



Modified Infiltration Technique for Cutaneous Nerve Entrapment Syndrome

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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ABSTRACT

Lateral thoracic or abdominal cutaneous nerve entrapment syndrome (C.N.E.S.) refers to the pain originating from thoracic or abdominal wall. It is a common ailment which is often misdiagnosed as arising from a source inside the abdominal cavity mistakenly leading to inappropriate diagnostic investigations, unsatisfactory treatment, and considerable costs.

The thoracoabdominal nerves terminate as the cutaneous nerves at a point from which accessory branches are given off in the rectus channel ending in the skin. Peripheral nerve entrapment occurs at anatomic sites where the nerve changes direction to enter a fibrous or osseofibrous tunnel because mechanically induced irritation is most likely to occur at these locations. Controlled investigations demonstrate that satisfactory alleviation is to be gained by immediate intervention by the most widely adopted technique of a fanning infiltration of the region of maximal point of tenderness with anesthetic and anti-inflammatory agents. Unfortunately, we observe that clinicians inexperienced performing this procedure are deterred from this technique owing to fears of inaccurate medication deposition or penetrating the abdominal cavity and perforating viscera. In this paper we describe a method to provide a safe and accurately targeted injection precisely at the necessary location without risking iatrogenic harm. This is easily achieved by raising a mound of the superficial soft tissue at the point of maximal tenderness and inserting the needle oriented

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parallel to the surface of the anterior body surface. Adoption of this method provides a simple, safe and effective solution for C.N.E.S. and will allow recruiting more physicians to join the circle of those actively treating this condition.

Keywords: Abdominal pain; chest wall pain; cutaneous nerve entrapment; infiltration injection.

1. INTRODUCTION

Lateral thoracic or abdominal cutaneous nerve entrapment syndrome (CNES) is a common ailment. Carnett,6 in the early 20th century, called this syndrome "intercostal neuralgia" and claimed to have seen three patients per week with this diagnosis and as many as three per day in consultation sessions. This condition refers to the pain originating from the thoracic or abdominal wall which is often misdiagnosed as arising from a source inside the thorax or abdominal cavity [1]. This will erroneously lead to inappropriate diagnostic investigations, unsatisfactory treatment and considerable superfluous cost. Some patients have been given a psychiatric diagnosis when the actual diagnosis could not be determined [2,3]. This condition is actually found to be the true source of pain in as many as 3-15% of patients presenting with abdominal pain, when this etiology is specifically sought [4,5]. Unfortunately, numerous and repeated publications have not yet altered the high frequency of instances that this ailment is overlooked [6,3].

Superficial cutaneous thoracoabdominal nerve entrapment may occur at anatomic sites where the nerve changes direction, so doing it enters an osseofibrous tunnel where it is subject to significant traction. This theory has been suggested almost 40 years ago and still bares the mainstay of support in current thought [7]. The anchorage of the thoracoabdominal nerves, are at six points before terminating as the cutaneous nerves [8]: 1) Spinal cord 2) Origin of the posterior branch 3) Origin of the lateral branches 4) Curvature where the anterior branch makes a sharp angle towards it entrance into the rectus muscle 5) The focus where the rectus gives off the accessory branches 6) The skin. From all the above, a point located about three quarters of the distance through the rectus muscle from its original path is the most common cause of abdominal wall pain. Simply the lateral border of the rectus muscle.

In these specific areas muscle contraction through spasm or physical activity may add further insult and contribute to the symptoms.

Other mechanisms possible aside from mechanical compression may be localized swelling with compromise of the nerve's circulation. We commonly confront cases where the superior region involved- is comprised of a relatively narrow span of tenderness which extends to a broader surface area inferomedially. This correlates well with the distribution of the anatomical sensory nerve supply.

Situations as recent enlargement of abdominal volume may contribute to elevated pressures and result in direct compression of the neurovascular bundle unit, where theoretically the pathological changes are generated. The most commonly encountered condition of abdominal enlargement is gestation followed by obesity. However, other causes such as ascites, benign or malignant tumours or organomegaly can all lead to this result. Sutures or scarring are frequently found in the vicinity of the tender zones are an established cause for this syndrome [9-11].

Previous study demonstrates the efficacy of diagnosis and injection treatment [12]. Use of corticosteroid drugs is chosen as an adjunct to the local anesthetic injection upon the assumption that an inflammatory process induces the symptoms and may improve outcomes with low risk. Just one single injection may result in a long-lasting effect. The acceptable standard procedure undertaken to infiltrate the tender area recognized as the source of the patient's discomfort is approaching the abdominal body surface in its natural position. This way, syringe and needle are inclined at an angle between 10°-45° of penetration. An overzealous therapist may push the needle tip directly into the body cavity. Trainees have repeatedly expressed fear of harm caused by mistaken entrance into the pleural or peritoneal spaces. Conversely, clinicians readily accept that if the injection is performed too superficially, the locus at the fascial plane will be missed.

The technique presented here recommends performing the complete procedure elevated from the body's surface to improve medication deposition into the incriminated entrapment site,

free of fear of penetrating deep structures. This is especially relevant when the thoracic wall is involved.

