Adding corticosteroids to a local anesthetic agent for abdominal wall trigger point infiltration in anterior cutaneous nerve entrapment syndrome (ACNES)

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ABSTRACT

Background: Ongoing entrapment of end twigs of intercostal nerves in the rectus abdominis muscle may lead to spontaneous neuropathic discharges and severe pain in what is known as the anterior cutaneous nerve entrapment syndrome (ACNES). Persistent pain relief is reported with sequential trigger point infiltrations using local anesthetic agents. However, adding corticosteroids as a means to improve anesthetic efficacy is controversial. Aim of the present study was to evaluate the effects of trigger point injections using local anesthetics combined with corticosteroids in ACNES patients.

Methods: Patients >18 years with suspected ACNES received 1-3 injections of 10 cc of 1% lidocaine combined with 40 mg of methylprednisolone into the point of maximal abdominal wall pain. Pain was recorded during physical examination just prior to and 15-20 minutes after injection and during follow up using a visual analogue scale and a verbal rating scale. A reduction of >50% on a Visual Analogue Scale (VAS: 1-100 mm) or a minimal 2 of points on a Verbal Rating Scale (VRS: 0-4) was considered a 'successful response'.

Results: Between August 2008 and December 2010, 50 consecutive patients were studied. Immediately following infiltration, 72% (36/50) demonstrated a successful response. One thirds of the injected patients (17/50) reported a lasting pain reduction. Five of these 17 patients needed multiple injections.

Conclusions: Trigger point infiltration(s) using a local anesthetic agent combined with methylprednisolone offers long-term pain relief in one third of patients with ACNES. It is unclear whether the anesthetic effect is due to methylprednisolone or to lidocaine.

INTRODUCTION

Up to 30% of patients with chronic abdominal pain of unknown origin may suffer from an abdominal wall related syndrome.[1,2] Repetitive laboratory tests and multimodal imaging often do not allow for identification of a wall related source of pain. However, simple palpation may unveil a discrete painful area containing a point of maximal pain. If such a pain pattern is present, patients may suffer from an anterior cutaneous nerve entrapment syndrome (ACNES). The presence of localized somatosensory disturbances and a positive Carnett's test contribute to the suspicion. A subfascial local anesthetics injection (trigger point infiltration) may be diagnostic. Entrapped end twigs of intercostal nerves at the level of the anterior sheath of the rectus abdominus muscle are thought to cause ACNES.[3] If untreated, on-going nerve entrapment may lead to microscopic damages resulting in spontaneous neuropathic discharges. Abdominal wall muscles movements aggravate these phenomena.[4]

Treating ACNES is simple and straightforward in most patients. A study reporting on a tailored regimen in a large cohort (n=139) supported findings of previous studies that a single diagnostic infiltration is therapeutic in a substantial portion of patients.[5] Moreover, persistent pain relief is reported in an even larger population using sequential trigger point infiltrations combining local anesthetics with corticosteroids.[6-8] It is hypothesized that corticosteroids may contribute to effective analgesia by alleviating ectopic neuronal discharges whereas the release of local inflammatory mediators at the site of nerve injury is prohibited.[9]

The literature on the effect of locally injected corticosteroids in the treatment of neuropathic pain syndromes is controversial. Moreover, the effects of corticosteroids in the treatment of ACNES are unknown. Authors of the present study have repeatedly observed that the addition of corticosteroids may elicit (temporarily) more pain than lidocaine injection alone. Conversely, using a cocktail of corticosteroids and an anesthetic agent may be more long-term effective compared to injection of an anesthetic agent only. The aim of the present study was to evaluate the efficacy of trigger point injections using local anesthetics combined with corticosteroids in ACNES patients.

