Long-term Efficacy of Abdominal Wall Trigger Point Injections

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Abstract

Introduction: We evaluated the efficacy of abdominal wall injections in 35 retrospective patients by a single physician.

Methods: Using uniform techniques to inject both Lidocaine and Depo-Medrol in patients with moderate to severe localized abdominal wall pain mostly related to laparoscopic scars.

Results: On initial follow-up at 15.2 ± 8.5 (mean ± standard deviation) days, the pain was reduced from 7.4 ± 1.5 (mean ± standard deviation) to 2.3 ± 2.3 (mean ± standard deviation) in 34 out of the 35 retrospective patients. One patient showed no response. On long-term follow up at 26.0 ± 28.5 (mean ± standard deviation) months, the pain was reduced to 1.2 ± 2.0 (mean ± standard deviation). Five of the 35 retrospective patients required more than one injection to the same site to achieve the pain control. No major complications were noted. Average cost of the abdominal wall injection was $134.72.

Conclusion: We propose that localized abdominal wall pain should be considered for trigger point injection early on in the management.

Introduction

Abdominal pain in different regions of the abdomen may indicate different sources of pain. Certain clinical characteristics differentiate the source of pain on clinical evaluation. For example, RUQ tenderness (Murphy's sign) with associated features of nausea and dyspepsia with high fatty meals indicates a problem with the gall bladder. On the other hand, intermittent pain in the RLQ is associated with menses, which may indicate conditions such as endometriosis or ovarian cysts.[1] Thomas et al. suggested that about 1 percent of general surgical referrals are likely related to abdominal wall pain.[2]

In the last decade, more abdominal surgical procedures are being successfully and efficiently completed using laparoscopic technology. Besides common laparoscopic procedures like cholecystectomies, complex colon cancer resections are being increasingly undertaken by minimally invasive surgical technique.

We are seeing an increase in number of patients with sharp, severe, localized abdominal pains after laparoscopic surgical procedures. Clinically, these patients undergo multiple tests, which are important to rule out other intra-abdominal conditions when certain signs or symptoms are present. Often these tests do not point to a specific etiology. It has been long recognized since 1792 by JP Frank that there can be a local nerve injury causing pain.[3] Srinivasan et al concluded that pain relief will be confirmed diagnostically and therapeutically helpful if the anesthetic/corticosteroid injection is in the proper place.[4]

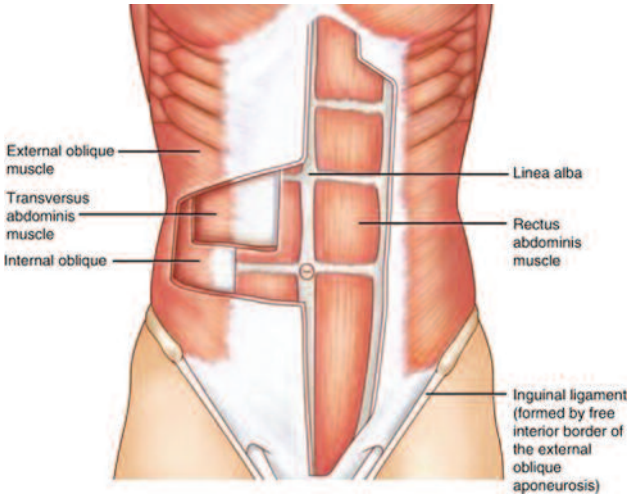
In this report, we are presenting 35 retrospective patients from February 2007 to May 2017 that went through a total of 42 abdominal wall injections by a single provider using the exact same technique.

Anatomy of Abdominal Wall

The abdominal wall consists of three layers of muscle. The external oblique muscle is the most superficial of the flat abdominal muscles. The internal oblique muscle lies just

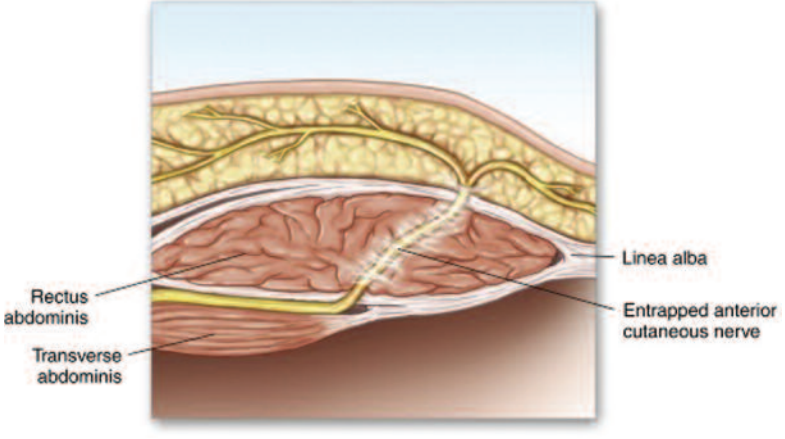
beneath the external oblique muscle. The transversus abdominis is the deepest of the three flat abdominal wall muscles. The rectus abdominis muscles are long, vertical muscles that continue the entire length of the abdomen (Figure 1).[6]

