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Ultrasound-Guided Pudendal Nerve Hydrodissection: A Novel Approach to the Treatment of Pudendal Neuralgia

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Abstract

Background: Pudendal neuralgia presents as a chronic debilitating pain in the genitalia, perineum, or anorectal region. This develops as a result of damage to the pudendal nerve via irritation, previous surgeries or compression, often by other surrounding structures and tissues. Hydrodissection is a minimally invasive technique involving injection of fluid to separate layers of fascia to release entrapped nerves, emerging as a potential treatment for pudendal neuralgia. Methods: We present the case of a 36-year-old female with chronic pelvic pain that was negatively impacting her activities of daily living. The patient had previously undergone a hysterectomy procedure. The patient reported a pain score of 8/10. The patient underwent ultrasound-guided pudendal hydrodissection to address pudendal inflammation and nerve entrapment. Ultrasound-guided hydrodissection of the pudendal nerves was performed aseptically with the patient in the prone position. The procedure was performed in theatre. After skin sterilisation and local anaesthetic administered, 10mls of 5% dextrose solution was delivered using 22 g needles, on each side, to free the pudendal nerves from surrounding scar tissue and muscle adhesions with good visualisation of the distribution of solution. Outcome: Following the hydrodissection procedure, the patient experienced marked improvement in symptoms and intensity of symptoms, with sustained improvement over the six weeks follow-up (pain score 2/10). Functional outcomes including pain-free duration and improvement in activities of daily living, improved substantially. No complications were reported. *Conclusion:* This case supports the potential role of dextrose hydrodissection as a safe, minimally invasive treatment option for pudendal neuralgia, particularly in patients with complex pain histories and previous failed treatments. Hydrodissection offers an alternative to more invasive interventions and warrants further investigation in the manage-

ment of pudendal neuralgia.

Keywords

Pelvic Pain, Pudendal Neuralgia, Hydrodissection

1. Introduction

Damage to the pudendal nerve most commonly occurs in the interligamentous space where the pudendal nerve passes between the sacrospinous and Sacro tuberous ligaments, or within the pudendal (Alcock's) canal [1]. Such damage may affect one or more branches of the nerve. Risk factors for chronic pudendal neuralgia include age, pelvic inflammatory disease (PID), endometriosis, a history of obstetric and gynaecological interventions, gastrointestinal surgery, use of analgesics, alcohol abuse and depressive mood disorders. The condition is estimated to affect approximately 4% - 14% of women [2] [3]. More than 80% of women affected endure symptoms for a duration of more than twelve months before seeking medical attention, with one third delaying for more than five years to consult a healthcare provider [2] [3].

Chronic pelvic pain is defined as persistent, debilitating pain localised to the lower abdomen, lasting more than six months. It may be accompanied by pain radiating to the periumbilical, epigastric sacral and perineal regions, as well as lower extremities [4]. Chronic pelvic pain is often conceptualised as a tunnel syndrome, characterised by pelvic pain that may be associated with bowel, bladder, and sexual dysfunction [5]. Common features of chronic pelvic pain include dysmenorrhea, dyspareunia, concomitant gastrointestinal symptoms, depression, and an unsatisfactory response to analgesics [6]-[8]. The pain may be of a continuous or intermittent character, with variation in severity, and often significantly impairs a patients' day-to-day functioning [9]. The condition is typically bilateral in presentation [10].

Among the most common aetiologies of female pelvic pain are those of gynaecological origins such as endometriosis, pelvic inflammatory disease, endosalpingiosis, adhesions, uterine fibroids, residual/ remanent ovary syndrome. Additional causes include urological origin such as cystitis, painful bladder syndrome, urethral syndrome, or gastrointestinal origins which include irritable bowel syndrome, inflammatory bowel disease, colorectal cancer, musculoskeletal origins of myofascial pain, fibromyalgia, coccygodynia and neurological conditions including pudendal neuralgia, and psychosomatic/ central sensitisation disorders [11] [12]. Peripheral nociceptive pain is frequently initiated by traumatic events such as surgery, endometriosis, physical injury such as falls, childbirth or inflammatory processes [10]. The persistent nature of chronic pelvic pain often results in profoundly debilitating personal and psychological consequences for patients as they commonly endure a prolonged and frustrating diagnostic and therapeutic path-

ways before achieving effective symptom management [10].

