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CASE REPORT

Low Back Pain and Radiofrequency Denervation of Facet Joint: Beyond Pain Control—A Video Recording

Mariateresa Giglio · Giacomo Farì · Angela Preziosa · Alberto Corriero · Salvatore Grasso · Giustino Varrassi · Filomena Puntillo

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ABSTRACT

Chronic low back pain is often due to L5S1 instability resulting in facet joint syndrome. Patients suffering from low back pain may also have a gait pattern characterized by a reduced speed and a shorter, asymmetrical step in order to reduce pain. This case is of a patient with L5S1 instability that occurred after L1 to L5 lumbar stabilization who was treated with radiofrequency (RF) denervation of the medial branch of L5S1 bilaterally. RF ablation outcome was tested by comparing its impact on pain, function, quality of life, and on gait pattern, before and 1 month after the procedure. To objectify the impact of a good pain control on gait, a video recording was performed (see Video 1).

Keywords: Facet joint pain; Radiofrequency denervation; Gait analysis

DIGITAL FEATURES

This article provides a digital feature, including a video to facilitate the understanding of the article. To view digital features for this article, go to https://doi.org/10.6084/m9.figshare.22068623.

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M. Giglio · A. Corriero · F. Puntillo (✉)
Anaesthesia, Intensive Care and Pain Unit, Department of Interdisciplinary Medicine, University of Bari "Aldo Moro", Piazza G. Cesare 11, 70124 Bari, Italy
e-mail: filomena.puntillo@uniba.it; nuccia.puntillo@gmail.com

G. Farì
Department of Translational Biomedicine and Neuroscience (DiBraiN), Aldo Moro University, 70121 Bari, Italy

A. Preziosa
Anaesthesia and Intensive Care Unit, Policlinico Hospital, Bari, Italy

S. Grasso
Department of Precision and Regeneration Medicine and Jonian Area, University of Bari "Aldo Moro", Bari, Italy

G. Varrassi
Paolo Procacci Foundation, Rome, Italy

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Key Summary Points

L5S1 instability causes facet joint syndrome resulting in chronic pain.

Patients experiencing facet joint pain may have an impaired gait pattern.

The radiofrequency ablation of the medial branch can allow good pain relief.

Gait analysis can objectify the outcome of the radiofrequency ablation in case of L5S1 instability.

INTRODUCTION

Low back pain (LBP) is one of the most disabling conditions in industrialized countries and has important social and economic repercussions [1]. In high-income countries, its incidence is higher in women and older workers [2], and it is associated with an increased burden worldwide due to work and social limitation. This in turn causes augmented direct and indirect costs linked to medical management, productivity loss, and work absenteeism [3]. Moreover, many other factors can contribute to low back pain and disability, such as biophysical [4], psychological [5], and socioeconomical factors [6] that can interplay and potentiate each other, further complicating its management.

Among the pathogenetic sites of "mechanical" low back pain, there are the facets joints, with an estimated prevalence of 31% [7]. The facet joint is a highly innervated structure consisting of the subchondral bone, joint cartilage, synovial membrane, and fibrous capsule. Its innervation is supplied by the medial branch that comes from the corresponding posterior spinal ramus [8]. The osteoarthritic facet joints or degeneration of the capsule may promote nociceptors activation, local inflammation, increased vascularization, fat-induced nerve injury [9], and all these factors contribute to pain sensitization.

Facet joint syndrome may be suspected in moderate to severe non-radicular somatic low back pain, with a typical pattern of distribution that can involve the buttock, thigh, or groin. Pain usually worsens with lumbar hyperextension, extension–rotation, or straightening from flexion [8, 10].

Patients tested positive for facet joint pain may undergo, after a double positive nerve block, radiofrequency (RF) denervation of the medial branch, even if conflicting results are reported on pain intensity [11, 12].

Patients suffering from low back pain also have a different gait pattern if compared to healthy subjects, since it is characterized by a reduced speed and a shorter and asymmetrical step, all strategies implemented to reduce pain [13]. Interestingly, recent evidence suggests that after a home-based specific treatment, an improvement in gait parameters, pain, function, and quality of life was reported in low back pain [14].

