Neuromusculoskeletal Medicine (OMT) Original Article

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Osteopathic manipulative treatment for refractory chronic traumatic pain and mobility restrictions at a level 1 trauma center

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Abstract

Context: Traumatic musculoskeletal injuries may result in chronic pain and mobility limitations, decreasing quality of life, and increasing predisposition to comorbid disorders. Osteopathic manipulative treatment (OMT) utilizes palpatory assessment and application of manual forces as an adjunct intervention for musculoskeletal disease. Multiple studies have demonstrated OMT's potential benefits for a range of disease states, but data on osteopathic OMT are limited.

Objectives: The objective of our study was to understand the potential benefits of a novel OMT for trauma outpatient program for the care of injured patients suffering chronic pain and mobility limitations.

Methods: In 2021, the New York University (NYU) Langone Hospital – Long Island Level 1 Trauma Center established a novel outpatient OMT for Trauma Program (OTP). We performed a retrospective analysis of OTP patients seen from January 1, 2021 to December 31, 2022 with the chief complaint of refractory chronic (persistent ≥3 months since inciting injury) postinjury pain and mobility limitations (inclusion criterion). We excluded patients missing follow-up, then extracted and analyzed patient demographic, injury-specific, and OMT data. Data are presented as frequencies (percentages) or medians (interquartile range [IQR]).

Results: Forty-three patients (75.4 % of patients treated at the outpatient OTP) reported a mechanism of injury (MOI). Of these, 30 (69.8 %) met the inclusion criteria, and seven met the exclusion criterion, yielding 23 total patients for the analysis (40.3 % of the total OTP population). 73.9 % were female aged 46 (39–59) years old. Patients presented 3.00 (0.58–20) years since etiologic injury. MOIs included 56.5 % motor vehicle collisions (MVC), 21.7 % falls, 8.7 % penetrating, and 13.0 % sports-related or lifting injuries. Patients reported 3 (2–4) treatment modalities tried and 2 (1–3) medications attempted prior to the OTP. After the first OMT session, 95.7 % of patients reported subjective improvement in pain with a decrease in pain score 3 (3–7) out of 10. After OMT, patients also self-reported ease of activities of daily living (ADLs, 82.6 %), improved sleep hygiene (26.1 %), improved anxiety/mood (65.2 %), and decreased use of analgesic medication (13.0 %). Four (17.4 %) reported post-OMT complication of 2–3 days of self-limited, mild musculoskeletal pain. Univariate logistic regression models demonstrate that OMT benefited patients regardless of time since inciting injury.

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Conclusions: OMT may benefit refractory chronic traumatic pain and mobility limitations regardless of the time since inciting the injury. This is the first major publication from the OTP and bolsters proof-of-concept for an organized OMT program at a level 1 trauma center. Further study, including comparative analysis with more formalized pain assessments utilizing validated tools as well as standardized OMT session surveys, is warranted.

Keywords: injury; mobility; osteopathic manipulative treatment; pain; trauma; trauma center

Annually, traumatic injuries result in 4.4 million mortalities, constitute approximately 8 % of all deaths, and are responsible for nearly 10 % of all years lived with disability [1]. Chronic pain and mobility limitations are leading causes of postinjury disability and often increase predisposition to comorbid disorders, decreased quality of life, and death [2–4]. In the United States, chronic pain may result in up to 635 billion dollars of annual healthcare costs, which is in excess of those for cardiovascular disease, cancer, or diabetes [5].

In addition to pharmaceutical and operative interventions, chronic postinjury pain and mobility limitations may benefit from manual medicine [5, 6]. Osteopathic manipulative treatment (OMT) is a physician-administered treatment, utilizing nuanced palpatory diagnosis and facilitating healing potential through precise application of manual forces [7]. OMT is noninvasive, can be applied to the entire body as well as a range of disease states, and is individualized to distinct patient palpatory findings, physiology, and pathophysiology [4].

