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MYOFASCIAL PAIN AND TREATMENT: CASE SERIES

Dry needling in chronic abdominal wall pain of uncertain origin

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ABSTRACT

Background: Abdominal wall pain is considered as pain that arises from the abdominal muscles rather than the underlying viscera or the spine. It is frequently overlooked and is often misdiagnosed, as these patients continue to suffer with pain. Many such patients would have even been subjected to a psychiatric evaluation in view of the absence of any ostensible clinical cause for the pain. In this study, we describe the role of myofascial trigger points in the abdominal wall pain that could be a cause of chronic pain and present our findings of pain relief by dry needling technique.
Objectives: To report the effect of dry needling treatment for patients who suffer from chronic abdominal wall pain of uncertain etiology and in whom specific myofascial trigger points were identified.
Methods: Twelve patients diagnosed with chronic abdominal wall pain were included in the study. All patients were clinically evaluated and subjected to a combination of imaging techniques. Once categorized as patients suffering from chronic abdominal wall pain, they were subjected to a thorough palpation of the abdominal wall to identify the presence of myofascial trigger points (MTrPs) over the abdominal muscles. All had MTrPs over one or more abdominal muscles either unilaterally or bilaterally. Dry Needling using a standard technique was done based on the side and localization of the myofascial trigger points. Numerical pain rating scale (NPRS) was used to measure pain before and after treatment and at the end of four months. All patients were then seen by the primary clinician and re-evaluated.
Results: Eleven out of twelve patients had significant reduction with a mean difference 5.95 in NPRS in their pain levels at four months follow up. Seven patients had complete resolution of the pain. Some patients had improvement in complaints such as Dysmenorrhea, Urinary Frequency and constipation.
Conclusion: Dry Needling can be a useful adjunct in treating chronic abdominal wall pain especially in those patients in whom Myofascial Trigger Points in the muscles of abdomen are identified by palpation.
Level of evidence: Level 4.

1. Introduction

Chronic abdominal pain is usually ascribed to diseases of the intra-abdominal organs with the abdominal wall being often overlooked as a potential source of pain. The incidence of pain of abdominal wall origin was reported to vary between 10 and 90% of patients with unknown cause of abdominal pain. (Srinivasan and Greenbaum, 2002). Most patients would have visited many clinicians to seek relief from the pain. The pain is either well localized or diffuse and may be felt in any quadrant of the abdomen with frequent referral of pain to the back, chest and thigh. The abdominal wall comprises of the parietal peritoneum, fat, aponeurosis, musculature, and skin, and derives its somatic nerve supply from the intercostal nerves T7 to T12 (Sharpstone and Colin-Jones, 1994). As a corollary, it can be safely assumed that abdominal pain could be from any of those structures once it has been ascertained that the pain is not of visceral origin.

Chronic abdominal wall pain is often misdiagnosed as visceral pain resulting in inappropriate diagnostic investigations, unsatisfactory treatment and considerable expenditure (Grover, 1926). A study in the US showed up an average cost towards investigations and treatment per patient in those with chronic abdominal wall pain was $1100 (Costanza et al., 2004). A high degree of clinical suspicion, thorough physical and clinical examination that includes movement testing, palpation and Carnet's test are of prime importance in identifying the Abdominal Wall Pain. Carnett's test is the key physical examination for diagnosing abdominal pain that

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arises from the structures within the wall. A positive test indicates that the pain is most likely in the abdominal wall and is not visceral in origin.

As the abdominal wall comprises mainly of skeletal muscles, the pain could arise from the specific Myofascial Trigger points. Myofascial Trigger Points(MTrPs) are hyperirritable points in the skeletal muscle that is exquisitely tender in a palpable taut band, which can cause local and referred pain (Travell and Simons, 1999). MTrPs harbouring in the abdominal muscles can mimic visceral conditions and are sometimes mistakenly identified as hernia, appendicitis, cholecystitis etc. The patient generally has a nagging pain and at times may experience intense and deep-seated pain in the abdominal region. Often, the patient can pinpoint the exact site of the pain. Abdominal Myofascial Trigger Points(AMTrPs) have also been reported in patients with endometriosis (Stratton et al., 2015), interstitial cystitis (Weiss, 2001), irritable bowel syndrome (Starlanyl, 2009), chronic pelvic pain (Montenegro et al., 2009) and dysmenorrhea (Huang and Liu, 2014). AMTrPs have also been known to develop after any abdominal surgery. The trauma to the muscle during the surgery and the post-surgical scar could lead to the formation of AMTrPs. These patients will experience persistent pain for long period after the surgery and investigations do not reveal any visceral pathology. Treating the Myofascial trigger points in such cases could help the patients recover from the pain.

