

Research Article,

Ultrasound-Guided Lumbar Peri-Facet Joint Blocks: A Therapeutic Approach to Chronic Lower Back and Referred Leg Pain Management

Inklebarger J^{*1}, Syed KZ²

^{1,2}London Prolotherapy Ltd, 88 Willesden Lane, London, NW6 7TA

Email Address: james.inklebarger@yahoo.co.uk

Abstract:

Intra-articular fluoroscopically-guided facet joint (FJ) blocks are performed with diagnostic-therapeutic aims, whereas the main focus of ultrasound guided peri-facet joint blocks (USG-PFJB) is pain relief. USG-PFJB will therefore typically utilize higher injection volumes to potentially offer injection spread to other pain-generating structures. This study explores the potential role of USG-PFJBs in the outpatient management of chronic low back pain with or without leg symptoms in patients with MRI-confirmed mild to severe lower lumbar FJ arthrosis. USG-PFJBs were performed on 19 patients, (4 male and 15 females, mean age 55) at the L4/5 and/or L5/S1 segments at paraspinal points of palpable focal pain. All procedures were performed by the same clinician. One patient was lost to follow up and telephone reviews at 2-6 months on the remaining 18 patients, noted that 59.73% experienced significant & sustained pain relief. In conclusion, lower lumbar segment USG-PFJBs appear to be effective treatment option in patients with mild to severe MRI-confirmed FJ degeneration and palpable paraspinal lower back pain and with or without lower limb pain.

Introduction:

Lumbar ultrasound-guided facet joint blocks are a minimally invasive procedure used for diagnosing and treating pain in the facet joints of the lumbar spine. The history of this procedure can be traced back to the development of the concept of facet joint syndrome in the mid-20th century. Mooney et al published the first description of facet joint syndrome and its treatment with facet joint injections in 1976. [1]

However, the use of fluoroscopy to guide injections had limitations such as exposure to radiation and difficulty visualizing the joints. In the early 2000s, advances in ultrasound technology led to the development of ultrasound-guided facet joint blocks as an alternative to fluoroscopy-guided injections.

Several studies have been conducted to evaluate the efficacy and safety of ultrasound-guided facet joint blocks. For example, a meta-analysis by Wu et al. in 2016, found that ultrasound-guided injections had similar efficacy to fluoroscopy-

guided injections, but with fewer complications and lower cost. [2] Ultrasound guided lumbar FJ blocks cross-referenced by Computer Tomography, has demonstrated consistently accurate cadaver needle placement. [3]

Other comparative studies obtained almost identical Satisfactory feasibility, accuracy and clinical efficiency comparing US to low dose CT guidance with US offering real-time needle-tip monitoring. [4]

Facet to Peri-Facet Facet Joint Anatomy, Ultrasound Anatomy & Biomechanics

The facet joints (FJ) are paired diarthrodial articulations located between the posterior elements of the adjacent vertebrae; also known as zygo-apophyseal joints. They are formed by the articulation of the inferior articular processes of one vertebra with the superior articular processes of the vertebra below. [5]

The FJs are the only synovial joints in the spine, with hyaline cartilage overlying subchondral bone,

a synovial membrane and a joint capsule; comprising the postero-lateral articulation between vertebral levels. The FJ joint has a potential capacity of 1 to 2 ml. Existence of menisci has also been highlighted in numerous publications. [6]

The FJs are anatomically designed to restrain excessive mobility and distribute axial loading over a broad area. The variation in their shapes and their orientation prevents forward displacement and rotatory dislocation of the intervertebral joint. The articular processes do provide a sliding surface for some movements, with roughly 5 to 7 mm of motion possible along the plane of the joint. [7]

Pain referral patterns following stimulation of zygapophyseal joints have been studied in both

symptomatic and asymptomatic volunteers. L1/2 to L5/S1 zygapophyseal joints could refer pain to the low back region, greater trochanter, posterolateral thigh, and groin region, and occasionally, to leg and foot. [8]

The anterior and relatively thinner posterior band of the iliolumbar ligaments originate from the traverse process of L5 to insert into the posterior iliac crest. There superficial anatomy facilitates examination for tender points and renders the accessible to manual therapies and therapeutic injections. [9]

Peri-facet joint blocks as described in this paper, are achieved when the needle tip is placed and injectant delivered adjacent to but not inside the FJ.



