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Letter to the Editor
Ultrasound Approaches to Three Entrapment Locations in Pudendal Nerve Compression: Comments on "Ultrasound-Guided Pudendal Nerve Dextrose Hydrodissection for Urinary Incontinence: A Clinical Review and Case Reports"

Dear Editor:

We are writing to express our appreciation to *Pain Medicine Case Reports* and the authors of "Ultrasound-guided pudendal nerve dextrose hydrodissection for urinary incontinence: A clinical review and case reports." The authors have made a commendable contribution to the field. We offer 3 primary areas of comment, addressing a critical anatomic inaccuracy, the flexibility to use various dextrose concentrations, and additional considerations pertinent for treatment and potential research designs for pudendal-nerve (PN)-entrapment-related incontinence.

An anatomical error appears in Fig. 1 of the article. The authors inadvertently labeled the "ischial tuberosity" at the site of the pudendal nerve's turning after branching from the sacral plexus. The correct label should be the "spine of ischium," as this bony landmark serves as the attachment point for the sacrospinous ligament (SSL), while the ischial tuberosity is located more caudally. This correction is crucial for clinicians and researchers to understand the PN hydrodissection approach into the "biligamentary tunnel", which addresses the most common entrapment site of the PN (1).

Second, the authors state that "higher concentrations of dextrose (than 5%) are not recommended, as they may cause irritation or damage to the nerve or surrounding tissues." Our cited reference (2) was not cautionary as to the dextrose concentration choice, as ≥ 20% dextrose was the initial concentration reported for use in perineural injection (3,4), histologic evidence (other than with a continuous intravenous drip) of an inflammatory effect of dextrose injection separate from a needling effect has not been confirmed (5,6), and a recent study suggests that the hyperosmotic effect of dextrose is very brief due to rapid diffusion, inconsistent with an inflammatory mechanism (7). D5W, however, is a commonly used, and readily available concentration with evidence of clinical efficacy for entrapment neuropathy (8).

Third, while the current article identifies the first entrapment point of the PN at the fascial planes of the SSL attachment to the spine of ischium, other potential PN entrapment sites include entry into and exit from Alcock's canal (or pudendal canal [PC]), as each site may contribute to PN-dysfunction-related incontinence. An ultrasound (US)-guided technique to approach the pudendal nerve at the entrance to the PC was first described in 2016 (9). More recently, the injectate recommendation for US-guided perineural hydrodissection about peripheral nerves excludes anesthetic in favor of a dextrose-only injection (8,10,11). This eliminates anesthetic-related safety concerns. However, aspiration and observation of injectate spread under doppler is recommended to confirm free soft tissue rather than intravascular injection.

Entrapment at the Entrance of the PC

Anatomy and sonoanatomy: The PN and internal pudendal artery and vein (IPAV) enter a fascial space known as the PC, situated medial to the fascia of the obturator internus muscle, and lateral to the fascia of the Iliococcygeus muscle. This canal has its own fascia, which can become a potential site for PN entrapment (12).

US-guided hydrodissection protocol: The patient should be positioned prone during the procedure to optimize access to this entrapment site (Fig. 1A). The US transducer is placed on the ipsilateral side of the PN being treated, with the physician standing on the