2. DIAGNOSIS

Characterization of the nature of the pain begins with a detailed history. Then the patient is requested to direct the examiner to the most exquisitely tender point inflicting the symptoms. Confirmation of the locus of nerve exit necessarily that point located by the patient, the examiner's hand should rest gently on the patient's chest or abdomen lateral to the tender spot indicated. As the fingers apply gradually increased pressure the patient will recoil or grab the examiner's hand in defence. This is termed a positive Hover Sign [13].

Carnett's test is demonstrated by palpating the tender region in the supine relaxed patient and observing often increased tenderness as the patient tenses the abdominal wall by elevating the head and shoulders or raising their legs. When pain arises from an intra abdominal source, the tensed muscles in the abdominal wall guard the underlying bowel, thus reducing the discomfort (negative test) [14]. However, when the pain arises from the abdominal wall, the muscle contraction will accentuate the pain (positive test). I prefer the 'pinching' or 'pill rolling' maneuver diagnostic for fibromyalgia trigger

points [5]. Directly squeezing the tender superficial abdominal wall tissue between the thumb and index finger, with further rolling of the tissue fold, will cause an instinctive grabbing hold of the examiner's hand or at least, illicit a clear grimace (Fig. 1).

It should be stressed that this technique demands some experience since there will be those patients in whom the thick and tense abdominal wall makes it very challenging to grasp the desired fold. Sometimes this fold will immediately slip from the fingertips. Nevertheless with growing experience, this proficiency can be mastered even with the more difficult patients.

There is basically no justification for ancillary testing such as electromyographic studies of nerves affected which has been reported by Knockhaert to show abnormalities in 60% of patients studied [15]. However, she herself admits that by large the procedure has a low sensitivity.

3. LITERATURE SEARCH

PubMed, PubMed Central were searched from 1966 to 2009 using the terms *lidocaine*, *glucocorticoids*, *corticosteroids*, *abdominal wall* and *cutaneous nerve entrapment*. None of the articles generated made reference to this technique.



Fig. 1. Demonstration of 'pill rolling' or 'pinching' localization of point of maximal tenderness. Both hands used to 'roll' superficial soft tissue

4. INDICATIONS

Basically, whenever drug infiltration is proposed this technique is indicated. The indication and contraindications are summarized in (Table 1).

Table 1. Indications and contraindications of procedure

Indications
Indications for this technique include the following:
<ul style="list-style-type: none"> • History and classic findings of CNES; • Satisfactory communication with the patient; • Ability to fully cooperate during the procedure;
Contraindications
Relative contraindications:
<ul style="list-style-type: none"> • Communication barriers • Absence of comprehension of the proposed procedure • Cooperation issues
Absolute contraindications:
<ul style="list-style-type: none"> • Infectious process involving the tissues surrounding the tender site • Known hypersensitivity to any of the agents to be injected • Motion disorders such as akathisia may preclude remaining still during the interventional procedure.

5. MATERIALS

These are listed in Box 1.

Box 1. Material required to perform modified CNES infiltration

<ul style="list-style-type: none"> • Sterile gloves • Alcohol and Povidone swabs • 1 mL of 80 mg/mL methylprednisolone • 5 mL of 1% lidocaine (without epinephrine) • 25-gauge spinal needle for aspiration • 4 × 4-inch gauze swabs • Cotton swabs • Adhesive tape (micropor)
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6. TECHNIQUE

After explaining the injection procedure and informed consent obtained, the patient is requested to lie on the healthy side of the body with the most prominent part of the tender abdominal or chest site facing upwards. The

physician approaches the patient from the back or side. Palpation by the pinching technique is performed inching across the surface until the point of maximal tenderness is located and this point marked by a non erasable marker. After antiseptic swabbing, injection is performed by a freehand technique. Since the designated region is not anatomically defined, sonographic guidance is unnecessary since it would add no benefit. Basically any of the aminoamides is adequate. These are stable compounds that act through reversible sodium channel blocking and include short acting agents such as prilocaine, lidocaine or mepivacaine. Likewise any of the corticosteroids can serve us equally for example: methylprednisolone, triamcnenolone acetone or betamethasone dipropionate. According to the literature no specific benefit can be demonstrated for one medication over the next. Therefore a selection must be dictated by experience, cost and availability. A mixture of a glucocorticoid agent with short acting amide anesthetic is drawn into a 10 mL syringe. My choice is specifically: 80-mg methylprednisolone 1 mL, and 1% lidocaine 5 mL (without adrenaline). These concentrations are recommended which provide equal efficacy with lowest risk. (Other glucocorticoid agents should have an identical effect.)

The modified procedure presented here begins with grasping the intended injection site by pinching the designated location between the thumb and index finger of the gloved, non-dominant hand. The raised mound of the abdominal or chest wall soft tissue, is orientated precisely along the planned axis of medication infiltration. The direction of insertion begins from a superolateral direction facing towards an imaginary inferomedial aspect beyond the marking. This position is maintained throughout injection. The needle is inserted horizontally at a very slight inclination of 10-20 degrees 3-5 cm away from the mark upon the same axis (Figs. 2 & 3).

