Short Communication

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Persistent pain relief following a single injection of a local anesthetic for neuropathic abdominal wall and groin pain

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Abstract

Objectives: It is our experience that a small portion of patients with neuropathic abdominal wall pain syndromes such as the anterior cutaneous nerve entrapment syndrome (ACNES) have a long term beneficial response following just one single tender point injection (TPI) with a local anesthetic agent. This report focuses on the phenomenon of ongoing pain relief following a single local anesthetic injection in neuropathic abdominal wall and groin pain syndromes.
Methods: This report is an overview based on earlier studies from a center of expertise for neuropathic abdominal wall and groin pain syndromes. All studies on neuropathic abdominal wall and groin pain syndromes reporting on efficacy of a diagnostic TPI using a local anesthetic agent were included.
Results: A total of 10 studies including 834 patients fulfilled study criteria. Each of these 10 studies found that approximately 10% (range, 4–25%) of the cases experienced persistent pain relief after a single TPI with lidocaine 1%.
Conclusions: Persistent pain relief after a single TPI using a local anesthetic agent may be observed in approximately one of 10 patients suffering from neuropathic abdominal wall or groin pain syndromes. When a patient is suspected of having a neuropathic abdominal wall or groin pain syndrome, a single TPI using a local anesthetic agent should be administered as long term pain relief may occasionally occur.

Keywords: abdominal wall; groin; injections; lidocaine; nerve block; neuralgia.

Introduction

Some 5–10% of the general population suffers from neuropathic pain [1–3]. Neuropathic abdominal wall pain such as ACNES (Anterior Cutaneous Nerve Entrapment Syndrome) and neuropathic groin pain syndromes such as the post Pfannenstiel pain syndrome and inguinal postherniorraphy pain can be regarded as peripheral neuralgias. A 'local injection approach first' may play an important role in the diagnostic work up of these syndromes. Lidocaine or bupivacaine may occasionally be combined with other agents such as corticosteroids [4, 5]. If pain relief after such a diagnostic injection is long lived, beneficial effects are often attributed to the anti-inflammatory actions of corticosteroids, but not to the lidocaine component. Nevertheless, a persistent pain relief has been reported after just one diagnostic local lidocaine injection in peripheral neuralgias [6, 7].

It is our experience that a peculiar finding of long term pain relief of lidocaine is also present in a small portion of patients with ACNES and groin pain. This report focuses on the phenomenon of persistent pain relief after a single 'diagnostic' injection of a local anesthetic agent in patients with neuropathic abdominal wall and groin pain syndromes.

Materials and methods

This report is an overview based on research that has been conducted over the previous 15 years at SolviMáx Center of Excellence for

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Abdominal Wall and Groin Pain. Only studies on neuropathic abdominal wall and groin pain syndromes reporting on the effect of a first (diagnostic) tender point infiltration (TPI) with a local anesthetic were included. Exclusion criteria were studies reporting on other pain syndromes, studies solely reporting on pain reduction immediately (15–20 min) after injection, or studies reporting on multiple injections or combinations of agents.

Results

A search in Pubmed using the two senior authors names resulted in 64 articles, and nine fulfilled study criteria. A clinical trial evaluating the role of ultrasound guided TPI for ACNES, that is currently under review was also included [8]. Therefore, patient data of 10 studies were analysed. Not one study had a control arm. The placebo controlled study of Boelens et al. on TPI was excluded as only pain reduction immediately after (15–20 min) injection was considered [9].

All 10 studies reported on small subpopulations of patients who had a complete or profound pain relief after just one single TPI of a local anesthetic agent (Table 1). Most studies were based on retrospective data. All studies used lidocaine 1% as local anesthetic agent. The definition of a persistently successful, clinically important pain relief differed slightly between the studies. For instance, three studies defined a clinically important pain relief as a minimal 50% pain reduction based on a Numeric Rating Score (0–10: 0 no pain; 10 worst pain), or on the basis of a substantial improvement in Verbal Rating Score (VRS) (Table 2) [8, 10, 11]. Three of the 10 studies did not mention the scoring system indicating the 50% pain reduction [12–14]. Four studies based success on patients who were pain free, defined as score of 1 on the 1–5 VRS scale [15–18].

