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Neuropathic pain after spinal cord injury resistant to conventional therapies – case report

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Summary

Introduction. There are patients with neuropathic pain in whom the treatment is ineffective, despite the fact that is conducted with adherence to the current guidelines. In these patients alternative treatment methods such as hypnosis could be effective.

Material and method. The paper presents a case of a 58-year-old man with central neuropathic pain after cervical spinal cord injury. The conservative treatment with antiepileptics (including gabapentoids), antidepressants (tricyclic and selective noradrenaline and serotonin inhibitor — SNRI) and opioids was not effective. In the pain management centre the celiac plexus stimulation and neuromodulation was performed, however, with no positive results. The patient was referred to the psychiatrist using hypnosis in his medical practice.

Results. The psychiatrist qualified the patient to pain treatment with hypnosis. After several hypnotic sessions the pain intensity score in numeric rating scale (NRS) decreased from NRS 7 to NRS 5 points and became acceptable for the patient.

Conclusions. Hypnosis can be considered an effective method of neuropathic pain treatment in some patients.

Key words: neuropathic pain, hypnosis

The study was not sponsored

Introduction

Neuropathic pain can result from a lesion or a peripheral or central somatosensory system disease. Neuropathic pain is a clinical description, not a diagnosis and a diversity of associated conditions is one of the reasons why the epidemiology of neuropathic pain has not been adequately studied.

Current pooled estimates suggest that neuropathic pain may affect as much as 3% of the U.S. and European population. Ample evidence indicates that neuropathic pain impairs patients' mood and quality of life. In the United States health care system, the costs associated with chronic pain have been estimated at $150 billion annually, of which almost $40 billion are attributable to neuropathic pain [1].

Neuropathic pain treatment is difficult and often ineffective as the therapeutic effect of the majority of analgesics including strong opioids is unsatisfactory. Some studies have investigated alternative, non-pharmacological approaches to neuropathic pain treatment, such as Transcutaneous Electrical Nerve Stimulation (TENS), Percutaneous Electrical Nerve Stimulation (PENS), supportive psychotherapy, and cognitive-behavioural therapy [2–4].

In difficult and resistant to conventional treatment cases of neuropathic pain, unconventional methods are recommended. Currently, there seems to be a growing interest in hypnotic treatments for chronic pain. The results from studies using functional magnetic resonance imaging confirmed that chronic pain experience is linked with the supraspinal sites activities. Using these imaging studies, it was demonstrated that that hypnosis modifies the neurophysiological processes associated with chronic pain [5]. It has also been confirmed, that changes in the areas related to pain perception, especially thalamus are an effect of analgesia suggestion [6].

There are many definitions of hypnosis or hypnotherapy as the nature of the phenomenon is still unknown. In the available literature there is no consensus among the researchers of the phenomenon, and the described explanations are only some chosen hypotheses.

Spegiel defines hypnosis a state of vigilance, in which a hypnotised person focuses all their concentration ability on one point, minimising concentration on other points [7]. On the other hand, Psychological Medicine Group of the British Medical Association describes hypnosis as a temporary condition of altered attention in the subject and in which a variety of phenomena may appear spontaneously or in response to verbal or other stimuli. These phenomena include alterations in consciousness and memory, increased susceptibility to suggestion, and the production in the subject of responses and ideas unfamiliar to him in his usual state of mind. Further, phenomena such as anaesthesia, paralysis and rigidity of muscles, and vasomotor changes can be produced and removed in the hypnotic state [8].

In the considerations on the nature of hypnosis and the mechanisms of hypnotic behaviours we can distinguish three basic theoretical approaches: trance, non-trance and interactive approach.

The trance approach is historically the oldest. It describes hypnosis as an altered consciousness state, thanks to which such phenomena as age regression, positive

or negative hallucinations can be incited. The representatives of such approach are Bowers (1966), Evans (1968), Hilgard (1986), Orne (1959) and Shor (1959) [9–13]. According to this concept, hypnosis is an altered state of consciousness, different from other consciousness states such as sleep, wakefulness, intoxication or unconsciousness. It can reach various depths, depending on hypnotisability and hypnotic induction. The depth of a hypnotic state conditions the occurrence of certain phenomena or behaviours in hypnosis. Hilgard is the author of two theories of hypnotic phenomena – non-dissociative and developmental-interactive theories.

In opposition to these views, there are theoretical interpretations of the supporters of a non-trance approach. In this group, a socio-psychological, cognitive-behavioural and role-playing theories can be distinguished [10, 14, 15]. The followers of a non--trance approach question the legitimacy of the notion of trance as a special state, fundamentally different from other states. According to them, this term is misleading and redundant, and reactivity to suggestions made both after the hypnotic induction and without it can be explained by making reference to terms that are an integral part of social psychology, such as attitudes, expectations, approaches, motivations. According to the creators of this theory, each studied person has specific attitudes, expectations to the experiment, in which is participating and they determine the range of reactivity to received suggestions.