Currently, there is limited large-scale, published evidence, demonstrating that OMT may be utilized to alleviate pain and disabilities after injury. Relevant studies include those for spinal cord damage, sports-related trauma, motor vehicle collisions (MVCs), and brain injury [8–18]. To our knowledge, to date, no American College of Surgeons (ACS)-verified trauma center has formally integrated an OMT program for injured patients.

In January 2021, our hospital's ACS-verified level 1 trauma center established a novel OMT for Trauma Program (OTP), focusing on injured and/or perioperative inpatients and outpatients. The outpatient OTP identified a trend of patients with chronic, refractory postinjury pain and mobility limitations who experienced significant benefit from OMT. Herein, we detail a retrospective analysis of OTP patients who suffered chronic postinjury symptoms and illustrate the potential for OMT's benefit among the trauma population through an organized trauma center-based program and discuss how these data may inform growth of the OTP and similar programs.

Methods

After obtaining New York University (NYU) Langone Health Institutional Review Board (IRB) approval as an exempt study (#i22-01545), we conducted a retrospective review of patients who presented to our level 1 trauma center's outpatient OTP, reported injury as the etiology of chronic (≥3 months since injury) pain and mobility limitations from January 1, 2021 to December 31, 2022 (inclusion criterion) [19]. The only exclusion criterion was no follow-up after the initial OTP OMT session.

From patient electronic health records (EHRs), we extracted demographics, injury details, chief complaints, previous treatments attempted, and details of OMT treatment, including patient self-reported post-OMT outcomes.

While OMT is practiced worldwide, a trauma center-based OTP is a novel concept and the first of its kind at any level 1 trauma center. Thus, symptom improvement post-OMT was based on patient self-reports on retrospective free-text reviews immediately after the first session of OTP OMT or at the first follow-up encounter. Symptom benefits were based on pain scales, improvements in mobility, improvements in sleep hygiene and mood, qualitative frequency of the use of analgesics, and ease of activities of daily living (ADLs) per patient-reported outcomes.

Data were summarized descriptively utilizing median (interquartile range [IQR]) and frequency (percentage), as appropriate. Pre- and post-OMT pain scores were compared utilizing the Wilcoxon signed-rank test. The change in OMT pain score (post-OMT minus pre-OMT) was visualized utilizing a box-and-whiskers plot. Univariate logistic regression models were utilized to assess the effect of years since injury on several outcomes. Results were considered statistically significant if $p<0.05$. All data analyses were performed utilizing SAS 9.4 (SAS Institute Inc., Cary, NC) and Excel 2016 (Microsoft Corporation).

Results

Forty-three patients (75.4 % of patients treated at the outpatient OTP) reported a mechanism of injury (MOI) as the etiology of their chief complaints. Of these, 30 (69.8 %) met the inclusion criterion, and seven did not follow up from their initial OTP session within the study time period (met exclusion criterion), yielding 23 total patients for analysis (40.3 % of total outpatient OTP population).

The study population was 73.9 % (17 of 23) female with a median age of 46 (IQR: 39–59) years old. Patients presented to their initial OTP session 3.00 (0.58–20) years after

their MOI. MOIs included 56.5 % MVCs (inclusive of pedestrians or bicyclists struck by motor vehicles), 21.7 % falls, 8.7 % penetrating (1 multiple gunshot wounds [GSWs], 1 multiple stab wounds), and 13.0 % sports-related or lifting injuries.

Patients reported a median of 3 [2–4] nonpharmacologic treatment modalities tried (the most common being physical therapy [91.3 %]) and 2 [1–3] analgesic medications attempted prior to their initial encounter at OTP. These modalities and medications consisted of a wide variety, including other manual treatments (e.g., chiropractic, massage) and opioids (Table 1).

During the study period, patients had a median of 2 [1–3] and mean of 2.47 OMT sessions with an absolute range of 1–12 sessions. Immediately after the first OTP session, 87.0 % of patients reported improvement in their pain. During OTP session #2, 95.7 % reported improvement in pain since OTP session #1. The median decrease in pain score from pre-OMT to OMT session #2 was 3 (3–7) (Figure 1, signed rank p=0.001).

