Abdominal Pain as an Unusual Referral to Physical Therapy: A Case Report

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Abstract

**Background and Purpose:** While gastrointestinal origins are the most common cause of moderate abdominal pain, it is estimated that 20% of cases may be caused by dysfunction in structures of the abdominal walls as opposed to being from visceral-related causes. Physical therapists are trained to address musculoskeletal and neural dysfunction, as well as to screen for more systemic causes, that may warrant patient referral back to the physician. Increasing clinical awareness of these musculoskeletal origins, that may be treated by conservative physical therapy, may help patients receive non-invasive treatment with minimal pharmaceutical intake. The purpose of this case report is to discuss the efficiency of non-invasive physical therapy interventions to improve functional movements and decrease pain and other symptoms in a 35-year-old female with complaints of abdominal pain.

**Case Description:** The patient was a 35-year-old female complaining of abdominal pain of unknown origin. After evaluating the patient, conservative physical therapy techniques were utilized, including thoracic spine joint mobilizations, neural mobilization, therapeutic exercises and addressing the neurophysiology and neurobiology of chronic pain with the patient.

**Outcomes:** The Oswestry disability index was administered to the patient to track her progress throughout her treatment. Sitting times were recorded throughout sessions, and subjective reports were taken regarding the ability of the patient to carry out functional activities. By the end of treatment, the patient was able to participate in her work activities and perform all functional activities with minimum to no onset of abdominal symptoms, despite not having a significant change in the outcome measure results.

**Discussion:** Given the array of differential diagnoses for abdominal and thoracic pain coming from neural and musculoskeletal origins, it is imperative that clinical awareness of these musculoskeletal origins be made to clinicians. This case report suggests that patients with abdominal symptoms that have been cleared of gastrointestinal and cardiovascular origins should be considered for physical therapy referrals.
Background and Purpose

Abdominal pain affects nearly every person at least once in their lifetime, independent of age, gender and social background.\(^1\) It is a common symptom in the general population frequently referred to gastroenterologists and even general surgeons for treatment.\(^2\) It is estimated that up to 17-43\% of the global population seek medical attention for abdominal pain.\(^3\) While gastrointestinal origins seem to be the most common cause of moderate abdominal pain, about 20\% of cases, with idiopathic abdominal pain, originate in structures of the abdominal walls as opposed to visceral-related causes.\(^2,4\) Nevertheless, the musculoskeletal system is often overlooked by physicians, and health care providers in general, as a possible cause for abdominal pain.\(^2,3\)

It is important to consider that abdominal pain may be referred from unsuspected origins, such as from musculoskeletal or neural dysfunctions coming from thoracic and/or lower back structures. A systematic review conducted by Fernandez and colleagues discussed the different structures surrounding the abdominal wall that may refer pain to the abdomen.\(^2\) These structures included nerve root impingement or injury at level T7-T12. Abdominal pain of musculoskeletal origin is usually described as “sharp and focal, cramping and aching, or deep.”\(^3\)

It is further explained that the visceral sympathetic fibers along with the afferent somatic nociceptive fibers converge in the same dorsal root, and therefore pain originating in the spinal musculature or in vertebral bodies around these thoracic levels may be interpreted as visceral pain.\(^2\) It has been suggested that repeated movements or sustained thoracic flexion posture may lead to the lengthening of the thoracic paraspinal muscles and develop biomechanical stress that may cause pain in the thoracic spine.\(^5\) Damage or dysfunction in structures surrounding the thoracic spine, including the costochondral junctions, the lower few fixed ribs and the sternal xyphoid may also cause thoracic pain that is referred to the abdominal wall, even in the absence of trauma.\(^2\) Another differential diagnosis includes that of the “painful rib syndrome” which is characterized by the hypermobility of the floating ribs, which usually consist of the last two ribs, which do not connect to the sternum.\(^2\) The floating ribs may superimpose on top of each other, causing an intermittent pain localized around the inferior costal margin or superior abdominal region, which may be exacerbated by specific positions such as squatting, bending over, getting up, and lateral shifts but is usually relieved by stretching or by adopting the supine position.\(^2\)

