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Quality of life in chronic pain treated through pulsed radiofrequency therapy

A retrospective study

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Abstract

Anxiety and depression are often symptoms present in people who suffer from chronic pain, compromising the quality of life of these individuals. The objective of this study was to assess whether a pulsed radiofrequency (PRF) treatment, in addition to psychological support intervention, can decrease chronic pain, thereby improving quality of life and restoring psychological well-being.

Fifty outpatients with a diagnosis of chronic pain, without any benefit from traditional drug therapies, were selected to perform a PRF treatment in combination with a psychological intervention. They were evaluated before and after the intervention through the Hamilton Anxiety Rating Scale and the Beck Depression Inventory-II for anxiety and depression symptomatology, respectively, the Short Form Health Survey 36 (SF-36) was used to assess the subject's quality of life, and the Numerical Rating Scale was used for pain assessment.

The Wilcoxon signed-rank test showed a significant difference in Beck Depression Inventory-II ($P < .001$), Hamilton Anxiety Rating Scale ($P < .01$), and Numerical Rating Scale ($P = .004$). In the SF-36 scores, we observed a significant difference between T0 and T1 in both mental ($P < .001$) and physical ($P < .001$) dimensions.

This study shows that a chronic pain reduction leads to a decrease of anxiety-depressive symptoms and an improvement in quality of life. PRF seems to be an appropriate method to reduce the chronic pain that influences psychological well-being and quality of life.

Abbreviations: BDI-II = Beck Depression Inventory, CRF = conventional continuous radiofrequency, HAM-A = Hamilton Anxiety Rating Scale, NRS = Numerical Rating Scale, PRF = pulsed radiofrequency, QoL = quality of life, SF-36 = Short Form Health Survey 36.

Keywords: anxiety, chronic pain, depression, quality of life, radiofrequency

1. Introduction

Chronic pain is a persistent and prolonged disorder, as a pain that continues at 3 months and 6 months since onset.[1] It can also persist for years, affecting emotional, interpersonal, and physical aspects of patients.[2] In the last 2 decades there was an increase in knowledge about the neurophysiology of chronic pain and its causes, with an increasing interest in the development of pharmacological and/or surgical treatment modalities.[3] However, treatment has limited success and not all patients achieve satisfactory long-term pain relief.[4] One possible explanation could be the not recognizing of the multidimensional nature of chronic pain, which involves more than just subjective experience.

Following a biopsychosocial approach, chronic pain can be treated as a mix of medical, physical, and psychological components. Thus, several studies used multidisciplinary interventions and multimodal strategies of pain management reporting significant results.[5] However, patients are rarely referred to a multidisciplinary treatment.[6] It would be necessary to assess the multidimensional aspect of pain and its effects on an independent lifestyle since many people are unable to perform a variety of daily activities,[7] leading to a reduction in the patient's quality of life,[8,9] and increasing the risk of anxiety-depressive symptoms as well.[10]

The pulsed radiofrequency (PRF) current is a novel method in the treatment of chronic pain. It is a variation of the conventional continuous radiofrequency (CRF) offering the advantage of pain control without the tissue destruction and the painful sequelae associated with CRF, especially in cases of neuropathic pain in which CRF is relatively contraindicated.[11] Indeed, PRF produces an analgesic response to the electromagnetic field

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The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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generated around the tip of the cannula, and it seems to be suitable for the treatment of several neuropathic pain conditions such as cervical root pain, trigeminal neuralgia, Arnold neuralgia, chronic shoulder pain, and chronic lumbago.[10,12] Recent studies have confirmed the improvement of both thermal hyperalgesia and mechanical allodynia and show that the analgesic effect of PRF involves enhancement of descending noradrenergic and serotonergic inhibitory pathways.[13]

The aim of this study was to evaluate whether the treatment for chronic pain based on the use of PRF combined with psychological support leads to changes in patient's quality of life, as well as in their levels of anxiety and depression symptoms.