Various treatment modalities such as Laser, ultrasound, manual trigger point release, wet needling, dry needling have been utilized to treat MTrPs. Wet needling uses local anaesthetics like lidocaine, botulinum toxin or hypertonic solutions to cause local myotoxicity thereby resolving the pain. The utility of wet needling in abdominal myofascial trigger points in primary dysmenorrhea was published previously (Huang and Liu, 2014). Physical therapists across the world are increasingly switching over to Dry Needling to treat MTrPs. Dry needling is performed by using mono filament needle through the skin without introduction of any drug to stimulate MTrPs and connective tissue for the management of neuromusculoskeletal pain (Caramagno et al., 2015). Dry Needling helps in deactivation of the MTrPs thereby bringing about pain relief. At times, the pain relief could be instantaneous, and the effects could last long. There is a paucity of evidence regarding the efficacy of physical therapy intervention for chronic abdominal wall pain and to our knowledge this is first study done on usage of Dry Needling in such cases.

2. Methods

This study was done in the Physiotherapy Department in collaboration with General Surgery Department in Raj Mahal Vilas Hospital, Bangalore, India. Patients were recruited from October 2015–December 2016. Twelve patients suffering from abdominal pain for more than three months that was unrelieved by medications were included in the study. The patients were initially thoroughly screened by an experienced General Surgeon. All patients were subjected to an imaging study apart from a thorough clinical examination to rule out any obvious visceral causes of pain or specific abdominal wall problems such as hernia, lipoma, neurofibromas etc. After ruling out other possible causes, these patients were referred to the physiotherapy department. The author who administered the treatment has eight years of experience in diagnosis and treatment (including dry needling) of patients with myofascial pain syndromes. Carnett's test was used after identifying the point of maximal tenderness to identify and confirm that the tenderness in the specific point of pain would become more on head or leg raising. This test is performed with the patient lying supine and the therapist must carefully, gently palpate for the point of maximum tenderness in the abdominal wall. Once the point is located, the patient is asked to lift their head and shoulder off the couch. The therapist applies additional pressure over the point which is located earlier. If the patient feels more pain over the abdomen during the head lifting movement, it can be confirmed that the muscles are at fault. With the same head lifting movement, if the patient experiences a reduction in his pain then the pain is not parietal in origin. The therapist must maintain the pressure over the tender point throughout the test and must clearly interpret the finding based on the patient's pain experience; having said this, it is obvious that extreme gentleness is called for during the test lest the patients refuse further therapy if the pain worsens.

Carnett's test is used to discern abdominal wall pain from the intraabdominal sources. There are limited studies on validity or reliability of Carnett's sign. However, in a study on 130 patients with abdominal wall pain, it was shown that the Carnett's test has a positive and negative likelihood ratio of 2.62 and 0.23 respectively (Takada et al., 2011). Many studies showed that interventions based on the diagnosis made by a positive Carnett's sign were quite helpful (Lara et al., 2015) (Kuan et al., 2006) (Kanakarajan et al., 2011). The reliability of Carnett's sign is yet to stand the scrutiny of reproducibility; however, in the absence of any other concrete tests, Carnett's sign has been relied upon by many authors for basing their therapeutic interventions.

In our study, 11 out of 12 patients had a positive Carnett's sign. All these patients were referred to Physiotherapy department for receiving dry needling to the abdominal wall muscles. Patients who were having chronic regional pain syndrome, visceral Problem, hormonal or pregnancy related problems were excluded in the study. Demographic data, history, pain assessment and physical examination findings were documented (Table 1). Specific examination was carried out to identify any lumbar, thoracic or rib cage pathology that might contribute to abdominal pain. Apart from clinical palpation, manoeuvres that are pain provocative were carried out to rule out lumbar, thoracic or rib cage involvement. Where necessary, imaging studies including MRI or CT or ultrasound studies were carried out. All patients were referred to the department of physiotherapy after relevant examination and investigations had ruled out any plausible causative factor for the intra-abdominal pain.