Figure 1. Abdominal wall muscle layers. Reprinted by permission from Springer Nature: Springer Nature, Anatomy of the Abdominal Wall, Garcia CM, Ruiz SG, Franco CC, Copyright 2014.



The abdominal wall is innervated by intercostal nerves T7 to T12. These intercostal nerves run along the ribs then between the internal oblique and the transversus abdominis until they reach the lateral border of the rectus abdominis. The nerves then take a 90 degree turn to travel towards the superficial part of the abdominal wall turning into the anterior cutaneous nerve (Figure 2); then they take another 90-degree turn to run alongside the abdominal wall.[7,8] The most common site for anterior cutaneous nerve entrapment is at both 90-degree turns.[4,8-10]

Figure 2. Route of anterior cutaneous nerve. Reprinted from Elsevier, Waldman SD, Atlas of Uncommon Pain Syndromes, Pages No. 202-204, Copyright 2014, with permission from Elsevier.



Skin incisions are becoming much smaller with the use of laparoscopic and robotic surgical techniques, which allow for quicker healing and a reduction in complications. However, instruments such as the trocar, cautery probe, suction devices, etc. require larger skin incisions than what is provided from laparoscopic and robotic surgeries. When these larger instruments are placed through the smaller skin incision, the subcutaneous tissue layer is stretched causing nerve injury from the formation of scar tissue. Stretching of the subcutaneous layer causes the nerve to be more tightly packed in the neurovascular bundle causing inflammation and a reduction in blood supply to the nerve tissue, which may lead to scar tissue.[10] Scar tissue causes the distal portion of the neurovascular bundle to herniate through the fibrous ring causing an entrapped nerve.[10] The most common site for this process to occur at is the 90-degree turns of the anterior cutaneous nerve because it is most distal from the spinal cord and the neurovascular bundles are more tightly packed together.[10]

Methods

From a single provider with a long-term gastroenterology practice with 3,284 patients, using a keyword search on the electronic health record (EHR), all patients that went through an abdominal wall injection were identified. Initially, all records were reviewed by Cason Heier to assure patient information and procedures were recorded correctly. Each patient's chart was then verified by Chandar Singaram, MD. The gathered information including demographics were entered into a spreadsheet. After entering the information into the spreadsheet, it was verified by Bharathi Vallalar, PhD. Graphing and statistical analysis were obtained directly from the spreadsheet to reduce error from transfer. Since the information was entered immediately after each treatment, we did not identify any missing data.

Thirty-five patients were identified that went through abdominal wall injection procedures from February 2007 to May 2017. The physician treated with abdominal wall injections only on 35 patients during this time period. This time period was chosen because 2007 was the year the current EHR system was installed. Twenty-nine out of the

35 patients were seen in the clinic within 15.2 ± 8.5 (mean ± standard deviation) days after the injection. Out of the 35 patients, 30 had a long-term follow up within 26.0 ± 28.5 (mean ± standard deviation) months after the injection. During each clinic visit, the patients had their vital signs recorded and their level of pain documented using the numerical pain scale from zero to ten where zero meant no pain and ten meant the worst pain possible. This information was used to calculate the change in pain level at the original site of pain.

Each patient must meet the following criteria:

1) Localized abdominal wall tenderness with positive Carnett test.[11] Carnett's test is done in the clinic by the physician to determine if the pain is of abdominal wall origin or intra-abdominal origin. The patient is asked to tense their abdominal muscles by laying down flat on their back and raising their head or feet.[12] If the pain becomes more tender than it is more than likely a musculoskeletal source and if the pain becomes less tender than it is more than likely a visceral source.[12]

2) Pain localized close to a laparoscopic scar.

3) No other clinical evidence of intra-abdominal diseases.

After excluding organic diseases, clinical diagnoses of nerve entrapment syndrome or abdominal wall pain was recognized.