There were attempts of formulating a so-called interactive hypnotic theory both with reference to a therapeutic situation and an experimental one [10, 16]. These authors adopted a view that hypnosis is a result of a special interaction between the hypnotist and the hypnotised.

Hypnosis is a subjective state which depends on the person's hypnotisability (ability to become hypnotised) [10]. Entering a hypnotic state usually requires another person who plays the role of a hypnotist; however, spontaneous trance is also possible. A hypnotic experience is a controlled situation, where the hypnotist controls the behaviour of the hypnotised, who enters a state of lower criticism and is therefore more prone to suggestion. The hypnotised person can stop the process anytime. Suggestibility depends on the depth of hypnosis that a hypnotised person can reach in certain context and with a certain hypnotist [7].

In hypnosis, imagined situations may be perceived as real stimuli evoking somatic reactions. The mechanism of semantic information dominance over the sensory one together with the mechanism of fear reduction is successfully used in hypno-analgesia [17]. The hypnotised person may transform an idea into an act as thoughts, acts, feelings and imagination are transformed before the rational mind's intervention. The hypno--analgesia is related both to the experience of intensity of pain and pain-related emotions [18, 19]. Hypno-analgesia can be seen as an active process of turning off the consciousness which requires an inhibitory effect not related to consciousness, where the Supervisory Attentional System (SAS) plays an important role [20].

There are neurological proofs for hypnosis and, especially for hypnotic pain treatment. Rainville et al. confirmed that suggestion in hypnosis changes the activity in ACC area, related to cognitive and emotional dimensions of pain. Using the CNS imaging technique, Rainville et al. confirmed that different hypnotic suggestions in-

fluence different brain areas related to sensorial and affective pain components [21, 22]. Aleksandrowicz, using fMRI technique confirmed that applying suggestion may be connected with the heightened activity of the right hemisphere anterior cingulate gyrus (R-ACG) and that hypnotic induction correlates with heightened activity in orbitofrontal regions, especially in the left hemisphere [6].

Hypnosis might be an effective tool in behaviour shaping, using brain plasticity. To implement these non-pharmacological therapies, a multidisciplinary team focused on individualising pain management is needed [23].

Case report

A 58-years old male sustained cervical vertebral column trauma. He fell off the ladder head down and this resulted in C1–C7 multiple fractures and spinal cord injury (SCI).

Two months after the accident, when physiotherapy started, a pain in the left and lower part of the abdomen occurred. Initially, it was a dull sensation with moderate intensity. During next four months the pain character changed into piercing and stinging. The area of distribution increased, incorporating the whole trunk and impeding normal breathing. Each meal provoked an additional pain, deep and diffuse with generalised localisation in the abdomen. The visceral pain was diagnosed. Physiotherapy and baths were increasing the sensation of pain and causing limb numbness. These subjective symptoms were accompanied by haemodynamic response in the form of blood pressure increase.

The patient was treated in several pain management centres, receiving combined therapy with antiepileptics (including gabapentoids), antidepressants (tricyclic and SNRIs) and opioids. Acupuncture was also employed. None of the therapies brought about the expected effect. Somatic origin of visceral pain was excluded, based on numerous radiologic and endoscopic examinations. The possibility of implanting spinal cord was excluded due to the significant deformity of cervical spine and due to the complexity of pain symptoms the patient was not qualified for deep brain stimulation. The decision was made to perform a trial celiac plexus neuromodulation. Celiac plexus stimulation produced haemodynamic response of blood pressure reduction (30% from baseline) and bradycardia of 40 beats per minute. The patient noticed a tingling sensation in the area innervated by celiac plexus and estimated pain intensity score NRS 7 points. Lacking significant improvement in patient's state in 2 days after the electrode implantation, a decision was made to perform a spinal injection at L3-L4 level with 1 mg of morphine and 75 μg of clonidine. No analgesic effect was achieved.

A psychiatrist was consulted and the patient was subject to hypnosis. The consulting psychiatrist diagnosed the patient with neuropathic pain on psychosomatic basis. A standard hypnotic induction with elements of the Schultz's autogenic training and neuromuscular relaxation techniques employing Autonomic Nervous System were used in the studied patient. The neuromuscular relaxation technique involved inciting by autosuggestion experiences similar to the hypnotic state and internal meditation. The autogenic training consisted of six elements, one taking place after the other:

inciting the feeling of heaviness, inciting the feeling of heat, regulation of heart rate, regulation of normal breathing, inciting the feeling of heat in the solar plexus (abdominal cavity), inciting the feeling of cold on the forehead.

