


Ultrasound-Guided Hydrodissection Combined with Acupotomy Release versus Hydrodissection Alone for Deep Gluteal Syndrome: A Retrospective Study on Short-Term Efficacy

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Purpose: To evaluate the short-term efficacy and safety of ultrasound-guided hydrodissection alone versus hydrodissection combined with acupotomy release for deep gluteal syndrome (DGS).

Methods: This retrospective study included 82 patients with DGS, divided into a hydrodissection group (n = 41) and a combined hydrodissection with acupotomy group (n = 41). Both groups underwent ultrasound-guided sciatic nerve hydrodissection; the combined group additionally received acupotomy to incise surrounding fascia. Primary outcomes were changes in Visual Analog Scale (VAS) and Oswestry Disability Index (ODI) scores at two weeks post-treatment.

Results: No complications (eg, bleeding, nerve injury) occurred in either group from immediately post-treatment to two weeks. At two weeks, both groups showed significant improvements in VAS and ODI scores compared to baseline (P<0.001). The combined group had greater VAS improvement [median (IQR): 4.00 (4.00, 5.00)] than the hydrodissection group [3.00 (2.00, 4.00); P < 0.001] and greater ODI improvement [40 (20, 60) vs 20 (20, 30); P = 0.004].

Conclusion: Ultrasound-guided hydrodissection combined with acupotomy release was associated with greater short-term pain relief (VAS) and functional improvement (ODI) in patients with DGS compared with hydrodissection alone.

Keywords: deep gluteal syndrome, ultrasound guidance, hydrodissection, acupotomy release, short-term efficacy

Introduction

Deep gluteal syndrome (DGS) is a non-discogenic condition characterized by sciatic nerve entrapment within the deep gluteal space, resulting in chronic buttock pain, sciatica-like symptoms, sensory abnormalities, and reduced lower limb strength.¹⁻⁴ These symptoms, often arising from pathological changes in structures such as the piriformis muscle, external hip rotators, or bursae, significantly impair quality of life.^{1,5,6} Epidemiological data indicate that DGS accounts for approximately 0.3% to 6% of cases presenting with lower back or posterior thigh pain, highlighting its underdiagnosed nature and contribution to undiagnosed sciatica.⁷

The key challenge in managing DGS involves developing minimally invasive treatments that effectively alleviate pain and improve function while minimizing risks.⁸ Conservative strategies, including physical therapy and corticosteroid injections, frequently provide inconsistent relief, especially in cases with dense fibrotic adhesions.^{5,9,10} Surgical options, such as endoscopic or open nerve release, offer more definitive decompression but are associated with

complications like nerve injury and extended recovery periods.^{9,11,12} Ultrasound-guided hydrodissection has gained attention as a safe, minimally invasive method to separate nerve adhesions and administer anti-inflammatory agents; however, it may be insufficient for resolving mechanical compression from fibrotic bands.^{13–16} Similarly, acupotomy enables precise incision of fibrotic tissues but lacks real-time imaging, potentially increasing procedural risks, and its application in DGS remains underexplored.^{17–19}

The integration of ultrasound-guided hydrodissection with acupotomy may offer synergistic benefits by combining hydraulic separation of adhesions with targeted mechanical release of fibrotic structures. This retrospective cohort study evaluates the short-term efficacy and safety of ultrasound-guided hydrodissection alone compared with hydrodissection combined with acupotomy release in patients with DGS, with the hypothesis that the combined intervention yields superior improvements in pain and disability scores.

Methods

Study Design

This retrospective cohort study received approval from the Ethics Committee of Zhangjiakou First People's Hospital (No. 2025-LW-25) and was conducted in accordance with the principles outlined in the Declaration of Helsinki. Because the study utilized retrospectively collected, fully anonymized clinical data, the Ethics Committee granted a waiver of informed consent, citing the minimal risk to participants and the impracticability of obtaining consent from all eligible patients. Clinical data were extracted from individuals diagnosed with DGS at Beijing Chaoyang Hospital, Capital Medical University, between January 2023 and March 2025. Participants were allocated into two cohorts according to the intervention received: the hydrodissection group (ultrasound-guided sciatic nerve hydrodissection alone) and the combined-therapy group (hydrodissection supplemented with acupotomy).

Setting and Participants

Eighty-two patients were included (41 per group). Baseline demographics (age, sex), clinical data (BMI, disease history), and outcomes were systematically collected. Efficacy was assessed at baseline and two weeks post-treatment using VAS²⁰ and ODI.²¹

Inclusion Criteria

(1) Age 18–80 years; (2) Confirmed DGS via imaging (MRI/ultrasound) and physical exam, with symptoms >3 months; positive piriformis test and/or FAIR test;^{5,22} (3) Imaging excluded significant lumbar pathology but showed piriformis abnormalities or sciatic nerve adhesions; (4) Failed conservative treatment ≥ 3 months.