2. Methods

This is a retrospective study conducted on a sample of outpatients attending the antalgic therapy unit of the IRCCS Centro Neurolesi "Bonino Pulejo" of Messina from January 2018 for 1 year. Patients attending the antalgic therapy unit carry out a treatment, according to pain etiology and its level of chronicity. Usually, patients presenting trigeminal neuralgia or fibromyalgia suffer from a moderate chronic pain, and they after a prolonged time of drug treatment failure (i.e., at least 6 mo) are treated with PRF. The procedure, performed while awake and under local anesthesia, consists of introducing 1 or more thin needles into specific areas of the epidural space, for applying an intermittent electrical pulse, but avoiding heating the nerve and damage it. In addition to the pain interventions, patients are also followed by a skilled neuropsychologist to manage chronic pain through a cognitive-behavioral treatment. The psychological support is aimed to face dysfunctional coping strategies, low frustration tolerance, external locus of control, and mislabeling of somatic sensations, but also in changing the manner in which patients perceive their pain to increase their self-efficacy, improving the management of stress by strengthening their resources, and promoting their quality of life as well.

2.1. Study population

Fifty patients (16 men, 34 women) with a mean age of 62.0 ± 13.76 years, and a mean education of 8.0 ± 4.76 years, were found eligible for this study according to the inclusion/exclusion criteria established as follows. Inclusion criteria: PRF performed; age between 30 and 90 years; presence of persistent pain from at least 3 months; unsuccessful previous drug therapy (paracetamol, FANS, opioids, anticonvulsants, and cortisone); absence of any neurological deficit. Exclusion criteria: presence of psychiatric, neurodegenerative or severe cognitive disorders; use of antidepressants and anxiolytics. This retrospective cohort study did not require the approval of the Ethics Committee, in accordance with the current rules of our hospital. However, written consent to use information was obtained from all subjects.

2.2. PRF treatment protocol

All selected patients underwent the same protocol involving the introduction of a 4 French diameter (about 1.35 mm) catheter into the epidural space (cervical, dorsal, lumbar, or sacral) by using a 14-Gauge introducer needle, with stimulating active tip. This lead is directed to the affected nerve root. The procedure is performed while awake and under local anesthesia so that the patient can report the sensation of "tingling" induced by the catheter on the nerve roots, which indicates the exact location of the stimulating electrode. The procedure is performed in the morning on the day of the hospital admission, and the patient is discharged after 2 days of ordinary hospitalization.

2.3. Assessment

Before performing the PRF (T0), and 6 months after the PRF treatment (T1), each patient underwent a clinical and neuropsychological assessment by means of the following scales: Beck Depression Inventory (BDI-II), Hamilton Anxiety Rating Scale (HAM-A), Short Form Health Survey 36 (SF-36), and Numerical Rating Scale (NRS). BDI-II measures the severity of depressive symptoms and includes 21 items concerning different domains, with 4 possible answers describing symptoms of increasing severity associated with a score from 0 to 3. The maximum total score is 63 where 0–13 indicates minimal depression, 14–19 mild depression, 20–28 moderate depression, and above 29 severe depression.[14] HAM-A measures the severity of anxiety symptoms. The scale consists of 14 items, each defined by a series of symptoms, and measures both psychic anxiety (mental agitation and psychological distress) and somatic anxiety (physical complaints related to anxiety). Each item is scored on a scale of 0 (not present) to 4 (severe), with a total score range of 0–56, where below 17 indicates mild severity, 18–24 mild to moderate severity, and 25–30 moderate to severe.[15] NRS is an 11-point numeric visual analog scale. The score is ranged from 0 to 10, with 0 indicating pain absence, whereas 10 being the worst pain possible.

SF-36 is a tool for evaluating health-related quality of life (QoL) in 8 different dimensions: physical functioning, role physical, bodily pain, general health, vitality, social functioning, role emotional, and mental health. Two composite scores are derived from these subscales: the Physical Component Summary (SF-36 Physical) and the Mental Component Summary (SF-36 Mental).[16]

2.4. Statistical analysis

Normal distribution of the data was evaluated using the Shapiro–Wilk normality test. Since most of the target variables were not normally distributed, a nonparametric analysis was performed. Thus, we used the Wilcoxon signed-rank test to compare variables between T0 and T1 (intragroup analysis), and the Mann–Whitney U test to compare the 2 groups (intergroup analysis) both at T0 and T1; reporting the results as median values and first-third quartiles. We also performed an interaction effect analysis (improved time) by calculating the T1–T0 differences of anxiety, depression and QoL scores to correlate by the Spearman's coefficient with SF-36 subscores. Analyses were performed using the open source R3.0 software (R Foundation for Statistical Computer, Vienna, Austria). A 95% of confidence level was set with a 5% alpha error.