Figure 1: Para-sagittal long-axis (sagittal) lumbar spine view. Dots: L4/5, L5/S1 facet joints. Star: Sacrum



Figure 2/2a: Transverse-axis view with corresponding Chair/Footstool formation. Stars: Spinous processes, Dot: L4/5 facet joint, Arrows: L4/5 peri-FJ target edge of seat target area. The arrows follow the circa 45 degree angle needle trajectory for injection. TP-Traverse process.

Methods:

Nineteen chronic low back pain patients referred by their GPs lower back pain patients visited our outpatient clinic in 2019 to 2022. All had mild to severe MRI confirmed lumbar FJ degeneration. Prior studies have demonstrated no significant relationship between the magnitude of FJ degeneration and back pain. [Jung H et al 2012] All had no long-term improvement with prior analgesics, physical therapy, rehabilitation programs, and manual therapies. Exclusion Criteria: Those with prior lumbar surgery with metalwork in situ, systemic infection, lumbar cutaneous infection, HBA1c above 7%, coagulopathies, pregnancy, young age, and recent same area FJ steroid injections (< 6 weeks) were excluded from the study.

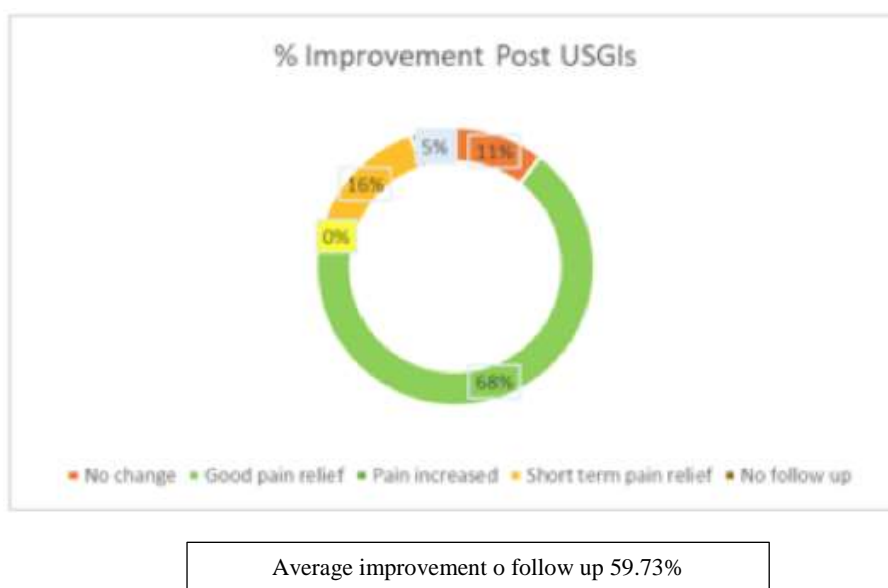
Procedure: The patients were placed in a prone position with a pillow under the abdomen if required to countervail hyperlordosis. The anatomical surface landmarks of the posterior iliac crests, posterior superior iliac spines and spinous processes were visually-palpably identified, and points of maximum palpable paraspinal pain were marked with a pen. Lumbar ultrasound views were achieved by first identifying the lower segment spinous processes (SPs) and sacral base in a longitudinal plane, [Image 1] as these anatomical landmarks and levels are easier to identify than in the transverse plan. For upper lumbar spine

vertebrae cases, the 12th rib may also be used as a sonographic landmark. After finding the location of the desired lower lumbar vertebra level, the transducer was rotated orthogonally to obtain a transverse view of the desired facet joint target level. The SP tip may be imagined as a chair top, chair back (lamina), footstool (TP), with the peri-facet target corresponding the edge of the seat (arrows). [Figure 2-2a].