Chronic pain is often also associated with social, and economic consequences that prove it to be an emergent global health focus [13]. A recent review on the prevalence of chronic pelvic pain estimates its value in the range of 5.7% to 26.6% [14]. However, these numbers may not accurately predict the healthcare burden of chronic pelvic pain, as there is a notable absence of a single definition of the condition, a lack of appropriate diagnostic tests and a noticeable lack of population-based studies dedicated to chronic pelvic pain [14]. It is estimated to account for 10% of all gynaecologic visits, 40% of laparoscopies and 12% of hysterectomies, despite more that 80% of patients not having a gynaecological origin for their pain [15]-[17].

Treatment strategies for chronic pelvic pain typically aim to prevent further nerve damage and may include perineural steroid injections, and decompression surgeries [18]. An effective pudendal nerve block should ideally anaesthetise three primary branches: the dorsal nerve of the penis/ clitoris, the perineal nerve, and the inferior rectal nerve [18].

Hydro dissection involves the injection of a local anaesthetic and 5% dextrose solution with the aim of separating nerves or other anatomical structures from adjacent tissues, fascia, or surrounding structures [17]. The therapeutic effects of hydro dissection are believed to stem from the alleviation of compression on the nervi nervorum or vasa nervorum [19]. Accurate identification of these structures and precise delivery of the injection into the appropriate anatomical sites are optimally achieved using ultrasound guidance. The objective of this case study was to evaluate the role of hydro dissection in the treatment of pudendal neuralgia using ultrasound guidance. To date, the application of hydro dissection with 5% dextrose under ultrasound guidance for the treatment of pudendal neuralgia has not yet been reported. This case report presents the first documented use on ultrasound-guide hydro dissection as a therapeutic approach for the treatment of pudendal neuralgia.

2. Case Report

A 36-year-old female presented with chronic pelvic pain that was negatively impacting her activities of daily living. Clinical diagnosis was achieved based on clinical history, physical exam and ruling out of other differentials via MRI of pelvis and lumbosacral spine to rule out disc herniation, tumours, or entrapment.

The patient had previously undergone a hysterectomy procedure. The patient reported a pain score of 8/10. Conservative management, namely physiotherapy and the use of analgesic agents, had previously failed to control her symptoms. She had previously found temporary relief with a symphysis pubis injection, which had given her short term benefits and conservatively managed her pain with analgesia; however, these treatment options have failed to adequately resolve her pain. The patient reported that she had obtained good relief from her symphysis pubis injection, however, she was still utising vimovo and oxynorm for her

analgesic routine. Physiotherapy, strength and conditioning of the abdominal wall were recommended to the patient as conservative management, however, these proved to be unsuccessful in alleviating her symptoms. The patient was then consented for pudendal nerve hydro dissection treatment.

Dynamic ultrasound scanning (curvilinear transducer) of the affected area was conducted to examine the anatomical structures and to identify any hypoechoic areas indicating localized pathology (Figure 1). The skin was prepared with chlorprep, and ultrasound guidance was used throughout the procedure to ensure continuous visualization of structures and accurate needle placement (Figure 2). Aseptic technique was strictly maintained as the needle was carefully positioned at the targeted sites. After confirming the accurate placement of the needle tip, 5 mL of 0.25% Lidocaine was injected. Subsequently, 10 mL of 5% dextrose was administered on each side for hydro dissection, with clear visualization of the distribution of the solution. No adverse effects or complications were noted during or after the procedure. 5% dextrose was proposed to reduce neuropathic pain by inhibiting the release of CGRP, an inflammatory mediator.