3. Results

The Wilcoxon signed-rank test showed a statistically significant difference in BDI ($P < .001$), in HAM-A ($P < .01$), and in NRS ($P = .004$), as shown in Table 1. In SF-36 scores, we observed a significant difference between T0 and T1 both in mental ($P < .001$) and physical ($P < .001$) subscales (see Fig. 1). Moreover, we found a negative correlation of these 2 subscales with NRS ($r = -0.37$), BDI ($r = -0.51$ and $r = -0.36$), and HAM-A ($r = -0.63$ and $r = -0.6$) scores, as represented in Figure 2.

Table 1

Baseline-follow-up significant comparisons of the patient's clinical scores.

	T0 Median (I–III quartile)	T1 Median (I–III quartile)	*P* value
BDI-II	15.0 (8.0–21.0)	5.0 (2.0–10.0)	<.001
HAM-A	14.0 (7.80–20.30)	5.0 (2.0–9.0)	<.01
NRS	8.0 (5.8–10.0)	5.0 (3.0–7.30)	.004
SF-36 (P)	31.0 (25.0–35.0)	80.0 (74.24–85.43)	<.001
SF-36 (M)	32.0 (28.0–35.3)	87.0 (82.2–89.3)	<.001

BDI = Back Depression Inventory, HAM-A = Hamilton Anxiety Rating Scale, NRS = Numeric Rating Scale, SF-36 (M) = Short Form Health Survey 36 (Mental), SF-36 (P) = Short Form Health Survey 36 (Physical).

The intragroup analysis by gender provided in Table 2 showed a significant decrease between T0 and T1 in BDI and HAM-A, and a significant increase in SF-36 (both physical and mental), for both genders, but the NRS score change was significant ($P = .005$) only in the female group.

Inter-groups analysis showed significant differences between groups in SF-36, in particular, in mental (T0: $P = .004$; T1: $P = .04$) and in physical score (Table 2).

4. Discussion

Chronic pain is a highly disabling condition associated with a progressive reduction of autonomy. It leads to a deterioration of the QoL, especially due to the presence of depressive and anxious symptoms. Several studies helped to understand the etiology, evaluation, and treatment of persistent and chronic pain with respect to quality of life. For instance, the study authored by Colombo et al[17] shows lower levels of quality of life in patients with chronic pain than in the general population, while the more recent study by Hadi et al shows that the multidimensional negative impact of chronic pain makes QoL worse in patients with chronic pain, compared with the general population, and in patients with other long-term conditions.[18]

Moreover, several studies have found considerable overlaps between pain- and depression-induced neuroplasticity changes, as well as neurobiological mechanism changes.[19] Therefore, it would seem that pain increases depression levels, and depression, in turn, causes more pain.

This study shows that the use of alternative methods, as pulsed radiofrequency combined with psychological support, can reduce chronic pain and promote an improvement in psychological well-being, as well as in both mental and physical QoL domains. Findings emerge an improvement in anxiety and depression, through the significant reduction of the HAM-A and BDI-II scores over time (Fig. 1). We also found that pain reduction is correlated with the decrease of analgesics drug ingestion and the improvement in the psychophysical state, revealing a significant clinical effect of the multidimensional approach.

Chronic pain negatively affects daily activities, physical and psychological health, as well as work productivity.[20] Pain is also associated with anxiety, depression, loss of independence, interference with work and relationships.[21] Therefore, this disease injures multidimensional areas of the person, and these different psychological factors can influence the assessment of pain, compromising the treatment.[22] The dimensions that contribute to the pain experience are physical, psychological, and social, supporting the idea of a multidimensional and biopsychosocial experience of pain. Any clinical evaluation process must address all relevant dimensions of pain.[23]

Multiple factors are considered responsible for sex differences in pain perception, and for a higher prevalence of chronic pain in women. Such differences in pain arise from an interaction of genetic, anatomical, physiological, neuronal, hormonal, psychological, and social factors that modulate pain differently in the sexes.[24] Therefore, we are not surprised that females improved more significantly than males in all test scores between T0 and T1, because it is probably that RPF acted better on women precisely for their greater predisposition to detect pain.