The aim of the following case report was to show the modification of gait patterns, using a video support, before (T0) and 1 month (T1) after RF on the medial branch of the vertebral zigapophyses in one patient with chronic low back pain due to facet syndrome associated with L5-S1 instability. Moreover, the modification of pain, disability, and quality of life were reported.

Ethics committee approval was not required for this study. The study was performed in accordance with the Helsinki Declaration of 1964 and its later amendments. The patient gave his informed consent to participate and for publication.

CASE REPORT

The selected patient was a 61-year-old man, who underwent L3L4 discectomy and subsequent L1 to L5 stabilization in 2011. Five years later, he began to complain of non-radicular low back pain (NRS 8); pain was localized bilaterally at the L5S1 level and worsened with lumbar hyperextension and pressure. The pain increased when he maintained the same position for 10 min. The patient reported that a walker was necessary for every movement. Also, his sleep quality was very poor, since his sleep time was always interrupted by pain. A diagnosis of facet joint syndrome due to L5S1 instability was made and the patient was tested with a double analgesic block of the L5S1 facet joints (using two local anesthetics with different half-life), under fluoroscopic guidance. He reported a numeric rating scale (NRS) reduction after the diagnostic blocks > 50%, therefore RF ablation was planned. RF denervation was performed under fluoroscopic guidance at 80 °C per 90 s, at the medial branch of L5S1 bilaterally after a positive sensory and motor stimulation. A 10-cm, 18-gauge needle with 10-mm active tip was used. A G4™ RF Generator was used. At T0 (before RF) and at T1 (1 month after RF), the patient underwent a gait analysis, according to the modified Davis protocol [15], with the addition of surface EMG detector electrodes at the level of the spine and lower limbs. So, before the analysis, EMG sensors were applied bilaterally to the dorsolumbar paravertebral muscles, hamstrings and medial gastrocnemius, and inertial sensors were applied to dorsal and lumbar spine, hips, knees, and ankles. Then, the patient was required to walk on the sensorized walkway and was filmed. The data relating to muscle electrical activity, joint kinematics, and global gait pattern were then analyzed by dedicated software and transformed into graphic and numerical reports visible on a monitor.

At T0 and T1, the patient also underwent a clinical evaluation. The intensity of pain was evaluated using the NRS, the degree of disability was measured using the Oswestry Disability Scale (ODI), and the impact of disability and pain on quality of life was evaluated according to Short Form-12 (SF-12). The ODI was used in its version 2.0 modified by the original authors [16], according to which each item score is calculated from 0 to 5 based on the response selected by the patient in relation to his disability severity. The final score was calculated according to the following formula: total points/50 $\times$ 100 = % points; for the interpretation of the score Fairbank [17] proposed: 0–-20% = minimum disability; 21–40% = disability modest; 41–60% = moderate disability; 61–-80% = severe disability; 81–100% = complete disability. SF-12 is the short-form of Short Form-36 (version 2.0, third edition), widely used to measure the quality of life using 12 items, of which there are five on motor disability and seven on the psychological consequences of the pathology in question. The score is calculated by entering the data in an online demo [18] obtaining two scores, one referring to the patient’s mental dimension (MCS) and one referring to the physical dimension (PCS). Moreover, patient satisfaction was tested using the Global Patient Impression of Change (PGIC). PGIC is a seven-point scale depicting a patient’s rating of overall improvement. Patients rated their change as “very much improved = 3,” “much improved = 2,” “minimally improved = 1,” “no change = 0,” “minimally worse = − 1,” “much worse = − 2,” or “very much worse = − 3.

The patient reported at T0 a NRS of 9, while ODI was 80%, the MCS component of SF12 was 36 and the PCS component was 23. At T1, NRS decreased to 3, ODI to 35, the MCS component of SF1 was 62 and the PCS component was 43 (see Fig. 1). The patient reported a very high level of satisfaction, since his PGIC was 3. This high level of satisfaction was justified, in his opinion, to the reduced pain associated with sitting and walking. He reported the ability to tolerate a sitting position for more than 1 h, an increased mobility in daily activities and self-care, and an increased walking distance (more than 500 m), associated with an increase of time spent in social activity. In addition, his sleep time increased since he reported the ability to rest supine with no pain.