Between OTP session #1 and #2, 100 % of patients reported improved mobility. Patients also self-reported: improved ability to perform ADLs (82.6 %); improved mood (65.2 %); improved sleep hygiene (26.1 %); and decreased use of analgesic medication (13.0 %). Four (17.4 %) patients reported post-OMT complications, all of which were described as 2–3 days of self-limited musculoskeletal pain, described universally as mild (Table 1).

Univariate logistic regression of each symptom improvement relative to the time since inciting the injury revealed no relationship between benefits from OTP encounter and time, suggesting that OMT may improve chronic postinjury pain, mobility limitations, and other injury-related symptoms regardless of years since inciting the injury (Table 2).

Referrals to the OTP came from a variety of medical specialties and other sources. Physical Medicine and Rehabilitation (PM&R) providers, including PM&R Pain Management subspecialists, provided the majority of the studied OTP referrals (43.5 %). Additionally, 26.1 % of the referrals came from providers within our Division of Trauma and Acute Care Surgery. Interestingly, 13 % of OTP patients were referred by other OTP patients, while primary care physicians (Internal Medicine and Family Medicine) and self-referrals (i.e., through our hospital system's website) each contributed 8.7 % of referrals.

Table 1: Osteopathic manipulative treatment (OMT) for trauma program demographics and self-reported outcomes.

Female (n, %)	17, 73.9
Male (n, %)	6, 26.1
Age in years (median [IQR])	46 [39–59]
Years since injury (median [IQR])	3 [0.58–20]
MOI (n, %)	
MVC	13, 56.5
Falls	5, 21.7
Sports-related/lifting	3, 13.0
Penetrating (GSW or stabbing)	2, 8.7
Prior treatment modalities tried (median [IQR])	3 [2–4]
Physical therapy (n, %)	21, 91.3
Pain management (n, %)	11, 47.8
Other (e.g., cupping, herbals; n, %)	10, 43.7
Any hospital admission (n, %)	5, 21.7
Occupational therapy (n, %)	5, 21.7
Chiropractic (n, %)	5, 21.7
Massage therapy (n, %)	4, 17.4
OMT (n, %)	3, 13.0
Any emergency department treat and release (n, %)	3, 13.0
Previous medications tried (median [IQR])	2 [1–3]
Over-the-counter analgesic (not prescribed; n, %)	18, 78.3
Muscle relaxant (n, %)	14, 60.9
Anti-inflammatory (n, %)	8, 34.7
Steroid (n, %)	5, 21.7
Opioid (n, %)	4, 17.4
Neuropathic (n, %)	2, 8.70
Other (n, %)	2, 8.70
Antidepressant (n, %)	1, 4.35
Self-reported symptom improvement after OMT (n, %)	
Pain immediately after first OMT session	20, 87.0
Pain at first follow-up	22, 95.7
Mobility at follow-up	23, 100
Ease of ADLs	19, 82.6
Mood	15, 65.2
Frequency of pain-free periods	11, 47.1
Sleep hygiene	6, 26.1
Use of analgesics	3, 13.0
OMT complications (all self-limited aches/pains; n, %)	4, 17.4

ADLs, activities of daily living; GSW, gunshot wound; IQR, interquartile range; MVC, motor vehicle collision; OMT, osteopathic manipulative treatment.

Four exemplary OTP cases

In light of the novel nature of the OTP, we provide illustrations of the OTP case encounters.

