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Ultrasound-Guided Steroid Injection for Low Back Pain Caused by Bilateral Pars Interarticularis Defects With Fluoroscopic Confirmation, A Case Report

Jose Uriel Perez, MD[1], Derek Cooper, BSc Kin, BEd[1], Karamjot Sidhu, MD[1,2], Alex Wasserman, MD[1], Arun Gupta, MD[2], and George Deng, MD[2,3]

Background: Low back pain is a prevalent issue with various etiologies, one of which includes pars interarticularis (pars) defects. While traditional fluoroscopic guidance has been the standard for administering injections, both fluoroscopic and ultrasound-guided injections for the management of low back pain have been shown to be similar in efficacy. The benefits of ultrasound guidance include real-time visualization, reduced radiation exposure, and improved patient access.

Case Report: A 51-year-old active man with chronic low back pain underwent bilateral pars injections using ultrasound guidance. Ultrasound and fluoroscopic imaging confirmed accurate needle placement. The patient's history indicates that the injections resulted in significant pain relief, which was sustained at the 3-month follow-up.

Conclusions: This is a technical description of an ultrasound-guided pars injection, which can be used as an alternative to fluoroscopic-guided injection.

Key words: Case report, spondylolysis, ultrasonography, sports medicine

BACKGROUND

Pars interarticularis (pars) defects, or spondylolysis, is one of many causes for primary low back pain (1). The pars is known as the region between the superior and inferior zygapophyseal (facet) joints (2). Pars defects are typically stress fractures resulting from mechanical stress and repetitive loading, most commonly occurring in the L5 vertebra (1). Pars defects can be classified into 5 types: dysplastic, isthmic, degenerative, traumatic, or pathological (2). Iatrogenic causes may also be considered in some cases, although they are not included in the original classification. The optimal treatment approach for pars defects remains unclear, with options including physiotherapy, bracing, activity modification, pain management, and, in rare cases, surgery (1,2). For pain management, steroid injections are one potential treatment option. These steroid injections are most often performed under fluoroscopy guidance, a radiation-exposing procedure (3,4). Ultrasound provides an alternative method for administering steroids into the spine, offering real-time visualization, no radiation exposure, and improved accessibility for patients

From: [1]University of Calgary, Cumming School of Medicine, Calgary, AB, Canada; [2]Section of Physical Medicine and Rehabilitation, Department of Clinical Neurosciences, University of Calgary, Cumming School of Medicine, Calgary, AB, Canada; [3]Department of Anesthesiology, Perioperative and Pain Medicine, University of Calgary, Cumming School of Medicine, Calgary, AB, Canada

Corresponding Author: Jose Uriel Perez, MBT, E-mail: jose.perez@ucalgary.ca
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(5,6). Other neuraxial procedures typically done under fluoroscopic guidance have also been described using an ultrasound technique (7). This is the first report describing pars injection using ultrasound guidance with confirmation under fluoroscopy.

Patient Information and Clinical History

A healthy 51-year-old man presented with a 4-year history of a gradual onset of axial low back pain with extension intolerance. The patient was 177 cm tall and weighed 74 kg (body mass index: 23.7).

The patient scored 17/50 on the Oswestry Disability Index (ODI) (8). His clinical presentation was negative for rheumatologic symptoms, including uveitis, rash, morning stiffness, dactylitis, and a history of inflammatory bowel disease. He also did not exhibit red flag neurologic symptoms, such as saddle anesthesia or urinary retention. On examination, there was tenderness upon palpation of the bilateral L5 paraspinal region. The lumbar spine and hip range of motion were within normal limits.

Biomechanical assessment revealed slightly decreased hip abduction strength, rated 4+/5 using the modified Medical Research Council Manual Muscle Testing scale (9). Special testing was positive for pain provocation with the extension rotation test and lumbar extension with a single-legged stance. However, the sacroiliac joint cluster test, slump test, and straight leg raise were all negative.