Once other causes were ruled out, abdominal wall palpation was carried out gently and systematically including the Rectus Abdominis and External Obliques of both sides. Presence of Myofascial Trigger Points were confirmed based on Travel and Simons' diagnostic criteria (Simons, 1999); 1) palpation of a taut band; 2) identification of an exquisitely tender nodule (MTrP) in the taut band; and 3) reproduction of the patient's symptomatic pain with sustained pressure. The rectus abdominis muscle was involved in all patients whilst 4 patients had concomitant MTrPs in External oblique (Fig. 1). Numerical Pain Rating Scale(NPRS) was used to record initial scores. A detailed discussion was again held with the patients regarding the possible cause for their pain and that deactivating the trigger points may benefit them. The procedure of Dry needling was explained, and a video shown where necessary and an informed consent was obtained.

2.1. Needling procedure for rectus abdominis

The patient was made to comfortably lie down in a supine position on an examination couch and the myofascial trigger point was confirmed by flat palpation and marked. After disinfecting the area with alcohol based solution, a 0.25×50 mm needle (EACU) was angulated perpendicular to the MTrP (Fig. 2). The needle length varies depending on the skin and subcutaneous tissue thickness of the patients. Some patients required slightly longer needles (0.25×60 mm). Once the needle penetrates the skin and adipose

Table 1
Information of demographics, Pain, NPRS before and after treatment.

Case No.	Age	Gender	Surgery	Pain Duration (Months)	Carnett's Sign	Muscles identified	Needling Sessions	NPRS -Pre	NPRS -Post	Associated Symptoms
1	53	Female	Hernia Repair, Gastric shunting	36	Positive	RA- Right	4	8	1	No associated symptoms
2	68	Female	Hernia Repair	24	Positive	RA- Left	3	6	1	No change in constipation
3	41	Female	Tubectomy	24	Positive	RA- B/L	1	7	0	No associated symptoms
4	39	Female	No surgery	12	Positive	RA- B/L EO- B/L	4	9	8	No change. Lost follow up.
5	43	Male	Laparoscopic duodenal closure	60	Positive	RA- Right	2	5	2	Pain after food intake reduced. Weight lifting no more painful.
6	61	Female	Mesh Hernioplasty, Appendicectomy	36	Positive	RA- Right EO- Right	3	7	0	Urinary Frequency is normalized.
7	31	Female	Appendicectomy	30	Positive	RA- Right	2	9	3	Dysmenorrhea reduced
8	42	Female	Hysterectomy	24	Positive	RA - Right	1	9	0	No associated symptoms
9	55	Female	Umbilical Hernia Repair	6	Negative	EO -Right	1	7	0	Affected side lying is no more painful.
10	66	Male	Colectomy, Appendicectomy, inguinal hernia repair	6	Positive	RA - Left EO - Right	3	4	0	Stools are more solid now and the frequency reduced
11	46	Male	No Surgery Endoscopy- Peripyloric Ulcer	24	Positive	RA - Left	1	7	0	No associated symptoms
12	29	Female	Tubectomy	108	Negative	RA- Right	2	9	0	Dysmenorrhea reduced

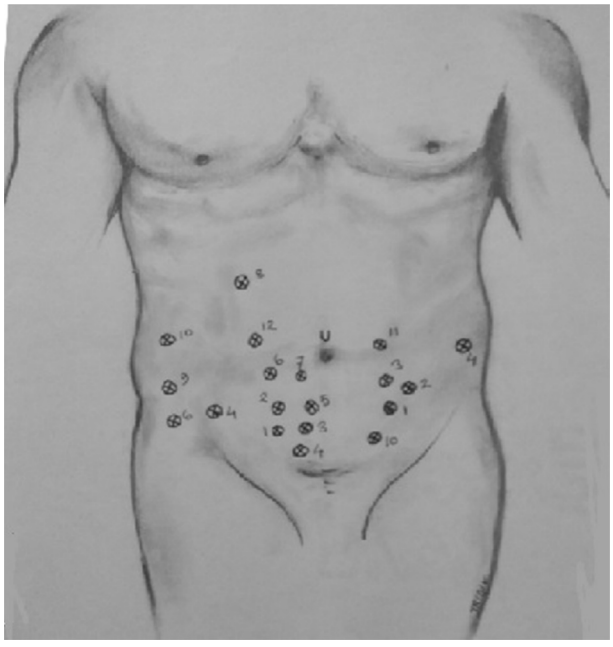

Fig. 1. Location of Abdominal Myofascial Trigger points in all 12 subjects.