Patient A: motor vehicle collisions

A 59-year-old female referred by her primary care physician reported being struck while riding her bicycle 32 years ago resulting in forehead contusion, concussion, and right hip and pelvis trauma without operative injury. She reports an MVC occurring 13 years ago from which she sustained right

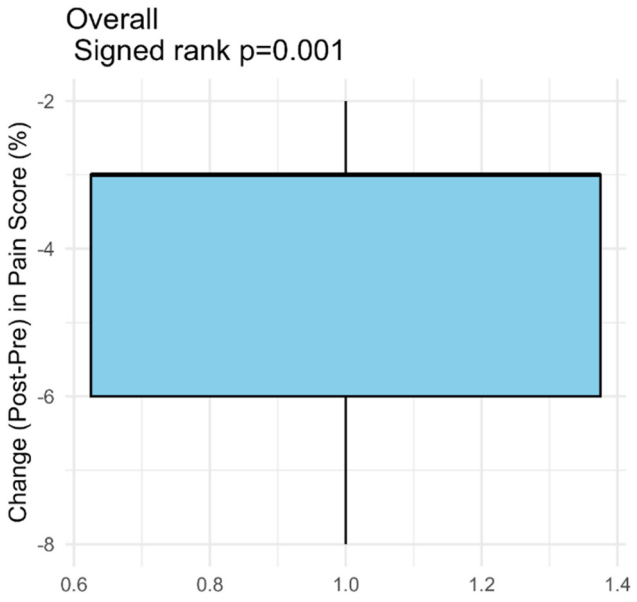

Figure 1: Pre-post change in pain score between OTP OMT sessions #1 and #2. The median (interquartile range [IQR]) pre-post change is −3 (−7, −3), signed rank p=0.001, suggesting a significant decrease in the pain score.

hip, pelvic, left shoulder, and upper chest injuries, which she attributes to her current symptoms. Upon presentation to the OTP, she complained of persistent lower back pain exacerbated by lying supine, lower neck pain, decreased lower-back and lower-extremity mobility, and chronic constipation beginning after the bicyclist-struck injury and then exacerbated by the MVC. She attempted various physical and pharmaceutical treatment modalities, including physical therapy, chiropractic, massage, and steroids, none of which provided significant relief.

She underwent six total OTP OMT sessions that utilized predominantly myofascial release (MFR), balanced ligamentous tension (BLT), muscle energy (ME), inhibition, osteopathic manipulation in the cranial field (cranial), and facilitated positional release (FPR).

Immediately after her first OMT session, the patient reported a decrease in her presenting baseline pain from 5/10 to 3/10 as well as a significant reduction in pain when lying supine. During subsequent OTP encounters, she continued to experience improvement in her chronic pain scale, with much of her lingering neck, upper back, and shoulder pain being attributed to work-associated exacerbations; for the first time in decades, she reported pain-free episodes.

Upon the completion of six sessions, the patient rated her pain 0/10, reporting only occasional low back “discomfort” and improved mobility, during maneuvers at work, including being able to shelve items above her head for the first time since the injury.

Table 2: Univariate logistic regression models assess the effect of the years since the injury on outcomes. In this sample, none of the outcomes was associated with the years since injury.

Outcomes	Odds ratio[a]	95 % confidence interval[a]	p-Value
ADLs	1.01	0.94, 1.09	0.784
Mobility	[b]	[b]	[b]
Mood	0.99	0.93, 1.06	0.858
Sleep	0.93	0.86, 1.01	0.086
Medication use	1.003	0.91, 1.11	0.946
Complication	0.97	0.90, 1.05	0.424

[a]Estimated via logistic regression models. [b]All subjects experienced mobility benefit. ADLs, activities of daily living.

Patient B: falls and heavy lifting

A 39-year-old female presented after referral from an OTP patient with complaints of left-sided hip, shoulder, and back pain attributed to several blunt injuries and excessive heavy lifting sustained during her time of military service. She notes that the worst injury was 14 years prior to presentation, involving a fall from the back of a military vehicle onto her left side while carrying a heavy object. The patient did not receive treatment immediately after this fall and continued to engage in physical activity, resulting in more and relatively minor falls. She reports no fractures or injuries that required medical or surgical intervention. For 14 years, she has experienced persistent pain on her left side, especially when rolling onto this side during sleep, and she has been diagnosed with osteoarthritis of only the left hip. She has attempted regular massage therapy that provided relief transiently but experienced recurrence of pain soon thereafter. She has also attempted two forms of medications, including over-the-counter (OTC) analgesics and prescribed muscle relaxants.

