

INTRADISCAL PLATELET-RICH PLASMA DELIVERY VIA MODIFIED TRANSDURAL INTERLAMINAR COMPUTED TOMOGRAPHY-GUIDED ACCESS IN SEVERE L5-S1 DISC COLLAPSE: A TECHNICAL CASE REPORT

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Background: Intradiscal platelet-rich plasma (PRP) has emerging evidence for the treatment of discogenic low back pain. However, procedural access becomes technically challenging at the L5-S1 level in the presence of severe disc collapse, steep lumbosacral lordosis, or high iliac crest morphology, which may preclude standard posterolateral or transforaminal trajectories.

Case Report: A 42-year-old man with chronic discogenic low back pain demonstrated severe L5-S1 degeneration (modified Pfirrmann grade 6) with approximately 3-mm residual disc height, rendering conventional intradiscal access unsafe or impossible. A modified computed tomography-guided interlaminar trajectory passing briefly through the thecal sac was used to achieve intradiscal access. Two milliliters of ultra-high cell-count PRP was injected into the disc nucleus. During controlled needle withdrawal, small aliquots of PRP were deposited at the dural puncture sites to biologically reinforce the needle tract.

Conclusions: Our case describes a technically feasible intradiscal PRP delivery route for end-stage L5-S1 disc collapse when all conventional access methods are obstructed. No postprocedure cerebrospinal fluid leak symptoms or neurological complications occurred, and early symptomatic improvement was reported. Further investigation is warranted to evaluate safety, reproducibility, and broader clinical applicability.

Key words: Case report, PRP, intradiscal, transdural, disc collapse

BACKGROUND

Discogenic low back pain remains a prevalent and challenging clinical entity. The L5-S1 motion segment is exposed to substantial compressive and anterior shear forces due to its lumbosacral angulation and load transmission characteristics, predisposing this segment to progressive degeneration and disc height loss (1,2).

Intradiscal interventions typically rely on posterolateral or oblique needle trajectories. However, anatomical features unique to L5-S1, such as high posterior iliac crests, facet orientation, and lumbosacral morphology, can make standard access technically difficult (3-5). When L5-S1 disc height is reduced, the safe needle

corridor may be markedly reduced or absent, making standard intradiscal access technically difficult or unsafe.

Biologic therapies, such as platelet-rich plasma (PRP), are administered via image guided intradiscal injection and are intended to target the nucleus pulposus compartment, where degenerative changes originate. Accurate needle placement within the disc space is therefore considered essential to optimize potential therapeutic benefit (6-9). Our report describes a modified transdural interlaminar computed tomography (CT)-guided approach that enabled intradiscal PRP delivery in a patient with severe L5-S1 disc collapse and prohibitive anatomy.

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Patient consent for publication: Consent obtained directly from patient(s).

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CASE PRESENTATION

Patient Description

A 42-year-old man presented with chronic axial low back pain centered in the lumbosacral region. The pain was mechanical in nature, aggravated by flexion, prolonged sitting, and axial loading. No radicular symptoms or neurological deficits were present.

Case History

Symptoms had persisted for several years despite structured physiotherapy, exercise-based rehabilitation, nonsteroidal anti-inflammatory medications, and activity modification. Pain was deep, midline, and consistently reproduced with flexion-based activities. There was no history of prior lumbar surgery.

Physical Examination

Lumbar flexion reproduced the patient's characteristic pain. Central posterior-anterior pressure at L5-S1 elicited focal tenderness consistent with discogenic pathology. Motor strength, sensation, and reflexes were normal in both lower extremities.

Investigations

Magnetic resonance imaging, illustrated in Fig. 1, demonstrated:



Fig. 1. Sagittal T2-weighted 3T MRI of the L5-S1 degeneration. MRI, magnetic resonance imaging.

- Modified Pfirrmann grade 6 degeneration at L5-S1 (10)
- Residual disc height approximately 3 mm
- No disc sequestration or radiographic instability
- No significant central canal or foraminal stenosis

Treatment Considerations

Given the failure of conservative therapy and the absence of any viable conventional intradiscal trajectory, treatment options were limited. With full informed consent outlining the investigational nature of intradiscal PRP and the procedural risks associated with nonstandard access, the patient elected to proceed with a modified CT-guided approach.

Procedure

CT-Guided Modified Transdural Interlaminar Approach

The patient was positioned prone under sterile conditions. Using CT guidance (Philips iQon Spectral CT, Philips Healthcare, Cleveland, OH), an interlaminar trajectory was selected that allowed controlled passage through the dorsal thecal sac to reach the posterior disc margin, avoiding obstructed posterolateral routes (Fig. 2).