Fig. 2. Needling for left rectus abdominis.

tissue, the initial resistance encountered with the needle indicates that the deep fascia that overlies the muscle is penetrated. The needle is then further advanced gently for a few more millimetres to reach the MTrPs and moved around slightly [scanning] to elicit a Local Twitch Response (LTR). The LTR is characterized by a visible contraction of part of the taut band in the involved muscle upon mechanical stimulation with needling or palpation of a sensitive site in a MTrP region. Eliciting Local Twitch response further confirms the presence of Myofascial Trigger Points. After eliciting the LTRs the needles are removed and disposed of using specific protocols for disposal of sharps. Any other points if present in the rectus abdominis were treated similarly.

2.2. Needling procedure for External Oblique

The patients were positioned in lateral decubitus with the affected side uppermost. This position offers a benefit of letting the abdominal organs sag down with gravity so that the muscle can be targeted easily. Using 0.25×50 mm needle, a flat or pincer palpation technique is used to fix the point before inserting the needle. After the treatment, patients were briefed about the possibility of mild soreness due to the needle prick that may last for a day, as well as the occurrence of mild discolouration due to ecchymoses that will resolve by itself. No other treatment or exercises were prescribed. All patients were treated similarly based on the muscles involved. A gap of seven days was given between the sessions. The number of sessions depended on the patient's assessment of pain relief. None of the patients experienced any adverse effects except for mild soreness at the site of needle prick for a day. Patients who were relieved completely were not treated again. The maximum number of sessions for any patient needed was four. All patients were followed up after four months after the last treatment session. The outcome was recorded immediately after the first session, after the final session and at the end of 4 months at follow up.

3. Results

Twelve consecutive patients (9 Females and 3 Males) included in this study with identifiable abdominal myofascial trigger points were treated by dry needling technique over the involved muscles. The patients had a mean (SD) age of 47.8 (12.8) years. The pain

duration (months), number of dry needling sessions, pre and post NRPS were summarised as median (IQR). The mean pain duration was 24 (15, 36) months; mean number of dry needling sessions were 2 (1, 3); pre and post NPRS were 7 (6.2, 9) and 0.5 (0, 1.75). Pre and post NRPS were compared using Wilcoxon Signed Ranks Test and the difference was statistically significant ($Z = -3.08$; $p = .002$). Among the 12 patients, 11 patients experienced significant improvement in pain, needing no further treatment or medications even at 4 months follow up analysis.

4. Discussion

In this present study 12 patients were treated for chronic abdominal wall pain. These patients were screened thoroughly for any other abdominal pathology by an experienced General Surgeon and were investigated accordingly by at least an ultrasound study of the abdomen. All patients indicated that the pain medications were of minimal help; all of them also had received Pregabalin a neuromodulator which too was not effective. Once specific points of pain were identified, they were referred to the physiotherapy department for needling with the surgeon having briefly outlined the procedure and its benefits to them. The definition of abdominal wall pain indicates that the pain is arising from one or more abdominal muscles that supports the abdominal viscera. Carnett's sign has been used to differentiate pain of abdominal wall origin from intraabdominal pain (Carnett, 1926). In this study, eleven patients had a positive Carnett's sign implying that the pain was probably arising from the muscles; furthermore, these patients were investigated to rule out other causes of their pain. Further focused palpation of those tender points reproduced patient's familiar pain that helped us to identify specific Myofascial Trigger points. Dry Needling as described above was the only treatment given to these patients. We could elicit LTR for all patients while needling. Elicitation of LTR is crucial for achieving significant pain relief (Chou et al., 2014). LTR during needling is also a sensitive measure and objective confirmation of needles penetrated in to the correct spot and should be used as the primary goal to achieve maximal response (Ge et al., 2008). The number of LTRs elicited was directly proportional to subjective pain intensity and LTR would be elicited in 100% of MTrPs treated by dry needling (Hong et al., 1997). The mechanism by which the LTR relieves pain is still not fully understood but studies have shown that LTR is associated with immediate and long-lasting pain relief than no elicitation of LTR (Shah et al., 2008). However, a recent comprehensive narrative review concluded that LTR is unnecessary and unrelated to many of the positive effects of dry needling (Perreault et al., 2017). Though we managed to elicit LTRs in our patients, we are unable to ascertain its clinical significance and feel that the needling possibly led to an equivalent phenomenon of destruction of pain bearing nerve fibres. The pain, in our opinion, could be considered analogous to the excruciating pain that arises in glomus tumours, where pain is triggered off by pressure at specific points.