At the OTP, she underwent three OMT treatments, utilizing primarily MFR, BLT, FPR, inhibition, diaphragm release, and ME with noted predominantly left-sided extremity somatic dysfunction. After her first OMT session, she reported complete resolution of her pelvic and hip pain, and relatively more noticeable pain to the left shoulder and flank. Before her third OMT session, she experienced complete resolution of pain for 1.5 months before a gradual return, albeit with lesser intensity. She also reported improved mobility, mood, and sleep. After her third session, the patient confirmed complete alleviation of her pain, citing 0/10 pain and “not even discomfort” when lying on her left side. As a

result, she also reported improvement in her psychoemotional state and her ability to exercise pain-free.

Patient C: penetrating trauma

A 26-year-old female was referred to the OTP by the Trauma Surgery Division 3 months after sustaining multiple GSWs to the right chest and right upper extremity, which resulted in persistent right upper extremity, rib, and back pain. Injuries included rib fractures and hemopneumothorax. Additionally, the patient experienced significant posttraumatic stress disorder (PTSD) symptoms following her traumatic injury, for which she was receiving psychiatric care.

The patient had previously received standard inpatient then outpatient care, including tube thoracostomy and multimodal analgesia (OTC and prescription anti-inflammatories, muscle relaxants and opioids), occupational therapy, physical therapy, and a brief session of inpatient OMT.

Upon presentation to the OTP, she complained of 10/10 pain, which was decreased to 3/10 immediately after the first OMT session. The OMT techniques utilized included MFR, BLT, counterstrain, inhibition, diaphragm release, ME, and cranial. During OMT sessions, she was counseled on her psychoemotional well-being, including when memories of the event emerged during treatment, for example, during positioning for counterstrain into positions mirroring her guarded position to evade the shooter. She had two additional OMT sessions in which she reported progressive benefits from OMT, including in terms of right upper extremity mobility, ADLs, mood, and analgesic medication use. She self-elected out of additional OMT sessions after her symptoms had resolved.

Patient D: sports injury

A 20-year-old male who self-referred to the OTP via an online search engine had suffered chronic low back pain and feeling of low back and hip instability (i.e., he constantly feels like he is leaning/falling to one side) since a forcible torso twisting injury during a baseball game that resulted in a lumbar pars fracture 3 years prior to the OTP encounter. He had undergone physical therapy and PM&R treatments, including tenderpoint injections without significant or consistent relief. His symptoms have limited his progress as an athlete.

He underwent two OMT sessions at the OTP and experienced immediate improvement in the severity and quality of pain as well as an improved sense of body stability and mobility. At his follow-up OTP encounter, he had experienced some return of his previous symptoms after increasing the intensity of his workouts; however, it was not to the same intensity or "sharp" quality as it was previously. Despite this reinjury, his tissues were noted to be more mobile than before the initial OTP session, and OMT was more successful, resulting in immediate 0/10 pain (from 5/10 prior to this second session) and feeling "like totally aligned." He has since returned to full athletic activity at his college.

Discussion

Chronic pain and mobility limitations after injury may have broad impacts on an individual's well-being and contribute to long-term comorbidities [2–4]. Methods of alleviating chronic pain and mobility limitations through nonpharmaceutical and nonoperative strategies may shorten the recovery time from injury [5, 6] and may minimize the adverse effects of medications [20].

Our retrospective analysis of the novel OTP at a level 1 trauma center demonstrates that OMT may uniquely benefit chronic pain and mobility limitations as adjunct to other postinjury treatment modalities. Osteopathic medicine is founded upon the principles that structure and function are interrelated and that the body is naturally self-healing [21]. Impaired or abnormal structure of the somatic system may result in structural distortion caused by traumatic forces being applied to physical structures of the body. Nociceptive nerve misfiring and muscle spasms may also occur after physical trauma, affecting the body's abilities as a self-regulating entity [7].

