

Introduction

Chronic pain is a complex issue, leading to distress and severely impacting the lives of those who suffer from it. It affects between one third and one half of the UK population with similar estimates of prevalence worldwide (1, 2). There are a variety of treatment options, although due to the complexity of the disease there is no one size fits all approach. The more effective treatment options available to those suffering with chronic pain, the better their chances of pain relief and improved quality of life. This is why I would like to look at an under-researched treatment option, ECT, and its potential role in chronic pain management.

Electroconvulsive Therapy (ECT) was once seen as a very controversial treatment, but now the use of it in mental health disorders is well established. It is the most effective treatment in severe depression, treatment resistant schizophrenia and a range of other psychiatric conditions (3). ECT is a medical procedure which induces a controlled generalised seizure in the patient, leading to a variety of changes within the brain.

At the beginning of my psychiatry placement there was a brief session on ECT, and we learned how transformative the treatment can be for certain patients. I admittedly was not convinced by this treatment as I have seen a lot of negative portrayal of it in the media. In fact, a large majority of films and TV programs such as *One Flew over the Cuckoo's Nest*, which portray ECT, show a negative and inaccurate picture of the treatment (4). Although these depictions are outdated, they have an enduring impact on public opinion surrounding ECT, including my own. At the end of the presentation, the doctor also made a comment about how ECT could possibly be a treatment for chronic pain. This was intriguing to me as I have only known ECT as a treatment for psychiatric conditions. During my psychiatry placement I have seen first-hand how life changing ECT can be. I have seen severely depressed individuals, who are bedbound with symptoms including catatonia and poor quality of life undergo ECT and have their lives completely changed for the better. After learning about how safe and efficacious the treatment is I began to understand why ECT is used frequently in severe psychiatric conditions.

This made me think about other potential uses for ECT, particularly in conditions where patients' quality of life is severely impaired. I thought back to the comment my lecturer made. So why could ECT possibly work for chronic pain?

Like depression, chronic pain can have a huge impact on quality of life; both conditions are debilitating and there is an established link between them (5). Research shows that there are similar biochemical changes which occur in the brain in patients diagnosed with depression and those suffering with chronic pain (6). The changes seen in the brain after ECT overlap with the areas of the brain affected in the two conditions.

Chronic pain

Chronic pain is defined by the ICD-11 as 'pain that persists or recurs for longer than 3 months' and states that chronic pain is 'multifactorial: biological, psychological and social factors contribute to the pain syndrome'(7). Everyone has experienced pain at

some stage in their life. It is an unpleasant experience, but for the majority the pain is short lived and goes away with time and medication. Chronic pain can be extremely distressing for the patient making it hard for them to continue with their normal life and partake in activities which they enjoy. As a result, chronic pain can have a profound emotional effect on the person experiencing it, leading to the strong link associated between chronic pain and Major Depressive Disorder. In a UK study of 24,405 patients it was found that in individuals with chronic widespread pain, 45.7% had a 'lifetime' history of depression (8).

Chronic pain can be split into different types, including neuropathic, nociceptive, inflammatory, musculoskeletal, headache, cancer pain and many others. The various types of chronic pain significantly overlap with each other, and patients experiencing one chronic pain type are significantly more likely to have other types when compared to the general population (9). This complicates the management massively, as a treatment which works well for one type of chronic pain may be less effective in other types of chronic pain.

As chronic pain is experienced differently in all those who suffer from it, it is vital that there is a range of different treatment options available. Approaches such as analgesic medication, stimulation (spinal cord, electrical nerve, deep brain), physiotherapy and talking therapies are just some of the methods currently used in the management. However, there is still no cure, and many patients are left with debilitating pain and a feeling of hopelessness. It is important to note that opioids are often used for pain relief in those with chronic pain but can be addictive and have several side effects such as constipation, nausea, dizziness and confusion. Opioids use can also pose more serious risks, including dependence, which can increase the likelihood of overdose, respiratory depression and even death. (10). So, the more available treatment options there are, the better the outlook for those experiencing chronic pain will be. This is precisely why I think it is important to examine the potential use of ECT in the management of chronic pain, especially for patients who have tried other methods of managing their pain and are still unable to cope. But it would be futile to suggest a treatment with no evidence at all, so what evidence do we have in support of the hypothesis that ECT will help in chronic pain management?

What is ECT?