MATERIALS AND METHODS

This prospective case series was conducted at a large teaching hospital (Máxima Medical Center (MMC), Veldhoven) in the Southeastern part of the Netherlands. MMC is an 865-bed community hospital serving a population of approximately 350,000 inhabitants. The surgical department has gained a considerable experience in the treatment of chronic abdominal wall pain and groin pain syndromes[10-14]. Patients with ACNES and

other neuralgias (post-herniorrhaphy or Pfannenstiel entrapments) are evaluated and treated by a team of experts in 'SolviMáx' (Center of Excellence for Abdominal Wall and Groin Pain), a referral center for a substantial number of other Dutch hospitals including all 8 Academic Centers. The Medical Ethics Committee of MMC approved study design, protocol and informed consent procedures. The study was registered in the Dutch Clinical Trial Register (NTR2016). Design and reporting of this trial was performed according to the CONSORT guidelines.[15] Randomized trials studying aspects of diagnostics and surgery of ACNES were recently published.[3,5] The present paper reports on some observational aspects of conservatively treated ACNES in this trial cohort.

Study criteria

Patients were eligible for the present study if all of the following criteria were met as previously reported:

1. Adult patients (>18 year) suffering from loco-regional abdominal pain for at least one month
2. Unilateral single tender spot in the abdominal area (trigger point)
3. Constant site of abdominal tenderness with a small (< 2 cm^2, 'fingertip') area of maximal intensity situated within the lateral boundaries of the rectus abdominis muscle
4. Tenderness increases by abdominal muscle tensing using the Carnett's test. During this test, the investigator localizes the point of maximal pain using his index finger. While maintaining the finger on this tender spot, the patient is asked to lift the upper torso or both legs. When pain intensity is increased following this movement, the origin of the pain is most likely located in the abdominal wall
5. Normal laboratory findings (C-reactive protein concentration <6 mg/L, serum-leukocytes 4-10^9 L, urine sedimentation)
6. No abnormal abdominal imaging (if previously performed).

Exclusion criteria were surgical scar related pain syndromes, recent intra-abdominal pathology, relevant comorbidity or impaired communication. Study information was provided in the outpatient department and patients were given sufficient time to consider participation. Informed consent was obtained once individuals complied with all study requirements. Most participants had already received a subfascial diagnostic injection with an anesthetic agent (10 cc of 1% lidocaine) in an earlier phase as part of a randomized trial.[3]

Specifics of injection

The area of maximal pain was confirmed using Carnett's test and marked with a pencil. A subfascial injection of 10 ml of 1% lidocaine combined with 40 mg of a methylprednisolone suspension was administered at the point of maximal pain. The primary investiga-

tor (OB) performed all of the injections and outcome assessments. At the outpatient department a free hand technique was used with the patient in supine position. The accuracy of free hand technique is currently under trial and compared to ultrasound guided injections. Ultrasound guidance was not deemed necessary in this trial as a needle tip passing the superficial rectus fascia can easily be felt by an experienced surgeon (> 200 injections) in patients with a BMI <30. Patients were encouraged to resume daily activities as soon as possible.

Follow up

Patients were interviewed and examined some 15 to 20 minutes after the injection(s), and two weeks thereafter in the outpatient clinic. Primary endpoint was a successful response following injection. Success was defined as a minimal 50% improvement in pain perception using a visual analogue scale [VAS, 0 mm (pain absent) to 100 mm (excruciating pain)], or an at least 2-point improvement on the verbal rating scale (VRS 0-4, 0 = no pain, 4 = severe pain) as reported previously. [3,16] If success was only temporary, a stratagem of repeated injections was provided with a maximum of three injections of 10 ml of 1% lidocaine/40 mg methylprednisolone suspension with two-week intervals. When patients reported an unsatisfactory result after this multiple injection regimen, the trial endpoint was reached and they were offered alternative treatment options including a surgical neurectomy.[5,16]

Characteristics including age, sex, body length, weight and pain related specifics such as presumed etiology were tabulated. Level of disability caused by the pain was measured using a 4-point VRS-disability score (table1).

Role of the funding sources

No funding was used or had any role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all data in the study and had final responsibility for the decision to submit for publication.