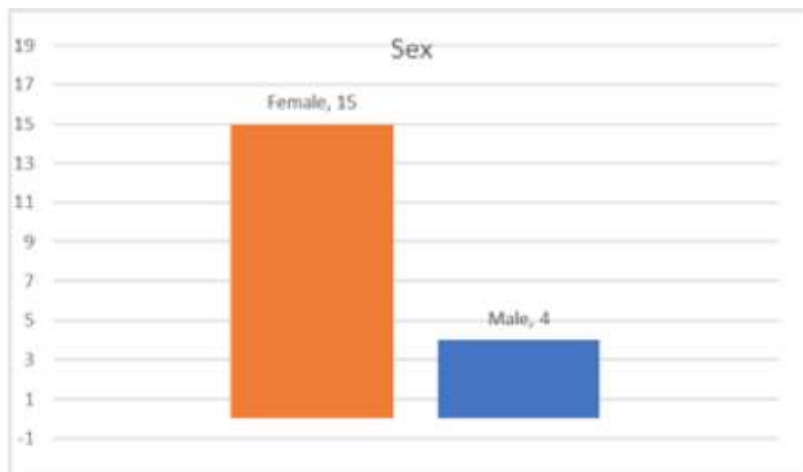
The skin injection field was sterilized, draped, and sterile sono-gel applied. A 22-G stylet needle was inserted 45 degrees obliquely to the skin, approximately 1 cm lateral to curved transducer in line with the transducer [Figure 2]. Peri-facet blocks were performed at the sites of palpable paraspinal pain, using Kenalog 10-40 mg in 5-10 ml Lidocaine at each level.

Results:

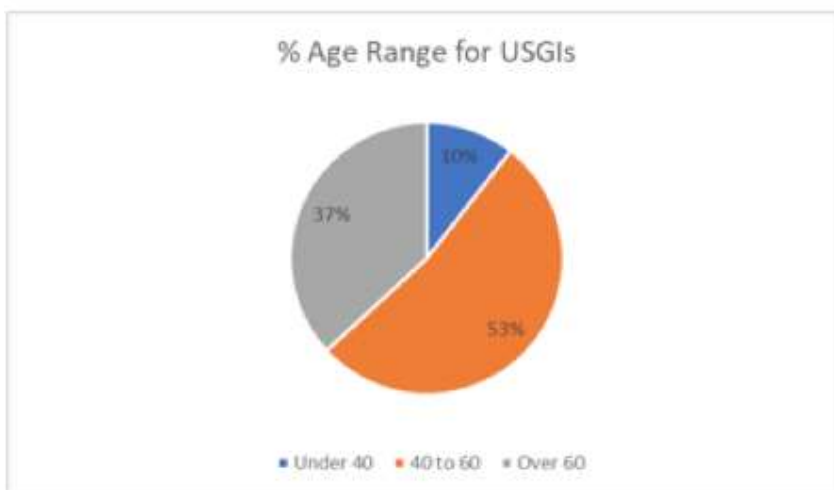
One patient was lost to follow up. On two-three month post injection telephone follow up of the remaining 18 patients, 59.73% of these reported significant & sustained improvement. One patient was lost to follow up, two were referred back to their referring GPs, and nine were referred onward to the pain clinic for consideration of medial branch radiofrequency ablation. Five were discharged to self-management. None reported an increase in pain following the injections.



Inklebarger J .Et.al./Ultrasound-Guided Lumbar Peri-Facet Joint Blocks: A Therapeutic Approach to Chronic Lower Back and Referred Leg Pain Management



Male to female ratio: 4/15 and % of male compared to female in the study: 21.05% male, 78.95% female



