Long-Term Outcomes in the Management of Painful Diabetic Neuropathy

Lauren M. Mai, A. John Clark, Allan S. Gordon, Mary E. Lynch, Pat K. Morley-Forster, Howard Nathan, Catherine Smyth, Larry W. Stitt, Cory Toth, Mark A. Ware, Dwight E. Moulin

ABSTRACT: Background: Painful diabetic neuropathy (PDN) is a frequent complication of diabetes mellitus. Current treatment recommendations are based on short-term trials, generally of ≤3 months’ duration. Limited data are available on the long-term outcomes of this chronic disease. The objective of this study was to determine the long-term clinical effectiveness of the management of chronic PDN at tertiary pain centres. Methods: From a prospective observational cohort study of patients with chronic neuropathic non-cancer pain recruited from seven Canadian tertiary pain centres, 60 patients diagnosed with PDN were identified for analysis. Data were collected according to Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials guidelines including the Brief Pain Inventory. Results: At 12-month follow-up, 37.2% (95% confidence interval [CI], 23.0-53.3) of 43 patients with complete data achieved pain reduction of ≥30%, 51.2% (95% CI, 35.5-66.7) achieved functional improvement with a reduction of ≥1 on the Pain Interference Scale (0-10, Brief Pain Inventory) and 30.2% (95% CI, 17.2-46.1) had achieved both these measures. Symptom management included at least two medication classes in 55.3% and three medication classes in 25.5% (opioids, antidepressants, anticonvulsants). Conclusions: Almost one-third of patients being managed for PDN in a tertiary care setting achieve meaningful improvements in pain and function in the long term. Polypharmacy including analgesic antidepressants and anticonvulsants were the mainstays of effective symptom management.

RÉSUMÉ: Résultats à long terme de la prise en charge de la neuropathie diabétique douloureuse. Contexte: La neuropathie diabétique douloureuse (NDD) est une complication fréquente du diabète sucré. Les recommandations de traitement actuelles sont basées sur des essais cliniques de court terme, en général d’une durée de 3 mois ou moins. Il existe peu de données sur les résultats à long terme du traitement de cette maladie chronique. Le but de cette étude était de déterminer l’efficacité clinique à long terme de la prise en charge de la NDD chronique dans des centres tertiaires de traitement de la douleur. Méthodologie: Nous avons analysé les données de 60 patients chez qui un diagnostic de NDD avait été posé. Ces patients ont été identifiés parmi les patients d’une cohorte d’observation prospective de patients atteints de neuropathie chronique non cancéreuse, recrutés dans 7 centres tertiaires canadiens de traitement de la douleur. Les données ont été recueillies selon les lignes directrices Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials incluant le Questionnaire concis sur les douleurs, version courte. Résultats: Au moment du suivi de 12 mois, 37,2% (intervalle de confiance à 95% [IC] de 23,0 à 53,3) parmi les 43 patients dont les données étaient complètes avaient obtenu une diminution de la douleur de 30% ou plus, 51,2% (IC à 95% de 35,5 à 66,7) avaient obtenu une amélioration fonctionnelle avec diminution de 1 ou plus à la Pain Interference Scale (1-10 au Questionnaire concis sur les douleurs, version courte) et 30,2% (IC à 95% de 17,2 à 46,1) avaient obtenu ces deux résultats. Au moins deux classes de médicaments étaient utilisées chez 55,3% des patients et trois classes de médicaments chez 25,5% (opiacés, antidépresseurs, anticonvulsivants) pour la gestion des symptômes. Conclusions: Presque le tiers des patients traités pour une NDD dans un centre tertiaire de traitement de la douleur obtiennent des améliorations significatives de la douleur et de la fonction à long terme. La polypharmacie, incluant des analgésiques, des antidépresseurs et des anticonvulsivants, constitue la base du traitement pour une prise en charge efficace des symptômes.

