CASE REPORT

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A Case of Chronic Postoperative Abdominal Wall Pain Successfully Treated with the Fascial Distortion Model

Abstract

We describe the case of a 55-year-old female with nine months of chronic postoperative abdominal wall pain likely representing anterior cutaneous nerve entrapment syndrome (ACNES), who experienced marked symptomatic improvement with the use of the fascial distortion model (FDM) in the emergency department (ED). This is the first case report in the literature on the successful application of the FDM for abdominal wall pain, and there is still little FDM literature in the emergency medicine (EM) setting.

Background

The FDM was developed by Dr. Stephen Typaldos, DO, an EM physician, as a new model within osteopathic manipulation. Typaldos identified six distortions of the fascia that he saw commonly in his patients. These distortions were identifiable via body language and verbiage that was used by his patients repeatedly. Other authors have noted the universality of body language and words used to describe the six fascial distortions, which crosses cultural and language barriers.[1-4] Typaldos developed manual manipulation techniques to address the fascial distortions he identified.[1] These distortions and techniques now comprise the FDM.[1] This is utilized by physicians and osteopaths worldwide, but is just beginning to enter the standard curriculum of many osteopathic medical schools.[2]

Fascia is known to contain afferent sensory fibers capable of signaling pain (even more than muscle),[5-8] and pain signaling from fascia is enhanced by inflammation.[9-11] Chronic pain syndromes such as chronic low back pain and myofascial pain may be the result of fascial adhesions that inhibit fascial gliding.[10,12] One study in rats performing repetitive motion for three weeks compared those treated with manual manipulation of the forearm to control rats and demonstrated decreased inflammation in fascia adjacent to the median nerve as well as improvements in pain.[13] Numerous studies have demonstrated reductions in chronic myofascial pain through manual manipulation.[14-16] In light of this, it is theorized that breaking up fascial adhesions through manual methods such as the FDM could improve fascial gliding and reduce pain.[17]

Cylinder distortions and herniated trigger points (HTPs) are among the six distortions described within the FDM model.[1-2,4] Cylinder distortions, which are somewhat rare, can be difficult to recognize. Patients may report

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paresthesia-like pain (such as numbness or burning) in a distribution that does not match with anatomical dermatomes.[1-2,4] These distortions are indicated by patients using jumpy movements with their hands, often hovering above the body rather than touching the skin.[1-2,4] Cylinder distortions are presumed to be caused by superficial fascia that is tangled upon itself,[18] often associated with the use of belts, tight clothing, splinting, or casting.[1-2] The presence of an HTP, a more common fascial distortion, is indicated when the patient pushes into an area of soft tissue with multiple fingers or their knuckles.[1-2,4] The underlying pathophysiology is thought to be entrapment of superficial cutaneous nerves.[1] The treating clinician will be able to palpate a "knot" of soft tissue in the area the patient indicates, which is often tender to palpation.[1-2,4] The "knot" is thought to consist of fascia which is protruding through the same opening as the superficial cutaneous nerve, thus compressing the nerve.[1] This is treated using firm, direct pressure at the point of maximal tenderness followed by a thrust until there is a palpable release of the soft tissues.[1-2,4] The presence of fascial distortions such as cylinders and HTPs may produce chronic myofascial pain, such as chronic abdominal wall pain (CAWP).[1-2]

Chronic abdominal wall pain (CAWP) is a condition responsible for up to 30% of cases of chronic abdominal pain for which no other diagnosis can be identified after extensive laboratory and radiologic testing, and the most common cause is anterior cutaneous nerve entrapment syndrome (ACNES).[19] ACNES is caused by entrapment of a thoracoabdominal nerve sensory branch.[20] Carnett's sign (in which contraction of abdominal wall musculature worsens pain) helps the clinician suspect CAWP, and CAWP diagnosis is confirmed via pain resolution with trigger point injections.[19-20] A wide variety of treatments ranging from conservative therapy such as trigger point injection to surgery can be used to treat the ACNES variant of CAWP,[21-22] and case reports exist of osteopathic manipulation being utilized as part of a multimodal approach for treating ACNES.[20]

Here we describe a case of a patient with CAWP that developed after fleur-de-lis panniculectomy whose pain was refractory to traditional treatments, but markedly improved immediately following manual therapy informed by the FDM. This is the first case report in the literature documenting the use of the FDM for the treatment of CAWP.