Interruption to the neurodynamic pathways may also play a role with the thoracic spine. The nervous system must function in the body sending electric signals while dealing with surrounding tissue and pressure which may pinch the pathway and interrupt signaling.\(^6\) The nervous system must also be able to adapt to the body’s movement, and the different pressure, narrowing of pathways and blood flow changes that may be created in response to limb and trunk motions.\(^6\) As explained by Louw and Schmidt, “From an anatomical and a physiological perspective, the nervous system requires space, movement and blood supply.\(^6\) If any or all of these three requirements are compromised, clinical signs and symptoms may develop.”\(^6\)

As defined by the American Physical Therapy Association, “Physical therapists (PT’s) can teach patients how to prevent or manage their condition so that they will achieve long-term health
benefits. PT’s examine each individual and develop a plan, using treatment techniques to promote the ability to move, reduce pain, restore function, and prevent disability.” PT’s are trained to treat medical problems or health-conditions, including musculoskeletal, neural and other orthopedic conditions which may limit a patient’s ability to move and perform daily functional activities. Thoracic spine mobilization and manipulations have been known to be used by physical therapists to treat patients with thoracic dysfunctions. Literature is controversial when it comes to outcomes and long-term pain management of patients treated by joint mobilizations. Nevertheless, because there are a couple of studies suggesting it may be beneficial, PT’s continue to use mobilization as an option for treatment such as with thoracic and lumbar hypomobility. A systematic review by Ellis and colleagues suggested that neural mobilization was advocated for treatment of neurodynamic dysfunction, with most studies having a positive therapeutic benefit, as opposed to no therapeutic effect. However, the review also suggested that the studies included in the systematic review were not the best quality and further research should be performed. The goal of neural mobilization is to facilitate movement between neural structures and their surroundings through manual techniques or exercise, as described in a systematic review by Basson and colleagues. This more recent systematic review (2017), suggested that neural mobilization was effective in the management of nerve-related low back, neck and arm pain, among others, though there was also limited evidence and only small study samples available to draw these conclusions. Another physical therapy intervention commonly used to treat back pain and hypomobility is therapeutic exercises. Among those, core strength training and hip musculature strengthening have been considered to reduce chronic low back pain because of the motor control thought to be gained when strengthening these body parts. Several studies have shown positive results when using core and hip strengthening to treat low back pain, but again, the literature is controversial. Nevertheless, this is also a popular method used among physical therapists to treat patients with chronic low back pain. Finally, in a systematic review conducted by Louw, Diener and colleagues suggested there was compelling evidence that addressing the neurophysiology and neurobiology of pain may have a positive effect on the patient’s pain, disability, catastrophizing and physical performance. Most physical therapists are trained and educated in strategies to address pain and use the science behind it in order to educate their patients.

Given the array of differential diagnoses for abdominal and thoracic pain coming from neural and musculoskeletal origins, it is imperative that clinical awareness of these musculoskeletal origins be made to clinicians. Because physical therapists are trained to address musculoskeletal and neural dysfunctions that may be impeding or affecting a patient’s functional movement, patients with abdominal pain that have been cleared of GI and cardiovascular issues should be considered for physical therapy referrals. Furthermore, physical therapists have been trained to differentially diagnose in case the patient has been misdiagnosed as having a musculoskeletal dysfunction when in fact it may be visceral. The purpose of this case report therefore was to consider the efficiency of non-invasive physical therapy interventions to improve functional movements and decrease discomfort in a 35-year old female with complaints of abdominal pain of unknown origin.
Case Description:

The patient was a 35-year-old female in generally good health, referred to physical therapy with a ten-year history of intermittent abdominal and anterior thoracic pain on the left side that had become more frequent within the last two years prior to evaluation. The patient’s chief complaint was the abdominal pain which she described as pain that wrapped around the ribcage when aggravated and felt “as if my organs sometimes would catch on my ribcage.” Previous medical assessment by physician and the PT included gastrointestinal and cardiovascular screens, which were negative. When asked about previous medical history, the patient reported a disc protrusion at an unknown level in her lumbar spine in her late teens which was resolved. She also reported a history of migraines and a couple of falls within the last two years, one of which lead to an ankle sprain late 2017. The patient denied any numbness and tingling but did report occasional thoracic spine pain higher up in trunk. The patient’s body chart can be seen in Figure 1. She was an architect, and her job required her to sit in front of a computer regularly, as well as to frequently drive short distances for work related appointments.

Figure 1. Patient body chart of symptoms as described by the patient. 1: Sharp abdominal pain that wraps around ribcage. 2: Intermittent dull low back pain. 3: Intermittent higher thoracic pain.