Exclusion criteria

(1) Prior gluteal surgery or major trauma; (2) Contraindications to gluteal procedures; (3) Comorbid lumbar/hip conditions requiring priority treatment; (4) Active infection; (5) Pregnancy/lactation; (6) Coagulation disorders or anticoagulation without safe pause; (7) Severe psychiatric/cognitive impairment.

Variables

Primary outcomes: Changes in VAS (Visual Analogue Scale, assessed using a 0–10 integer, where 0 = no pain and 10 = worst imaginable pain) and ODI (disability, assessed using a percentage 0–100%, where 0% = no disability and 100% = worst imaginable disability) scores. Secondary: Safety (complications like bleeding, nerve injury). Variables were defined per standard scales; confounders (eg, age, BMI) were assessed for baseline balance.

Data Sources and Measurement

Interventions used a GE LOGIQ E10 ultrasound system (3–5 MHz convex probe). Hydrodissection solution: 20 mL mixture (5 mL 1% lidocaine, 1 mg betamethasone sodium phosphate, saline to volume).^{13,15} Acupotomy used a sterile needle-knife (0.8 × 80 mm; Hanzhang Medical Devices, Hebei, China).²³

Procedure: Patients were positioned prone. For sciatic nerve ultrasound positioning, the probe was placed transversely at the gluteal fold to identify the sciatic nerve as a hypoechoic fascicular structure lateral to the ischial tuberosity and medial to the greater trochanter, with longitudinal views confirming its course between the quadratus femoris and biceps femoris muscles.^{14,24} For hydrodissection, a 23G needle was advanced under real-time guidance into the perineural fascial plane, and the solution was injected to create a fluid halo separating the nerve from surrounding tissues (Figure 1A).⁶ In the combined group, following hydrodissection, the 0.8 mm needle-knife was inserted along the same trajectory under ultrasound guidance; small, controlled incisions (typically 2–4 mm in length) were made in the identified fibrotic fascia or piriformis tendon, targeting areas of thickening or adhesion while avoiding vascular structures, with post-incision ultrasound confirming nerve decompression and fluid distribution (Figure 1B).^{17,23} Treatment concluded upon verification of an annular fluid halo on short-axis (Figure 1C) and long-axis (Figure 1D) views. The hydrodissection group omitted the acupotomy step.

Bias and Study Size

To minimize selection bias in this retrospective design, all eligible patients during the period were included without sampling. Data from electronic medical records were reviewed for completeness; no missing data for key variables. Study size was determined by available cases; post-hoc power analysis confirmed adequate power (VAS/ODI differences, $\alpha = 0.05$, power > 0.8). Potential biases (eg, retrospective data inaccuracies) were addressed via standardized record review.

Statistical Methods

Data analyzed using SPSS 26.0. Non-normal data described as median (IQR). Between-group comparisons: Mann–Whitney *U*-test. Within-group: Wilcoxon signed-rank test. Categorical: Chi-square/Fisher’s exact test. $P < 0.05$ significant. Missing data: None for outcomes; complete case analysis.

Results

Participant Flow and Baseline Characteristics

All 82 patients met criteria and were analyzed (no exclusions or losses). Baseline characteristics (age, height, weight, BMI, pre-treatment VAS/ODI, sex, location) showed no significant differences ($P > 0.05$; Table 1). No complications occurred immediately post-treatment or at two weeks.