Report of Case

The patient was a 55-year-old female with a history of hypothyroidism, hypertension, hyperlipidemia, type 2 diabetes mellitus, anxiety, depression, and obesity presenting to the ED for a one-week exacerbation of CAWP, which she rated 10/10 in severity. Fourteen months earlier she had undergone fleur-de-lis panniculectomy at an outside hospital and was not pleased with the cosmetic results. The same surgeon had performed scar revision nine months prior to her ED visit. However, the patient reported still feeling dissatisfied with the cosmetic outcome and was in the process of seeking another opinion for repeat scar revision at our institution. Since the second procedure, her pain continued to progress until she presented to the ED. This was associated with a new "burning" pain of her circumferential abdominal wall, which had begun one week ago and was at its worst on the day of the ED visit. The patient had not tried manual manipulation, massage, or trigger point injections up to this point, but was using over-the-counter analgesics and wearing an abdominal binder continuously. Despite this, the patient was struggling to perform her daily activities such as standing in the kitchen to cook meals, getting dressed, and sitting down for prolonged periods to perform her job. The patient was spending excessive time in bed and was concerned that she would not be able to continue functioning on a day-to-day basis if her pain continued to be this severe. In addition, the pain was causing her significant anxiety and insomnia, which were not improved with her chronic daily medication regimen of fluoxetine, hydroxyzine, nortriptyline, and temazepam. All other comorbidities were well-controlled with appropriate medication therapy.

On the evening of her ED visit, our patient described a sensation of "bulging" with pain along the inferior aspect of her lower scar (Figure 1), which was not new, but was more painful than usual this week. She indicated these areas of pain along the inferior scar margin with multiple fingers. Her verbiage and body language were consistent with the presence of HTPs. In addition, the patient described a new sensation of "burning" of the skin of her abdominal wall that extended circumferentially around to her back and was bordered inferiorly by her lower scar and superiorly by her costal margin (the same distribution covered by the abdominal binder that she had been wearing) (Figure 2). The patient used both hands to point to various areas throughout her torso as the source of her paresthesia-like pain. She demonstrated

her pain by jumping her hands from one area to another over the abdominal wall and back. This description and body language was consistent with the presence of a cylinder distortion.

On physical examination, the patient was awake, alert, and in moderate to severe painful distress, which worsened if her abdomen and back were even lightly touched. She avoided flexion, extension, and rotation of her abdominal wall since these movements exacerbated her pain. Her heart sounds demonstrated regular rate and rhythm with no murmurs, rubs, or gallops. Her lungs were clear to auscultation bilaterally. Her skin was warm, dry, and well-perfused. On abdominal examination, the patient had normoactive bowel sounds. The abdomen was soft with no distension, rebound, guarding, or hernias noted. A well-healed fleur-de-lis panniculectomy scar was present. The inferior margin of the panniculectomy scar was tender to palpation, particularly in the areas where the patient noted a subjective sense of "bulging." Carnett's sign was positive.