For the past few months, the patient felt that her sitting tolerance had decreased due to poor posture which often aggravated her abdominal, thoracic and lower back pain. Side bending to the left also exacerbated the abdominal and back pain. The pain was interfering with the patient’s ability to work as well as with recreational activities such as running and barre, which sometimes also aggravated her symptoms [Figure 2].
The patient admitted to being apprehensive of moving in certain ways, fearing that she would somehow trigger the abdominal and thoracic pain. The patient had been receiving physical therapy for a sprained ankle in late November of 2017, when she was inclined to ask her primary care physician about her thoracic and abdominal pain and the possibility of getting it treated with physical therapy. In mid-December, the physician referred the patient back to physical therapy for conservative treatment for chronic thoracic spine pain and muscle spasms. The patient’s physical therapy goals included decreasing abdominal and thoracic pain in order to return to her previous level of function, which included sitting for extended periods of time at work, driving for long distances, running, barre and the ability to move without fear of triggering pain. The first clinical impression of the patient consisted of a young physically irritable, hypomobile female with abnormal posture who was apprehensive of movement.

**Examination**

Upon inspection at the orthopedic physical therapy clinic, the patient presented with her left T10 rib elevated as compared to the right side and slightly rotated towards the left. She also had limitations with seated thoracic rotation (left more than right), increased tone in thoracic and lumbar paraspinals levels T3-L4, and delayed rib movement on the left with inhalation. Hip flexor weakness on her left side, as compared to the right, was also noted during functional movements such as leg lifts in supine and standing. Furthermore, pain occurred during hip flexor manual muscle test. Hip flexor, quadratus lumborum and rectus abdominus soft tissue restrictions were also noted in later follow ups. When assessing passive accessory intervertebral movement of lumbar and thoracic spine, levels L1-3 were determined to be hypomobile along with thoracic levels T9-12. The patient’s symptoms were initially grossly distributed, leading the PT to consider
neural tension as a component of the patient’s symptoms. A single leg raise with a chin tuck was done to assess neural tension, which was positive on the patient’s left side.

Further follow up on sitting posture at work demonstrated excessive left lateral trunk shift [Figure 3]. Her sleeping posture demonstration showed lumbar and thoracic rotation possibly causing an increase of pressure in certain segments of her spine. The PT was able to replicate the abdominal and thoracic pain with neural tension tests, as well as thoracic and rib mobilizations, mostly at levels T7-T10. Positioning and soft tissue restrictions also seem to play a role in the symptoms the patient was having, considering there was an onset of pain in the patient when she would rotate into certain positions. Given these findings, the PT recommended the patient attend physical therapy two times a week for a total of eight weeks.

![Figure 3. Patient’s sitting position at work. Note increased right-side bend with slight left rotation and left lateral lean.](image)

**Intervention**

The patient received 20 physical therapy sessions over ten weeks at two times per week, which included joint mobilizations, neuromuscular reeducation, nerve mobilizations, and therapeutic exercises for her management of symptoms. Fear avoidance behaviors were addressed with the patient, as well as general education on pain. The patient would take the occasional over the counter pain reliever, but did not receive any other medical, therapeutic or invasive procedures as treatment for the abdominal and thoracic spine pain. A home exercise program was prescribed on the first visit, and constantly reviewed and updated as the patient progressed. Interventions and exercises were customized and prescribed based on the activities that the patient reported having pain with during that week. Sitting posture at work, sleeping posture, gait, pelvic and core control were emphasized during each session. Patient education was administered every day to help the patient understand the treatment, allowing her to become more conscious of her movement and independent with her home exercise program.

Manual therapy included joint mobilization, specifically left unilateral posterior to anterior mobilizations and transverse mobilizations (UPA’s) of levels T7-10, using grades II-III as defined by the Maitland technique, for 30 seconds x 3 sets (additional sets added if necessary after
reassessment). Left posterior to anterior mobilizations at grades II to III were also applied. All these joint mobilizations caused a reproduction of abdominal symptoms initially, however, symptoms decreased as the mobility of these segments improved. Prone caudal pelvic glides were applied to decrease thoracolumbar soft tissue tension as well. Soft tissue release techniques were used on the bilateral obliques, quadratus lumorum, piriformis, intercostals, thoracolumbar paraspinals, and proximal hip flexors. Techniques include massage, trigger point release and the use of the Graston instrument. Additionally, neural tension release with her knees extended, hips flexed, and her chin tucked while in side lying and supine was done.

