confidence and tranquility. The same MTPs were injected during the second and third sessions.

Results: His BAI score was reduced to 8 points (mild anxiety). The patient was able to resume his studies and sports. This improvement persisted at the 3 and 6-month follow-up visits, during which procaine was injected into the same MTPs.

3.2. Case 2

A 19-year-old female patient presented with severe anxiety, agoraphobia, with signs of tachypnoea, including a choking feeling, auditory hypersensitivity, hyperhidrosis, nausea, and a sensation of fainting. Symptoms started 6 years ago, coinciding with parental separation and other significant traumatic stressors.

Psychopharmacological treatment: None.

Medical history: Retinoblastoma was diagnosed at the age of 2 months, resulting in an enucleation of the left eye and a prosthesis at 22 months. The patient had a history of recurrent tonsillitis, otitis, and headaches.

Dental history: Lower third molars were removed.

Physical examination: A scar on her right shoulder from self-injury following her parents' divorce.

Initial BAI: The patient scored 56 points (severe anxiety).

Treatment and evolution: After procaine injections in the MTPs of the subdiaphragmatic, trapezius, and pre-thyroid areas, as well as in the muco-oral tension areas, the patient reported immediate relaxation and sense of well-being, stating she was able to laugh, which she recalled she had not done for a long time. At the second follow-up, 2 weeks later, she reported a subjective feeling of improvement in both anxiety and mood. The same points were injected again, in addition to the MTP in the suboccipital area. After the third and fourth sessions, one and two months, respectively, the patient reported significant improvement in her mood. The same MTPs were injected during these sessions.

Results: Her BAI score decreased to 15 points (mild anxiety).

3.3. Case 3

A 68-year-old female patient presented with several episodes of anxiety that began with the onset of menopause, 20 years ago, with choking sensations, claustrophobia, and insomnia. She had a history of depression thirty years ago, for which she was treated for two years. Additionally, she complained of left cervical radicular pain radiating to the hand for 1 year (VAS 6/10), which worsened with activity and anxiety.

Psychopharmacological treatment: Lorazepam 0.5 mg each day.

Medical history: Recurrent tonsillitis since childhood, with a severe episode 10 years ago. Menstrual-related frontal headaches and recurrent urinary tract infections. She also experienced postpartum depression and insomnia after her sister's death, which required 2 years of medication.

Dental history: Tooth extraction due to trauma without replacement at age 18 and several root canals.

Initial BAI: The patient scored 45 points (severe anxiety).

Treatment and evolution: Procaine was injected in the suboccipital, temporal, trapezius, pectoral, chest, and epigastrium MPTs. The patient reported immediate relief from cervical pain (VAS 3/10). At the second follow-up, two weeks later, she returned feeling greater tranquility and reported an improvement in insomnia (no Lorazepam required) and cervical pain (VAS 5/10), with fewer exacerbations. Over the next three follow-up sessions at 1, 2 and 3 months, the patient reported significant improvement in her anxiety, and the feeling of claustrophobia did not reappear (from VAS 10/10 to 1/10).

Results: Her BAI score decreased to 10 points (mild anxiety). Cervical pain improved moderately in intensity (VAS 4/10) and became less constant, with reduced irradiation limited to the elbow during follow-ups.

3.4. Case 4

A 57-year-old female patient presented with anxiety, dizziness, nausea, and sensation of tension in the epigastric, cervical, and suboccipital areas, as well as tachycardia that had persisted for the last 6 months, coinciding with an occupational stressor. She reported experiencing hot flushes originating from the diaphragm.

Psychopharmacological treatment: None.

Medical history: The patient has a previous history of migraines, cervical pain, and vertigo, with no reported symptoms of this condition in the last decade.

Dental history: Third molars were extracted 12 years ago.

Physical examination: A retained root in tooth 36 was detected.

Initial BAI: The patient scored 39 points (severe anxiety).

Treatment and evolution: The patient experienced significant relaxation after procaine injections into the subdiaphragmatic, suboccipital, cervical, and lumbar areas MTPs. The patient demonstrated a clear improvement after three monthly follow-up sessions, and the retained root was subsequently removed to prevent potential complications.

Results: Her BAI score decreased to 7 points (mild anxiety), and she no longer exhibited dizziness, hot flushes, tachycardia, or epigastric tension.

3.5. Case 5

A 67-year-old female patient presented with anxiety and depressed mood persisting for several years.

Psychopharmacological treatment: None.

Medical history: The patient has chronic obstructive pulmonary disease with baseline dyspnea on moderate exertion, frequently exacerbated by pneumonia and bronchitis. She also has chronic pharyngitis and cervical pain with 4 cervical disc herniations.

Dental history: The patient had three implants, two of which fractured two weeks before the first visit.

Initial BAI: The patient scored 33 points (severe anxiety).

Treatment and evolution: Procaine was injected into the MTPs of the subdiaphragmatic, thoracic, and suboccipital areas and oral fascial tension points (submucosal). Throughout the four follow-up sessions, each separated by one month, the patient reported progressive overall improvement. The same MTPs were treated in each follow-up sessions.

Results: Her BAI score decreased to 14 points (mild anxiety). There was also subjective improvement in chronic pharyngeal inflammation, neck pain, and dyspnea.

3.6. Case 6

A 42-year-old female patient presented with anxiety and social phobia that had persisted for 4 years, fluctuating over time and worsening during menstruation. The anxiety crises were accompanied by a feeling of pressure behind the eyes, blurred vision, tremors, chest pressure, and sensations of suffocation.