Eleven out of twelve patients had improvement in their pain by the end of the study and four had complete pain relief immediately by the end of the first session, whilst seven needed more than one session. This immediate recovery could be due to a reduction of pain substances and biochemicals like calcitonin gene related peptide (CGRP) and substance P (SP) (Shah et al., 2008). This positive biochemical change in the MTrPs after needling may be due to the wash out effect related to local vasodilation commenced after dry needling (Perreault et al., 2017). However, an earlier study had shown that dry needling causes mechanical injury to muscle and nerve fibres causing rapid inflammatory reaction (Domingo et al., 2013). This could be the reason for the soreness felt by some patients post needling.

One patient did initially find some relief but then was lost to follow-up. Apart from pain relief, in two patients, dysmenorrhea symptoms reduced substantially. A previous study done on wet needling therapy in Primary dysmenorrhea found that treating the lower abdominal muscles were effective in reducing the symptoms (Huang and Liu, 2014). One of the reasons for Primary Dysmenorrhea is elevated levels of plasma prostaglandin produced by endometrium during menstrual cycle (Sultan et al., 2012). High levels of prostaglandin was speculated to activate latent MTrPs in the abdominal muscles (Huang and Liu, 2014). Release of prostaglandin stimulates muscle nociceptors and can setup a neural circuit between the central nervous system, nociceptors, and motor unit (Baker, 1998). In our study, the two patients who had dysmenorrhea pain had suffered more abdominal pain during their menstrual cycle than other days. After our dry needling session, their subsequent menstrual cycles did not cause them pain. Dry Needling could be considered as an option for women suffering from Dysmenorrhea especially if they have MTrPs in their abdominal muscles.

One patient had suffered from frequent urination (once every hour at night) that affected her sleep. Upon dry needling the frequency drastically reduced to 2 times at night. Another patient had symptoms of loose stools and mucus diarrhoea characteristic of irritable bowel syndrome that got reduced after the needling sessions. Previous studies have shown association between Abdominal MTrPs and interstitial cystitis (Weiss, 2001), irritable bowel syndrome (Hartmann and Sarton, 2014). Both viscera and the abdominal muscles have common segmental innervation, so problems in one can influence the other; these are labelled as Somatovisceral and Viscerosomatic connections. Somatovisceral connection is explained as the afferent nociceptive signal from dysfunctional somatic structures (muscles, joints, fascia) that simulate visceral disease because of the convergence on the same pool of spinal cord neurons that also receive afferent input from regionally related visceral organs (Nansel and Szlazak, 1995). Similarly, afferents emerging from the visceral organs converge into a pool of neurons that also receives information from the somatic structures. Owing to this, a true pathology in the viscera can get represented through the somatic structures. Even if the visceral pain disappears, the somatic pain will linger for several months or even several years (Kuan et al., 2006). The possible physiological effects following abdominal muscle needling on visceral functions needs to be explored further since this is an uncharted territory.

Even though our study is too small, it would be pertinent to consider Dry Needling therapy in resolving the myofascial abdominal pain. Dry Needling is less utilized in abdominal muscles compared to any other region in the body. This could probably be due to minimal awareness of the procedure itself amongst clinicians and the concept of visiting physiotherapists for abdominal wall pain is still not established. The prevalence of abdominal wall pain is probably much more than recorded in literature with most of these patients being subjected to a whole battery of investigations and intervention that do not ultimately relieve them at all. It would be prudent to say that if an awareness is created amongst clinicians regarding trigger points, its role in abdominal wall pain and the use of dry needling as a modality, the benefit to the patients in terms of money saved and pain relief could be immense.

5. Conclusion

In this case series, we had subjected 12 patients, with well investigated and previously medically treated chronic abdominal wall pain, to dry needling. Eleven out of twelve patients got significant pain relief after dry needling treatment and the

improvement was maintained at four months follow up. Additional benefits of improvement in terms of urinary frequency, dysmenorrhea, frequency of loose stools was also noted. Considering that apart from a minimal soreness that lasts for less than a day and absolutely no other side effects, with easy reproducibility, dry needling can be recommended in the treatment of chronic abdominal wall pain as an alternative modality.

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