The video recording (See video 1 in the online/HTML version of the manuscript or follow the digital features link under the abstract) shows the gait pattern of the patient at T0 and T1, highlighting an impressive improvement in all phases of the analysis and in kinematic data. In particular, the alteration of the pelvic tilt and obliquity tend to normalize after the analgesic procedure.

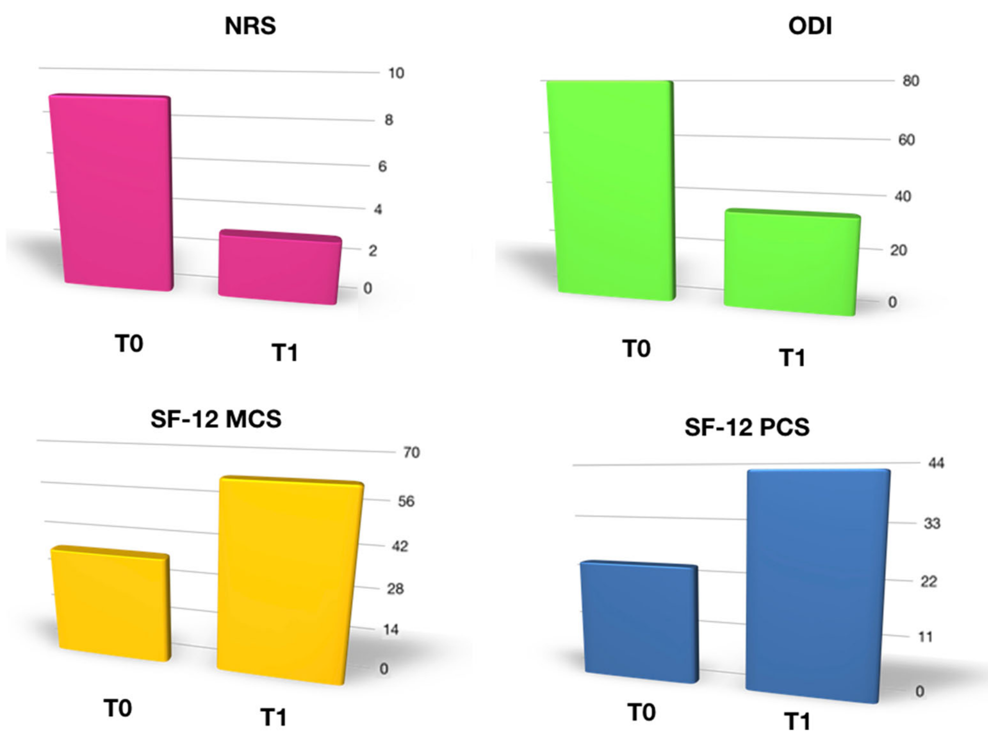

Fig. 1 The change in NRS (numerical rating scale), ODI (Oswestry Disability Scale), MCS (motor state), and PCS (psychological state) component of SF12 at T0 (before radiofrequency ablation) and T1 (1 month after radiofrequency ablation of medial branch)

DISCUSSION

The present case shows that RF denervation of the medial branch of lumbar facet can significantly reduce pain and disability in patients with LBP due to facet syndrome. Moreover, pain reduction is associated with an improvement of gait pattern, particularly with a remodulation of specific bio-mechanical behaviors related to the postural adaptation observed in these patients. The reduction of pain, increased mobility, and the perceived improvement of autonomy all concur to explain the significant increase of ODI and both the components of SF-12 observed in the present case.