Keywords: painful, diabetic, neuropathy, management, long-term, outcome
patients may experience spontaneous improvement or even symptom resolution, PDN is a chronic disease for most patients.6,7

In a meta-analysis of randomized controlled trials, pharmacological management with analgesic antidepressants, including serotonin-norepinephrine reuptake inhibitors and tricyclic antidepressants, anticonvulsants (notably, pregabalin), and opioid analgesics were better than placebo for pain control in those suffering from PDN—similar to the outcome in other chronic neuropathic pain conditions.9,10 Published guidelines, based on systematic reviews, are available from the American Academy of Neurology (AAN) and the European Federation of Neurological Societies to guide clinical management of PDN. The AAN recommends the use of pregabalin as first-line treatment for PDN, noting its established effectiveness with Level A evidence.11 In addition to pregabalin, the European Federation of Neurological Societies adds tricyclic antidepressants, gabapentin, and serotonin-norepinephrine reuptake inhibitors (duloxetine, venlafaxine) as potential first-line treatments.10 However, the randomized controlled trials that form the basis for these clinical practice guidelines are limited by evidence of efficacy in only short-term trials, generally of ≤3 months’ duration.8,11 Thus, evidence is lacking as to the long-term effectiveness of these medication classes for this chronic disease. Although high-quality randomized controlled studies used to support clinical recommendations have good internal validity, their external validity (real-world outcome) is often left to be ascertained.12 In the case of PDN, adherence to a specific pharmacologic regimen over the long term in this patient population may alter the generalizability of the results; thus, the aim of this study is to determine the long-term clinical effectiveness of the real-world management of PDN at tertiary pain centres.

METHODS

The Canadian Neuropathic Pain Database was established in 2008 to provide a registry for neuropathic pain patients seen in academic tertiary care pain clinics in Canada.13 From this registry, we identified a cohort of patients with type 1 or type 2 diabetes mellitus to carry out a long-term observational prospective study of the management of PDN. The diagnosis of PDN was established by clinical criteria14 and supported by the Douleur Neuropathique en 4 Questions questionnaire, which is a reliable discriminator of neuropathic pain.15 Patients with comorbid pain of other etiologies were included if they reported that their neuropathic pain was on average more intense and more disabling than their other pains. Informed consent was obtained for every participant before enrolment. Independent review boards representing each participating institution (University of Calgary, Alberta; Western University, McMaster University, University of Toronto and University of Ottawa, Ontario; McGill University, Quebec; Capital District Health Authority Research Ethics Board, Nova Scotia) approved the study.

Standard outcome measures for chronic pain according to Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials guidelines16 were obtained at baseline and at 12 months. The primary outcome measure was the composite of a reduction of ≥30% in average pain intensity and 1-point drop in the Pain Interference Scale of the Brief Pain Inventory (BPI, 0-10) relative to baseline at 12 months. Secondary outcome measures were impact on function (Pain Disability Index), mood (Profile of Mood States), quality of life (12-item short form health survey [SF-12]), catastrophizing (Pain Catastrophizing Scale), and patient satisfaction (Patient Global Satisfaction Scale). Use of prescription medications was recorded both at baseline and then again at 12-month follow-up.

Statistical Analysis

Descriptive statistics, including means and standard deviations for continuous characteristics and frequencies and percentages for categorical characteristics, were calculated for baseline and for 12-month follow-ups. In addition, for the composite outcome, 95% confidence intervals (CIs) are presented. McNemar’s chi-square test for dichotomous values was used to assess the change in the proportion of patients using major classes of analgesics (analgesic antidepressants, anticonvulsants, opioid analgesics) from baseline to the 12-month follow-up. The change in the opioid dose was evaluated using a Wilcoxon signed-rank test. Fisher’s exact test was used to detect any difference in responder rate (achievement of primary outcome) between those being treated with two analgesic classes and those being treated with all three classes. For secondary outcome measures, baseline and 12-month values were compared using paired t tests. Univariable logistic regression was used to evaluate the association between baseline characteristics and the primary 12-month outcome. The p value for the association between opioid treatment and the proportion of subjects achieving and not achieving the primary outcome at 12 months was based on the chi-square test. The p value for the difference in primary outcome based on opioid doses was derived from the Wilcoxon two-sample test.

RESULTS

Of the 789 patients recruited to participate in the Canadian Neuropathic Pain Database, 60 were identified as having PDN. Thirteen (21.7%) were lost to follow-up, leaving 47 patients with evaluable data and 43 patients with complete data at 12-month follow-up. Baseline characteristics of these patients with PDN are presented in Table 1 and patient analgesic history is presented in Table 2. The most common baseline analgesics were anticonvulsants (53.3%), followed by opioids (48.3%).

