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RESEARCH ARTICLE

Effect of a structured stretching exercise program on resolution of myofascial pain and opioid usage in "legacy pain" patients: A retrospective cohort study

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Abstract

Objective: The aim of this study was to determine whether the implementation of a structured exercise stretching routine targeted at resolving myofascial pain is effective in improving outcomes of "legacy pain" patients.

Design: Retrospective cohort study.

Setting: Private community-based interventional pain management practice.

Subjects: "Legacy pain" patients, defined as patients on opioid therapy for >1 year.

Methods: Subjects were initiated on a structured home exercise stretching routine targeted at resolving myofascial pain consisting of 14 lumbar, four thoracic, and seven cervical stretches as appropriate. Daily morphine milligram equivalent, functional status (Oswestry Disability Index), and pain level (Numeric Rating Scale) were compared pre- and post-treatment at one year.

Results: After 1 year, exercise techniques reduced daily morphine milligram equivalent intake on average from 76.3 to 21.0 mg ($p < 0.001$) with 84.4% of patients decreasing their total opioid dose ($p < 0.001$) and 34.4% of patients being completely weaned off of opioids ($p < 0.001$). Numeric Rating Scale of pain and Oswestry Disability Indices were unchanged with treatment, 7.0–6.7 ($p = 0.122$) and 30.4–29.3 ($p = 0.181$), respectively.

Conclusions: The addition of a structured stretching exercise program focusing on the resolution of the myofascial pain in the treatment of "legacy pain" patients was shown to significantly reduce and often discontinue opioid use without adversely affecting pain score or functionality.

KEYWORDS
myofacial pain syndrome, opioids, pain

INTRODUCTION

Long-term opioid therapy became the standard approach to managing chronic musculoskeletal pain in the late 1990s despite a lack of high-quality data on benefit and harm.[1] The rising rates of deaths from opioid overdoses have led to new guidelines discouraging opioid prescriptions for chronic pain and have recommended tapering of opioid dosages.[2] Unfortunately, there has been a large cohort of patients known as "legacy pain" patients who have been maintained on high doses of opioids for long periods of time. There is limited evidence regarding the treatment of these "legacy pain" patients with regards to reduction in pain, improvement in

function, and weaning down of opioids, and physicians are unclear of the best ways to manage these patients.[3]

Studies have demonstrated that a large portion of "legacy pain" patients suffers from a myofascial component to their pain.[4–6] Myofascial pain is defined as pain that originates from myofascial trigger points in skeletal muscle.[7,8] Overuse or misuse of muscles is postulated to result in neuronal sensitization, further worsening myofascial pain.[9] This type of pain is commonly thought to be treated well with non-opioid techniques such as exercise, physical therapy, and other non-opioid pharmacologic therapies.[10,11] The goal of this study was to determine whether a structured exercise stretching routine targeted at myofascial pain could be effective in improving the outcomes of "legacy pain" patients. It was hypothesized that this intervention would decrease morphine milligram equivalent usage and improve the functional status of patients.

PATIENTS AND METHODS

A retrospective review was conducted of "legacy pain" patients seen in a private community-based interventional pain management practice in Buffalo, New York, from 2016 to 2019. "Legacy pain" patients were defined as those taking opioids for >1 year prior to their first appointment. The inclusion criteria for this study were patients who were >18 years of age, were taking opioids for >1 year, were on workers' compensation, and had a diagnosis of chronic pain. The study was restricted to workers' compensation patients to further homogenize the cohort. Patients were excluded if they had substance use disorders due to future restrictions in prescribing opioids. This research study was conducted retrospectively from data obtained for clinical purposes during routine care. No collected information remained linked to identifiable patient data. Thus, the study was waived from IRB approval.

Intervention

As was considered routine care in this practice, patients were taught a structured stretching exercise program at their first appointment with a focus on areas of myofascial trigger points. The stretching program consisted of 14 lumbar, four thoracic, and seven cervical stretches as appropriate (see Appendix S1). The patients were asked to hold these exercises to the point of stretch, not pain, for five repetitions of 15 s twice daily. Follow-up visits were planned within two weeks of initial consultation and monthly thereafter when possible. In addition to the stretching routine, patients were started in physical therapy. Non-opioid adjuvants (nonsteroidal anti-inflammatories, muscle relaxants, benzodiazepines, antidepressants, and anticonvulsants) and interventional pain treatments were continued, added, or discontinued at provider's discretion. At the follow-up visits, the exercise stretching routine was monitored and corrections were made. Patients also underwent a physical examination and monitoring of symptoms, pain scores, and function at each visit. Patients were encouraged to wean off muscle relaxants, benzodiazepines, and opioids with improvement in pain.