Mean age of the patients in study: 54.52 years



Referred back to GP: 2 patients

Referred to pain clinic: 9 patients

Referred to spinal team: 2 patients

Self-manage: 5 patients

No follow up: 1 patient

Total patients	Patient number/ Age/Sex	Injections site	Pain level	Follow up	% Outcome
1	0062/F/38	USG R L5/S1 FJ + ILL Block	Severe	8x weeks	50%
2	1479/F/64	USG L4/5 & L5/S1 FJ Blocks	Severe	8x weeks	50%
3	7297/M/82	USG bilateral L4/5 FJ Blocks	Moderate	12x weeks	80%
4	4104 /F/50	Bilateral USG L5/S1 FJ Blocks	Severe	4x weeks	90%
5	3328/M/66	Bilateral USG L4/5 & L5/S1 FJ Blocks	Severe	8x weeks	40%
6	2646/F/36	USG L-side C3/4 FJ Blocks	Severe	4x weeks	80%
7	3025/F/49	USG L4/5 & L5/S1 FJ Blocks & CE	Moderate	12x weeks	0
8	4487/F/47	USG L-side L4/5 & L5/S1 & ILL blocks	Severe	12x weeks	0
9	2578/F/62	USG R-side L4/5 & L5/S1 & ILL blocks	Severe	20x weeks	75%
10	0253/F/54	USG bilateral L4/5 & L5/S1 FJ & ILL Blocks	Severe	12x weeks	80%
11	5553/F/58	USG CSI L-ILL & bilateral L4/5 & L5/S1	Severe	12x weeks	75%
12	6799/F/45	USG bilateral L5/S1 & ILL CSI	Severe	12x weeks	80%
13	1285/F/45	USG bilateral L5/S1 CSI	Severe	8x weeks	50%
14	2196/F/74	USG L-L4/5 & L5/S1 FJ blocks	Severe	8x weeks	75%
15	4434/M/63	USG R-L4/5 & L5/S1 CSI x2	Severe	12x weeks	85%
16	4473/M/46	USG L-side L5/S1 CSI	Severe	8x weeks	85%
17	4700/F/71	USG bilateral L4/5 & L5/S1 FJ CSIs	Severe	12x weeks	90%
18	8949/F/44	USG L-L5/S1 <u>perifacetals</u> & IL CSI	Severe	No Follow up	-
19	2306/F/42	USG bilateral L4/L5 L5/S1 & IL FJ CSIs	Severe	16x weeks	70%

Table – 2: USG FJ and iliolumbar (IL) injections

(USG= Ultrasound guided, ILL= Iliolumbar ligament, CSI= Corticosteroid injection)

Average follow up time: 10 weeks approximately

Average improvement noted on follow up: 59.73%

No change on follow-up: 2x patients

No follow up recorded: 1x patients

Pain increased on follow up: 0

Discussion:

Lumbar facet joint pain is a common cause of low back pain, affecting 15-45% of the population. [10] Lumbar facet joint injections are a commonly used treatment for this condition, but their efficacy is mired in controversy. [11] However, USG FJ block injection meta-analysis and systemic review papers have confirmed a significant efficacy, lower comparative cost to other guided techniques, and a better safety profile.

[12, 13]. Another more recent 2019 study demonstrated that the IA LFJ corticosteroid injection treatment was effective, regardless of FJOA severity. [14]

USG-guided lumbar facet joint blocks for pain relief are now commonplace procedures. Diagnostic lumbar FJ blocks use smaller volumes [typically 1-1.5 ml of an equal combination of corticosteroid & anaesthetic] of injectant, [15], for delineating intra-capsular FJ pain generation for other potential pain-generating structures. The facet space itself though readily visible fluoroscopically, may be challenging to visualise on ultrasound. [Image 2] However, when the main objective is pain management, both

Fluoroscopically-guided FJ and Peri-FJ blocks appear to have equal pain relief efficacy, [16] the same may also hold true for USG-PFJBs. In this study the USG-PFJ blocks were also performed with higher volumes of injectant (Kenalog 10-40 mg in 5-10 ml volume] at each peri-facetals injection site, with an aim to diffuse the injectant to other potential extra-capsular pain generators such as the iliolumbar ligaments. [17]

Functional restoration is an important outcome measure for patients with lumbar facet joint pain, as it can significantly impact their quality of life. Systemic studies have noted functional restoration with USG FJ blocks in patients with chronic low back pain [14]. Other systemic studies have found that ultrasound-guided lumbar facet joint blocks significantly improved functional restoration, beneficially impacting patient's financial stability and quality of life. Another prospective study evaluated the effect of ultrasound-guided lumbar facet joint blocks significantly improved the ability to return to work, with 92% of patients returning to work within six months of the procedure. [11, 18, 19]