The use of the PRF technique to promote pain reduction was found to be noninvasive and safe.[25,26] Indeed, no complications have been reported as yet, making it an attractive option in providing new possibilities for the treatment of chronic pain syndromes.[27] Thus, an alternative treatment for pain as PRF can provide relief to patients with chronic pain, promote the restoration of psychophysical abilities, and improve the patient's

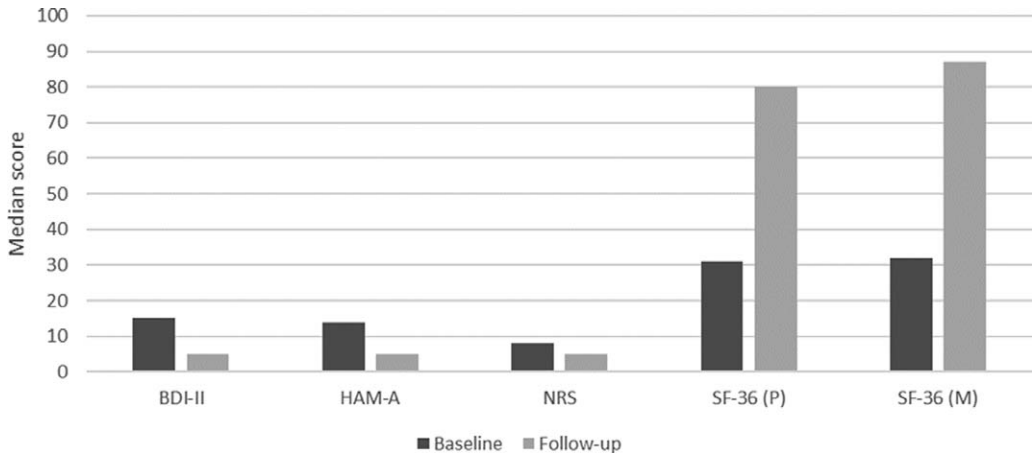

Figure 1. Bar graphs of BDI-II, HAM-A, NRS, and subitems of SF-36 scores over time. (M) = mental, (P) = physical, BDI-II = Back Depression Inventory, HAM-A = Hamilton Anxiety Rating Scale, NRS = numeric rating scale, SF-36 = short form health survey 36. The chart represents the variances in median score between baseline and follow-up, statistically significant for each measure reported.