Electroconvulsive therapy is a medical treatment which was introduced in the 1930s. This came at a time when treatment for mental health conditions was limited. Originally it was trialled on patients with schizophrenia but over time it has been used in a wide range of mental health conditions, showing greatest effect in those with severe Major Depressive Disorder (11). Currently, it is performed by placing electrodes on the external surface of patients' head while the patient is under general anaesthesia. A low voltage current is then administered, which induces a generalised seizure in the patient. The electric current is high enough to induce a seizure but not high enough to cause any damage to the brain tissue. The seizure typically lasts from 20-60 seconds and then terminates (12). It is usually administered as a series of treatments over several weeks.

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The mechanism behind why inducing a seizure helps relieve these neuropsychiatric symptoms is not fully understood. However, there is evidence which has been able to identify specific changes in the brains of patients who have undergone ECT.

ECT Negatives

Like any medical treatment, there are side effects and drawbacks of ECT. The procedure is performed under general anaesthesia which comes with its own risks. A very common side effect is confusion and memory loss, most patients experience retrograde amnesia for events that occurred close to the time the ECT treatment, this usually resolves during in the months following ECT, however, in some patients the retrograde amnesia remains (13). Typical side effects patients experience after ECT include dry mouth, nausea, headache and muscle aches, although the general anaesthesia may contribute to these (14). As I previously mentioned, ECT has often been negatively portrayed in the media leading to widespread misconceptions about it. This can dissuade some patients from considering ECT, especially for chronic pain, where ECT treatment has not been widely studied or commonly recommended.

Why ECT may help chronic pain

There is a well-researched and supported association between the depression and chronic pain. Therefore, a hypothesis that a treatment which works well for one disease could work for the other disease seems logical. This hypothesis is given more foundation when the similarities of changes in the brain are discussed.

Patients experiencing chronic pain and depression share similar changes in neuroplasticity and have overlapping neurobiological pathways. In both conditions there are reduced levels of neurotransmitters, which play a crucial role in mood regulation and pain perception (6).

Through inducing a controlled seizure, ECT is known to affect a wide range of structures, mechanisms and pathways within the brain. The effects of ECT on the brain can be grouped in three categories, neurophysiological, neuro-biochemical and neuroplasticity changes (15). There is a 'dizzying array of neuroreceptors, neurotransmitters, neuromodulators and neurohormones that change in one way or another' with ECT say Rasmussen and Rummans (16). Exploring all the specific changes which occur in the brain after ECT is beyond the scope of this essay. However, I want to highlight the changes which coincide with the pathophysiology of chronic pain.

ECT is known to affect and increase the levels of different neurotransmission systems (serotonin, dopamine, adrenaline etc.) within the brain, which are vital in pain processing throughout the central nervous system (17).

ECT has also been referred to as 'resetting' the brain due to some of the neuroplastic changes that occur (neurons, synapses, dendrites and the vasculature are all affected). It is known that dysfunctional neural pathways play a role in chronic pain, and the use of ECT may be able to reset these abnormal pathways to a normal physiological state which reduces the pain experienced (18). As I have mentioned, ECT involves inducing a controlled seizure which causes widespread effects on the

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brain, this means that those areas which are responsible for pain sensation will be affected.

It has been shown that ECT has a significant effect on the endogenous opioid system. In a study performed on rats, it was found that using ECS (electroconvulsive shock) had autonomic effects that were similar to those seen when opioids were administered 'intracerebroventricularly' (16, 19). Other studies have found similar results showing increases in CNS enkephalin levels (e.g. Beta-endorphins) and enkephalin receptors (e.g., mu-opioid receptors) (20). It is well known that the endogenous opioid system plays a large role in pain modulation and perception in chronic pain conditions. The effectiveness of this system is decreased in chronic pain, and this can lead to a reduction in natural pain relief. So, a treatment such as ECT which can disrupt this malfunctioning system could be useful in the management of chronic pain.

Many studies are ongoing to further understand what occurs within the brain during ECT, but it is known that it is very effective at treating Major Depressive Disorder. Discussing why ECT may be effective in chronic pain management is promising, however, concrete evidence showing that it can be used for pain reduction in chronic pain is essential.