At 12-month follow-up, the proportion of patients using analgesic antidepressants, anticonvulsants, or opioid analgesics increased across all categories but did not reach statistical significance (Table 3).

The proportion of subjects achieving a ≥30% reduction in pain at 12 months relative to baseline was 16/43 or 37.2% (95% CI, 23.0-53.3) and the proportion of subjects experiencing a reduction of at least 1 point on the Pain Interference Scale (BPI) was 22/43 or 51.2% (95% CI, 35.5-66.7). The primary outcome measure—that is, the proportion of subjects achieving both at least a 30% reduction in pain and a 1-point reduction on the Pain Interference Scale—was achieved in 13/43 patients or 30.2% (95% CI, 17.2-46.1).

Opioid analgesics were included in the pain management strategy of 27/47 (57.5%) patients at 12-month follow-up. This was an increase from 22/47 (46.8%) at baseline, although this increase was not significant (Table 3). Of the 47 patients accounted for 12-month follow-up, 16 were using opioids at both baseline and 12-month follow-up; opioid doses had significantly increased (p = 0.002) from baseline to 12-month follow-up in this subgroup, although this was not associated with a significant improvement in
the primary outcome measure. Table 4 details the opioid dose of the patients who remained on this treatment modality. Data were complete in 25 patients whose pain management included opioid analgesia at 12-month follow-up. Of the 13 responders achieving the primary outcome, seven (53.9%) had a treatment strategy that included opioid analgesia. In the nonresponder group, 18/30 (60%) were using opioids. Thus, by 12-month follow-up, all patients were encouraged to increase their level of function despite ongoing pain.

Table 1: Patient characteristics at baseline (N = 60)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>57.1 ± 11.7</td>
</tr>
<tr>
<td>Sex (M)</td>
<td>56.7%</td>
</tr>
<tr>
<td>DN4 score (0-10)</td>
<td>6.6 ± 1.8</td>
</tr>
<tr>
<td>DN4 ≥ 4, N (%)</td>
<td>57 (95.0%)</td>
</tr>
<tr>
<td>Pain duration (years)</td>
<td>Mean 4.9 ± 3.9</td>
</tr>
<tr>
<td></td>
<td>Median 4.0 (2.7)</td>
</tr>
<tr>
<td>Average pain intensity (0-10, BPI)</td>
<td>6.7 ± 2.1</td>
</tr>
<tr>
<td>Average Interference Scale Score (0-10, BPI)</td>
<td>6.4 ± 2.6</td>
</tr>
<tr>
<td>Education, N (%)</td>
<td>Primary school 5 (8.5%)</td>
</tr>
<tr>
<td></td>
<td>Secondary school 25 (42.4%)</td>
</tr>
<tr>
<td></td>
<td>College or university 28 (47.5%)</td>
</tr>
<tr>
<td>Smoking status, N (%)</td>
<td>Current 16 (26.7%)</td>
</tr>
<tr>
<td></td>
<td>Previous 23 (38.3%)</td>
</tr>
<tr>
<td>Marijuana use (current), N (%)</td>
<td>4 (6.8%)</td>
</tr>
<tr>
<td>Comorbidities, N (%)</td>
<td>Mechanical neck or back pain 7 (11.7%)</td>
</tr>
<tr>
<td></td>
<td>Fibromyalgia 2 (3.3%)</td>
</tr>
<tr>
<td></td>
<td>Headache 3 (5.0%)</td>
</tr>
<tr>
<td>Disability compensation, N (%)</td>
<td>16 (26.7%)</td>
</tr>
</tbody>
</table>

Data are mean ± standard deviation, median (Q1,Q3), number; DN4 = Douleur Neuropathique en 4 Questions: score ≥4 indicates probable neuropathic pain.