Laboratory evaluation in the ED was obtained and revealed a white blood cell count 5.1 K/cumm, hemoglobin 14.1 g/dL, sodium 136 mmol/L, potassium 4.0 mmol/L, chloride 101 mmol/L, bicarbonate 23 mmol/L, blood urea nitrogen 13 mg/dL, creatinine 1.00 mg/dL, glucose 83 mg/dL, calcium 10.1 mg/dL, total bilirubin 0.2 mg/dL, aspartate aminotransferase 14 units/L, and alanine

Figure 1. *Illustration of fleur-de-lis panniculectomy scar. Black stars indicate approximate locations of abdominal wall HTPs treated with the FDM. Illustration credit: Kristen C. Kern.*

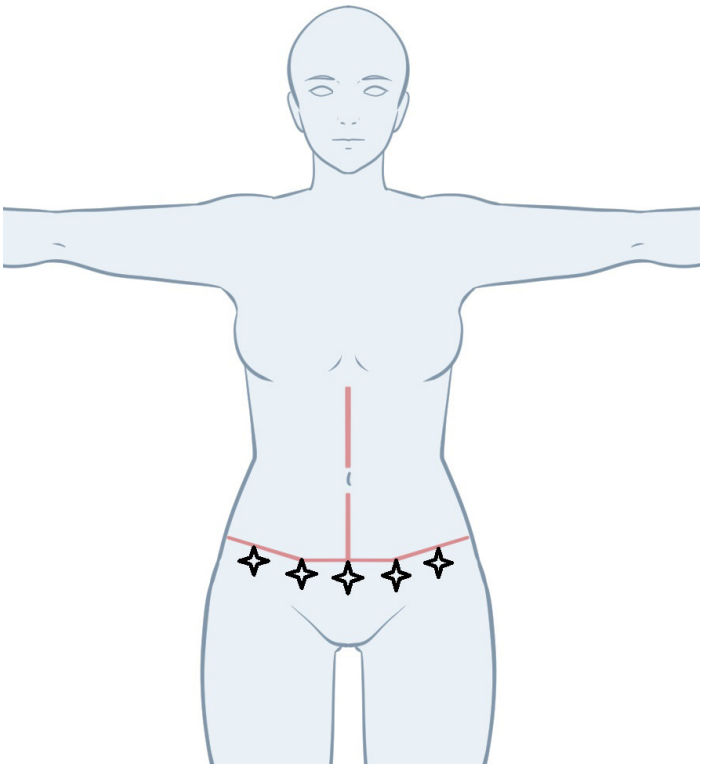
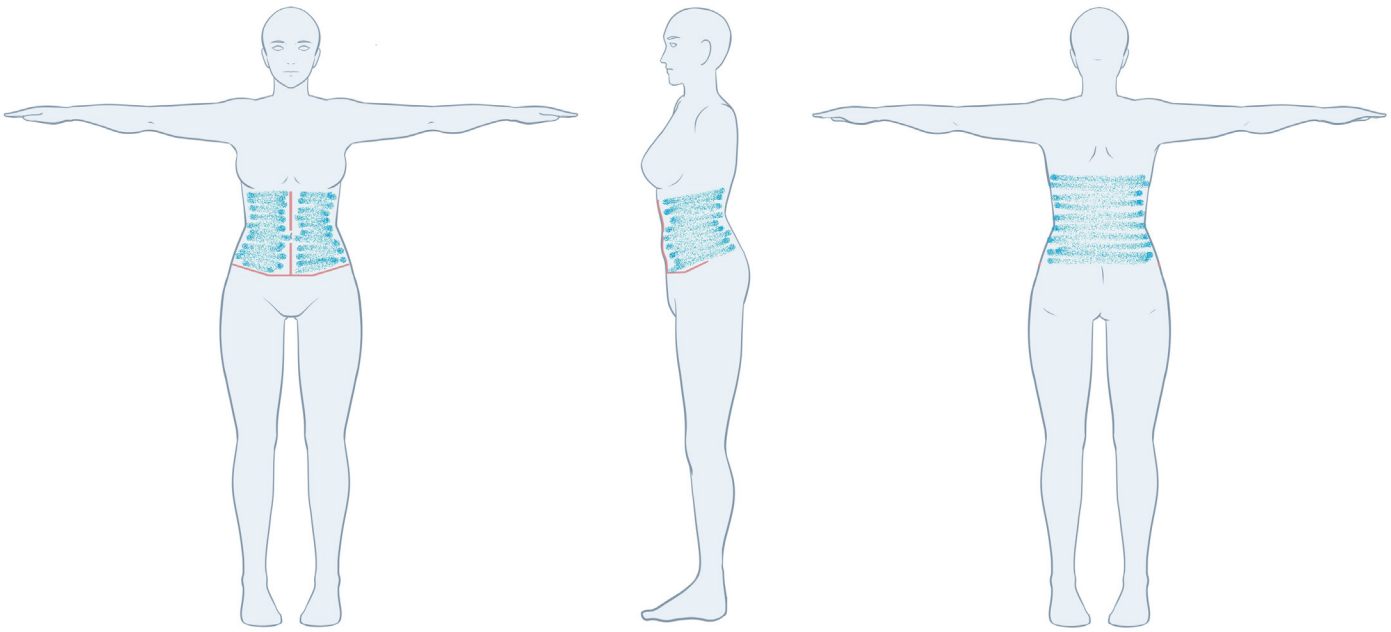