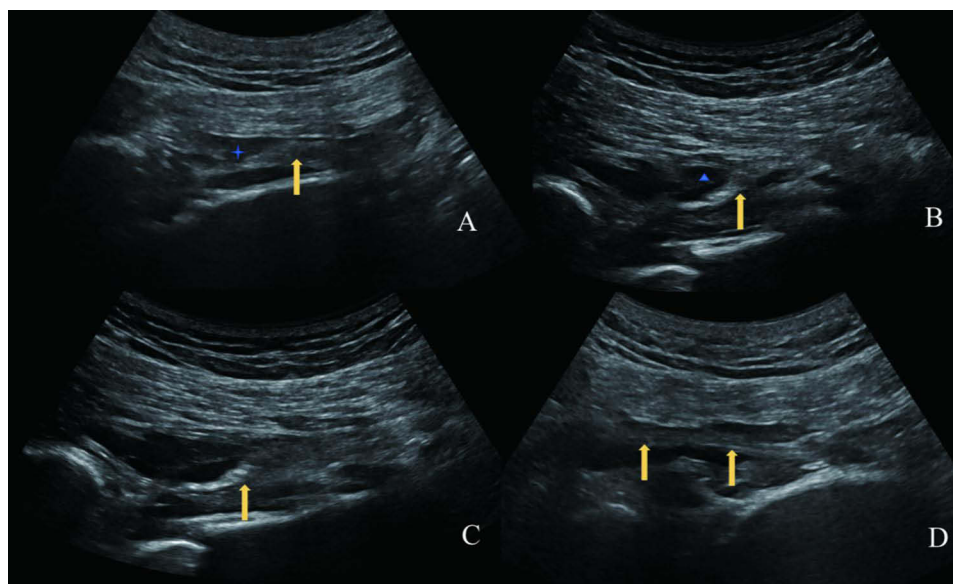


Figure 1 Ultrasound-Guided DGS Release Procedure. (A) Short-axis hydrodissection; (B) Short-axis acupotomy release of superficial fascia; (C) Short-axis fluid enveloping sciatic nerve; (D) Long-axis fluid enveloping sciatic nerve. Yellow arrow: Sciatic nerve; Star: Hydrodissection needle tip; Triangle: Acupotomy tip.

Table 1 Baseline Characteristics Before Treatment

Variables	Total (n = 82)	Hydrodissection Group (n = 41)	Combined Treatment Group (n = 41)	Z/ χ^2	P
Age, y, M (Q ₁ , Q ₃)	52.00 (37.25, 64.75)	55.00 (35.00, 70.00)	51.00 (40.00, 61.00)	-0.91	0.361
Height, cm, M (Q ₁ , Q ₃)	165.50 (160.00, 171.00)	165.00 (160.00, 170.00)	168.00 (160.00, 173.00)	-0.98	0.329
Weight, kg, M (Q ₁ , Q ₃)	65.00 (56.25, 74.75)	62.00 (56.00, 72.00)	66.00 (60.00, 75.00)	-1.51	0.13
BMI, M (Q ₁ , Q ₃)	23.70 (21.87, 25.38)	23.62 (21.48, 25.39)	23.73 (22.20, 25.35)	-0.88	0.378
Pre-treatment VAS, M (Q ₁ , Q ₃)	6.50 (6.00, 7.00)	7.00 (6.00, 8.00)	6.00 (6.00, 7.00)	-0.13	0.897
Pre-treatment ODI, %, M (Q ₁ , Q ₃)	50 (43, 70)	50 (50, 70)	60 (40, 70)	-0.18	0.857
Sex, n(%)				3.22	0.073
Female	48 (58.54)	28 (68.29)	20 (48.78)		
Male	34 (41.46)	13 (31.71)	21 (51.22)		
Location, n(%)				1.76	0.185
Left	40 (48.78)	17 (41.46)	23 (56.10)		
Right	42 (51.22)	24 (58.54)	18 (43.90)		

Abbreviations: Z, Mann-Whitney test; χ^2 , Chi-square test; M, Median, Q₁, 1st Quartile; Q₃, 3rd Quartile.

Table 2 Hydrodissection Group Outcomes (n = 41)

Variables	Pre-Treatment	Post-Treatment	Z	P
VAS, M (Q ₁ , Q ₃)	7.00 (6.00, 8.00)	3.00 (2.00, 6.00)	-5.339	<0.001
ODI, %, M (Q ₁ , Q ₃)	50 (50, 70)	30 (20, 40)	-5.564	<0.001

Abbreviations: Z, Related-Samples Wilcoxon Signed Rank Test; M, Median; Q₁, 1st Quartile; Q₃, 3rd Quartile.

Table 3 Combined Group Outcomes (n = 41)

Variables	Pre-Treatment	Post-Treatment	Z	P
VAS, M (Q ₁ , Q ₃)	6.00 (6.00, 7.00)	2.00 (2.00, 2.00)	-5.645	<0.001
ODI, %, M (Q ₁ , Q ₃)	60 (40, 70)	20 (10, 20)	-5.609	<0.001

Abbreviations: Z, Related-Samples Wilcoxon Signed Rank Test; M, Median; Q₁, 1st Quartile; Q₃, 3rd Quartile.

Treatment Outcomes

Hydrodissection group: VAS and ODI significantly decreased at two weeks vs baseline ($P < 0.001$; [Table 2](#)). Combined group: Similar significant decreases ($P < 0.001$; [Table 3](#)).

Comparative Analysis

Combined group showed greater VAS and ODI improvements than hydrodissection group ($P < 0.001$ and $P = 0.004$; [Table 4](#)).

