

CASE REPORT

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Surgical management of post-surgical intercostal thoracic-abdominal nerve neuroma

Soubrata Raika¹, Arun Angelo Patil^{2*} , Amelia Simmons² and Thomas Nilles-Melchert²

Abstract

Background: Formation of post-operative neuroma formation after laparoscopic surgery is not common. Its diagnosis is often missed because pain often mimics intra-abdominal pathology. In this paper, the authors report a case in which the severe pain resulting from the abovementioned neuroma was successfully treated by excision of neuroma and implant of the proximal stump into the adjacent muscle.

Case presentation: The patient is a 20-year-old female who had laparoscopic surgery on her left kidney. Immediately after surgery, she started experiencing severe pain at the operative site that continued for 5 years. A recent nerve block of the thoracic-abdominal intercostal nerve deep in the abdominal wall immediately beneath the incision gave her temporary relief for a couple of weeks. The patient was operated on. The neuroma was identified in the scar tissue of the transversalis muscle. The neuroma was excised, and the proximal stump was buried in the adjacent muscle. After the operation, she was free of pain and continues to be free of pain at 6 months follow-up.

Conclusion: Formation of neuroma with severe chronic abdominal pain can occur after laparoscopic surgery. Nerve block is a diagnostic study for this condition. Neuroma resection with burying the covering of the stump can result in the cure of the pain.

Keyword: Post-operative, Neuroma, Laparoscopic, Surgical treatment

Background

Peripheral nerve regeneration following traumatic injury is susceptible to the formation of a neuroma due to disorganized growth of nerve fibers. Such neuromas are fibrotic, minimally vascular, and often associated with pain and paresthesia in the affected area. Neuroma formation can occur following surgical procedures, trauma, and mild repetitive trauma, or the cause may be unknown. Neuropathic pain occurs due to compression, ischemia of nerve fibers within scar tissue, and random firing of nociceptors. The initial management of a neuroma is pain medications and avoiding possible aggravating factors, such as pressure or trauma. If pain persists, opioids, antidepressants, or

anticonvulsants (e.g., pregabalin or gabapentin) are tried. If this fails, steroid injections with local anesthetic, intercostal nerve blocks, radiofrequency ablation, chemical neurectomy, or surgical intervention can be tried [1]. Though there are several reports related to the surgical treatment of neuromas in the extremities, report on intercostal neuromas in the abdominal wall is scarce and often misdiagnosed.

The surgical approach to treat this condition has been to maintain a microenvironment conducive for nerve regrowth via translocating the nerve stump to the site of minimal stimulation [1, 2]. The techniques include proximal ligation to the nerve stump with or without resection of the neuroma. This method has high re-operation rates. The second technique is burying the nerve stump into the muscle. This method has good results with a reduction of pain and histological findings of improved

* Correspondence: aapatil@cox.net

²Department of Surgery, Creighton University School of Medicine, 7710 Mercy Road, Suite 501, Omaha, NE 68124, USA
Full list of author information is available at the end of the article

organization of nerve fibers. There is also a report of transplantation of a nerve stump into the bone. Another approach involves covering the nerve stump with muscle to create a stable environment [2]. One of the techniques caps the nerve by suturing the epineural cuff to prevent neuroma formation. Studies have used arteries and synthetic tubing to function as a sleeve to join the nerve ends. Complications include nerve fibers extending through the cap, fluid build-up, and possible displacement of the cap. The effectiveness of this technique is unclear as success rates vary. The next technique uses nerve-to-nerve anastomosis. Variations for this method include the use of vein or nerve grafts. Yet, another method is to implant the transected ends of a nerve to an extended autologous venous nerve conduit or processed allograft. This protects the nerve from surrounding scar tissue and attenuates the regeneration of neuronal fibers [1].

There are scarce reports of thoracic intercostal nerve neuromas [3–5] and post-operative thoracic-abdominal intercostal nerve neuroma formation which had successful outcomes following surgery. Furthermore, surgical treatment is rarely considered because this condition is often misdiagnosed, or the treating physician believes that surgical intervention is ineffective. This has resulted in long-term pain medication intake by patients and drug addiction. The authors, therefore, are reporting a case of post-surgical abdominal intercostal neuroma that was surgically treated with excellent results.

Case presentation

The patient is a 20-year-old female status-post laparoscopic excision of kidney diverticulum who presented with severe chronic abdominal pain in the left upper quadrant deep to the operative scar. The pain started almost immediately following the operation. The pain was excruciating in nature and localized deep to the incision site. The severe pain was intermittent throughout the day and lasted approximately 3 to 4 h. In the intervals between the severe pain, the patient felt dull pain. The severe pain was refractory to medications, including to opioids and anti-seizure medications. The patient had a multitude of visits to the emergency rooms without getting adequate relief. She visited a couple of prestigious medical facilities in the Midwest. They were able to block the pain only temporarily with steroids and local anesthetic. She was told that there was nothing else they could do and dissuaded her from having any surgical procedure. She was diagnosed with mental health disorder and reflex sympathetic dystrophy syndrome. More recently, her pain had reached the height of its severity and was associated with incontinence of urine. Urological investigations for incontinence were negative. She also had several MRI scans of the abdomen and pelvis with negative findings.