Table 1: Studies of SolviMáx Center of Excellence for Abdominal Wall and Groin Pain reporting on persistent pain relief following a single diagnostic TPI.

Author, year	Study information	Pain syndrome	Local anesthetic	Definition success	Success rate	Follow-up
Loos, 2008 [12]	Retrospective questionnaire	PPPS	10 mL lidocaine 1%	>50% pain reduction: Yes of No	19% (5/27)	Long-term, not defined
Boelens, 2011 [15]	Retrospective cohort study	ACNES	10 mL lidocaine 1%	Pain free=VRS 1	21% (28/135)	18 months (median, range 1–64)
Siawash, 2017 [11]	Prospective case series	ACNES	5 mL lidocaine 1%	≥50% pain reduction on NRS	15% (13/85)	17 months (median, range 4–39)
Siawash, 2016 [18]	Cross-sectional cohort study	ACNES	5 mL lidocaine 1%	Pain free=VRS 1	25% (3/12)	Two weeks
Maatman, 2017 [17]	Retrospective database	LACNES	5–10 mL lidocaine 1%	Pain free=VRS 1	17% (5/30)	60 months (median, range 2–103)
Verhagen, 2018 [14]	RCT: injection therapy vs. neurectomy	Postherniorraphy inguinal neuralgia	10 mL lidocaine 1%	>50% pain reduction: Yes of No	5% (3/57)	Unknown
Mol, 2018 [10]	RCT: injection regimen with lidocaine vs. lidocaine + steroids	ACNES	5–10 mL lidocaine 2%	≥50% pain reduction on NRS	6% (8/136)	Six weeks
Verhagen, 2018 [13]	Retrospective database	PPPS	5–10 mL lidocaine 1%	>50% pain reduction: Yes of No	4% (8/186)	Long-term, not defined
Heukensfeldt Jansen, 2020 [16]	Retrospective database	ACNES	5–10 mL lidocaine 1%	Pain free	8% (4/49)	Long-term, not defined
Jacobs, 2021 [8]	RCT: ultrasound guided vs. freehand injection regimen	ACNES	5–10 mL lidocaine 1%	≥50% pain reduction on VRS	5% (6/117)	12 weeks
Total					**10% (83/834)**	

TPI, tender point injection; mL, millilitre; PPPS, post Pfannenstiel pain syndrome; ACNES, anterior cutaneous nerve entrapment syndrome; LACNES, lateral cutaneous nerve entrapment syndrome; RCT, randomized clinical trial; NRS, numeric rating scale; VRS, verbal rating scale.

Table 2: Level of satisfaction after treatment for ACNES using verbal rating scale [15].

(1) I am very satisfied; I have no pain anymore.
(2) I am satisfied; I occasionally experience some pain.
(3) I have improved, but experience some pain on a regular basis.
(4) The treatment did not change my pain level.
(5) My pain has worsened after the treatment.

The percentage of patients reporting pain relief after one TPI ranged from 4–25% (Table 1). Although it is statistically inappropriate to calculate an average percentage in the absence of a systematic review or meta-analysis, a total of 83 of 834 patients (10%) reported a complete or profound (>50%) pain relief.

Discussion

The aim of the present overview was to determine how often a phenomenon of persistent pain relief after a single diagnostic TPI with a local anesthetic agent in neuropathic abdominal wall and groin pain syndromes may occur. The present data incorporating 10 studies from a center of excellence demonstrates that a single local injection of a short acting local anesthetic agent, administered as means to support or confirm the diagnosis of neuropathic pain, can provide a long lasting relief in selected patients. While from a patient perspective a short-term beneficial effect of a single 'diagnostic' block in chronic pain is possibly irrelevant in terms of pain relief, a local anesthetic effect that lasts for months is clinically important. A small portion of studies even reported pain relief for over one year in some individuals [19, 20]. This finding is in line with our own experience in patients with abdominal cutaneous nerve entrapment (ACNES) who occasionally report total pain relief following one single injection although they were suffering from severe pain for over three years [10, 21].