Table 4 Change Scores Comparison

Variables	Hydrodissection Group (n = 41)	Combined Group (n = 41)	Z	P
VAS Change, M (Q ₁ , Q ₃)	3.00 (2.00, 4.00)	4.00 (4.00, 5.00)	-4.14	<0.001
ODI Change, %, M (Q ₁ , Q ₃)	20 (20, 30)	40 (20, 60)	-2.84	=0.004

Abbreviations: Z, Mann-Whitney test; χ^2 , Chi-square test; M, Median; Q₁, 1st Quartile; Q₃, 3rd Quartile.

Discussion

Summary of Findings

This retrospective study suggests that ultrasound-guided hydrodissection combined with acupotomy release may offer greater short-term clinical benefit than hydrodissection alone for patients with deep gluteal syndrome (DGS), as evidenced by greater improvements in Visual Analog Scale (VAS) scores [median change (IQR): 4.00 (4.00, 5.00) vs 3.00 (2.00, 4.00); $P < 0.001$] and Oswestry Disability Index (ODI) scores [40 (20, 60) vs 20 (20, 30); $P = 0.004$], with no observed complications such as bleeding or nerve injury in either group.

Comparison with Previous Research

Our findings align with prior studies on ultrasound-guided hydrodissection for peripheral nerve entrapments, including DGS, which have demonstrated its efficacy in reducing pain by separating adhesions and delivering anti-inflammatory agents.^{13,15,16} For example, a recent case-series by Yen et al reported improved clinical outcomes in DGS patients treated with sciatic nerve hydrodissection, consistent with our hydrodissection group's significant VAS and ODI reductions ($P < 0.001$).¹² The potential role of acupotomy in relieving musculoskeletal pain, such as in piriformis syndrome, is consistent with the more pronounced improvements observed in our combined group, as it facilitates precise mechanical decompression of fibrotic tissues.^{17–19,25} This study contributes to the literature by being among the first to evaluate the combination of these techniques. The observed results suggest a potential synergistic effect that may surpass the outcomes of hydrodissection alone, particularly for dense fibrosis, which previous studies noted as a limitation of hydrodissection alone.^{15,26,27} The absence of complications in our cohort is encouraging and appears favorable when compared to the risk profiles associated with more invasive surgical approaches (eg, endoscopic or open release) reported in prior work,²⁸ which noted potential nerve injuries.^{1,9,11} Additionally, our results are supported by recent reports emphasizing the safety of ultrasound-guided interventions due to real-time visualization.^{24,29,30}

Study Limitations

This study has several limitations: (1) its single-center retrospective design may introduce selection bias and limit generalizability to diverse populations; (2) the short 2-week follow-up period precludes assessment of long-term efficacy or recurrence rates, the lack of formal calculation of effect sizes and minimal clinically important difference (MCID), and the limited sample size for assessing safety over a longer term; (3) the absence of objective neurophysiological measures, such as electromyography (EMG) or nerve conduction studies, limits the ability to quantify nerve function improvements; (4) reliance on subjective outcome measures (VAS, ODI) without blinded assessment may inflate effect sizes; (5) No multivariable adjustment (eg, regression analysis) was performed to control for potential confounding factors; therefore, claims of baseline comparability alone are insufficient to fully address the risk of residual bias.

Potential Solutions to Limitations

To address these limitations, future studies could consider: (1) employing multicenter, prospective randomized controlled trials to reduce bias and enhance external validity; (2) extending follow-up to 6–12 months with interim assessments to evaluate sustained outcomes; (3) incorporating EMG and dynamic ultrasound to objectively assess nerve function and mobility; and (4) using blinded outcome assessors or placebo-controlled designs to minimize subjectivity in outcome reporting.

Future Research Directions

Future research could explore modifications to the treatment protocol, such as varying acupotomy needle sizes or hydrodissection injectate compositions (eg, adjusting corticosteroid doses) to optimize outcomes. New questions include whether this combined approach is equally effective in specific subgroups (eg, athletes vs elderly) or compared to endoscopic release. Additionally, investigating its efficacy in preventing DGS recurrence in high-risk groups could be valuable. We recommend large-scale RCTs with advanced imaging follow-up and neurophysiological assessments to confirm long-term efficacy and explore these variations.

Conclusion

Ultrasound-guided hydrodissection combined with acupotomy release was associated with greater short-term pain relief and functional improvement in patients with DGS compared with hydrodissection alone, appearing as a promising and well-tolerated therapeutic approach. Further high-quality, long-term studies are warranted to confirm these preliminary findings and refine the treatment strategy.

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Disclosure

The authors report no conflicts of interest in this work.

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