Neuromuscular reeducation and therapeutic exercises were applied and progressed throughout the sessions. Techniques such as proprioceptive neuromuscular facilitation were used to encourage dynamic stability and pelvis initiation with movement, as opposed to initiating with the trunk, in order to decrease the pressure on the spine. Pelvic scooting was also practiced to achieve efficient weight shifting during movement. The PT suspected the patient’s symptoms might have been recurring partially due to trunk weakness which lead the patient to compensate with her lumbar spine and return to right side bending and the left lateral lean position, especially during sitting. The exercises were customized to help the patient address these compensations and deficits. Exercises included trunk strengthening and activation, as seen with different variations and progressions of the dead bug, planks, and quadruped core exercises. Several of these exercises were performed supine on a foam roller to mimic thoracic mobilization at home. The foam roller was also used to promote thoracic extension and rotation. Squat, lunge, bridge and plyometric series were slowly included and progressed as the patient improved her motor control and her confidence with movement.

Finally, pain science and movement fear avoidance education were consistently addressed as to try to reduce psychosocial aspects that might have been limiting the patient’s progression in her rehabilitation. Sitting, sleeping and standing postures were addressed with the purpose of improving the patient’s proprioceptive awareness. The goal of educating the patient on these topics was to decrease the tone in the patient’s paraspinals, possibly caused by increased lordosis of the spine in the patient’s current positions. Other goals of educating the patient on posture included obtaining stability from deep abdominals as opposed to spine to decrease thoracic and lumbar compensations with movement and postures, as well as to promote efficient weight shifting to allow for a neutral spine during functional movement. For example, the patient was advised to perform standing wall pelvic tilts at work to break up her work day sitting posture, and to use towel rolls to help maintain a neutral spine in sitting.

**Outcome**

The Oswestry disability index was administered to the patient as an outcome measure in order to track her progress throughout treatment. The Oswestry disability index has been determined to have an excellent reliability (ICC=0.94%, 95% CI) and validity (r=0.33) on patients with spine dysfunction and fear avoidance behaviors. However, no direct correlation has been made to link the Oswestry questionnaire with low back dysfunctions that may present as abdominal pain. The patient initially scored a 20% on the first Oswestry questionnaire administered the first week
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of treatment and she scored 14% on the day she was discharged. Literature conveys the Oswestry’s minimally clinically important difference (MCID) to be between 6-12%.\textsuperscript{17,18} Recent literature suggests the MCID value is actually closer to 10-12%.\textsuperscript{17}

Subjective information and objective testing based on the ICF model to determine the patient’s functional limitations were also tested throughout the sessions in order to determine progress. The patient was able to tolerate basic functional activities, such as sitting, to the point where it was no longer limiting her ability to participate in community or work activities. Figure 4 depicts a linear graph showing and overall trend of improvement in sitting tolerance throughout treatment. The patient was able to walk longer distances with no discomfort and bend over with no pain, activities that were previously limited because of her symptoms. She was also able to resume running, which was her hobby and main form of physical activity prior to the worsening of her symptoms.

\textbf{Figure 4.} Linear graph with tendency line depicting overall improvement in tolerance of sitting time at work by patient after each physical therapy visit.

\textbf{Discussion}

The purpose of this case report was to consider the efficiency of non-invasive physical therapy interventions to improve functional movements and decrease discomfort in a 35-year old female with complaints of abdominal pain of unknown origin. A thorough subjective and objective assessment of the patient throughout the first couple of sessions cleared the patient from possible gastrointestinal or cardiovascular dysfunctions. Joint mobilizations at the thoracic spine and ribs at levels T7-T10 reproduced the initial abdominal complaints. Given this presentation, the PT decided to use thoracic mobilization as one of the primary interventions. During different sessions it was consistently observed that the patient’s abdominal pain would tend to resolve or at least significantly reduce post thoracic and rib mobilizations. These results were consistent
with findings from studies which suggested thoracic spine dysfunction may refer pain to the abdomen.\textsuperscript{2,3,4}

Soft tissue release, including manual release and instrument assisted techniques seemed to improve the patient’s hip and thorax mobility, which allowed the patient to perform exercises, specifically functional movements such as lunges, squats and lumbar flexion with minimal to no symptoms. Soft tissue release was used as an intervention after observing increased tone of bilateral paraspinals on the day of the patient’s evaluation. Since hip flexor, quadratus lumborum and rectus abdominus soft tissue restrictions were noted in later follow ups, these areas were also targeted and re-tested after being worked on by the PT. Furthermore, hip flexor weakness and a lack of abdominal and core motor control were observed with these same functional movements, and the patient would tend to complain of an onset of her abdominal and back pain.