After confirmation of intradiscal needle placement, 2 mL of ultra-high cell-count PRP was injected into the nucleus pulposus. During slow, controlled needle withdrawal, small aliquots of PRP were deposited at

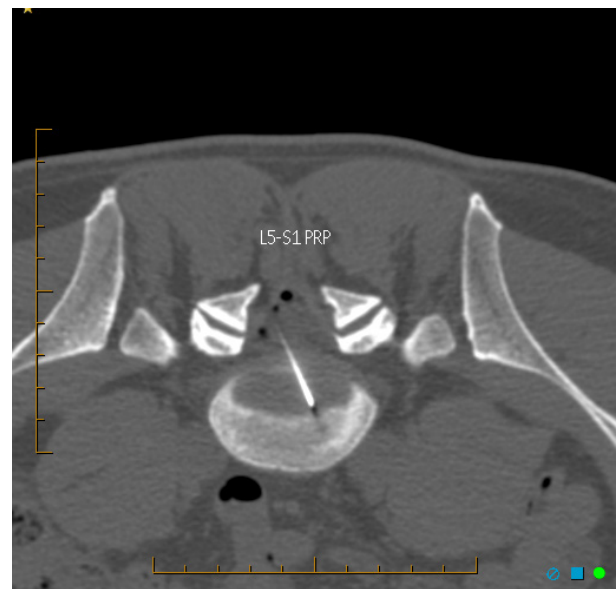


Fig. 2. CT-guided transdural interlaminar needle trajectory achieving intradiscal access at L5-S1. CT, computed tomography.

each dural puncture site to biologically reinforce the thecal sac puncture site (Fig. 3).

The patient remained supine for 60 minutes following the procedure.

Outcome

No symptoms suggestive of cerebrospinal fluid (CSF) leak - including postural headache, nausea, photophobia, or radicular numbness - were reported. The patient noted early improvement in axial low back pain during daily functional activities within the 2 weeks, which further improved over the following 2 months. No adverse neurological events or procedural complications occurred.

Patient Perspective

The patient reported long-standing low back pain that had significantly limited daily activities and quality of life despite extensive conservative management. He expressed frustration at being told that interventional options were not technically feasible due to the degree of disc collapse at L5-S1. After detailed discussion regarding the investigational nature of the procedure, potential risks, and alternative options, the patient elected to proceed. Following the intervention, he reported early improvement in axial pain during routine activities and was satisfied with the decision to pursue this approach. He expressed appreciation for being offered a treatment option despite challenging anatomy and understood that long-term outcomes remain uncertain.

DISCUSSION

Access Challenges at L5-S1

The L5-S1 disc is consistently cited as the most technically challenging lumbar level for intradiscal access. High iliac crest obstruction, steep lordosis, and deep disc position often limit or eliminate safe posterolateral trajectories (3-5). These challenges are amplified in cases of severe disc collapse, where reduction of sagittal disc space eliminates the normal needle corridor exploited during discography or biologic injection.

Rationale for Modified Transdural Access

In rare cases where conventional posterolateral or transforaminal access is not feasible, alternative approaches have been described in the surgical literature. In this case, direct CT visualization allowed controlled thecal sac and exit, providing the only viable route for accurate intradiscal delivery. This approach was selected

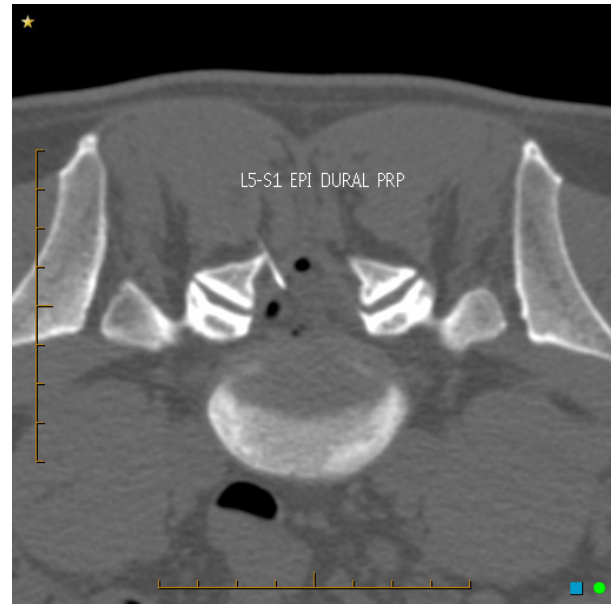


Fig. 3. CT-guided transdural interlaminar needle withdrawal with PRP deposition at the external dural puncture site following intradiscal injection at L5-S1. CT, computed tomography; PRP, platelet-rich plasma.

only after all conventional trajectories were deemed unsafe.

PRP as a Biological Sealant

Autologous blood patches have traditionally been used for CSF leak management. However, emerging evidence suggests that platelet-rich products may provide enhanced sealing through fibrin matrix formation, platelet activation, and growth factor-mediated tissue repair while also offering a lower risk of infection (11,12). Preclinical studies have shown that platelet concentrates enhance fibroblast proliferation, extracellular matrix synthesis, and early biomechanical strength during soft tissue healing compared with untreated controls. Clinical imaging studies (13,14) further suggest improvements in tendon structure consistent with enhanced matrix remodeling. While formal evidence for PRP use specifically as a dural sealant in this context remains limited, the biological rationale supports further investigation.

Limitations

Our report describes a single case and does not establish safety or efficacy beyond technical feasibility. Transdural access should not be considered routine and must be reserved for exceptional cases where no alternative exists.

CONCLUSIONS

Our case demonstrates a technically novel and feasible method for intradiscal PRP delivery in the setting of severe L5-S1 disc collapse when all standard access routes are obstructed. A modified transdural interlaminar CT-

guided approach enabled accurate disc entry without CSF-leak symptoms or neurological complications. Further study is required to evaluate reproducibility, safety, and broader clinical applicability.

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