OMT utilizes manual techniques to diagnose and alter tissue structural changes caused by traumatic forces, thus supporting return to the pre-injury physiological mechanisms of the body [22]. Our study demonstrates that when OMT is utilized to alleviate the somatic dysfunction of injured patients, pain and mobility limitations can be improved even years after the inciting injury.

At the OTP, OMT is utilized to diagnose structural changes in the body, referred to in osteopathic terminology as "restrictive barriers," that result from forces applied at the time of the injury. These barriers often reflect the body's position at the moment of trauma, and the assessment of restrictive barriers can provide insight into the MOI. For example, the pattern of restrictive barriers in a patient who fell sideways from standing would differ markedly from one who experienced a head-on collision while seated. These patterns, or composite of restrictive barriers, can persist for years or even decades if left untreated. OMT offers a means of identifying and resolving these long-standing dysfunctions. This phenomenon has been described in both osteopathic and nonosteopathic literature [23–26].

The OTP engaged in a number of OMT techniques to counter and overcome such restrictive barriers. For example, MFR in which the physician applies force to move the dysfunctional myofascial tissues toward or away from a restrictive barrier, lengthening antagonistic muscle groups that contribute to dysfunctional pain, was the most frequently applied OMT technique at the OTP [7]. ME is another commonly utilized OMT technique in which the patient engages the dysfunctional muscle group while the physician supplies counterforce resistance; this combination relaxes and lengthens muscles, relieving tension and improving strength, thus allowing for greater range of motion [27, 28]. Such OMT techniques improved chronic mobility limitations by surpassing restrictive barriers that resulted in decreased range of motion, immobility, and joint pain. Our study findings suggest that OMT applied in the context of a level 1 trauma center may be a useful modality for patients with posttraumatic chronic pain and mobility limitations, perhaps in conjunction with and augmented by other physical treatments, including other forms of bodywork like physical therapy.

Physical therapy has been a long-accepted method for the rehabilitation of patients after traumatic injury. Early physical therapy among trauma patients has been shown to decrease the odds of hospital complications, shorten lengths of stay, as well as promote a favorable disposition upon hospital discharge [29]. However, as highlighted in the RECOVER trial in 2015, increases in hospital physical rehabilitation post-ICU discharge may not improve long-term physical recovery or health-related quality of life [30]. The RECOVER trial underscores the need for innovative approaches to address persistent physical deficits among this patient population in addition to physical therapy.

The OTP and our study look to address this innovation gap by demonstrating that providing OMT for trauma patients as part of an ACS-verified level 1 trauma center's standards, including its near-ubiquitous use of physical therapy and analgesics, may improve injured patients' symptoms. Our results suggest that OMT performed by trauma surgeons would provide additional relief for these chronic deficits and that at least among some patients, OMT may improve overall pain, mobility, daily function, sleep hygiene, anxiety, and mood beyond the standard of care.

Massage therapy is another hands-on treatment modality (often more familiar to the lay population) that is known to improve muscle tension and stiffness, accelerate recovery from sprains, reduce muscle pain and edema, enhance blood flow, and promote the clearance of lactate and creatine kinase [31]. Numerous studies have investigated the benefits of massage in postoperative care. In one randomized controlled trial following 605 veterans undergoing major surgery, the massage group showed statistically significant short-term decreases in pain intensity, pain unpleasantness, and anxiety compared to the control group [32].

A systematic review and meta-analysis conducted by the American Massage Therapy Association on postoperative care in thoracic surgery found that massage therapy reduced pain by an average of 0.80 points on a 10-point pain scale [33]. Yıldız et al. evaluated non-pharmacological pain management options in Turkey and reported a threefold decrease in pain for patients who received massage therapy [34].

OMT integrates soft tissue manipulation similar to massage therapy, and our study noted that OTP patients benefited in pain scale and mood similar to the results delineated above for massage therapy. In contrast to massage therapy, the whole-body approach of OMT allows for manipulation of bones, joints, and viscera that massage therapists cannot address and when also treated, may lead to better outcomes. For example, an RCT of thoracic osteopathic manipulation of the chest wall, diaphragm, and neural inputs to the respiratory mechanism improved poststernotomy pulmonary function, pain scale, and hospital length of stay [35].