Figure 2. *The distribution of the cylinder distortion described by the patient, indicated by blue shading Illustration credit: Kristen C. Kern.*



transaminase 12 units/L. Testing for influenza A/B and COVID-19 were negative. Overall, no concerning laboratory findings were identified. Given that the patient's description of her symptoms did not correlate with any obvious intraabdominal pathology and that her symptoms seemed most consistent with acute exacerbation of her CAWP, we engaged in a shared decision-making conversation and opted to try osteopathic manipulation for her pain.

The "bulging" verbiage and body language using multiple fingers were consistent with HTPs within the FDM. Several HTPs were reduced in the following manner: After palpating the HTPs (which felt like "knots" in the subcutaneous soft tissues), each of these areas were reduced using firm, direct pressure followed by a thrust motion with the thumb at the point of maximal tenderness until a release was noted in the soft tissues by the provider. Each thrusting motion lasted no more than five seconds. There was a palpable change in the soft tissues, with resolution of the "knots." This led to marked improvement of the patient's pain along the inferior scar margin.

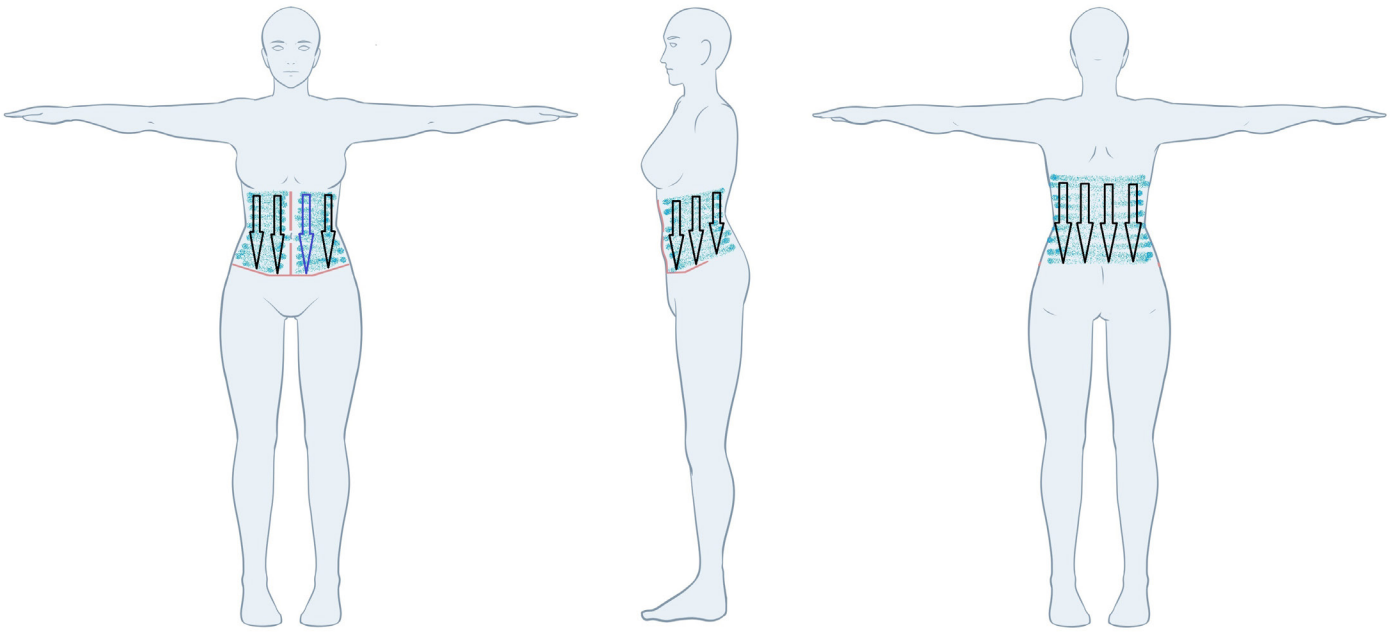
The paresthesia-like verbiage and jumpy body language that would not be consistent with any clear dermatome was consistent with a cylinder distortion. A tiger claw technique was utilized,[18] starting inferior to the costal margin. This was performed by grasping the skin and superficial fascia between the four fingers and thumb of each hand and tugging gently until a release was palpable. The hands were moved inferiorly just below the area of treatment and the same method was employed again. This was repeated in a superior to inferior manner until reaching the lower scar margin in a column-like fashion. The intervention was applied to vertical columns of fascia circumferentially from the costal margin to the level of the inferior scar margin (Figure 3).[1] The patient reported complete resolution of the burning pain (rated 0/10 in severity), and she could move freely without any pain. She was instructed to apply ice up to 20 minutes per hour, avoid heat, and use over-the-counter analgesics as needed for pain control at home.