The deepening of the hypnotic state was achieved by the visualisation of the colours of the rainbow (red, orange, yellow, green, blue, violet) and by "descending the stairs" technique [24].

Among the techniques used to reduce and to remove pain, the dissociative, associative and symbolic techniques were applied. The ego strengthening techniques, direct and post-hypnotic suggestions, autohypnosis and visualisation (e.g. visualisation of the positive health energy) were used in the therapy. A regression to the period of the patient's good physical health with the visualisation of positive recollections (e.g. playing football, swimming in the river, fishing) was applied.

The effect of the dissociative techniques was separating the pain (in the patient's imagination) from the rest of the healthy body, giving it shape, colour, smell, structure. To achieve this, the patient was asked to "draw" a scheme of his body with a clear distinction of the painful parts and separation from the healthy ones. The abdominal cavity and the chest were the painful areas that he marked with a red or black colour. He was then asked to colour, in his imagination, the painful areas with a different colour. White was chosen. The technique was repeated as many times as the colour symbolising pain was substituted. With reference to other sense modalities related to pain (unpleasant smell, taste, etc.) similar techniques were used, based on substitution of an unpleasant taste and smell for pleasant sense modalities (the smell of jasmine, the taste of plums). During every hypnotic session the same steps were followed repeatedly. He was then asked to put the "white coloured" sheet of paper into a box. "The weight of the box" was diminishing after every therapeutic session. The next step was walking to a cave with the box were "A Great Healer" was (visualisation of the health energy). The patient asked the "Great Healer" what he could do with the box so as to remove pain (burning it in a magical fire; or freezing it in a very low temperature). After leaving the cave, a visualisation of a water stream was applied and the patient reported the sensation of coldness and numbness of the arm immersed in the stream. It was then suggested so that he could displace these sensations onto the painful areas of the body.

The ego strengthening techniques were also used (e.g. visualisation of a growing tree; a safe place from the past, where one can feel happy and contented and where there is no suffering and pain).

The patient was taught the auto-hypnotic technique and it was indicated that he should apply the hypnotic techniques every day. Using the post-hypnotic suggestions, the desired state (without suffering and pain) was anchored to the events that were to happen in the future (wedding anniversary, birthday). The applied techniques were repeated during every session. After every therapeutic session the patient remained in the hypnotic state for approximately an hour. He was given a suggestion that after that period the hypnotic process would end and he would then open his eyes. At that time he was given an age regression suggestion to the early youth period when he was on holidays. The positive experiences from holidays were being associated with

the antagonistic sensations towards pain (warmth, relaxation, swimming, positive sensations). During this period, the patient was alone in the room until the hypnosis was over.

The period of pain reduction was lengthening after each therapeutic session. The pain intensity score decreased to NRS 5 points and became acceptable for the patient. He became more socially active and more engaged in the family life. This period lasted for 11 months until the patients died of respiratory failure in course of pneumonia.

Discussion

The prevalence of pain after spinal cord injury has ranged from 18–90% depending on various reports [25, 26]. Several theories have been published to explain the mechanisms of this phenomenon.

Siddall reviewed the literature and suggested that the mechanisms of neuropathic pain following spinal cord injury may arise from "downstream" changes in damaged nerve roots as well as from "upstream" changes in the brain [27].

Hulsebosch et al. in another review suggested that the mechanisms of remote microglial activation and pain signalling in "below-level" central pain are dorsal horn neuron hyperexcitability, central sensitisation, microglial activation, and locally upregulated chemokine synthesis [28].

A complete injury was significantly more likely to result in chronic pain than incomplete injury, and was associated with increased pain severity [26]. The described case confirms the results of this investigation.

The management of pain following SCI includes pharmacotherapy, neurostimulation, psychological and environmental management and surgical approaches. Surgical techniques can reduce pain, but nowadays are rarely used because of serious complications [29].

Adequate pain relief is often difficult to attain using pharmacological methods only.

Neurostimulation treatments including spinal cord stimulation (SCS) and transcutaneous electrical nerve stimulation (TENS) have proved to be effective in some patients [30].

Siddall, among others, reported on the efficacy of these methods in neuropathic pain treatment after spinal cord injury [27]. Some researchers, such as Cioni et al. did not manage to achieve similar outcomes using the listed neurostimulation methods [31].

Transcutaneous celiac plexus neuromodulation, despite described high efficiency in neuropathic pain treatment after SCI, has not met our expectations in this case.