Nevertheless, this phenomenon may also occur in populations other than ACNES or neuropathic groin pain. After a single pudendal nerve block with 4 cc of lidocaine 1% for pudendal neuralgia, eight of 68 patients (12%) had over 30% pain relief that persistent after three months [22]. Single TPI for saphenous neuralgia resulted in persistent pain relief in two of nine patients [23]. A single block using a local anesthetic agent in trigeminal neuralgia gave profound pain relief for several months to even years in some individuals [19, 20]. Interestingly, an occipital nerve block for migraine resulted in complete or substantial pain relief for up to two months in selected patients [24]. These findings strongly support the existence of the phenomenon of persistent pain relief after a single injection of a local anesthetic agent for peripheral neuropathic pain syndromes.

The exact mechanism underlying this phenomenon is largely unclear. In these cases, pain relief is far beyond the injected agent's half-life (lidocaine, approximately 4–6 h). As this remarkable phenomenon is demonstrated both following TPI and after systemic administration, a similar underlying mechanism may be at hand. One potential explanation is inhibition of the so-called vicious circle of pain as reported many decades ago by Bonica [25]. It may be that a similar circle may exist in peripheral neuropathic pain, starting with increased locoregional muscle tension, progressive nerve ischemia and subsequent oedema resulting in more pain, etc. This vicious circle of events may be interrupted by a single administration of a local anesthetic agent.

Others have speculated on alternative theories explaining long term pain relief under these circumstances. Several groups have attracted attention to a possible ongoing inhibitory effect on a chronic inflammatory state. There is abundant evidence indicating that lidocaine influences the inflammatory reaction and *in vitro* wound healing in rats and humans [26–30]. In addition, lidocaine was found to exert a protective role regarding tissue dysfunction and mortality in an endotoxin shock model [29, 31, 32]. Moreover, lipopolysaccharide-induced production of pro-inflammatory molecules such as inducible nitric oxide synthase and monocyte chemotactic protein-1 in macrophage cell lines were down-regulated [29, 33, 34].

If one considers a potentially beneficial effect of an injection, a so-called needling effect may also play a role. This theory is based on a presumed mechanical injury of the nerve that is caused by an injection needle [35, 36]. Although attractive in its simplicity, there are several reasons why this theory is not universally embraced. For instance, it does not explain the systemic effects following an administrational route other than local (e.g., intravenous). Moreover, a double blind randomized controlled trial in ACNES demonstrated that the short term anesthetic effect of an injection was due to lidocaine and not to saline excluding a dry needling or volume effect [9].

An alternative hypothesis states that a local anesthetic such as lidocaine or bupivacaine downregulates or alters make up of excess sodium channels that are present in damaged nerves. These voltage-gated sodium channels are responsible for transmitting noxious information to the central nervous system. Moreover, recruitment of these channels is required for any type of painful stimuli to yield a sensation of pain [37]. If these channels are changed,

isomers associated with chronic pain could be altered or eliminated and therefore no longer be able to signal chronic neuropathic pain.

Is a placebo effect playing a role? Some dated literature states that approximately 35% of all success following injections can be attributed to a placebo effect [38]. More recent research suggests that placebo response rates may vary greatly. These effects are also influenced by nonspecific treatment effects such as attention, expectations of the doctor as well as setting and reputation of the hospital [39]. Included in this review are studies from one center of expertise which eliminates differences between hospital setting, treatment impressiveness, hospital reputation and physician differences. Nevertheless, the results vary greatly among these 10 studies, which makes a placebo effect rather unlikely, especially when pain had lasted for many years before the first injection treatment was administered.

The present overview has limitations. The report focuses only on the authors own research whereas most (6 of 10) studies were on ACNES, possibly suggesting that this phenomenon predominantly only occurs in neuropathic abdominal wall pain syndromes. However, this phenomenon was also identified by other authors in small case studies on alternative chronic pain syndromes [19, 20, 23, 24, 40]. Another limitation is the fact that the included studies were not controlled and mainly retrospective. Nevertheless, our research team earlier conducted a double-blind randomized controlled trial among ACNES patients (n=48) that compared the effect of lidocaine vs. saline injection on the short term (15–20 min after injection). This study showed that there were significantly more patients with a successful response after lidocaine TPI [9]. In order to confirm the findings of this report, a double-blind randomized controlled trial that evaluates the long-term effect of the injected local anesthetic is necessary.

Conclusion

Persistent pain relief after a single TPI by one local anesthetic agent may be observed in approximately one of 10 patients suffering from neuropathic abdominal wall or groin pain syndromes.

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