During each visit, the PT and the patient would focus on a functional activity that the patient had deemed to be the activity that had triggered her symptoms the most throughout the week. The PT also focused on trying to get the patient out of positions that might have been attributing to her symptoms, such as her rotated, right side bend, shifted sitting posture [Figure 3]. This observation can be compared to results discussed in the study by Park and colleagues, where it was suggested that repeated movements and sustained flexed postures of the thoracic spine can lead to adaptations in thoracic paraspinal length, strength and stiffness, which may then result in movement impairments and pain.\textsuperscript{5} This may offer an explanation as to why releasing the soft tissue decreased the patient’s onset of symptoms.

The PT also noted that the patient lacked a neutral pelvis or spine position with most functional activities or sustained postures, as demonstrated by the patient’s sitting and sleeping position, gait, squats and lunges. The PT suspected that the movement was coming from specific lumbar segments, which in turn may have been increasing the pressure and tension in her thoracic/lumbar spine, causing a referral of pain to her abdomen.

Interventions and prescription of exercises were customized to address these complaints and improve the patient’s confidence with movement. The fact that the patient was able to perform these exercises without triggering the pain at all, or only triggering the symptoms minimally, may be due to two different interventions. The first intervention has to do with the idea discussed in the articles by Chang and Lee, where it was suggested that improving hip and core mobility and strength may help address back pain.\textsuperscript{13,14} The idea was that improving mobility and strength would allow the patient to use her hip muscles more while giving her lumbar spine the proper support with her core, therefore moving with increased motor control.\textsuperscript{13,14} Part of that goal was to help the patient activate her larger hip muscles, such as her gluteus maximus and medius with movement, as opposed to using the smaller paraspinal muscles that fatigued quicker and increase the risk of further injury to her spine.

The second aspect that may have also played a positive role in the patient’s progress is that of pain science and reducing the patient’s fear of movement. A study by Louwe and colleagues found that helping the patient reconceptualize that their pain is their nervous system’s interpretation of the threat of the injury and not necessarily an accurate measure of the degree of injury in their body could help patients be more inclined to move, exercise and push into some discomfort to help re-adapt their body in ways where the patient would feel less symptoms.\textsuperscript{15} The theory is that by understanding all the factors that may influence pain, including fear of
movement, or an increase in anxiety because they are expecting pain, then the patient would be able to overcome these factors and decrease their pain ratings and increase physical performance, breaking the catastrophizing that tends to occur with chronic pain patients. Since both the physical and educational techniques were used on the patient simultaneously, it is difficult to determine which of these had a more significant effect on the patient’s ability to perform functional movements with minimal pain.

Another important issue worth discussing is that of the outcome measures available to patients presenting with abdominal pain. The patient scored 6% less on her final Oswestry disability index as compared to her initial one. Considering the 6% difference was already closer to the lower end MCID values for the Oswestry (MCID=10-12%), the outcome measures results seem insignificant. However, if the patient’s functional movement and quality of life are taken into consideration, the patient did in fact improve significantly to the point where she was able to return almost fully to her prior level of function by discharge. This suggests that in practice, the outcome measures available may not necessarily be linked to the subjective and functional improvements reported and observed in patients with abdominal symptoms, or at least not in this case.

Given the patient’s unique presentation of what seemed to be a thoracic dysfunction referring to her abdomen, the patient was prescribed 20 visits total to physical therapy. By visit ten, the patient was progressing and slowly returning to her prior level of function, as noted by the patient’s willingness to jog and walk distances further than a mile. The patient was also less hesitant about performing functional movements such as squats and lunges or bending in different directions. Her sitting tolerance at work also increased, all of which were activities that would initially trigger her abdominal pain.

It should be reiterated that physical therapists have the necessary training to receive patients presenting with abdominal pain and should be trusted to know how to screen the patients and refer them to a physician when and if the presentation is out of the PT’s scope. As seen with this patient, conservative physical therapy techniques may improve a patient’s quality of life by eliminating chronic pain, improving functional movement and decreasing functional limitation, without the need for strong pharmaceutical or invasive treatments.
References


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