The patient was seen by plastic surgery 5 weeks after her ED visit due to ongoing concerns about the appearance of her scars. At that time, she reported some ongoing pain in the distribution of the HTPs, but the pain associated with the cylinder distortion was no longer present. She did not return to the ED for repeat treatment.

Discussion

We describe the case of a patient with at least 9 months of post-operative CAWP presenting to the ED for acute exacerbation of her symptoms, felt to be secondary to fascial distortions, with near resolution of pain with the FDM. Based on medical record review, the patient did retain long-term resolution of the cylinder distortion

Figure 3. *The distribution of the cylinder distortion is indicated by blue shading. The pattern of application of the tiger claw technique that was utilized to resolve the patient's cylinder distortion is indicated by arrows. The blue arrow indicates the starting point for application. The tiger claw technique was performed in columns in a counterclockwise fashion around the torso from the subcostal region to the lower scar margin until symptoms resolved. Illustration credit: Kristen C. Kern.*



that prompted her ED visit. While the pathophysiology of the six fascial distortions remains to be definitively demonstrated, we suspect that fascial disruption during fleur-de-lis panniculectomy and scar revision contributed to the development of chronic HTPs. Given her positive Carnett's sign on exam, it is suspected that our patient had ACNES, though trigger point injection was not performed for confirmation of diagnosis.

During panniculectomy, the panniculus (a flap of excessive skin and fat on the abdominal wall) is removed for medical or cosmetic reasons, or a combination of both. The procedure is performed by incising through the skin, fat (Camper's fascia), and deep superficial fascia (Scarpa's fascia) down to the rectus fascia in order to resect the flap of skin and subcutaneous tissue, then reattaching Scarpa's fascia followed by dermis and skin.[23] The term "fleur-de-lis" panniculectomy refers to a version of the procedure in which flaps of excessive skin and fat are removed from the abdominal wall in both the horizontal and vertical directions, resulting in an anchor-shaped scar.[24] The procedure is often preceded by tumescent liposuction, in which crystalloid combined with lidocaine with epinephrine is infiltrated into the superficial abdominal wall layers to stiffen them and reduce bleeding.[25] Liposuction cannulas are used to remove subscarpal fat via the tiny incisions through which the infiltrate was administered. Drains may be used to prevent seroma formation, and rectus plication may be performed.[26] Scar revision may refer to several non-invasive techniques, but in our patient's case, she underwent operative scar revision consisting of excision of a dog ear from the right side of her inferior scar and release of her central scar. Surgical scar revision consists of excision of unsightly scar tissue with the goal of forming a more cosmetically appealing scar.[27]