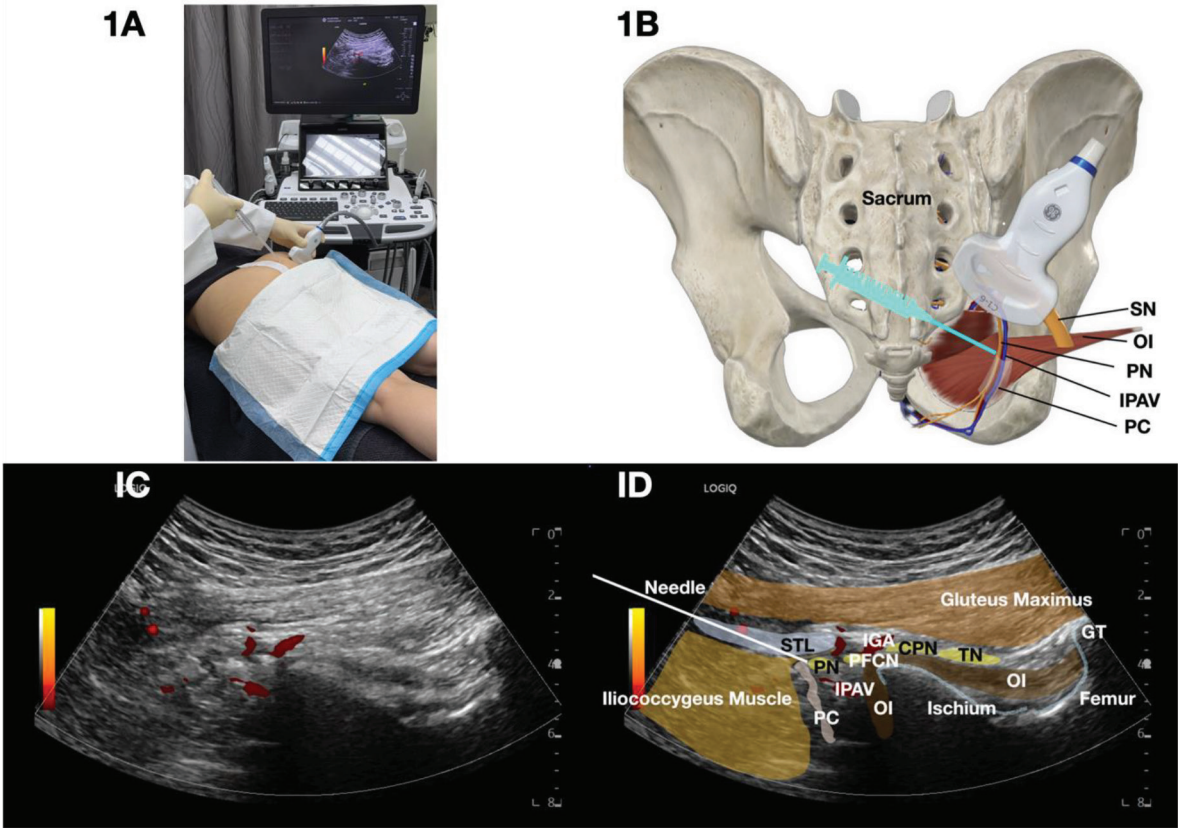

Fig. 1. The typical patient position (A), the probe position (A and B), sonoanatomy (C and D), and the trajectory of the needle (B and D).
CPN, common peroneal nerve; GT, greater trochanter; IGA, inferior gluteal artery; IPAV, internal pudendal artery and vein; OI, obturator internus; PC, pudendal canal; PFCN, posterior femoral cutaneous nerve; PN, pudendal nerve; STL, sacrotuberous ligament; TN, tibial nerve.

contralateral side. The line of the SSL and the spine of the ischium will be scanned first to locate the PN and the IPAV, which pass between the SSL and the sacrotuberous ligament. A short-axis linear slide should be performed about 1-2 cm distally to visualize the IPAV and PN as they enter PC, medial to the obturator internus (OI) muscle. An in-plane technique is employed, with the needle approaching from medial to lateral, targeting the PC entry point medial to the OI. A 22G, 4-inch spinal needle is typically used for hydrodissection in this area. A curved linear transducer is recommended, with power/color Doppler activated to locate the IPAV, which usually runs lateral to the PN (Figs. 1B-D). The power Doppler signal during hydrodissection can show the spread of the injectate and confirm the absence of intravascular injection.

Entrapment at the Exit of the PC

Anatomy and sonoanatomy: As the PN exits the PC, it branches into the perineal nerve (PeN), traveling alongside the perineal artery and vein (PeAV), and the PN continues with the IPVA towards the base of the penis in men or the clitoris in women. All of these structures are located medial to the ischial tuberosity (Fig. 2B) (13).