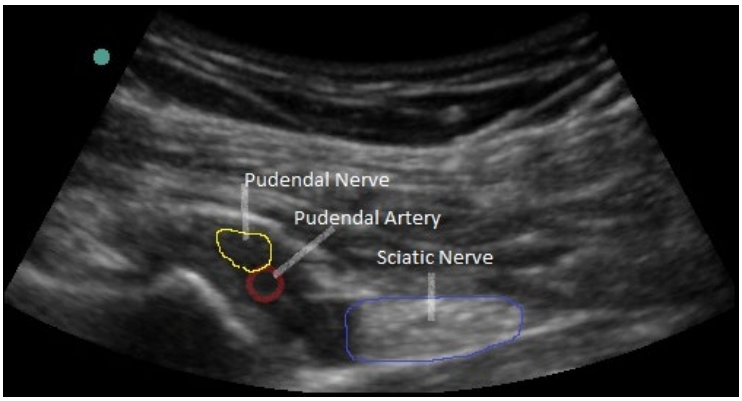

Figure 1. Illustration of pudendal nerve in relation to pudendal artery and sciatic nerve.

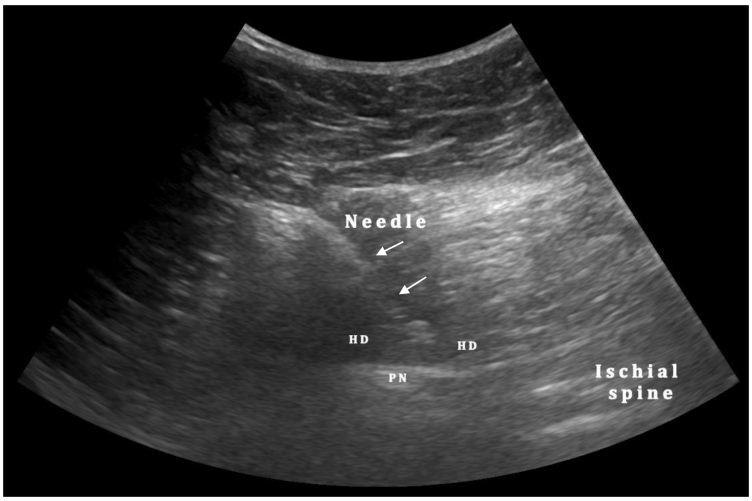

Figure 2. Illustration of pudenedal nerve (PN) hydrodissection (HD). Ischial spine is lateral. Injectate needle is illustrated by arrows.

Upon further follow-up, the patient reported excellent symptom relief from the procedure, with sustained analgesic relief and continued improvements during following appointments in three months (pain score 2/10) and 10 months post procedure (pain score 2/10). Analgesics were not required.

3. Discussion

This is the first documented case report of using ultrasound guided hydro dissection for therapeutic management of pudendal neuralgia. This approach presents a promising non-operative minimally invasive treatment option, with the potential to reduce the need for surgical intervention, minimise rehabilitation time and decrease hospital bed occupancy. This case highlights the efficacy of combining hydro dissection with a structured physiotherapy regime, which may lead to favourable patient outcomes. Additionally, the use of this method has the potential to reduce dependence on oral analgesics and other repetitive non-operative treatments, such as steroid injections.