To administer an abdominal wall trigger point injection, the patient is placed in the supine position. Both an alcohol and betadine swab are used to clean the skin where the injection will take place. Then a 22 French 1.5-inch-long needle is inserted into the area of maximum tenderness just beneath the skin into the muscle layer. The plunger is withdrawn slightly to ensure that the needle is not in any vasculature. Once the physician confirms that the needle is not in any vasculature, lidocaine, a local anesthetic, and Depo-Medrol, a steroid, are injected at the trigger point in multiple planes. Prior to 2007, the physician tested various doses for lidocaine and Depo-Medrol. The physician chose to use 4 to 15 cc's of Lidocaine and 240 mg of Depo-Medrol most of the time because this dosage did not produce any complications in previous experience. Given the tight area and volume of abdominal muscle tissue, 8 cc's of lidocaine and 240 mg of Depo-Medrol were found to be the most effective. Potential side effects of lidocaine include, allergic reaction, which can be reduced or avoided from checking the

Table 1. Patient demographics

Patient number	DOB	Gender	Age	Date of procedure	Depo-Mendrol	Lidocaine	Location
1a* JB	2/11/1943	F	72	8/07/2015	320 mg	15cc 2%	RLQ
1b JB	2/11/1943	F	72	10/28/2015	320 mg	15cc 2%	RLQ
2 AC	3/11/1974	F	41	2/22/2016	240 mg	7cc 2%	LLQ
3 SD	8/31/1947	F	66	9/27/2013	240 mg	6cc 2%	LLQ
4 DL	5/4/1965	F	49	9/22/2014	240 mg	10cc 2%	RLQ
5 KP	3/10/1994	F	18	8/6/2012	240 mg	10cc 2%	RUQ
6 AC	6/17/1984	F	31	2/1/2016	240 mg	5cc 2%	RLQ
7 DK	5/4/1965	F	49	11/13/2014	240 mg	5cc 2%	LLQ
8a* KP	3/10/1994	F	20	1/14/2015	240 mg	6cc 2%	Epigastric
8b KP	3/10/1994	F	21	1/22/2016	240 mg	5cc 1%	Epigastric
9 JH	4/28/1952	F	60	6/18/2012	240 mg	15cc 2%	RLQ
10 MN	9/27/1961	F	45	2/1/2007	100 mg	15cc 2%	RLQ
11 KK	8/30/1994	F	22	3/22/2017	240 mg	5cc 2%	Epigastric
12 SB	8/22/1956	F	56	7/15/2013	240 mg	8cc 2%	Epigastric
13 LB	3/26/1930	F	83	11/25/2013	240 mg	6cc 2%	LLQ
14 CH	11/20/1962	F	51	1/10/2014	240 mg	5cc 2%	Epigastric
15 JC	2/24/1994	F	21	7/27/2015	240 mg	8cc 2%	Epigastric
16 LA	2/24/1966	F	43	7/27/2009	240 mg	6cc 2%	Epigastric
17 SH	5/30/1972	F	41	2/21/2014	240 mg	4cc 2%	RUQ
18 SE	12/2/1984	F	30	6/12/2015	240 mg	6cc 2%	LUQ
19 DM	7/6/1944	M	69	3/13/2014	240 mg	5cc 2%	RUQ
20 CJ	2/1/1947	F	70	5/3/2017	240 mg	5cc 2%	RLQ
21 NS	5/12/1974	F	39	12/20/2013	240 mg	5cc 2%	Epigastric
22 JS	1/30/1995	F	18	7/10/2013	240 mg	8cc 2%	LLQ
23 JW	11/14/1984	M	28	8/30/2013	240 mg	8cc 2%	Epigastric
24 JT	3/28/1968	M	45	3/21/2014	240 mg	5cc 2%	LUQ
25 TT	1/9/1971	F	42	5/6/2013	240 mg	12cc 2%	RUQ
26 CZ	9/17/1957	F	51	12/15/2008	240 mg	12cc 2%	Epigastric
27 BW	12/22/1963	F	46	2/3/2010	240 mg	10cc 2%	LUQ
28 DV	6/22/1933	F	83	12/5/2016	240 mg	10cc 2%	Epigastric
29 JH	8/19/1972	M	40	4/1/2013	240mg	10cc 2%	RLQ
30a* SF	2/12/1965	F	49	10/17/2014	240mg	10cc 2%	Epigastric
30b SF	2/12/1965	F	51	10/10/2016	240mg	5cc 2%	Epigastric
31 SE	12/2/1984	F	30	11/16/2015	80mg	5cc 2%	Epigastric
32a* LG	7/7/1964	M	45	2/3/2010	240mg	7cc 2%	LLQ
32b LG	7/7/1964	M	45	3/3/2010	240mg	12cc 2%	LLQ
32c LG	7/7/1964	M	49	2/4/2014	240mg	8cc 2%	LLQ
32d LG	7/7/1964	M	49	6/12/2014	240mg	5cc 2%	LLQ
33 BH	1/12/1953	F	61	4/7/2014	240mg	5cc 2%	RLQ
34 CO	3/15/1996	F	17	12/6/2013	240mg	6cc 2%	Epigastric
35a* BF	7/20/1959	F	50	12/7/2009	160mg	10cc 2%	LLQ
35b BF	7/20/1959	F	54	11/11/2013	240mg	10cc 2%	LLQ

* The patient has had an injection to the same location on different days (1a, 1b, etc.).