Outcomes

Daily morphine milligram equivalent (MME), pain intensity as assessed by Numeric Rating Scale (NRS), and functional status as assessed by Oswestry Disability Index (ODI) were collected pre- and post-initiation of treatment at one year and compared as paired data sets.[12–14] Additional data points that were routinely collected for all patients in the clinic, such as return to work, reduction in weight, pain symptomatology (i.e., spasms, radiculopathy), non-opioid medication usage, and interventional procedure rate, were also compared. Data were also reported on patient demographics and prior treatments received. Patient MMEs were calculated based on medication being prescribed at the time of the initial visit verified through the New York State Prescription Monitoring Program. Conversions to MME dose were made using the 2019 Oregon Health Authority and Centers for Disease Control MME conversion factor.[15] Post-treatment MMEs were calculated in the same manner based on medications being prescribed at one-year post-initiation of treatment.

Statistical analysis and data management

Statistical analysis was carried out in SPSS version 25.0 (IBM Inc.). Nonparametric Wilcoxon signed rank tests with related samples were used to compare NRS pain scores, ODI scores, and changes in MMEs over the course of treatment. Fisher's exact tests were utilized to compare the occurrence of categorical data. The results were presented as both means and medians ± quartiles for numerical data and as frequencies with appropriate proportions for the categorical data. A p-value <0.05 was considered significant. As this was an exploratory study, an a priori power analysis was not conducted. Instead, all eligible patients within the three-year period from when the intervention first became routine in the practice were included in the sample.

RESULTS

The review resulted in 453 new workers' compensation patients seen between March 2016 and February 2019. Of these patients, 206 met the full inclusion criteria of the

study, and of this group, 64 (31.1%) patients proceeded with treatment and were included in analysis (Figure 1). The average age of the cohort was 54.1 years, and 60.9% were female (Table 1).

Exercise techniques reduced MME intake on average from 76.3 to 21.0 mg daily ($p < 0.001$, Table 2) with 84.4% of patients decreasing their total opioid dose ($p < 0.001$) and 34.4% of patients being completely weaned off of opioids ($p < 0.001$, Figure 2). This reduction in MME did not increase average NRS pain scores (average pretreatment NRS pain score of 7.0, average post-treatment NRS pain score of 6.7, $p = 0.122$, Table 2). Furthermore, reducing opioids with exercise techniques did not adversely affect patient function (average pretreatment ODI score of 30.4, average post-treatment ODI score of 29.3, $p = 0.181$, Table 2).

Non-opioid exercise techniques decreased the incidence of muscle spasms (decreased from 90.6% to 21.9% post-treatment, $p < 0.001$), intake of benzodiazepines (decreased from 28.1% to 14.1% of patients post-treatment, $p < 0.001$), and usage of muscle relaxants (decreased from 29.7% to 3.1% of patients post-treatment, $p < 0.001$, Table 2). Body mass index did not significantly change in this cohort ($p = 0.27$); however, the number of patients who returned to work significantly increased from its original level of 14.0% to 21.9% post-treatment ($p = 0.024$, Table 2). Interventional procedure rates decreased from 71.8% of patients to 25.0% of patients during treatment ($p < 0.001$, Table 2).

DISCUSSION

The results of this study demonstrate that integrating a structured exercise stretching program that focuses on the resolution of myofascial pain improves the outcomes of "legacy pain" patients. Patients in this study significantly reduced their daily opioid, muscle relaxant, and benzodiazepine use and had a significant decrease in pain symptoms, such as muscle spasms. Furthermore, reducing their medications did not adversely impact their NRS pain or ODI function scores, and instead