As the infiltration continues the therapist should gradually feel 'fullness' between the fingertips. This sensation guarantees that the instillation of the solution is deposited precisely under the marked location. Needletip retreat and then reinsertion into a point further down the tissue raised in a fanning technique will assure targeting the offending neurovascular bundles. (Upon completion, a dry gauze dressing is left over the penetration site.



Fig. 2. Non dominant hand raises mound of soft tissue above surface of body and maintains this in place until completion of infiltration parallel to plane of anterior torso



Fig. 3. Close up of modified infiltration technique

Pain improvement usually occurs within a few minutes, but maximum effect may take up to 72 hours later. It is not possible at this time to determine specifically who will experience immediate alleviation of pain. A delayed response may have to do with inaccurate deposition with slow diffusion of the medication to its destined site. Therefore adoption of the modified technique improving location should increase the proportion of those with instant improvement. In our experience, the rule is that before leaving the clinic, upon reexamination, the tenderness is practically completely relieved. Formal evaluation and informal feedback from those mastering this modification has been

excellent. Efficiency of the procedure is high and at the same time free of complications. Therefore this has become our technique of choice for these cases.

7. CONCLUSION

Cutaneous nerve entrapment syndrome of the thorax and abdomen is not uncommon and despite the abundance of published literature, it is seldom considered as a diagnosis in clinical practice. We hereby propose the “pinching” or “pill-rolling maneuver” with the patient lying in the lateral position. The operator squeezes the

abdominal tissue between the index finger and thumb until the most tender spot is located. Then, a cocktail of 80 mg methylprednisone and a local anesthetic is injected into the mound of pinched tissue with the needle maintained horizontally and entering the skin at 20-30 degrees. After feeling the fullness from initial injection, the needle is retreated and redirected to infiltrate the surrounding area in a fanning fashion. (Fig. 2) Pain relief will set in after a few minutes and achieve a maximum within 72 hours. Given its high efficacy and relative lack of complications, this technique has become our method of choice.”

CONSENT

Patients involved in delivery of the described treatment each provided informed consent. Patient consent for publication of this manuscript is non applicable.

ETHICAL APPROVAL

Intervention presented received full approval after ethical review.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Hall PN, Lee AP. Rectus nerve entrapment causing abdominal pain. *Br J Surg.* 1988;75:917-9.
2. Srinivasan R, Greenbaum DS. Chronic abdominal wall pain: A frequently overlooked problem. *Am J Gastroenterol.* 2002;97:824-30.
3. Suleiman S, Johnston DE. The abdominal wall: An overlooked source of pain. *Am Fam Phys.* 2001;64(3):431-9.
4. Adibi P, Toghiani A. Chronic abdominal wall pain: Prevalence in out-patients. *J Pak Med Assoc.* 2012;62:17-20.
5. Costanza CD, Longstreth GF, Liu AL. Chronic abdominal wall pain: Clinical features, health care costs, and long-term outcome. *Clin Gastroenterol Hepatol.* 2004;2:395-9.
6. Tijmen A, Jenneke WA, Scheltinga MR, Roumen MR. chronic abdominal wall pain misdiagnosed as functional abdominal pain. *J Am Board Fam Med.* 2013;26:738-44.
7. Kopell HP, Thompson WA. *Peripheral entrapment neuropathies.* Malabar (FL): Robert E. Kreiger Publishing. 1976;1-7,85-8.
8. Lindsetmo RO, Stulberg J. Chronic abdominal wall pain— A diagnostic challenge for the surgeon. *Am J Surg.* 2009;198:129-134.
9. Sippo WC, Burghardt A, Gomez AC. Nerve entrapment after Pfannenstiel incision. *Am J Obstet Gynecol.* 1987;157(2):420-1.
10. McGrady EM, Marks RL. Treatment of abdominal nerve entrapment syndrome using a nerve stimulator. *Ann R Coll Surg Engl.* 1988;70(3):120-2.
11. Gallegos NC, Hobsley M. Abdominal wall pain: An alternative diagnosis. *Br J Surg.* 1990;77(10):1167-70.
12. Boelens OB, Scheltinga MR, Houterman S, Roumen RM. Randomized clinical trial of trigger point infiltration with lidocaine to diagnose anterior cutaneous nerve entrapment syndrome. *Br J Surg.* 2013;100:217-21.
13. Carnett JB. Intercostal neuralgia as a cause of abdominal pain and tenderness. *Surg Gynecol Obstet.* 1926;42:625-32.
14. Greenbaum DS, Joseph JG. Abdominal wall tenderness test. *Lancet.* 1991;337:1606-7.
15. Knockaert DC, Boonen AL, Bruyninckx FL, Bobbaers HJ. Electromyographic findings in ilioinguinal-iliohypogastric nerve entrapment syndrome. *Acta Clin Belg.* 1996;51(3):156-60.

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