Safety and adverse effects are important considerations when evaluating the efficacy of ultrasound-guided lumbar facet joint blocks. A comprehensive search of the PubMed and Embase databases was conducted using the keywords "ultrasound," "lumbar facet joint block," "safety," "complications," and "adverse events," evaluated the safety of USG-PFJB limited English language publications on human subjects, including case reports (2), retrospective studies (2), and prospective studies (6), an overall incidence of complications associated with ultrasound-guided lumbar FJBs was low, ranging from 0% to 3.7%. The most common complications reported were pain at the injection site, post-procedural soreness, and bruising. In one case report, the patient experienced a vasovagal reaction after the injection. None of the studies reported any cases of nerve injury or intravascular injection. [20,, 21, 22, 23]

The evidence suggests that ultrasound-guided lumbar facet joint blocks are an effective low complication rate treatment for lumbar facet joint pain, with benefits in pain relief, functional restoration, and ability to return to work. USG-LFJBs have been found to be as effective as fluoroscopy-guided lumbar facet joint blocks for pain relief, and more effective than saline injections for pain relief. The evidence further suggests that ultrasound-guided lumbar facet joint blocks are safe, with a low risk of serious adverse effects. Ultrasound-guided lumbar facet joint blocks also have a lower risk of complications than fluoroscopy.

Several studies have investigated the effectiveness of ultrasound-guided lumbar FJBs in relieving lower limb referred pain. A randomized controlled trial published in the Journal of Back and Musculoskeletal Rehabilitation in 2018 found that ultrasound-guided lumbar FJBs were effective in reducing pain and disability in patients with chronic low back pain and referred leg pain (Kim et al., 2018). Similarly, a meta-analysis published in Pain Medicine in 2020 found that ultrasound-guided LFJBs were more effective than conventional blind techniques in reducing pain and improving function in patients with chronic low back pain [24]

Another study published in the Journal of Pain Research in 2019 compared the effectiveness of ultrasound-guided LFJBs with that of transforaminal epidural steroid injections

(TFESIs) in patients with lumbar disc herniation and lower limb radicular pain. The study found that both treatments were effective in reducing pain and improving function, but that ultrasound-guided LFJBs had a more immediate and longer-lasting effect than TFESIs [25]

The upper limit recommendation of steroid usage is 3mg/kg of body weight, or 210mg per year in an average person and a lifetime dose of 420 mg of steroid, equivalent to methylprednisolone. In the diagnostic phase, a patient may receive injections at intervals of no less than one, week, though a two-week interval is preferable. In the therapeutic phase, the suggested interval between injections is two months, provided that at least > 50% relief is obtained for 6 weeks. [11]

Conclusion:

USG-PFJB may offer an effective, lower cost, more rapid to perform alternative to fluoroscopy-guided lumbar FJ injections. Both techniques require a careful approach and a high degree of training and skill. Current evidence also demonstrates a superior safety profiles for USG FJ blocks in comparison to fluoroscopically guided procedures (no ionizing radiation for patient/clinician), with greater and longer lasting pain relief for the management of radicular lower limb pain when compared to Transforaminal Epidural Steroid Injections. TFESIs. [25] It is important to note however, that not all patients will respond to this treatment, and that individual patient factors such as the severity and location of pain, as well as the underlying cause such as biopsychosocial overlay, should be taken into consideration when determining the appropriate treatment approach. USG-PFJBs should probably considered as part of a rehabilitation package rather than a stand-alone treatment. Sub-optimal outcome may also be expected if patients continue to perform heavy manual work and activities of daily living without overload modifications, and it may also afford a pain free window of opportunity to engage in productive rehabilitation. However, further research is needed to fully understand the long-term effectiveness and NICE guideline feasibility of USG-PFJBs in relieving low back and lower limb referred pain. [26]

References:

- [1] Mooney V, Robertson J. The facet syndrome. *Clin Orthop Relat Res*. 1976 Mar-Apr ;(115):149-56. PMID: 130216.
- [2] Wu T, Zhao WH, Dong Y, Song HX, Li JH. Effectiveness of Ultrasound-Guided Versus Fluoroscopy or Computed Tomography Scanning Guidance in Lumbar Facet Joint Injections in Adults With Facet Joint Syndrome: A Meta-Analysis of Controlled Trials. *Arch Phys Med Rehabil*. 2016 Sep;97(9):1558-1563. doi: 10.1016/j.apmr.2015.11.013. Epub 2015 Dec 17. PMID: 26705882.
- [3] Galiano K, Obwegeser AA, Bodner G, Freund M, Maurer H, Kamelger FS, Schatzer R, Ploner F. Ultrasound guidance for facet joint injections in the lumbar spine: a computed tomography-controlled feasibility study. *Anesth Analg*. 2005 Aug; 101(2):579-583. doi: 10.1213/01.ANE.0000158609.64417.93. PMID: 16037179.
- [4] Ye L, Wen C, Liu H. Ultrasound-guided versus low dose computed tomography scanning guidance for lumbar facet joint injections: same accuracy and efficiency. *BMC Anesthesiol*. 2018 Nov 7;18(1):160. doi: 10.1186/s12871-018-0620-7. PMID: 30404599; PMCID: PMC6223004.
- [5] Hadley LA. Anatomico-roentgenographic studies of the posterior spinal articulations. *Am J Roentgenol Radium Ther Nucl Med*. 1961;86:270-276. [PubMed] [Google Scholar]
- [6] Saravanakumar K, Harvey A. Lumbar Zygapophyseal (Facet) Joint Pain. *Rev Pain*. 2008 Sep;2(1):8-13. doi: 10.1177/204946370800200103. PMID: 26525677; PMCID: PMC4589934.
- [7] Griffiths HJ, Parantainen H, Olsen PN. Disease of the lumbosacral facet joints. *Neuroimaging Clin North Am*. 1993;3:567-575. [Google Scholar]
- [8] Fukui S, Ohseto K, Shiotani M, Ohno K, Karasawa H, Naganuma Y, Yuda Y. Distribution of referred pain from the lumbar zygapophyseal joints and dorsal rami. *Clin J Pain* 1997;13: 303-7. [PubMed] [Google Scholar]
- [9] Rucco V, Basadonna PT, Gasparini D. Anatomy of the iliolumbar ligament: a review of its anatomy and a magnetic resonance study. *Am J Phys Med Rehabil*. 1996 Nov-Dec;75(6):451-5. doi: 10.1097/00002060-199611000-00010. PMID: 8985109.
- [10] Perolat R, Kastler A, Nicot B, Pellat JM, Tahon F, Attie A, Heck O, Boubagra K, Grand S, Krainik A. Facet joint syndrome: from diagnosis to interventional management. *Insights Imaging*. 2018 Oct;9(5):773-789. doi: 10.1007/s13244-018-0638-x. Epub 2018 Aug 8. PMID: 30090998; PMCID: PMC6206372.
- [11] Manchikanti L, Staats PS, Singh V, Schultz DM, Vilims BD, Jasper JF, Kloth DS, Trescot AM, Hansen HC, Falasca TD, Racz GB, Deer TR, Burton AW, Helm S, Lou L, Bakhit CE, Dunbar EE, A
- [12] Wu T, Zhao WH, Dong Y, Song HX, Li JH. Effectiveness of Ultrasound-Guided Versus Fluoroscopy or Computed Tomography Scanning Guidance in Lumbar Facet Joint Injections in Adults With Facet Joint Syndrome: A Meta-Analysis of Controlled Trials. *Arch Phys Med Rehabil*. 2016 Sep;97(9):1558-1563. doi: 10.1016/j.apmr.2015.11.013. Epub 2015 Dec 17. PMID: 26705882.
- [13] Manchikanti L, Hirsch JA, Pampati V, Boswell MV: Utilization of facet joint and sacroiliac joint interventions in medicare population from 2000 to 2014: Explosive growth continues! *Curr Pain Headache Rep* 2016; 20:58. [PubMed] [Google Scholar]
- [14] Kwak, D.G., Kwak, S.G., Lee, A.Y., & Chang, M.C. (2019). Outcome of intra-articular lumbar facet joint corticosteroid injection according to the severity of facet joint arthritis. *Experimental and Therapeutic Medicine*, 18, 4132-4136. <https://doi.org/10.3892/etm.2019.8031>
- [15] Peh W. Image-guided facet joint injection. *Biomed Imaging Interv J*. 2011 Jan-Mar;7(1):e4. doi: 10.2349/biij.7.1.e4. Epub 2011 Jan 1. PMID: 21655113; PMCID: PMC3107686.
- [16] Kershen LM, Nacey NC, Patrie JT, Fox MG. Fluoroscopically Guided Facet Injections: Comparison of Intra-Articular and Periarticular Steroid and Anesthetic Injection on Immediate and Short-Term Pain Relief. *AJNR Am J Neuroradiol*. 2018