Table 2: Patient analgesic history (N = 60)

<table>
<thead>
<tr>
<th>Analgesic Class</th>
<th>Baseline, N (%)</th>
<th>12 months, N (%)</th>
<th>p value (McNemar’s chi-square)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>7 (11.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NSAIDs</td>
<td>26 (43.3%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analgesic antidepressants</td>
<td>22 (36.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anticonvulsants</td>
<td>32 (53.3%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opioids</td>
<td>29 (48.3%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opioid dose (MED)</td>
<td>Mean 142.3 ± 224.2</td>
<td>Median 60.0 (18,160)</td>
<td></td>
</tr>
<tr>
<td>Prior analgesic trials, N (%)</td>
<td>None 24 (40.0%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NSAIDs</td>
<td>21 (35.0%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analgesic antidepressants</td>
<td>11 (18.3%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anticonvulsants</td>
<td>14 (23.3%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opioids</td>
<td>12 (20.0%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opioid dose (MED)</td>
<td>Mean 145.1 ± 336.0</td>
<td>Median 33.0 (15,88)</td>
<td></td>
</tr>
</tbody>
</table>

MED = morphine equivalent dose (mg/day); NSAIDs, nonsteroidal anti-inflammatory drugs. Data are mean ± standard deviation, median (Q1,Q3), number.

Table 3: Major analgesic class use at baseline and 12-month follow-up (N = 47)

<table>
<thead>
<tr>
<th>Major analgesic class</th>
<th>Baseline, N (%)</th>
<th>12 months, N (%)</th>
<th>p value (McNemar’s chi-square)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analgesic antidepressants</td>
<td>18 (38.3)</td>
<td>24 (51.1)</td>
<td>0.146</td>
</tr>
<tr>
<td>Anticonvulsants</td>
<td>25 (53.2)</td>
<td>28 (59.6)</td>
<td>0.453</td>
</tr>
<tr>
<td>Opioids</td>
<td>22 (46.8)</td>
<td>27 (57.5)</td>
<td>0.332</td>
</tr>
</tbody>
</table>

In addition, being on an opioid analgesic at baseline and being on treatment modalities, the most commonly used by 12 months were physical therapy and acupuncture, both reported by 10.6% of patients. Other methods included psychotherapy (8.5%), local anesthetic or steroid injections (2.1%), surgery (2.1%), and transcutaneous electrical nerve stimulation (2.1%). All patients were encouraged to increase their level of function despite ongoing pain.

Table 4: Major analgesic class use at baseline and 12-month follow-up (N = 47)

<table>
<thead>
<tr>
<th>Major analgesic class</th>
<th>Baseline, N (%)</th>
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<th>p value (McNemar’s chi-square)</th>
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MED = morphine equivalent dose (mg/day); NSAIDs, nonsteroidal anti-inflammatory drugs. Data are mean ± standard deviation, median (Q1,Q3), number.
positive results would be anticipated. treat or refractory pain. A study of PDN management in the pri-
where the patient population consists of those with difficult to
bias introduced by conducting the study at a tertiary care setting,
unfavourable outcomes was expected secondary to the referral
patients with acute PDN.7,17 Furthermore, a higher likelihood of
progressed to refractory chronic pain and are unlikely to experi-
der more meaningful benefit, both pain and function, can be tracked at
every visit using brief, validated instruments. The BPI used for
this study is one such example.16,23,24
Polyparmacy occurred in the majority of patients with PDN
by 12-month follow-up. This requirement for polyparmacy may
reflect the limited effectiveness of solitary medications in
achieving symptom reduction satisfactory to the patient, particu-
larly in those with chronic PDN who merit referral to a tertiary
care setting. However, the disadvantage of this strategy is that of
increasing adverse medication effects, such as drowsiness
and dizziness. There is some support for polyparmacy in that
combinations of morphine and gabapentin,25 nortriptyline and
gabapentin,26 and morphine and nortriptyline27 provided additive
analgesia relative to each agent alone in patients with PDN
and postherpetic neuralgia. In this study, although responders
were more likely to be using more than one pharmaceutical agent,
no difference in response rate was seen between those using
two analgesic classes versus three analgesic classes. Thus, it may
be possible to achieve similar benefit in the realms of pain
reduction and function by limiting the number of pharmaceutical
classes used and, in so doing, also limit the hazards of
polypharmacy such as compounding adverse effects and
medication interactions.
Finally, the authors acknowledge two principal limitations of
this observational study: the small number of patients recruited for
participation and the 22% dropout rate at 12-month follow-up.
Nevertheless, this study helps to clarify the long-term outcomes

| Table 4: Opioid dose in patients with opioid use at baseline and 12-month follow-up (N = 16) |
|---------------------------------|-----------------|-----------------|----------|
| MED (mg/day)                    | Baseline        | 12 months       | p value  |
| Mean (standard deviation)       | 186.3 (277.1)   | 267.4 (284.1)   | 0.002    |
| Median                         | 90.0            | 173.5           |          |

MED = morphine equivalent dose.

