CASE REPORT

Abdominal Anterior Cutaneous Nerve Entrapment Syndrome: Case Report of An Overlooked Diagnosis

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ABSTRACT

Introduction: Abdominal Anterior Cutaneous Nerve Entrapment Syndrome (ACNES) is a chronic abdominal pain condition caused by entrapment of thoracoabdominal nerve branches in the abdominal wall. It is often misdiagnosed due to nonspecific symptoms resembling gastrointestinal issues. Hydrodissection, a minimally invasive technique, involves injecting fluid to release entrapped nerves and alleviate pain. This case highlights successful pain relief in ACNES using ultrasound-guided hydrodissection.

Methods: A case report of a 27-year-old male pilot presented with chronic lower abdominal pain for five months, worsened by sitting post varicocele operation. The patient reported having persistent abdominal pain with a Numeric Rating Scale (NRS) score of 5–6. Despite undergoing prolotherapy and radiofrequency targeting the left ilioinguinal nerve, the pain intensified to an NRS of 8–9. Examination revealed a positive Carnett's sign, suggesting ACNES. Hydrodissection with lidocaine under ultrasound guidance was performed.

Result: Post-hydrodissection, the patient reported significant pain relief, with his NRS score decreasing from 8–9 to 0–1. He experienced near-complete resolution of chronic abdominal pain without adverse effects, demonstrating hydrodissection's effectiveness. Conclusion: Recognizing ACNES as a potential cause of chronic abdominal pain is essential for targeted intervention.

Keywords: Anterior Cutaneous Nerve Entrapment Syndrome; Hydrodissection; Ultrasound-guided; Interventional pain management; Carnett's sign

ABSTRAK

Pendahuluan: Abdominal Anterior Cutaneous Nerve Entrapment Syndrome (ACNES) adalah sindrom/gangguan nyeri perut kronis yang disebabkan oleh terjepitnya cabang saraf thorakoabdominal di dinding perut. Tidak jarang kondisi ini salah didiagnosis karena gejalanya yang tidak spesifik dan menyerupai gangguan saluran cerna. Hidrodiseksi adalah teknik minimal invasif yang melibatkan injeksi cairan untuk melepaskan saraf yang terjepit dan mengurangi nyeri. Laporan kasus ini menyoroti keberhasilan pengurangan nyeri ACNES menggunakan hidrodiseksi dengan panduan ultrasonografi.

Metode: Laporan kasus seorang pilot pria berusia 27 tahun yang mengalami nyeri perut bagian bawah kronis selama lima bulan, yang memburuk saat duduk pasca operasi varicocele. Nyeri dirasakan terus berlanjut dengan skor Numeric Rating Scale (NRS) 5–6. Meskipun telah menjalani proloterapi dan radiofrekuensi dengan menargetkan nervus ilioinguinal kiri, nyeri kian memburuk menjadi NRS 8–9. Pemeriksaan menunjukkan tanda Carnett yang positif, yang mengindikasikan ACNES. Hidroseksi dengan lidokain dan D5% dilakukan di bawah panduan ultrasonografi.

Hasil: Setelah prosedur hidroseksi, pasien melaporkan penurunan nyeri yang signifikan, dengan skor NRS turun dari 8–9 menjadi 0–1. Pasien mengalami hampir sepenuhnya pemulihan dari nyeri perut kronis tanpa efek samping, yang menunjukkan efektivitas hidrodiseksi.

Kesimpulan: Identifikasi ACNES sebagai salah satu penyebab potensial nyeri perut kronis sangat penting untuk pemberian terapi dan intervensi yang tepat.

Kata Kunci: Abdominal Anterior Cutaneous Nerve Entrapment Syndrome; Hidroseksi; Ultrasonografi; Manajemen Nyeri Intervensional; Tanda Carnett

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INTRODUCTION

Abdominal Anterior Cutaneous Nerve Entrapment Syndrome (ACNES) is a condition where the terminal branches of the lower thoracic intercostal nerves (typically T8–T12) become entrapped within the layers of the abdominal muscles. This entrapment leads to localized neuropathic pain, which is often severe and frequently misdiagnosed as other forms of abdominal pain. Abdominal ACNES is typically characterized by sharp, localized pain in the abdominal wall. The prevalence of abdominal ACNES ranges between 15% and 30% in studies concerning chronic abdominal pain. It is more common in adolescents, where it is diagnosed in one out of eight cases of chronic abdominal pain. In emergency departments, the prevalence of abdominal ACNES among patients presenting with acute abdominal pain is approximately 2%.[1,2]