Table 2. Localization of injections and changes in pain.

Patient number	Location	Initial pain	First follow-up pain	Final Follow-up pain	Percent decrease in pain
1a	RLQ	8	9	9	-12.5%
1b	RLQ	9	1	1	88.9%
2	LLQ	6	1	1	83.3%
3	LLQ	6	1	0	100%
4	RLQ	9	1	0	100%
5	RUQ	8	3	0	100%
6	RLQ	6	0	0	100%
7	LLQ	6	1	0	100%
8a	Epigastric	9	1	2	77.8%
8b	Epigastric	6	2	1	83.3%
9	RLQ	6	1	0	100%
10	RLQ	10	1	0	100%
11	Epigastric	9	1	0	100%
12	Epigastric	9	1	0	100%
13	LLQ	8	6	6	25%
14	Epigastric	9	8	0	100%
15	Epigastric	9	3	0	100%
16	Epigastric	9	0	0	100%
17	RUQ	7	2	0	100%
18	RUQ	9	2	3	66.7%
19	RUQ	7	2	2	71.4%
20	RLQ	9	1	1	88.9%
21	Epigastric	7	7	7	0%
22	LLQ	7	5	0	100%
23	Epigastric	8	2	1	87.5%
24	LUQ	5	1	0	100%
25	RUQ	8	8	0	100%
26	Epigastric	8	0	0	100%
27	LUQ	7	0	0	100%
28	Epigastric	8	0	0	100%
29	RLQ	3	0	0	100%
30a	Epigastric	7	2	4	42.9%
30b	Epigastric	4	0	0	100%
31	Epigastric	7	4	3	57.1%
32a	LLQ	7	7	7	0%
32b	LLQ	7	0	7	0%
32c	LLQ	9	6	8	11.1%
32d	LLQ	9	5	3	66.7%
33	RLQ	7	2	0	100%
34	Epigastric	6	0	0	100%
35a	LLQ	7	4	6	14.3%
35b	LLQ	9	2	0	100%

medical history. Two hundred forty mg of Depo-Medrol have not shown to have any major systemic side effects. Locally, both lidocaine and Depo-Medrol can potentially cause skin irritation. None of these potential side effects were noted in our 35 patients.

Categorical variables were calculated as proportions and expressed as percentages. Continuous variables were expressed as ranges and mean ± standard deviation (SD). The Fischer exact test was used to compare the upper and lower abdomen with a decrease in pain of greater than or equal to 70 percent and less than 70 percent. The paired t test was used to compare the mean ± SD of pain before the injection with both the mean ± SD of the pain after the injection at the initial follow-up and at the long-term follow-up. The level of significance used was 0.05.

The average cost for an abdominal wall injection was calculated for the 35 patients. The total expense was calculated by adding the price of one vial of lidocaine, three vials of Depo-Medrol and the average professional fee for the 35 patients.

Results

The average age of the 35 patients was 45.8 years (range, 17 to 83 years). Thirty (85.7 percent) were female and five (14.3 percent) were male (Table 1). Thirteen (37.1 percent) patients had epigastric pain, eight (22.9 percent) had RLQ pain, seven (20.0 percent) had LLQ pain, five (14.3 percent) had RUQ pain and two (5.7 percent) had LUQ pain. Thirty (85.7 percent) of the patients required only one injection, four (11.4 percent) required two injections and one (2.9 percent) required three or more injections. The average amount of 2 percent Lidocaine administered was 8.0 cc's (range, 4 to 15 cc's). Of the 42 injections, 37 had 240 mg Depo-Medrol, two had 320 mg, two had 160 mg and one had 80 mg.