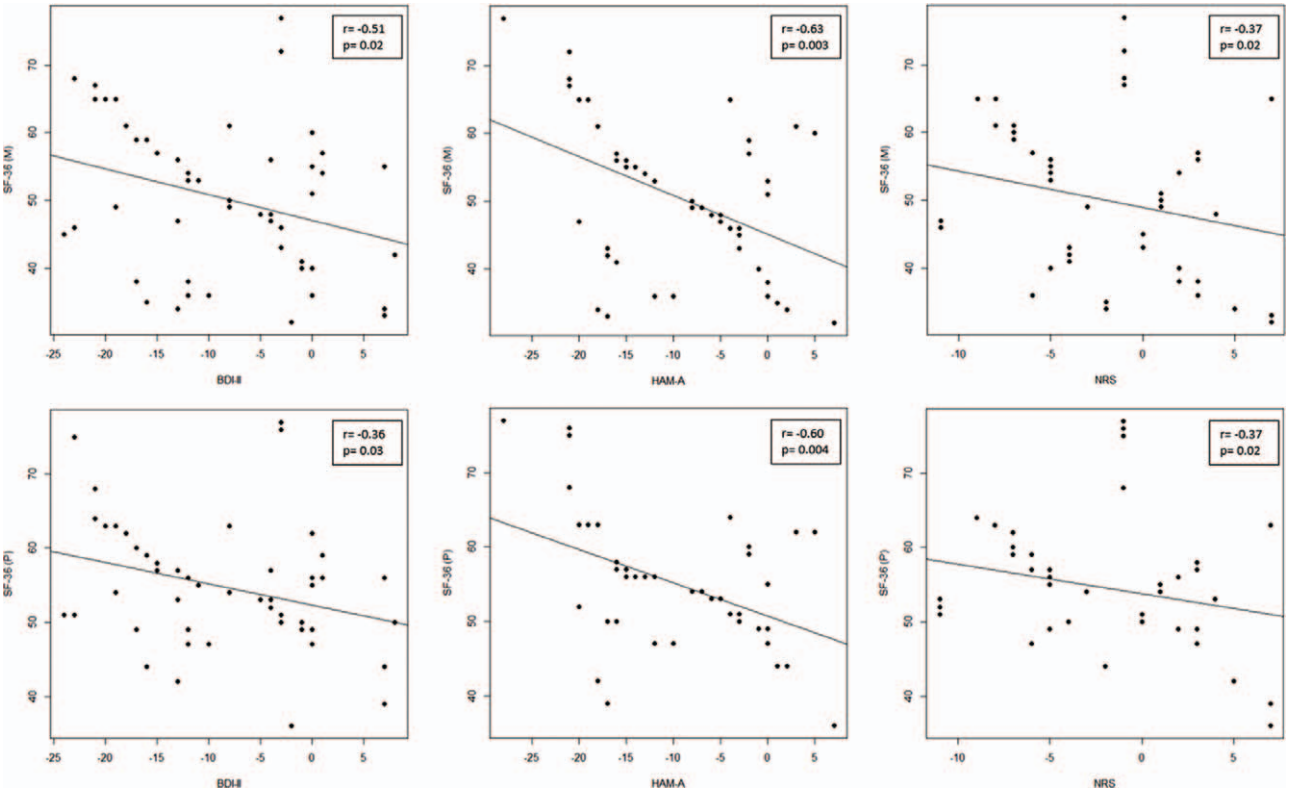

Figure 2. Spearman rank correlation graphs showing the relationship between SF-36 scores (mental and physical) and clinical outcomes. (M) = mental, (P) = physical, BDI-II = Back Depression Inventory, HAM-A = Hamilton Anxiety Rating Scale, NRS = numeric rating scale, SF-36 = short form health survey 36. Greater pain and mood disorder are associated with higher disability affect.

Table 2

Gender differences of SF-36 scores (mental and physical) and clinical outcomes.

	T0 Median (I–III quartile)	T1 Median (I–III quartile)	*P* value
BDI-II			
Female	10.5 (7.0–19.7)	5.5 (2.2–10.7)	< **.001**
Male	17.5 (12.2–25.0)	4.0 (2.0–7.5)	**.001**
P value	.06	.56	
HAM-A			
Female	13.5 (7.0–19.7)	5.5 (2.2–9.7)	< **.001**
Male	18.5 (8.0–22.7)	3.0 (2.0–7.5)	**.002**
P value	.21	.41	
NRS			
Female	8.0 (5.2–10.7)	5.0 (3.0–7.0)	**.005**
Male	8.5 (5.7–9.2)	5.0 (2.7–7.2)	**.05**
P value	.79	.95	
SF-36 (M)			
Female	30.0 (21.2–33.0)	83.5 (79.2–87.0)	< **.001**
Male	34.0 (30.7–35.5)	72.5 (69.7–76.5)	< **.001**
P value	**.004**	**.04**	
SF-36 (P)			
Female	30.0 (24.2–33.0)	86.0 (79.2–88.0)	< **.001**
Male	34.0 (31.7–37.0)	87.5 (85.2–90.5)	< **.001**
P value	**.02**	<**.001**	

BDI-II = Beck Depression Inventory, HAM-A = Hamilton Anxiety Rating Scale, NRS = Numerical Rating Scale, SF-36 (MH) = Short Form Health Survey 36 (Mental) Significance are in bold, SF-36 (P) = Short Form Health Survey 36 (Physical).

quality of life. In the search for possible treatments for chronic pain, the psycho-physical components of patients and their quality of life should always be considered, given the strong impact of pain on these aspects.

Our study presents some limitations. Indeed, the retrospective design of the study, as well as the small sample size, and the unequal distribution across gender could lead to an information bias. Indeed, we observed a different impact on effectiveness of treatment by gender. However, the greater limitation of the study is, without doubt, the lack of a control group. Indeed, in terms of the specificity of the study, it is not known what effect only the PRF has on the variables examined. Thus, the currently available evidence should be confirmed by further studies conducted on larger populations, and comparing the treatment effects with a control group matched for gender, age, and clinical condition. However, we adopted a scrupulous methodology for data collection, carrying on this phase in blind.

In conclusion, this study supports the hypothesis that the psychological symptomatology plays an important role in the antalgic experience perception. Therefore, a psychological support together with the use of PRF may facilitate an improvement in anxiety and depression symptoms. Thus, an integrated approach may favor the restoration of QoL and the resumption of normal daily and relational activities. However, it is essential to pay specific attention to the inclusion criteria, as they reflect the best available diagnostics.

Author contributions

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