Abdominal ACNES is frequently overlooked and often misdiagnosed because it mimics other abdominal pain condition and usually only identified after extensive investigations and referrals to pain management services.[3] Risk factors for abdominal ACNES are abdominal surgeries, such as laparoscopic procedures

as they may result in the formation of scar tissue which can cause the entrapment the nerves. Pregnancy is another important risk factor, as the physiological changes and increased stretch on the neurovascular bundle within the rectus muscle during pregnancy can cause entrapment. Additionally, sports activities involving the abdominal muscle can increase the risk.[3]

Patients with abdominal ACNES describe the pain in varying terms, such as dull, burning, or sharp, with potential radiation across the upper abdomen or obliquely downward into the lower abdomen. The pain or discomfort is often exacerbated by physical movements, such as twisting, bending, or sitting up, which can increase the severity of the pain. This pain is usually focused on a specific spot on the abdominal wall, where the nerve is trapped and often persist for a long time. The persistent nature of this pain, coupled with its often-misdiagnosed origin, can lead to considerable psychological distress. A hallmark of abdominal ACNES is the exacerbation of pain during activities that involve abdominal muscle tensing, such as the Carnett's test, which helps differentiate it from visceral sources of pain.[4,5]

Surgical management options for Abdominal ACNES include anterior neurectomy, revision surgery, and posterior neurectomy. Non-surgical management options include systemic drug therapy, which typically involves the use of systemic drugs, such as nonsteroidal anti-inflammatory drugs (NSAIDs), weak opioids, antiepileptic, trigger point injections with local anesthetics, ultrasound-guided nerve blocks, or hydrodissection.[6] Ultrasound-guided nerve hydrodissection, a method involving the injection of a fluid, such as saline, anesthetic, or 5% dextrose, around the entrapped nerve to separate the nerve from surrounding tissues which is the source of the pain. This method not only alleviates the mechanical pressure on the nerve, thereby reducing pain and improving function, but also enhances nerve mobility, which is crucial for long-term recovery.[7,8]

CASE DESRIPTION

A 27-year-old male pilot presented to our clinic with a primary complaint of chronic pain in the lower abdomen, extending from the left to the right quadrant, particularly aggravated when sitting. He described the pain as sharp and tight, and noted that it had worsened over the past three months. His symptoms began following a varicocele surgery on the left scrotum seven months prior. Two months post-surgery, he developed an infection at the surgical site, accompanied by pain around the area. Over the next two months, this pain gradually spread to his left lower abdomen with a Numeric Rating Scale (NRS) of 6/10, prompting him to seek treatment. Initially, he received five rounds of prolotherapy targeting the left ilioinguinal nerve, but experienced no relief. Subsequently, he underwent pulsed radiofrequency (RF) treatment on the same nerve two months prior to visiting our clinic. However, instead of improvement, his pain intensified to a 9/10 on the NRS, leading him to seek further evaluation at our clinic.

During his examination at our clinic, the patient reported that the pain became excruciating if he sat for more than 10 minutes. He also experienced pain with back flexion and extension. On physical examination, there was tenderness over both left and right ilioinguinal nerve dermatomes, and Carnett's sign was positive bilaterally both with and without neck flexion (Figure 1), suggesting involvement of the abdominal wall (Figure 2). No motor or sensory deficits were observed.

Figure 1. Positive Carnett's Sign (A) with neck flexion (B) without neck flexion

Based on his symptoms, we considered several differential diagnoses: Abdominal Cutaneous Nerve Entrapment Syndrome (ACNES), chronic ilioinguinal nerve entrapment, and genitofemoral nerve entrapment. After a thorough evaluation, we established ACNES as the working diagnosis and proceeded with an interventional pain management (IPM) procedure (Figure 2).