Past medical history includes morbid obesity and a post-traumatic injury to the right knee with right popliteal artery thrombosis which was surgically treated with popliteal-femoral bypass. Consequently, she developed deep vein thrombosis. Her medications included hydro-morphone, apixaban, and benzo diazepam. Her neurological examination was normal except for numbness in the lateral side of the right leg due to prior trauma. Local examination showed a healthy scar over the area associated with her complaints of pain and deep palpation-elicited severe pain.

Diagnostic studies

EMG study was attempted but was not completed because the patient did not want it. A nerve block was done under fluoroscopic control. Steroids and local anesthetic injection at the painful site 3–4 mm superficial to the peritoneal cavity gave her relief for a couple of weeks. A decision was then made to treat it surgically.

Operation

The procedure was done under general anesthesia. Muscle relaxant was not used. Dissection was carried down to the transversalis muscle. There was a large amount of scar tissue at the laparoscopic tract. The scar tissue was then stimulated area by area in motor mode at a current strength of 4–5 volts to narrow down the area in which the nerve was present. Once this area was identified, lower voltages 0.5–1 were used for the final identification. The nerve with neuroma formation within it was identified in the scar tissue and adipose tissue (Fig. 1) by observing the contraction of the muscles distal to it. The nerve was followed proximally and distally outside the scar tissue and cut. The proximal stump of the nerve was buried in the adjacent muscle, and the epineurium was sutured to the fascia over the muscle to hold it in place. The scar tissue with the neuroma and the distal stump within it was excised.

Result

The patient was immediately free of pain following the surgery except for mild incisional pain. At her 6-month follow-up, she was completely free of pain and incontinence. She has also discontinued all her pain medications.

Discussion

Though there is a large body of literature for extremity neuromas, there are scarce papers related to the neuromas of the abdominal wall, probably due to low occurrence or due to misdiagnosis. With the increasing use of laparoscopic surgery, in which, through a small incision instruments are navigated in and out of the peritoneal cavity more cases of neuroma formation are likely to happen. The tissue between the skin and the peritoneum



Fig. 1 Intraoperative images showing the proximal part of the nerve (thin arrow) and the neuroma formation (thick arrow)

is not visible to the surgeon while the instruments are being inserted. This increases the risk of injury to the nerves deep within the abdominal wall which can lead to neuroma formation. The resulting pain, deep within the abdominal wall, may mimic intra-abdominal pathology, leading subsequent investigations focused on intra-abdominal pathology. When these studies come negative, the condition is labeled as a psychosomatic disorder. This was the history in this case report.

EMG study and nerve block under fluoroscopic imaging or ultrasound imaging are needed to confirm the diagnosis. EMG may be hard to perform if the patient is in severe pain. Nerve block is easy to perform. The needle used for the block must be long enough to reach the transversalis muscle because the neuroma formation is usually on its surface. The needle insertion must be deep into the abdominal wall, about 5–10 mm superficial to the peritoneum. This needs intra-procedural ultrasound or fluoroscopic X-ray imaging.

Intraoperatively, it can be challenging to identify the neuroma and the associated nerve due to extensive scar tissue formation and adipose tissue in the area. Nerve stimulation is an excellent tool to find the nerve if it is not clearly visible. Stimulation is initially started at a higher voltage to narrow down the area. Then, the voltage is lowered for the final identification of the nerve. In the case of the intercostal nerve, the use of stimulation in motor mode is done because it has a motor component. This can be done even if the patient is under general anesthesia, as long as muscle relaxants are not used.

Although mere resection of neuroma may result in recurrence of the pain due to neuroma regrowth, newer methods of neuroma treatment mentioned in the introduction section of this paper have been successful. One study retrospectively reviewed 12 cases which underwent a neurectomy with reattachment of nerve stump to the muscle for management of postoperative abdominal or breast pain. A combined success rate of 84% of patients reported at least 50% reduction of pain [2]. They observed that nerve block was key to diagnosis and the cause of the pain.

Conclusion

Formation of neuroma should always be in the differential diagnosis of chronic abdominal pain after laparoscopic surgery. Nerve block is a diagnostic study for this condition. Neuroma resection with covering the stump or burying it are useful methods to prevent recurrence of the pain.

Acknowledgements

None

Authors' contributions

SR helped to write the paper and participated in the evaluation of the patient. AAP helped to write the paper and participated in the evaluation of the patient. AS helped to write the paper. TNM helped to write the paper. The authors have read and approved this paper.

Funding

There was no funding for this paper.

Availability of data and materials

This is only a technical note. Images available to the author are in the paper.

Declarations

Ethics approval and consent to participate

This is not a study. It is only a case report. There is no patient identification in the paper. The patient's written permission has been obtained to report this case.

Consent for publication

The patient gave written permission to publish her case presentation.

Competing interests

The authors declare that they have no competing interests.

Author details

¹Midwest Anesthesia and Pain Management, Elkhorn, NE, USA. ²Department of Surgery, Creighton University School of Medicine, 7710 Mercy Road, Suite 501, Omaha, NE 68124, USA.

Received: 14 December 2020 Accepted: 15 April 2021

Published online: 14 June 2021

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