RESULTS

A total of 126 patients were evaluated for an alleged abdominal wall related pain between August 2008 and December 2010 (Table 1). Based on physical examination or laboratory or imaging findings, the abdominal pain was not wall-related in 13 patients. Additionally, 53 patients were excluded for reasons as presented in figure 1. For instance, a substantial portion of patients (n=13) was excluded as they had received injections in the referring center. Moreover, 6 other patients became pain free after a single 'diagnostic' injection using 1% lidocaine in our institution. Eight patients did not

consent to participation. Therefore, 50 patients participated in the present study. Data sets of this population were complete. Baseline demographics, pain characteristics and disability scores are summarized in table 2.

Table 1.

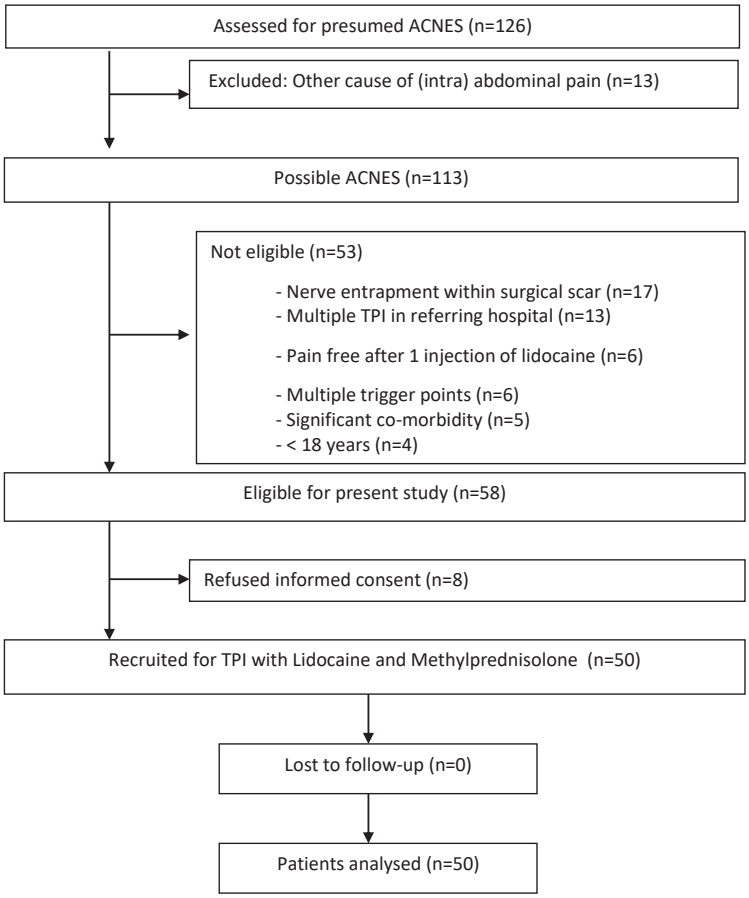

Diagram showing patient enrollment and follow-up; abbreviations: TPI = trigger point infiltration, ACNES = Anterior Cutaneous Nerve Entrapment Syndrome.

Prior to injection, the majority of patients (44/50) reported moderate to severe pain that was debilitating in 34 individuals. As per protocol, all patients received trigger point infiltration (TPI) using 10 cc of 1% lidocaine mixed with 40 mg of prednisolone. Some 15 to 20 minutes later, 72% (36/50) demonstrated a successful response (by definition). During a median 14 months follow-up period, twelve of these 36 patients still reported a significant pain reduction and were satisfied. Five other patients reported a lasting successful response after 2-3 additional injections.

Table 2.