Goroszeniuk et al. suggested that an introduction of a stimulating electrode should be done directly to the centre of painful area so that the impulses from the stimulator could act upon the nerves conducting nociceptive stimuli from this area [30]. It was very difficult to precisely localise a painful area in our patient and the decision concerning celiac plexus stimulation resulted from the presence of the visceral pain component. We failed to determine if the visceral pain was the only type of pain and that may have been the cause of low analgesic efficacy of the applied method.

Intrathecally administered drugs are one of the therapeutic options used for the treatment of neuropathic SCI pain. There are reports indicating that spinally administered opioids and clonidine are effective in neuropathic pain. There is also evidence that morphine and clonidine may have a synergistic action in reducing pain in that case [27, 32, 33].

Serial cerebrospinal fluid sampling studies provided some explanation of the intrathecal morphine-clonidine ineffectiveness.

The relatively large concentration of drug in the lumbar CSF with small or undetectable levels in the cervical CSF suggests interference of scar tissue around the site of spinal trauma with CSF flow. Furthermore, the greater hydrophilic character of morphine facilitates its cephalad distribution by bulk flow of CSF, to bind with supraspinal opioid receptors. The inability of the drug to reach the required site of action means that it will be difficult or impossible to achieve adequate analgesia even with the lumbar administration of relatively large doses.

Chronic pain is a complex phenomenon and is rarely managed with a single type of treatment. Hypnosis appears to be a viable and effective option for managing both, chronic [34–37] and acute [38–41] pain.

Research studying treatment satisfaction with hypnosis has found high rates of satisfaction among participants, even when a significant reduction in pain was not achieved. Lew et al. confirm the efficacy of hypnosis in post-operative side effect reduction such as irritability, anxiety, worrying [42]. It suggests that conducting research according to standard protocols may lead to better understanding of both the role of different types of suggestions on pain-related outcomes and on gaining insight into which components of hypnosis are critical to instigate change.

Several controlled trials have demonstrated that hypnosis is an efficacious treatment for chronic pain. Elkins et al. reviewed literature regarding chronic pain treatment with hypnosis and concluded that there are more and more proofs that confirm the efficacy of hypnotherapy in pain treatment and research confirms that hypnotherapy is helpful both in general and in additional pain treatment intervention [43]. Abrahamsen et al. conducted a randomised control trial to evaluate the effects of hypnosis in 40 chronic pain patients. Under hypnosis, the participants were given several suggestions for pain relief and improvement in psychological symptoms, including a suggestions to relax and to change pain perception through metaphor (e.g. changing the colour of pain), substitution (e.g. changing pain for warmth), to create feelings of anaesthesia, "let go" of bad memories, problems, and feelings of helplessness, and to increase ego strength [44].

Rainville et al. also used techniques related to age regression, such as anchoring of good memories to the stressful situation, remembering of painless times and imagining the future in which the patient manages pain. Finally, post-hypnotic suggestions were made, among others a suggestion to use pain as a signal to occupy one's attention with positive recollections [45].

Another technique applied in hypnosis is dissociation. The aim of the dissociative techniques is to separate pain and isolate it from the rest of the healthy body or to separate it from the consciousness of the part that suffers pain or is aware of it.

The hypnotic dissociation starts when the perception of pain is changed or reduced in the imagination by separating and completely isolating it from the scheme of the body [46].The term of dissociative techniques should not be mistaken for the term of dissociation (conversion) in psychopathology.

Jensen et al. analysed the influence of auto-hypnosis on pain perception in patients after SCI. Those who were encouraged to act following the therapeutic session tape recordings in order to exercise auto-hypnosis or to exercise auto-hypnosis without the tape proved to significantly reduce the intensity of everyday pain [47].

During hospitalisation, our patient was subject to hypnotic trances 3 times a week. Having achieved a deep hypnotic state, to reduce and to remove pain, the dissociative [45], associative, symbolic [46] and ego strengthening [48] techniques, as well as posthypnotic suggestions were used [47]. The therapy was continued at home and repeated many times. Finally, the patient learned self-hypnosis.

Our patient was initially rather resistant to the hypnotherapy. The analgesic effect was not satisfactory after the first session. According to Baker et al, the benefits of self--hypnosis training could be enhanced, when introduced very soon after an injury [49].

As authors suggested, the beneficial effects of early training in hypnotic strategies on pain and other symptoms in soldiers who were injured or experienced a trauma, presented the evidence that hypnosis can be used to improve post-traumatic stress disorder symptoms associated with the trauma [47, 50].

Conclusions

This case report supports the data presented in many reviews that the use of hypnosis could be an alternative and useful method for neuropathic pain treatment. Hypnotherapy should be available in multidisciplinary pain clinics. Hypnosis, when applied by psychiatrist or psychotherapist, could be complemented or replaced by psychotherapy.

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