Current evidence

A 2023 systematic review titled 'Chronic pain outcomes of patients receiving electroconvulsive therapy' looked at articles where patients had undergone ECT and had chronic pain (20). In the studies ECT was given to patients either for chronic pain or for a psychiatric condition where the patient had chronic pain. 22 Studies reporting a total of 109 cases were reviewed and patients with a wide range of chronic pain diagnoses were included. 80 patients had an identified psychiatric comorbidity with the most common being major depressive disorder. The participants had undergone 5-55 sessions of ECT with some patients undergoing regular indefinite maintenance ECT. The review found 78% of cases reported a reduction in pain symptoms post ECT with 96.3% reporting an improvement in mood. There was a noted association between mood and pain, and some patients even reported an improvement in pain without an improvement in mood. The review concluded 'ECT may be offered to patients with certain pain conditions who have not responded sufficiently to conventional therapies, particularly when comorbid mood symptoms are present'. The study also recommended that more research should be done in this area, stating specifically that there needs to be improved documentation on the outcomes for patients who undergo ECT and have comorbid chronic pain.

There was a very interesting randomised controlled trial conducted in 2022 which looked at pain and mood improvement after ECT (21). The study involved 97 patients with treatment resistant depression, half of which received ECT + agomelatine (an atypical antidepressant) and the other half received ECT + placebo. These patients were then followed up over the next 12 weeks and asked to rate their mood and pain. The results showed an improvement in both pain and mood after ECT with pain improving more gradually. The study concluded that 'pain can, therefore, be considered a separate entity from depression'. This is intriguing as it suggests that ECT may be effective for pain syndromes even in those without co-

morbid depression. A significant drawback of this study was that it was not originally designed to look at the relationship between pain and depression, which is why it was performed as a randomised controlled trial. A 2004 case-matching study found similar results. This study compared the analgesic properties of ECT against those of just antidepressants and concluded that 'ECT has analgesic properties independent of its improvement of depression in patients with chronic pain and major depression' (22).

There are other studies and many individual case reports which suggest that ECT can be very useful in different types of chronic pain (23, 24). A report by Abdi et al. discusses a patient who had chronic neuropathic pain of his upper limb for 10 years (25). He tried various treatments, and nothing cured the pain. Subsequently he developed severe depression and underwent ECT, which significantly improved his pain for two months. There are many similar case reports, and it gives me hope that ECT can be a useful and successful treatment for those with chronic pain.

So how else could the use of ECT in chronic pain be studied to determine if this is an appropriate treatment option?

Future use

It is evident that ECT and its use in the management of chronic pain would benefit from further research. Due to the nature of ECT and its limited evidence base in this context, I had originally thought it would be unethical to perform a randomised controlled trial on patients with chronic pain using ECT as an intervention. However, after giving this more thought, I think it could be a possibility for those who are experiencing life altering chronic pain. Of course, worries about the ethics of this study are valid, but I think it is worth discussing for patients who have severe life altering pain, and no typical treatment has worked to ease their pain, where ECT could be considered as a last resort. To address the ethical concerns of this study, patients would need to give comprehensive informed consent. This would involve patients not only learning about the risks of ECT but also learning about and acknowledging the limited research data available and the infrequent previous use of ECT for chronic pain. Choosing the right patients and having them give comprehensive informed consent is vital and I think addresses the ethical worries.

However, performing a randomised control trial on individuals with psychiatric conditions and comorbid pain who are about to undergo ECT would be unethical. Not performing ECT on half of the patients in the study would deprive them of this lifesaving treatment. Therefore, as the systematic review above concluded, a promising start to understanding ECT and chronic pain is to report changes in pain levels before and after ECT. This would be done by asking those with psychiatric illness and comorbid pain to rate their pain before and after ECT. Hopefully, through this, we can increase the scope of the literature and understanding around the role ECT can have in chronic pain management. I think we can get to a stage where ECT is seen as a plausible treatment to be performed on individuals who have debilitating, treatment resistant chronic pain and cannot function without an intervention.

I would suggest that given the anaesthetic requirement of ECT, it seems logical that if it is ever included in the management plan of chronic pain it would be used as a last resort where all other typical treatments have failed. This is the same approach as is used in psychiatric conditions, where ECT is very effective.

Conclusion

Chronic pain is a debilitating condition not only affecting physical health but also mental, emotional and social well-being. It is critical that there are a wide range of treatment options available to help those suffering with chronic pain. ECT is a well-established treatment which works exceptionally well in a variety of psychiatric conditions, particularly depression, in which there is significant epidemiological and pathophysiological overlap with chronic pain. With further research and a stronger evidence base, ECT has the potential to be an instrumental addition to the management of chronic pain, offering symptom relief and improving the quality of life of millions.

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