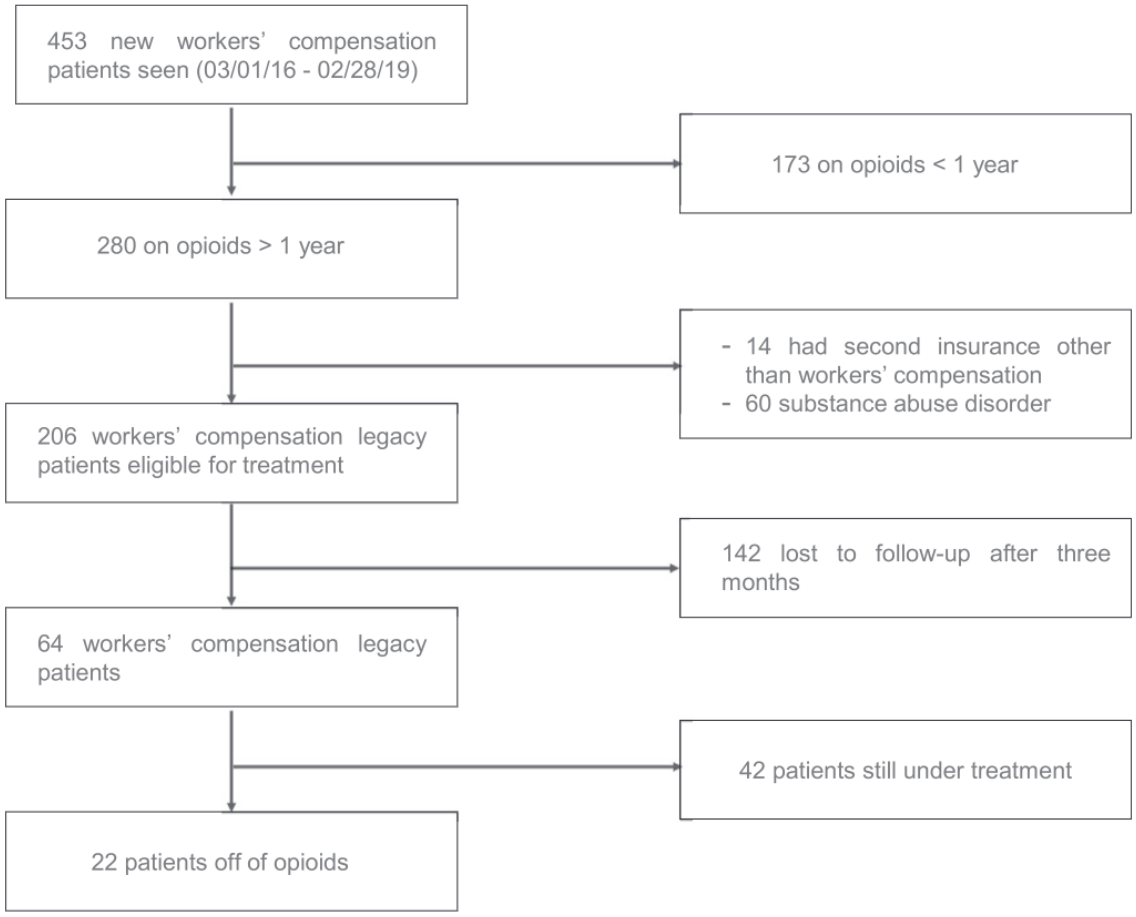

FIGURE 1 Flow chart of patients involved in the study

TABLE 1 Patient demographics and characteristics at the time of initial evaluation ($n = 64$)

Characteristics	Mean	SD
Age (year)	54.1	1.1
BMI (kg/m^2)	32.7	7.7
	Frequency	**Percentage**
Gender		
Male	25	39.1
Female	39	60.9
Ethnicity		
Caucasian	31	48.4
African American	28	43.8
Other	5	7.8
Prior treatments		
Physical therapy	57	89.1
Exercise	35	54.7
Surgery	46	71.9
Chiropractic therapy	39	60.9
Pain physician care	51	79.7
Surgeon's care	54	84.4
Years on opioids		
1–5	26	40.6
6–9	13	20.3
10–19	19	29.7
20–29	5	7.8
>30	1	1.6
Age started on opioids		
<30	6	9.4
30–39	14	21.9
40–49	27	42.2
50–59	15	23.4
>60	2	3.1

trended toward improving these outcomes. These results are corroborated by a number of systematic reviews that have investigated the effects of exercise therapy on chronic low back pain, including a Cochrane Review.[16–18] These reviews noted that there was a small-to-moderate improvement in pain scores with exercise therapy, but stated that further studies needed to investigate different forms of exercise interventions to determine which may be most effective. To our knowledge, this is the first study that has specifically investigated the addition of a structured exercise stretching program focusing on myofascial pain into the care of patients on opioid therapy for more than one year. Furthermore, a key aspect of this study that may have positively impacted the results was monitoring and correcting the exercise stretching routine at follow-up visits, as recommended by Kraus and Marcus in 1997.[19]

The potential economic impact of the outcomes of this study cannot be overstated. Prior research has demonstrated that patients who are on high-dose opioids are at higher risk of hospitalization, substance use disorder, and more frequent healthcare utilization.[2,20,21] With the addition of a simple intervention such as stretching that focuses on myofascial pain, not only were opioid doses significantly reduced, but healthcare costs also decreased, as medication and interventional pain treatments significantly reduced. The implementation of this structured exercise stretching program is an intervention that we feel can be implemented not only by pain specialists, but more importantly in the primary care setting. Additionally, given the restriction to workers' compensation insurance in this study, the demographics of patients were significantly skewed toward initiation of long-term opioid therapy prior to the age of sixty (96.9% of patients). Despite this working-age cohort, only 14.0% of patients were employed at the initiation of treatment. This number significantly improved to 21.9% post-treatment. These results are corroborated by previous studies that have demonstrated that musculoskeletal pain is the most common reason for lost workdays.[22] Thus, the addition of a structured exercise stretching regimen that focuses on myofascial pain is an inexpensive intervention that can not only have a positive impact on both patient outcomes and healthcare costs, but also on the economy as a whole.