The advantages of this technique are substantial. Ultrasound remains an invaluable tool for assessing tissue health, offering several key advantages: it is effective, accessible, non-invasive, efficient, and does not involve radiation. With employed by trained and experienced professionals, ultrasound provides a straightforward approach to the treatment of pudendal neuralgia. Furthermore, studies have demonstrated that ultrasound is easier to use, requires shorter procedure times and is generally more accessible for both patients and clinicians [20] [21]. The use of ultrasound intra-operatively allows for real-time feedback in monitoring the spread of the injected solution, ensuring that intended therapeutic effect is achieved. With precise localisation of the injected fluid, the likelihood of successful outcomes is enhanced. Additionally, ultrasound's ability to maintain image quality and accessibility, regardless of a patient's mobility status, makes it a reliable tool for both intra-operative and bedside use. Ultrasound can also reduce reliance on other imaging modalities such as MRI, which can induce stress and anxiety in patients, and may elucidate artifacts that compromise image quality [22]. Moreover, ultrasound minimises the need for CT and X-ray imaging, thereby reducing patient radiation exposure. The procedure can be performed relatively efficiently, leading to fewer follow-up appointments compared to traditional methods. In the context of pudendal neuralgia, ultrasound shows dual purpose: it provides dynamic, real-time imaging and facilitates therapeutic intervention. This allows for the potential to scan, diagnose, and treat the patient in a single visit, thereby reducing hospital waiting times and making this approach both time-efficient, cost efficient and resource-efficient.

Nerve hydro dissection is a novel technique that can be applied in appropriate cases to release fascia from the entrapped nerves, which are a common but often under-recognised source of pain [23]. Such injections not only aid in diagnosis, but also treat the underlying nerve entrapment by separation of the constricting tissues, diluting and flushing out of inflammatory mediators, as well as leveraging the anti-inflammatory effects of the injected corticosteroids or analgesics. Injec-

tion of a fluid volume into the deep fascial layers facilitates the separation of the entrapped nerve from surrounding fascia or bone [23]. Under normal anatomical conditions, the nerve moves smoothly and unhindered throughout the fascia, however entrapment leads to a pathological presentation resembling adhesions, where tethering of the nerves leads to pain, nerve dysfunction and autonomic dysfunctions. Nerve hydro dissection requires precise skill of ultrasound identification of nerves and meticulous manipulation of the transducer and needle to inject the solution into the perineural area thereby releasing the affected nerve, while avoiding intraneural injection. Accurate and atraumatic injection techniques are critical for maximising the therapeutic benefit of any nerve injection to address nerve entrapment [23]. In this case, we elected for hydro dissection with lidocaine and 5% dextrose solution, which is known for its excellent safety profile and low risk of adverse effects.

Potential intraoperative complications may include intravascular local anaesthetic injection, when local anaesthetic is used, and postoperative complications of site infection. Hydro dissection under ultrasound remains a minimally invasive and safe intervention. It is easy to perform and is both cost and time efficient. It has a good safety profile with low risk of adverse effects. This report describes a case study in which this novel technique is performed in the context of treating pudendal neuralgia has potential as a safe, feasible, accessible and effective option for the management of chronic pudendal nerve pain.

4. Conclusion

The aim of this study was to evaluate the effectiveness of hydro dissection in the treatment of pudendal neuralgia. In this case, we observed a significant improvement in patient symptoms following hydro dissection. This case supports the potential role of dextrose hydro dissection as a safe, minimally invasive treatment option for pudendal neuralgia, particularly in patients with complex pain histories and who did not achieve optimal results with traditional conservative treatment options. Hydro dissection offers an alternative to more invasive interventions and warrants further investigation in the management of pudendal neuralgia. As a novel and promising method in pain medicine, hydro dissection represents an exciting area for future therapeutic investigation.

Availability of Data and Material/Data Transparency

This case report is an honest, accurate, and transparent account of the case being reported. No important aspects of the report have been omitted. Any queries should be directed to the corresponding author via email. Requests for reprints should also be addressed to the corresponding author.

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We would like to extend our gratitude to the patient for his consent to publish this report.

Consent to Participate

The patient consented to participation and publication of the report as described.

Conflicts of Interest

There were no other competing interests involved in this research. There was no support from any organisation for the submitted work and no other relationships or activities that could appear to have influenced the submitted work.

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