A higher median dose at baseline did not predict outcome (p > 0.1
and p > 0.4, respectively).

**DISCUSSION**

The chosen primary outcome measure, that is, the proportion
of patients who achieved the composite of at least a 30% reduction
in average pain intensity on the BPI and a 1-point reduction in the
Interference Score (0-10) of the BPI at 12 months, recognizes clinically significant improvement in both pain and function.
Almost one-third of patients with PDN treated in tertiary pain
centres achieved this clinically significant measure at 12-month follow-up. Although the overall proportion of patients using
analgesic antidepressants, anticonvulsants, or opioid analgesics
after 12 months was not significantly different from the proportion
using these classes at baseline, this improvement may be
accounted for by care provided in the tertiary care clinic where
patients are exposed to interdisciplinary approaches to pain man-
agement including physiotherapy and psychological techniques.
In addition, clinicians routinely customize doses of adjuvant
analgesics in some patients and switch analgesics in others to
optimize analgesia and minimize side effects. More patients had
achieved a functional improvement (51.2%) than a diminished
pain rating (37.3%). The population studied had a median pain
duration of 4 years; thus, these subjects represent those who have
progressed to refractory chronic pain and are unlikely to experi-
ence spontaneous symptom resolution as has been reported for
patients with acute PDN.7,17 Furthermore, a higher likelihood of
unfavourable outcomes was expected secondary to the referral
bias introduced by conducting the study at a tertiary care setting,
larly in those with chronic PDN who merit referral to a tertiary
care setting. However, the disadvantage of this strategy is that of
increasing adverse medication effects, such as drowsiness
and dizziness. There is some support for polyparmacy in that
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medication interactions.

Finally, the authors acknowledge two principal limitations of
this observational study: the small number of patients recruited for
participation and the 22% dropout rate at 12-month follow-up.
Nevertheless, this study helps to clarify the long-term outcomes
parameters as well as catastrophizing. Catastrophizing is known to
be a particularly important predictor of pain expression and
activity intolerance in patients with chronic pain.18 The lack of
association between baseline characteristics and improvement in
pain and function at 12 months may be related to the relatively
small sample size of the patient population.

Although there is some evidence that chronic neuropathic pain
and, in particular, PDN, responds to opioid therapy, this evidence is
conflicting.11,19 There was no significant impact on achieve-
ment of the primary outcome measure in the 16 patients who were
-treated with opioid analgesics throughout the study despite the
increased opioid dose. Sizable increases were observed in these
16 patients, with the median morphine equivalent dose increasing
from 90 mg/day at baseline to 173.5 mg/day at 12 months. Fur-
thermore, there was no association between opioid treatment at
12 months and the achievement of the primary outcome (p > 0.05);
that is, patients treated with opioids achieved the primary outcome
just as frequently as those without opioid treatment. This is in
keeping with evolving basic science mechanisms that suggest that
opioid analgesics can actually increase pain in some patients
because of paradoxical hyperalgesia.20 A recent AAN position
paper strongly cautions against escalating opioid doses above
80 to 120 mg/day morphine equivalent dose in the treatment of
chronic non-cancer pain unless the patient has benefitted with
regards to pain and function.21 Keeping pace with acquired
pharmacodynamic opioid tolerance can prompt prescribing higher
opioid doses with time. Ensuing pharmacological tolerance may
not be overcome with dose escalation.22 Furthermore, the
significant risks of opioid-related morbidity and mortality20
should prompt the routine use of predetermined endpoints of
pain relief and physical function that, if not achieved, would lead
to a trial opioid taper to truncate opioid risks when patients are not
attaining meaningful benefit. To make an objective determination
of meaningful benefit, both pain and function, can be tracked at
every visit using brief, validated instruments. The BPI used for
this study is one such example.16,23,24

Table 5: Association between opioid treatment at 12 months and average pain intensity (BPI) reduction of ≥30% and
Interference Scale Score reduced by ≥1.0 (n = 25)