One main limitation of this study is that there was a high initial drop-out rate, as only 31.1% of patients continued their course of care. The exercise-based philosophy for treatment of chronic pain was explained at the patient's first visit, and many patients dropped out early as they were skeptical that exercise could decrease pain after having been on opioids and seeing so many different practitioners for long periods of time. The full demographics and characteristics of patients who dropped out of the treatment course within 3 months are shown in supplemental Table 1. These patients were more likely to have been on opioid treatment for longer, 11.6 years vs. 9.5 years on average. Additionally, "legacy pain" patients had a high surgical rate, both related and unrelated to their workers' compensation chronic pain, and therefore, a number of patients who continued treatment had difficulty carrying out the exercise program to its full extent perioperatively. During the course of treatment, 11 patients had surgery (17.2%) and 5 more scheduled surgery (7.8%). Finally, although there was a statistically significant reduction in opioid usage, this exploratory study may have been underpowered to elicit full statistical associations in regards to NRS and ODI scores. It is, however, worth nothing a negative trend in both scores. Future considerations would be to carry out a prospective randomized study on a larger cohort of patients with only one group implementing the exercise regimen.

TABLE 2 Study outcome variables before and after institution of the structured exercise program ($n = 64$)

Outcome	Before treatment	After treatment	*p*-Value
Daily opioid dose (morphine milligram equivalent)			
Mean	76.3	21	<0.001
Median [interquartile range]	42.5 [30.0–90.0]	20.0 [3.0–34.5]	
Numeric Rating Scale of pain intensity			
Mean	7.0	6.7	0.122
Median [interquartile range]	7.5 [6.0–9.0]	7.0 [5.0–8.0]	
Oswestry Disability Index			
Mean	30.4	29.3	0.181
Median [interquartile range]	31.0 [27.0–37.0]	30.5 [23.5–37.5]	
Muscle spasm	58 (90.6%)	14 (21.9%)	<0.001
Adjuvant use of muscle relaxant	19 (29.7%)	2 (3.1%)	<0.001
Use of benzodiazepine	18 (28.1%)	9 (14.1%)	<0.001
Actively employed	9 (14.0%)	14 (21.9%)	0.024
Interventional pain procedures	46 (71.8%)	16 (25.0%)	<0.001

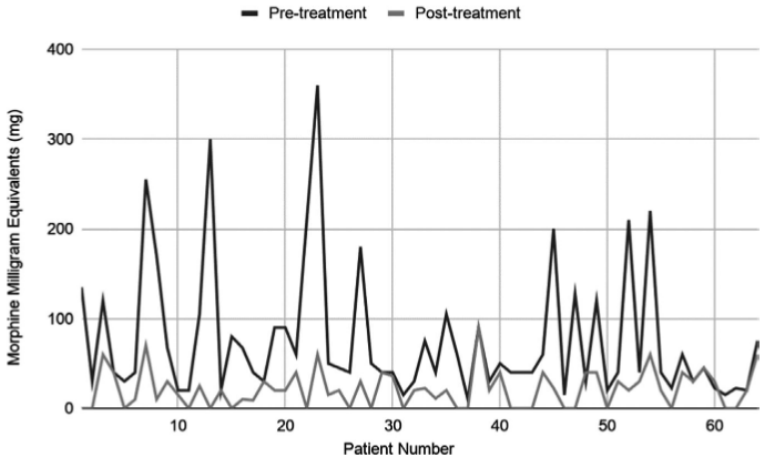

FIGURE 2 Individual patient daily morphine milligram equivalents before and after introduction of structured exercise stretching program. Exercise techniques reduced MME intake on average from 76.3 to 21.0 mg daily ($p < 0.001$) with 84.4% of patients decreasing their total opioid dose ($p < 0.001$) and 34.4% of patients being completely weaned off opioids ($p < 0.001$)

CONCLUSION

The addition of a structured stretching exercise program focusing on the resolution of the myofascial pain in the treatment of "legacy pain" patients was shown to significantly reduce and often discontinue opioid use without adversely affecting pain score or functionality. It decreased the incidence of muscle spasms, intake of benzodiazepines and muscle relaxants, and need for interventional pain treatments. Furthermore, a significant number of patients were able to return to work. The application of this exercise program can easily be incorporated into the primary care and chronic pain practice setting.

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CONFLICT OF INTEREST

There are no conflicts of interest for any authors for this project.

DATA AVAILABILITY STATEMENT

Data available on request from the authors.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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