Similar to massage therapy, various randomized controlled trials assessed the potential benefits of chiropractic in the treatment of chronic low back pain and postoperative rehabilitation. Currently, there is limited research regarding the potential benefits of chiropractic therapy in the use of rehabilitation for pain postoperatively [36, 37]. The available data suggest that multidisciplinary integrative care showed better outcomes for pain intensity as well as other measures – such as disability, satisfaction, and lower back symptom frequency – when compared with patients treated with chiropractic alone.

Like chiropractic, OMT may adjust the position of the bony structures and joints. Our study links this aspect of manipulation to the postinjury population, thus elaborating on the potential benefits the chiropractic literature has noted for other populations. In contrast to chiropractic doctors and physical and massage therapists, OMT practitioners are physicians with full practice rights in the United States, thus making it arguably the most ideal form of bodywork to integrate into a level 1 trauma center. OMT performed by trauma surgeons would allow the diagnosis and treatment of injury-related restrictive barriers and also an opportunity for wound and other injury assessment and management, follow-up for postinjury logistics such as providing prescriptions and paperwork as well as an opportunity to assess and treat the psychoemotional aftereffects of major injury. Our data reflect that chronic pain and

mobility limitation management by OMT in a trauma center also benefited patients' psychoemotional state, and because the mean duration of OMT sessions was approximately 45 minutes, the surgeon would have an opportunity to assist with other aspects of postinjury sequelae.

Our study emphasizes the potential benefit of trauma center-integrated ongoing care after index injury hospitalization. Other authors have created ongoing posttrauma admission care programs, with varying success [38]. And based on our data, we recommend integrating referral for OMT in select posttrauma admission settings. Because there has been relevant data supporting other manual treatment modalities as delineated above, OMT – which includes principles and techniques of physical therapy, massage therapy, and chiropractic – needs to be applied and analyzed for optimal application among injured patients in order to best understand how comprehensive manual care by full-physicians can help improve postinjury pain and mobility limitations. We hope that this study encourages further use and study of OMT after injury, specifically in trauma centers.

There are several significant limitations to our study, particularly those that are well-known to limit the value of retrospective, single-site studies. In addition, our study was performed without prospective standardization of data collection beyond the universal assessment of subjective pain and mobility – the absence of some quantitative pain score data points is most exemplary of this limitation. Further, patients were not specifically queried about all potential benefits of OMT beyond pain and mobility limitations, because we were uncertain what the outcomes would result from this novel program. The authors did not know which patients would be referred in and for which complaints; based on inpatient OMT use for acute trauma patients, the OTP only advertised to our colleague referral base the potential benefits for pain and mobility limitations. That an impressive number of patients experienced and self-reported improvements in ADLs, sleep hygiene, and mood was not anticipated and helped inform how future OTP data collection proceeded. A standardized data collection system for the OTP was developed so that future analysis would capture more accurate statistics with greater fidelity. The initial data from this study served as a guide for the design of future prospective studies to help clarify the role of OTP in potentially bridging the gap of chronic postinjury symptoms.

Despite these significant limitations, the authors believe that this first early analysis of a novel ACS-verified level 1 trauma center-based outpatient OMT program significantly adds to the literature and adds to the limited published data of postinjury OMT. We clearly illustrate the potential benefits of OMT for the postinjury patient and suggest that other trauma centers consider the option of referral to OMT for patients suffering chronic pain and mobility limitations after injury.

Conclusions

OMT may benefit refractory chronic traumatic pain and mobility limitations regardless of the amount of time since inciting injury. This is the first major publication from the OTP and bolsters the proof-of-concept for an organized OMT program at a level 1 trauma center. Further study, including a comparative analysis with more formalized pain assessments utilizing validated tools as well as standardized OMT session surveys, is warranted.

This study has informed OTP database modification and improvement in keeping OTP EHRs. The OTP has progressed over the years since this study took place, and we are in the process of analyzing a larger dataset to inform additional publications.

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