Given that our patient had been wearing an abdominal binder with increasing frequency and that this correlated in timing with the onset of paresthesia-like pain throughout her abdominal wall and back, it is likely the abdominal binder disrupted the superficial fascia, causing a cylinder distortion. Tight clothing, splints, compression socks, and abdominal binders have been noted to generate cylinder distortions.[1,18]

Further research remains to be conducted to elucidate the exact anatomic and pathophysiologic nature of HTPs, but they are theorized to represent micro disruptions between fascial planes that are usually too small to be notable on radiologic imaging.[28] A single case report has demonstrated herniation of soleus muscle through the overlying fascial plane at a two by two centimeter location where the patient described pain in terms consistent with an HTP.[29] HTPs are theorized to represent entrapment of superficial cutaneous nerves.[28] This correlates nicely with the pathophysiology of ACNES, in which sensory branches of the thoracoabdominal nerves become entrapped along the borders of the rectus musculature. Areas of pain are usually two centimeters or less in diameter and tender to palpation.[30] This description is nearly identical to that of the abdominal wall HTP and thus may represent its anatomical correlation. The immediate resolution of the patient's symptoms and the lack of any other interventions support that it was the FDM alone that resulted in her improvement. The marked improvement of the patient's pain with a one-time treatment with the FDM indicates that her pain generator was fascial in nature. As the HTPs were treated with the FDM to relieve entrapped cutaneous nerves, it is likely that this technique was intervening on the ACNES.

While our patient's pain markedly improved using the FDM, the evidence base for this newer model of osteopathic manipulation remains limited. Fink et al conducted an unblinded randomized control trial of 60 patients with adhesive capsulitis (frozen shoulder) comparing the FDM with passive stretching and range of motion. The FDM group achieved improvements in range of motion faster and was found to have greater functional improvement and reduction in pain.[17] A recent single-arm prospective effectiveness study employing the FDM for the treatment of plantar heel pain at baseline and at one week found that foot pain and function were clinically and significantly improved at 16 weeks.[3] In addition, plantar fascial thickness was significantly reduced at 16 weeks, indicating an anatomical change in the fascia that explained the improvement in pain and function.[3] Richter et al conducted a prospective non-randomized parallel group trial of 77 patients with low back pain comparing the FDM with standard of care and showed non statistically significant improvement in pain in the FDM group compared to control. However, the FDM group missed fewer days of work, used less pain medication, and had a faster decline in symptoms.[16] There are currently no other published works investigating the use of the FDM for the treatment of abdominal wall pain.

The use of the FDM in the ED setting is a relatively novel concept. One U.S. non-blinded, randomized clinical trial investigating the use of the FDM for the treatment of

subacute and chronic extremity pain in the ED was approved in 2020. Unfortunately, the trial was terminated in 2022 due to slow recruitment in the face of the pandemic.[31] It should be noted that our most robust studies of the FDM – those by Boucher et al,[3] Fink et al,[17] and Richter et al[16] – involved multiple treatments with this modality. Thus, long-term sustainability of pain relief from a single application of the FDM has yet to be elucidated. There is much research to be done to investigate the applicability and effectiveness of the FDM in the ED setting, particularly given the rapidity and ease with which it can be performed once the techniques are mastered.

Conclusion

We describe the case of a 55-year-old female whose chronic post-operative abdominal wall pain improved significantly after a one-time treatment with the FDM in the ED. Larger studies need to be conducted to investigate the effectiveness of the FDM for abdominal wall pain, as well as the feasibility of utilizing this modality for treating pain in the ED.

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