Included patients		(n=50)
Age[*]		46 (20-74)
Sex ratio	M:F	11:39
Height (cm)[**]		172 (8) cm
Weight (kg)[**]		77 (15) kg
BMI (kg/m^2)[**]		26 (5)
Etiology (n)		
Spontaneous		37
Recent abdominal surgery		8
Pregnancy		1
Unusual activity/sport		4
Duration of pain prior to enrollment (months)[*]		13 (5- >120)
Presence of local somatosensory disturbances around trigger point		33
VAS (mm)[*]		62 (11-85)
Verbal Rating Scale (n)		
0 = No pain		0
1 = Very mild		1
2 = Mild		5
3 = Moderate		20
4 = Severe		22
Verbal Rating Disability Scale (n)		
No pain on daily activities		0
Mild pain, but no disability		16
Disabled during *heavy* activity		15
Disabled during *light* activity		19
Abdominal wall pain location (n)		
Right upper quadrant		7
Right lower		29
Left upper		2
Left lower		12

Baseline patient demographics, pain characteristics and disability scores. Abbreviations: VAS = Visual Analogue Scale; BMI = Body Mass Index. Data are presented as medians (*) with ranges or means (**) with standard deviations, as appropriate.

At the end of the evaluation period, one third (17/50) demonstrated a significant and long lasting pain reduction following the lidocaine-methylprednisolone cocktail. Conversely, insufficient pain relief was obtained in the remaining population (33/50, 66%). A surgical neurectomy was performed in all but one of these refractory patients.[16]

No adverse events occurred during TPI apart from an occasional small hematoma that resolved spontaneously. Some dizziness during the first few minutes after injection was occasionally reported. At a median follow-up of over a year, only one of 17 patients returned with recurrent pain after a 2-year pain free interval.

DISCUSSION

This prospective case series investigates the effect of a strategy of trigger point infiltration (TPI) using a mix of 10 ml of 1% lidocaine and 40 mg methylprednisolone in ACNES patients. Strikingly, almost three quarters (72%) reported a significant pain reduction some 15-20 minutes following the injection. After a more than one year median follow-up period, a third (34%) was still satisfied with the anesthetic effect of injection therapy. Interestingly, a quarter of the patients reported this effect after just one single injection.

Recent literature strongly supports injection therapy as a first interventional step in patients with ACNES. A previous retrospective paper reporting on 139 consecutively treated ACNES patients found that 33% were pain free following one or multiple injections using lidocaine alone, occasionally combined with methylprednisolone.[5] Other authors have reported similar findings.[17,18] A review of the scarse literature on the efficacy of local anesthetics blocks in neuralgia identified two consistently remarkable features. Firstly, an anesthetic effect far beyond the reported half-life of the injected agent is consistently reported. Secondly, reported outcomes are highly consistent.[19] In the present observational study, 6 of 50 patients demonstrated a lasting effect after a single injection using a simple local anesthetic agent that was administered in the diagnostic phase. It may be questioned whether the long-term success of multiple injections is due to a cumulative effect of the repetitive injection of lidocaine per se. Alternatively, the addition of corticosteroids may be responsible for this beneficial effect. Randomized data possibly shedding light on these issues were not found in the literature.

The existing literature on the effects of injection therapy for various neuropathic pain syndromes is contradictory. On the one hand, one study found that a local block using 80 mg depo-methylprednisolone added to 0.5% lidocaine was more effective than lidocaine alone in patients with neuropathic pain due to peripheral nerve damage.[20] A blinded randomized study in Morton neuroma also demonstrated that corticosteroid injections were more effective compared to local anesthetics in the three months observation period.[21] Moreover, a local injection with triamcinolone acetonide combined with lignocaine was significantly more effective than lignocaine alone in the treatment of postherpetic pain.[22] On the other hand however, peri-radicular corticosteroids infiltration did not provide any additional benefit when compared to local anesthetic injection alone in patients with radicular pain due to lumbar disc herniation or lumbar spinal stenosis. Moreover, corticosteroid injections also did not obviate the need for subsequent interventions such as additional root blocks or surgery.[23] A comparable result was attained in a randomized controlled trial investigating epidural corticosteroid injections for sciatica. Lumbar epidural corticosteroid injections offered transient benefits at 3 weeks but not later on. In addition, surgery was required for both groups.[24] Remarkably, procaine HCl injection appeared as effective as steroids in the management of carpal

tunnel syndrome.[25] These contradictory results are possibly related to differences in pain entities, application sites and administered agents concentrations. Nevertheless, it is concluded that the literature does not provide a straightforward answer regarding questions on the merits of the addition of corticosteroid to a standard injection of anesthetic agents for neuropathic pain.