Twenty-four (68.6 percent) patients showed 70 percent or more reduction in pain and only eight (22.9 percent) had pain greater than three within one month after the injection. The mean pain was 7.4 ± 1.5 (mean ± standard deviation) before the injection and 2.3 ± 2.3 (mean ± standard deviation) at the initial follow-up after their injection ($p<0.0001$) (Table 2). Eventually, 30 (85.7 percent) of the patients experienced a reduction in pain by 70 percent or more (Figure 3). The last follow-up conducted at the patients most recent clinic visit showed that 29 (82.9 percent) patients continued to have a reduction in pain by 70 percent or more and only four (11.4 percent) had pain above three. The mean pain was 1.2 ± 2.0 (mean ± standard deviation) at the patient's last follow-up ($p<0.0001$ compared to mean pain before injection).

The Fischer exact test comparing the upper and lower abdomen proved to not be statistically significant ($p = 0.430$). Likewise, the Fischer exact test comparing the RUQ and the LLQ was also not statistically significant ($p = 0.576$).

Total expense of medications and professional fees was noted to be $134.72. One vial of lidocaine costs $8.53,

Figure 3. Pain levels at initial visit and at long-term visit is shown for each patient. Insert illustrates change in painfor each patient from the day of injection to the initial visit after the injection.

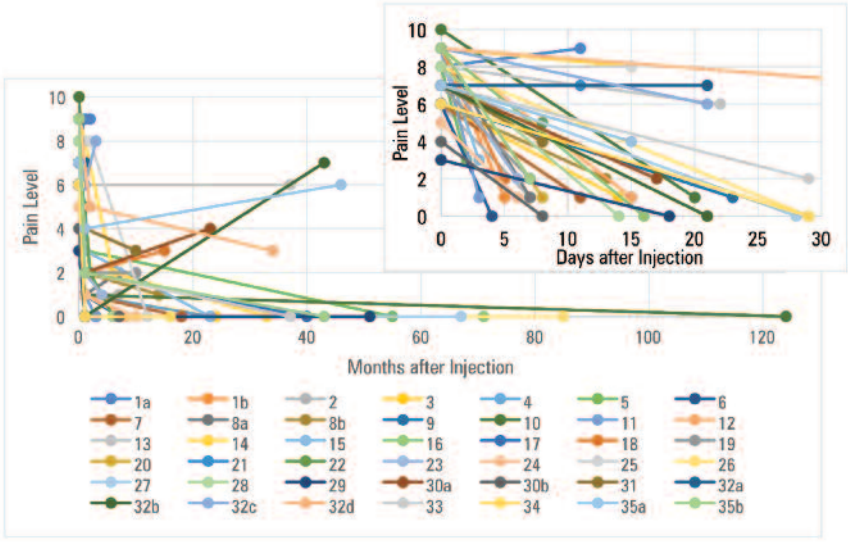
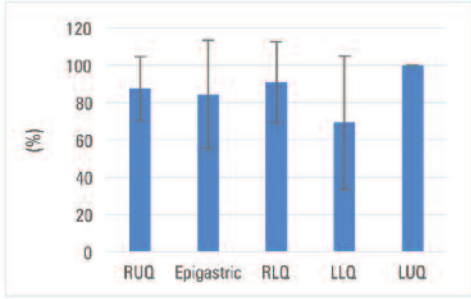


Figure 4. Average percent decrease in pain



three vials of Depo-Medrol costs $37.62 and the average professional fee was $88.57.

Discussion

Our retrospective chart analysis of 35 patients with abdominal wall pain showed an 80 percent improvement in pain in 15.2 ± 8.5 (mean ± standard deviation) days. This improvement in pain continued for 26.0 ± 28.5 (mean ± standard deviation) months. However, not all patients showed complete pain relief. One patient had no pain relief at all. It is possible that the Lidocaine and Depo-Medrol from the injections did not reach the site of nerve entrapment. It is also possible that, even though clinically it looked like nerve entrapment related pain, it may have been related to muscle or ligament pain.

Abdominal wall pain can mimic several abdominal organ issues. It is important to have a quality clinical evaluation and an endoscopic study with imaging to rule out other causes. A quality clinical evaluation includes identifying location of pain, onset of the pain in relationship to the laparoscopic surgery and Carnett test to determine that the pain is of abdominal wall origin. Upper endoscopy studies will be of value to rule out conditions such as gastric ulcers, gastritis, hiatal hernia, *Helicobacter pylori*, etc. A colonoscopy study needs to be considered if there is lower abdominal pain that is present with other symptoms like bleeding and change in bowel movements. Appropriate imaging studies may include an ultrasound or CT scan of the abdomen.

In this study, the provider used one dose of lidocaine and Depro-Medrol for an injection. Further studies are needed to determine dose for each type of medication and depth of scar tissue.

In conclusion, abdominal wall injections are effective in both short term and long-term follow up for patients experiencing abdominal pain.

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