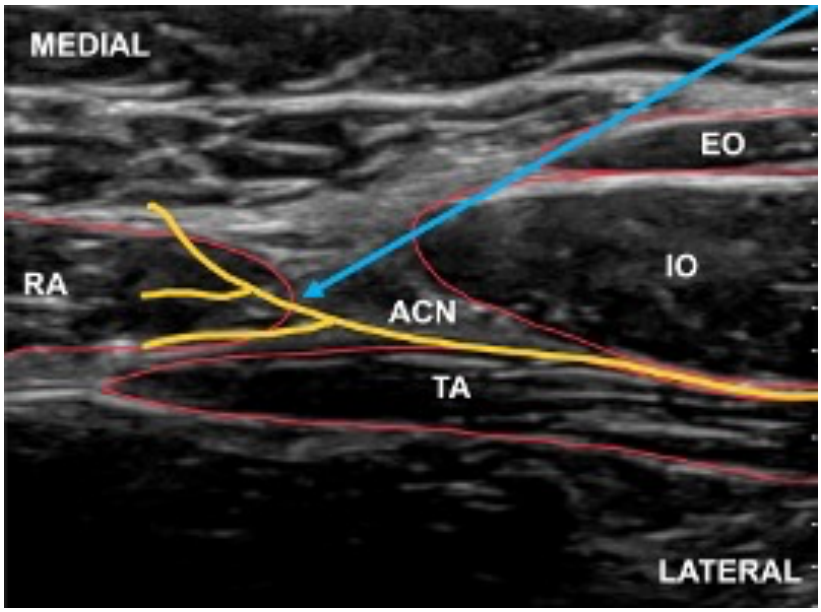

Figure 2. Interventional Pain Management (IPM) Procedure

The patient was positioned supine for the procedure. The target site was identified by palpating oval-shaped depressions along the lateral edge of the rectus muscle, corresponding to the aponeurotic openings of the T8–T12 anterior cutaneous nerves. We used this depression as the injection site. Under ultrasound guidance, a needle was advanced through the skin, subcutaneous tissue, and just beyond the aponeurosis, into the fatty tissue surrounding the nerve and associated blood vessels. We administered 1% lidocaine and 12 cc of 5% dextrose as prolotherapy with a hydrodissection technique to relieve the nerve entrapment.

After the procedure, we instructed the patient to return for a follow-up visit. At the follow-up a week later, he reported a

significant reduction in pain, with an NRS of 0–1/10. This outcome indicated a successful response to treatment, as the patient reported minimal to no pain on either side.

DISCUSSION

Abdominal Anterior Cutaneous Nerve Entrapment Syndrome (ACNES) is a condition caused by the entrapment of the terminal branches of thoracic intercostal nerves (T8-T12) within the abdominal muscles. This entrapment results in severe neuropathic pain, which can radiate dorsally along the affected dermatome.[9] Despite its relatively high prevalence, ACNES remains underdiagnosed in clinical practice, leading to prolonged patient suffering and unnecessary medical investigations.[10]

The patient in our case study had persistent stomach pain that had not gone away despite multiple conventional treatments. His quality of life and ability to execute his job as a pilot—a career where chronic pain can jeopardize efficiency and safety—were greatly impacted by the pain. The patient's pain was described as sharp and tight, extending across the abdomen, and worsened with abdominal muscle contraction. This clinical presentation, coupled with a positive Carnett's sign, led to the consideration of ACNES as the working diagnosis.[5]

Carnett's sign is a crucial diagnostic tool for distinguishing abdominal wall pain from visceral pain. During this test, the clinician identifies the point of maximal abdominal pain through deep palpation, after which the patient is asked to tense the abdominal muscles. ACNES is confirmed if pain persists during all test phases, indicating that the abdominal wall is the source. Carnett's sign is a straightforward yet efficient test for detecting abdominal wall pain, since studies have shown its high diagnostic value.[11] The working diagnosis of ACNES was further supported by clinical features that differentiated it from other nerve entrapment syndromes, such as chronic ilioinguinal and genitofemoral nerve entrapments. While these conditions may share overlapping symptoms, while ACNES is characterized by localized tenderness and a positive Carnett's sign, whereas other entrapment syndromes often present with radiating pain to the groin or thigh and are less responsive to Carnett's test.[5,11]

The management of abdominal ACNES recommendations are surgical treatments, such as anterior neurectomy, intraperitoneal-only mesh reinforcement, and non-surgical treatments such as systemic drug therapy and targeted interventions such as trigger point injections and ultrasound-guided nerve blocks. Given the chronic nature of the patient's condition and the failure of previous treatments, we opted for ultrasound-guided hydrodissection as an interventional pain management (IPM) strategy. This technique involves the injection of a fluid, typically saline or dextrose solution, around the entrapped nerve to separate it from surrounding tissues and relieve pain. Hydrodissection has been shown to provide immediate and sustained pain relief in cases of nerve entrapment. Hydrodissection is preferred for its effectiveness and safety.[2] These less invasive treatments offer substantial advantages, particularly in reducing patient morbidity and avoiding the complications associated with surgical procedures. Other studies have reported the treatments of ACNES using different methods such as using trigger point injection without US guidance, nerve block using US guidance, anterior neurectomy, and lidocaine injection. Overall, from the studies, the symptoms of pain are reduced by a significant amount.[11-15]