A lumbar spine x-ray confirmed bilateral L5 pars defects. Previously, he had completed a 3-month course of physiotherapy consisting of a personalized, strength-based rehabilitation program, which improved his symptoms initially, but the improvement eventually plateaued. He also underwent fluoroscopy-guided bilateral L4-S1 facet joint steroid injections, which resulted in 50% pain reduction lasting for 4 months. Due to persistent pain and incomplete relief from facet injections, the decision was made to trial bilateral pars injections.

METHODS

This case report conforms to all CAse REport guidelines and reports the required information accordingly. Informed written consent was obtained.

Procedure Description

The patient was positioned prone for the procedure. Both fluoroscopic and ultrasound guidance were utilized for precise needle placement. The pars defect was identified using a low-frequency curvilinear transducer. First, the transducer was placed in the sagittal plane to identify the L4-S1 facet joints (Fig. 1A). Then the probe was rotated approximately 30° in a counterclockwise direction so that the left (or clockwise to visualize the right side) L5 superior articular process, pars, lamina, dura, and spinous process were simultaneously visualized (Fig. 1C). With a sterile technique, using an in-plane approach, the needle was advanced from cephalad-lateral to caudad-medial.

Multiplanar fluoroscopic views (Figs. 2A and 2C) were used to confirm the needle tip location, and a small amount of Omnipaque 240 contrast was used to visualize the contrast spread and confirm the injection target (Figs. 2E and 2G). Subsequently, 20 mg of triamcinolone mixed with 0.5 mL of 0.5% bupivacaine was administered. This was repeated on the contralateral side. The procedure was well tolerated.

At the 3-month follow-up appointment, the patient reported a global-perceived improvement of change of 80% to 90% in pain and in function that was still sustained. The patient subjectively endorsed that the pars injection provided more complete pain relief than the facet joint injections. His ODI score was reduced to 10/50 (8).

3D Image Generation

Three-dimensional (3D) imaging was used for illustrative purposes to visualize the ultrasound (Fig. 1) and fluoroscopic (Fig. 2) views. Initial 3D image of the lumbar spine was accessed and subsequently modified to include the corresponding pars defect (10).

DISCUSSION

To the authors' knowledge, this is the first report of a bilateral pars injection using ultrasound guidance with confirmation under fluoroscopy. As described above, the preferred management for pars defects is unclear; however, pain management is a critical component for patients to begin rehabilitation exercises (1,2). As such, image-guided steroid injections are a part of a patient's treatment plan. Traditionally, these steroid injections are provided under fluoroscopic guidance (3,4). Compared to fluoroscopy, ultrasound offers several advantages, particularly real-time imaging without radiation exposure to both patients and physicians (11). With pars defects primarily affecting younger patients, eliminating radiation is preferred, as repeated exposure to ionizing radiation from x-rays or fluoroscopy may increase long-term risks (1). Additionally, ultrasound's accessibility in most clinical settings allows for more