<table>
<thead>
<tr>
<th>Achievement of primary outcome</th>
<th>No (%) (opioid use)</th>
<th>Yes (%)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (%) (opioid use)</td>
<td>18/30 (60.0%)</td>
<td>7/13 (53.9%)</td>
<td>0.707</td>
</tr>
<tr>
<td>MED (mg/day)</td>
<td>169.9 (256.4)</td>
<td>244 (237.5)</td>
<td></td>
</tr>
<tr>
<td>Mean dose (SD)</td>
<td>108.0 (46.2)</td>
<td>197.0 (30.4)</td>
<td>0.586</td>
</tr>
<tr>
<td>Median dose (Q1,Q3)</td>
<td>108.0 (46.2)</td>
<td>197.0 (30.4)</td>
<td></td>
</tr>
</tbody>
</table>

SD = standard deviation.
that are specific to PDN. Overall, our data support the referral of chronic PDN patients to a tertiary care centre to achieve meaningful improvements in pain and function.

ACKNOWLEDGEMENTS AND FUNDING

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DISCLOSURES

AJC reports grants from Pfizer Canada/Canadian Foundation for Innovation during the conduct of the study and personal fees from Pfizer Canada outside the submitted work. ASG reports grants from Pfizer and CIHR during the conduct of the study and grants from Purdue Pharma and Allergan outside the submitted work. CS reports grants from Pfizer Canada during the conduct of the study. CT reports grants from Pfizer Canada during the conduct of the study. DEM received grant support from Pfizer Canada and speaker’s honoraria and/or consulting fees from Merck-Frosst, Lilly, Johnson and Johnson, and Amgen Canada. The remaining authors do not have anything to disclose.

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12. Rothwell PM. External validity of randomised controlled trials: “To whom do the results of this trial apply?”. Lancet. 2005;365:82-93.

Table 6: Changes from month 0 to month 12 for secondary outcome measures

<table>
<thead>
<tr>
<th></th>
<th>Month 0</th>
<th>Month 12</th>
<th>Mean difference (SD)</th>
<th>95% CI</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average pain intensity, BPI</td>
<td>57</td>
<td>45</td>
<td>-1.39 (2.56)</td>
<td>0.59-2.27</td>
<td>.005</td>
</tr>
<tr>
<td>Mean interference</td>
<td>57</td>
<td>45</td>
<td>-1.94 (2.34)</td>
<td>1.09-2.79</td>
<td>.021</td>
</tr>
<tr>
<td>Scale score, BPI</td>
<td>57</td>
<td>45</td>
<td>-2.02 (2.74)</td>
<td>1.59-3.45</td>
<td>.123</td>
</tr>
<tr>
<td>POMS–SF</td>
<td>56</td>
<td>45</td>
<td>-0.86 (9.91)</td>
<td>-1.94-0.22</td>
<td>.577</td>
</tr>
<tr>
<td>SF-12 Mental</td>
<td>56</td>
<td>45</td>
<td>-2.80 (10.2)</td>
<td>-5.55-0.95</td>
<td>.145</td>
</tr>
<tr>
<td>SF-12 Physical</td>
<td>56</td>
<td>45</td>
<td>-2.26 (10.2)</td>
<td>-5.22-0.70</td>
<td>.158</td>
</tr>
<tr>
<td>Pain Disability Index</td>
<td>59</td>
<td>43</td>
<td>-3.87 (10.2)</td>
<td>-6.25-1.50</td>
<td>.123</td>
</tr>
<tr>
<td>Pain Catastrophizing Scale</td>
<td>57</td>
<td>44</td>
<td>-2.55 (10.2)</td>
<td>-5.10-0.00</td>
<td>.001</td>
</tr>
<tr>
<td>Patient Global Satisfaction</td>
<td>56</td>
<td>45</td>
<td>-0.79 (3.18)</td>
<td>-1.85-0.27</td>
<td>.158</td>
</tr>
</tbody>
</table>

BPI (0-10); PDI (0-70), higher score indicates greater disability; POMS–SF (0-120), higher score indicates greater impairment; SF-12 (0-100), score < 50 indicates below average health status; Pain Catastrophizing Scale (0-52), higher score indicates greater distress; Patient Global Satisfaction (0-10), higher score indicates greater satisfaction.