The primary goal when treating ACNES is the reduction and relief of pain

for the long term. Ultrasound-guided nerve hydrodissection is a highly effective and minimally invasive technique for treating nerve entrapment. It gives significant advantages over other treatments. By precisely injecting a fluid, such as saline, anesthetic, or 5% dextrose, around the entrapped nerve, it separates the nerve from surrounding tissues that may be the source of the pain. Hydrodissection of the entrapped nerve not only reduces pain and improves function but also increases nerve mobility, which is important for long-term recovery. The use of ultrasound and proper technique will minimize the risk of injury to nearby structures and increase patient safety. Moreover, recent studies have highlighted the potential of 5% dextrose not only for its mechanical benefits but also for its direct analgesic effects, making it a good option for the management of ACNES.[7,8]
In comparing the efficacy of different injection therapies, we found that prolotherapy with 5% dextrose offers unique advantages over corticosteroid-based injections. Dextrose-based prolotherapy has been shown to have a positive and significantly beneficial effect for patients with chronic musculoskeletal pain, ranging from 6 months to 1 year. There is evidence that dextrose-based prolotherapy has a similar effect compared to steroid injection. However, the use of corticosteroids has its concern of adverse effects, such as focal inflammation, necrosis, fragmentation of collagen bundles in the subacromial space, tendon/ligament weakening or rupture, and worsening osteoarthritic changes. In contrast, prolotherapy has no serious side effects and is effective, safe, and sustainable.[10]

Our study emphasizes how crucial it is to identify abdominal anterior cutaneous nerve entrapment syndrome (ACNES) in patients with chronic abdominal pain unresponsive to several treatments. Because of its vague symptoms that could be mistaken for other gastrointestinal issues, ACNES is often overlooked in clinical settings, despite its comparatively high frequency. This could lead to needless diagnostic testing and extended patient suffering. Most patients with chronic abdominal pain due to ACNES are diagnosed after a substantial time period. A substantial number of patients report previous visits to an emergency department (ED) with acute pain.[10] If patients with a localized acute abdominal syndrome demonstrate normal laboratory or imaging testing, it is necessary to consider ACNES in the differential diagnosis and should check for Carnett's sign even if no abdominal tenderness is identified by regular abdominal palpation.[10,11] With the right diagnosis, we could choose the best therapy option for patients. The successful hydrodissection not only provided significant and immediate pain relief but also underscored the effectiveness and safety of hydrodissection as a treatment choice for abdominal ACNES. Therefore, we emphasize the importance of diagnosing abdominal ACNES and support the adoption of hydrodissection as a preferable treatment choice alternative to surgical interventions.

CONCLUSION

In conclusion, abdominal anterior cutaneous nerve entrapment syndrome (ACNES) is a frequently overlooked cause of chronic abdominal pain, often misdiagnosed due to its similarity to other abdominal conditions. The condition is characterized by localized, sharp pain that can be exacerbated by physical movement and is typically confirmed through Carnett's test. While surgical interventions such as neurectomy can be effective, non-surgical approaches like ultrasound-guided nerve hydrodissection offer a safer, minimally invasive alternative with significant pain relief and improved nerve function. The presented case highlights the successful use of ultrasound-guided nerve hydrodissection with 1% lidocaine and 12 cc of 5% dextrose as prolotherapy to relieve

nerve entrapment. These findings highlight the need to recognize ACNES as a differential diagnosis of persistent abdominal pain and support hydrodissection as a preferred treatment modality to reduce patient morbidity and enhance recovery outcomes.

DISCLOSURES

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Conflict of Interest

The authors declared no conflict of interest.

Declaration of Patient Consent

We declared that we had obtained the consent of the patient. The patient has given his consent for his clinical information to be reported in the journal. The patients understand that their names and initials will not be published.

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Author's Contribution

All authors have contributed to all processes in this research, including preparation, data gathering and analysis, drafting and approval for publication of this manuscript.

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