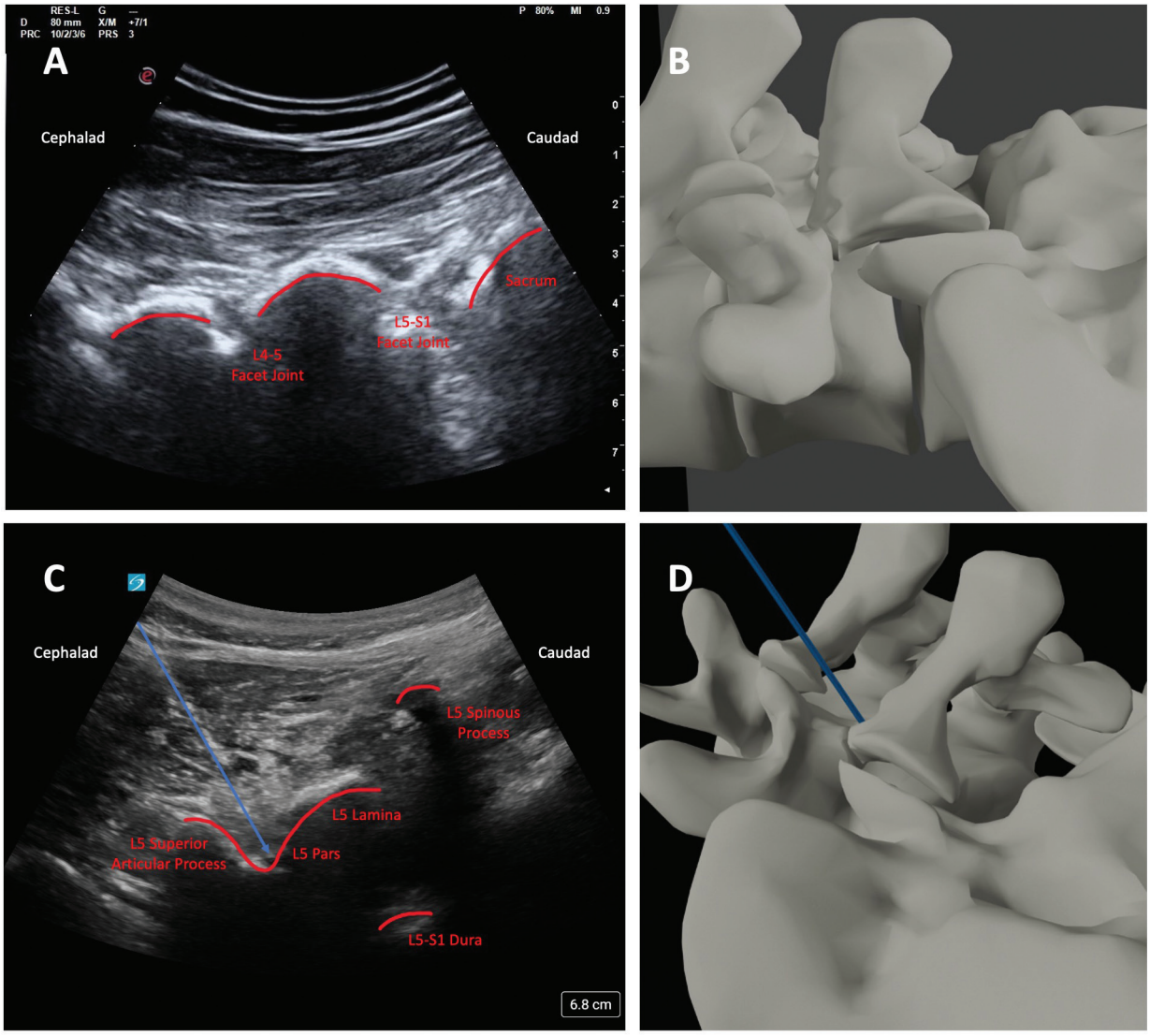

Fig. 1. Ultrasound images showing the injection site and needle placement, paired with 3D illustrations for comparison. 3D, three-dimensional.
A. Sagittal view of the L4-S1 facet joints visualized with ultrasound; B. Three-dimensional illustration of the L4-S1 facet joints sagittal view; C. Rotated view of the pars with key structures annotated (L5 superior articular process, pars, lamina, and spinous process; D. Three-dimensional illustration of the rotated pars view, with the needle placement shown for comparison.

timely treatment, reducing the wait times often associated with fluoroscopy-based procedures. Quicker access to care can help patients return to work or daily activities more rapidly, offering both individual and societal benefits (11).