This prospective case series harbors potential flaws. The study is biased by a lack of patient and observer blinding and a control group. Although this study strongly indicates a beneficial effect of corticosteroids, evidence is not provided. The role of injection therapy using local anesthetic agents (with or without corticosteroids) in ACNES is firmly established by a number of case reports, small series and one large series.[5,17] However, a controlled trial is required prior to incorporating corticosteroids as a standard additive agent for injection therapy in ACNES patients.

PROPOSAL OF A RANDOMIZED TRIAL (ACNES-CORTICO)

The contradictory literature combined with data of the present study have prompted us to design a prospective study termed 'Randomized single-blind controlled trial of conservative treatment by local injection therapy (with or without corticosteroids) for entrapment of the anterior intercostal cutaneous nerve (Netherlands Trial Registry NTR 4141).

The main objective of this study is to compare the anesthetic effect of trigger point infiltration using either a mix of 40 mg of corticosteroids and 10 cc of 2% lidocaine compared or just 10 cc of 2% lidocaine. A successful response in terms of pain reduction is defined as a minimal 50% drop using a VAS scale and/or a 2 points reduction using a 5 points VRS (McGill) pain questionnaire. Patients will receive a maximum of two of such injections at a 2-3 weeks interval. Endpoint of the study is reached after 12 weeks.

This multicenter single blinded interventional medication trial is performed in two Dutch hospitals, Máxima Medical Center, Eindhoven/Veldhoven and Maasziekenhuis Pantein, Boxmeer. Patients will be stratified according to hospital, duration of pain (less or more than 3 months) and successful diagnostic injection (elsewhere or at inclusion in own hospital). Inclusion criteria are age (>18 years), unilateral abdominal wall pain consistent with ACNES, trigger point within the borders of musculus rectus abdominis, a positive Carnett's test and a successful (>50% pain reduction) but temporary effect after a single injection using a local anesthetic agent. Exclusion criteria are recent other intra-abdominal pathology, previous treatment using corticosteroids, Pulsed-Radio-Frequency, epidural or paraspinal injections, impossible adequate follow-up, abnormal laboratory results possibly compatible with other intra-abdominal pathology, allergy to

local anesthetic (lidocaine) or corticosteroids, a history of peptic ulcer, viral or fungal infections, tropical worm infections, recent vaccinations or pregnancy.

After a temporarily successful diagnostic injection, patients are computer allocated to group A (trigger point injection with 10 cc of 2% lidocaine plus 40 mg of methylprednisolonacetate 2-3 weeks after diagnosis, and if required, repeated after 2-3 weeks) or to group B (trigger point injection with just 10 cc of 2% lidocaine 2-3 weeks after diagnosis and, if required, repeated after 2-3 weeks). The primary endpoint is the difference in number of patients with a >50% pain reduction on VAS or a 2-point reduction on the 5-point VRS 2-3 weeks after the second injection (evaluation at 12 weeks after diagnosis). Secondary endpoints of this study are pain levels 3 months after diagnosis and the necessity of other treatments during this period as well as the number of patients successfully treated after a single diagnostic injection with lidocaine only (and who were therefore not included in this trial).

Statistical differences are tested using a Mann-Whitney U test with a power of beta 0.20 and an alpha of 0.05. A power analysis has revealed that, based on a 30% success rate in the treatment group compared to a 10% rate in the control group, a 2 x 62 sample size is needed. Including a 10% dropout rate, a total number of 136 patients will be included. Completion of inclusion is anticipated towards the end of 2015.

In conclusion, trigger point infiltration(s) using a local anesthetic agent combined with methylprednisolone offers long-term pain relief in one third of patients with ACNES. The technique is readily available, easily applicable and safe. A randomized controlled trial studying the potential beneficial effects of corticosteroids addition to an anesthetic agent for ACNES is proposed.

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