US-guided hydrodissection protocol: The patient should be in a lateral decubitus position with the treatment side facing downward (Fig. 2A). The patient should be instructed to hold his/her nontreatment leg to the chest while relaxing the treatment leg. This positioning enables the physician to place the probe on the medial side of the ischial tuberosity of the treatment side and along the medial edge of the ischium to effectively scan the exit of the PC (Fig. 2B). Depending on the patient's body type, a 25G 2-inch needle or a 22G 4-inch spinal needle is typically used to target the exit of PC to hydrodissect the PN. The choice of transducer also depends on the amount of fatty tissue in the area. A linear transducer is preferred for thinner patients, while

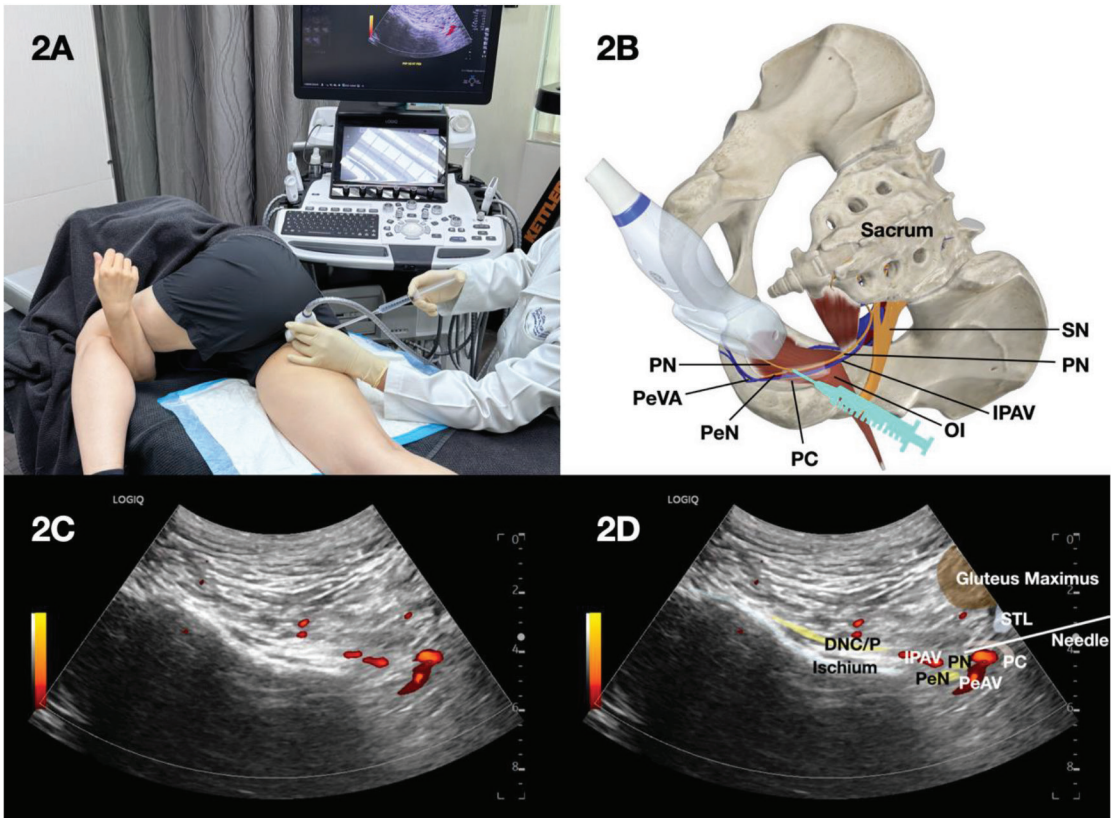

Fig. 2. The typical patient position (A), the probe position (A and B), sonoanatomy (C and D), and the trajectory of the needle (B and D).
DNC/P, dorsal nerve of clitoris / penis; IPAV, internal pudendal artery and vein; PC, pudendal (Alcock's) canal; PeAV, perineal artery and vein; PeN, perineal nerve; PN, pudendal nerve; SN, sciatic nerve; STL, sacrotuberous ligament.

a curvilinear transducer is used for those with more body mass. Power/color Doppler imaging is activated to locate the PeAV and the IPAV at the exit of PC. The PN travels alongside the IPAV, running approximately parallel to the ischium bone. Therefore, the needle trajectory should target the exit of the PC, where the IPAV and PN are still oriented in the short axis to the needle, making hydrodissection safer (11). If the PN is not clearly visible in this area, hydrodissection of the soft tissues surrounding the IPAV is an alternative. The power Doppler signal during hydrodissection helps visualize the spread of the injectate and confirms the absence of intravascular injection.

Thank you for considering these important points, and congratulations to Gharaei et al. for presentation of this very pertinent case report that may stimulate significant follow-up research efforts.

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