CONCLUSIONS

This case report documents a successful ultrasound-guided bilateral pars joint injection. The patient experienced significant and sustained pain relief, reporting an 80% to 90% improvement in pain and function at the 3-month follow-up. Further, the patient noted a lower ODI score. A description of the ultrasound technique was illustrated, with annotated ultrasound and fluoroscopic images confirming accurate needle placement. Fluoroscopy was used in this case solely to confirm the

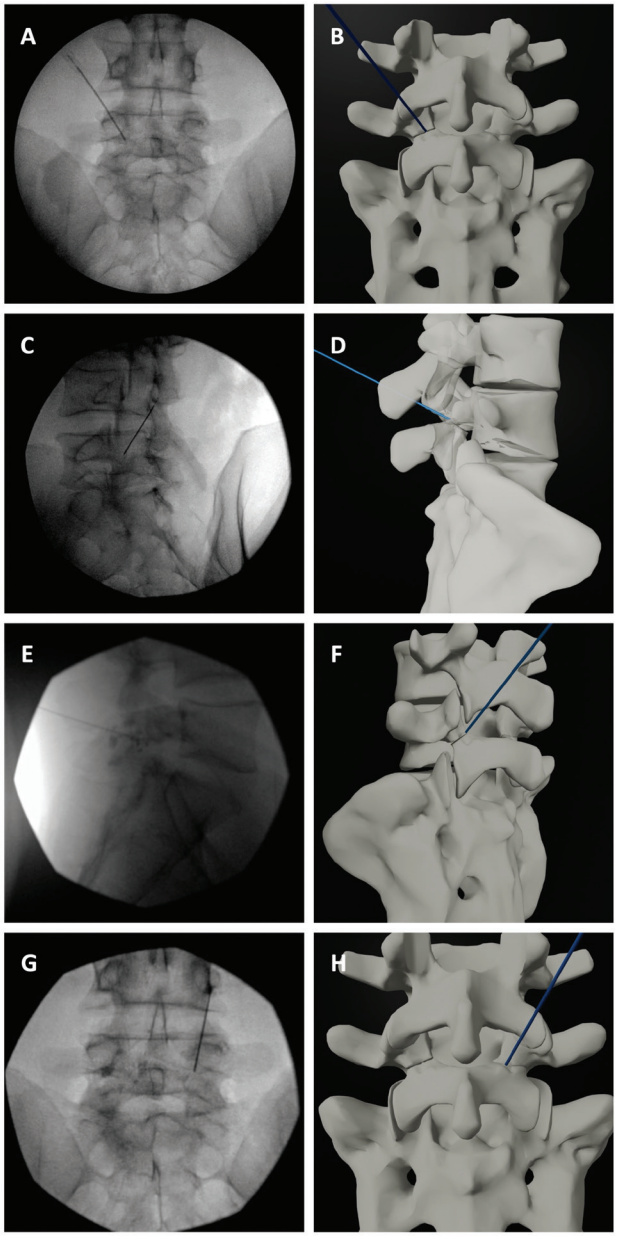

Fig. 2. Fluoroscopic images confirming accurate needle placement, paired with 3D illustrations for comparison. 3D, three-dimensional.
A. Anterior-Posterior (AP) view of the lumbosacral spine showing the needle placement at the left L5 pars; B. Three-dimensional illustration of the AP view; C. Left-sided oblique view showing the needle placement at the left L5 pars; D. Three-dimensional illustration of the oblique view; E. Lateral view postinjectate, demonstrating contrast flow into the left L5 pars; F. Three-dimensional illustration of the lateral view, with semitranslucent right-side structures to visualize the left-side needle placement; G. AP view of the lumbosacral spine showing Omnipaque 240 contrast dye at the left L5 pars, with needle placement confirmed for the right L5 pars prior to injectate; H. Three-dimensional illustration of the AP view, showing the needle placement at the right L5 pars.

accuracy of needle placement, with ultrasound guidance being the primary method employed. This case highlights ultrasound-guided steroid injection for bilateral pars defects as a safe, viable, and effective alternative to traditional fluoroscopic guidance. Clinicians are encouraged to consider ultrasound-guided pars injections as a potential treatment option for patients with pars defects. Future studies with larger cohorts, standardized outcome measures, and longer-term follow-up are needed to further validate the findings of ultrasound-guided spinal injections.

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