- Nov;39(11):2161-2165. doi: 10.3174/ajnr.A5805. Epub 2018 Oct 4. PMID: 30287461; PMCID: PMC7655378.
- [17] Nayak BK, Singh DK, Kumar N, Jaiswal B. Recovering from nonspecific low back pain despair: Ultrasound-guided intervention in iliolumbar syndrome. *Indian J Radiol Imaging*. 2020 Oct-Dec;30(4):448-452. doi: 10.4103/ijri.IJRI_382_19. Epub 2021 Jan 13. PMID: 33737773; PMCID: PMC7954157.
- [18] Cohen SP, Wenzell D, Hurley RW, et al. A double-blind, placebo-controlled, dose-response pilot study evaluating intradiscal etanercept in patients with chronic discogenic low back pain or lumbosacral radiculopathy. *Anesthesiology*. 2007;107(1):99-105.
- [19] FS, Schatzer R, Ploner F. Ultrasound guidance for facet joint injections in the lumbar spine: a computed tomography-controlled feasibility study. *Anesth Analg*. 2005 Aug;101(2):579-583. doi: 10.1213/01.ANE.0000158609.64417.93. PMID: 16037179.
- [20] Bhattacharyya P, McCrory C. Safety of ultrasound-guided lumbar facet joint injections. *Pain Med*. 2014;15(4):617-621. doi:10.1111/pme.12352
- [21] Buckenmaier CC 3rd, Nielsen KC, Pietrobon R, et al. Ultrasound-guided versus fluoroscopy-guided lumbar facet joint injections: a prospective randomized comparative study. *J Pain Res*. 2016;9:797-803. doi:10.2147/JPR.S112502
- [22] Chao T, Chen J, Chen C, Hsu C, Cheng H. The effectiveness and safety of ultrasound-guided versus fluoroscopy-guided lumbar facet joint injections: a systematic review and meta-analysis. *Br J Radiol*. 2020;93(1111):20190499. doi:10.1259/bjr.20190499
- [23] Heavner JE. Local anesthetics and complications: the second ASRA Consensus Conference. *Reg Anesth Pain Med*. 2003;28(3):172-197. doi:10.1016/S1098-7339(03
- [24] Wang, D., Zhou, J., Chen, Y., Zhang, W., Wu, Y., & Li, X. (2020). Efficacy and safety of ultrasound-guided lumbar facet joint block versus conventional blind technique: A systematic review and meta-analysis of randomized controlled trials. *Pain Medicine*, 21(5), 1048-1060.
- [25] Kim, E., Kim, S. Y., Kim, W. H., Kim, Y. R., & Moon, J. Y. (2019). Comparison of the effectiveness between lumbar facet joint block and transforaminal epidural steroid injection in patients with lumbar disc herniation and radicular pain. *Journal of Pain Research*, 12, 2931-2938.
- [26] Ellard DR, Underwood M, Achana F, et al. Facet joint injections for people with persistent non-specific low back pain (Facet Injection Study): a feasibility study for a randomised controlled trial. Southampton (UK): NIHR Journals Library; 2017 May. (Health Technology Assessment, No. 21.30.) Chapter 1, Background. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK436382/>



Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The images or other third-party material in this article are included in the article's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this license, visit <https://creativecommons.org/licenses/by/4.0/>.