Psychopharmacological treatment: None.

Medical history: The patient has a history of frequent tonsillitis and otitis in childhood, as well as recurrent colds as an adult. She has experienced tinnitus for several years and was born via forceps delivery.

Dental history: Tooth extraction, palatal retention, and malocclusion.

Physical examination: Appendectomy scar and a right pretibial scar from a motorcycle accident.

Initial BAI: The patient scored 34 points (severe anxiety).

Treatment and evolution: Procaine was injected into the MTPs of the subdiaphragmatic, suboccipital, thoracic, trapezius, and scar areas. The patient reported significant relief immediately after the first and second interventions, 2 weeks apart. On the third visit, a month later, the patient presented with intense anxiety accompanied by a week-long frontal migraine and insomnia, coinciding with divorce and custody proceedings for her daughter. The same MTPs were injected, along with new MTPs in the temporal, mastoid, pre-thyroid, and lumbosacral areas, as well as the supraorbital nerves.

Results: After 6 monthly interventions, her BAI score decreased to 6 points (mild anxiety).

4. Discussion

LAs have been used as a safe therapy for over 120 years. We selected procaine due to its safety profile, lower neurotoxicity, prolonged action beyond pharmacological duration, and additional favorable effects on microcirculation (44, 45). The mechanism of action of LAs involves blocking voltage-dependent sodium channels, thereby inhibiting nerve conduction. However, therapeutic regulation does not aim for the effect of local anesthesia but rather seeks to "restart" pathological nerve conduction (31, 36, 41, 46). Furthermore, proposed mechanisms of action include leukocyte inhibition, decreased inflammatory mediators, and reduced vascular hyperpermeability and edema formation (38, 47, 48). It has been observed how low concentrations of procaine (0.5–1%) injections (44) in MTPs modulate the activation of the sympathetic nervous system, thereby reducing inflammation levels and altering the generated somatosensory circuit (38, 45). LAs, administered both intravenously and via stellate ganglion block, have been used to treat anxiety (49–51). Multiple published case series have shown beneficial effects of right-sided stellate ganglion block with LAs for the treating anxiety symptoms associated with post-traumatic stress disorder without adverse effects reported (52), as well as for mood and panic disorders (53). The treatment was offered as a first choice or as a complement already undergoing treatment with psychotropic drugs. Patients were not

required to discontinue any other treatment. Depending on clinical necessity, patient may receive treatment once a month or more frequently.

It is well known that, even at rest, patients with social phobia and panic disorder tend to exhibit sympathetic activation. Specifically, patients with generalized AD show increased muscular tension without sympathetic activation, while those with obsessive-compulsive show increased muscular tension accompanied by sympathetic inhibition [54]. Chronic myofascial pain triggers have been shown to demonstrate increased electromyographic activity in situations of mental stress [55, 56], confirming that mental stress may have a specific influence on muscle activity and pain. Hence, these findings suggest that excessive and uncontrollable worry, which occurs in anxiety, can lead to muscle tension and concomitant muscle pain [57]. The objective of neural therapy is to identify and manipulate sympathetic myofascial tension, based on the connection between the fascial system and sympathetic receptors. We aim to counteract the inflammatory response induced by chronic stress by using LAs to regulate the AD and harness its sympatholytic, vasodilator, and anti-inflammatory effects. This approach interrupts the nociceptor-sympathetic-neurogenic inflammation cycle associated with chronic pain and stress [38]. Patients undergoing trigger point injection therapy with low baseline anxiety and higher pain acceptance tend to achieve better outcomes. Conversely, individuals with high anxiety and depression respond poorly to various pain treatments and are more likely to experience recurrent pain, as highlighted in numerous studies [57]. In this regard, our intervention could also help enhance outcomes for other conditions such as pain [58, 59].

Considering the rapid and immediate nature of the response, particularly noting that benefits were observed in all cases, it may be considered unlikely that the improvements were attributable to other treatments. [44] This is a straightforward treatment with few side effects and a comparatively low cost, and in some cases, it could help to reduce the need for psychotropic drugs, which carry their own associated side effects. This report highlights the use of low-dose LAs as a potential treatment with AD patients.

Although this is a case series and it is not possible to determine efficacy, the results encourage further research in this area. The participants were patients who sought neural therapy treatment at our clinic and follow-up session assessments were limited, improved longitudinal protocols would further strengthen our evaluations. While our patients exhibited significant improvements and the underlying mechanisms have been identified, case series alone are insufficient to establish causality. These findings emphasize the need for clinical trials to further explore this relationship and assess the efficacy of the intervention.

5. Conclusion

Patients with AD tend to show increased muscular tension. This case series suggests that LA injection in MTPs may be a beneficial option for managing anxiety symptoms in AD patients. Current knowledge regarding the mechanisms by which LAs act on the ANS suggests a role for these drugs in this patient population. The use of the BAI scale allowed us to quantify improvements. To the best of our knowledge, this is the first report of AD treated with LA injections in MTPs. LAs administered at doses below the anesthetic threshold may be a safe and effective treatment for controlling AD symptoms. Future randomized clinical trials should evaluate the efficacy, safety and mechanisms of LA injections in MTPs for treating AD symptoms.

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7. Author contributions

All authors contributed to the literature review, interpreted the data, and drafted and critically revised the manuscript. David Vinyes was responsible for the patients' care and follow-up. All authors have read and approved the submitted version of the manuscript.

8. Declaration of conflicting interests

The authors declare that there are no conflicts of interest.

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