The effect of RF denervation is still under debate, with emerging conflicting evidence on its utility in reducing pain and disability [11]. A recent trial reported a significant reduction of pain until 1 year, even if the effect reduced over time [19] and the last updated guidelines of the American Society of Interventional Pain Management recommend lumbar radiofrequency ablation with a level of evidence II and a moderate strength of recommendation [20]. However, the identification of patients who could benefit most of interventional procedures is a critical point that requires an accurate screening of pain history, clinical signs and symptoms, and radiologic pathology. Moreover, other psychological and physical factors should often be considered, such as obesity, depression, or a limited baseline function, since these factors also have been associated with a poor effect of an invasive procedure [21]. Therefore, a medial branch block should always be undertaken as a prognostic screening tool before planning a RF lumbar ablation [22].

The present study suggests that RF lumbar denervation, in carefully selected patients, can obtain good pain control associated with increased mobility. Moreover, gait analysis could represent a useful tool to demonstrate clinical improvement in motility after lumbar facet denervation. This type of objective, visible improvement in function, if reproducible, could be extremely important in assessing the global effect of RF denervation on pain mobility and quality of life in chronic low back pain.

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Disclosures. All authors declare that they have nothing to disclose.

Compliance with Ethics Guidelines. Ethics committee approval was not required for this study. The study was performed in accordance with the Helsinki Declaration of 1964 and its later amendments. The patient gave his informed consent to participate and for publication.

Data Availability. Data are available, on request, by contacting the corresponding author: filomena.puntillo@uniba.it.

REFERENCES

1. Hartvigsen J, Hancock MJ, Kongsted A, Louw Q, Ferreira ML, Genevay S, Hoy D, Karppinen J, Pransky G, Sieper J, Smeets RJ, Underwood M, Lancet Low Back Pain Series Working Group. What low back pain is and why we need to pay attention. Lancet. 2018;391(10137):2356–67.
2. Yang H, Haldeman S, Lu ML, Baker D. Low back pain prevalence and related workplace psychosocial risk factors: a study using data from the 2010 National Health Interview Survey. J Manipulative Physiol Ther. 2016;39(7):459–72.
3. Olafsson G, Jonsson E, Fritzell P, Hägg O, Borgström F. Cost of low back pain: results from a national register study in Sweden. Eur Spine J. 2018;27(11): 2875–81.
4. Dubois JD, Abboud J, St-Pierre C, Piché M, Descarreaux M. Neuromuscular adaptations predict functional disability independently of clinical pain and psychological factors in patients with chronic nonspecific low back pain. J Electromyogr Kinesiol. 2014;24(4):550–7.
5. Campbell P, Bishop A, Dunn KM, Main CJ, Thomas E, Foster NE. Conceptual overlap of psychological constructs in low back pain. Pain. 2013;154(9): 1783–91.
6. Shmagel A, Foley R, Ibrahim H. Epidemiology of chronic low back pain in US adults: data from the 2009–2010 National Health and Nutrition Examination Survey. Arthritis Care Res (Hoboken). 2016;68(11):1688–94.
7. DePalma MJ, Ketchum JM, Saullo T. What is the source of chronic low back pain and does age play a role? Pain Med. 2011;12(2):224–33.
8. Gellhorn AC, Katz JN, Suri P. Osteoarthritis of the spine: the facet joints. Nat Rev Rheumatol. 2013;9(4):216–24.

9. Li W, Gong Y, Liu J, Guo Y, Tang H, Qin S, Zhao Y, Wang S, Xu Z, Chen B. Peripheral and central pathological mechanisms of chronic low back pain: a narrative review. J Pain Res. 2021;27(14):1483–94.

10. Won HS, Yang M, Kim YD. Facet joint injections for management of low back pain: a clinically focused review. Anesth Pain Med (Seoul). 2020;15(1):8–18.

11. Juch JNS, Maas ET, Ostelo RWJG, Groeneweg JG, Kallewaard JW, Koes BW, Verhagen AP, van Dongen JM, Huygen FJPM, van Tulder MW. Effect of radiofrequency denervation on pain intensity among patients with chronic low back pain: the mint randomized clinical trials. JAMA. 2017;318(1): 68–81.

12. Lee CH, Chung CK, Kim CH. The efficacy of conventional radiofrequency denervation in patients with chronic low back pain originating from the facet joints: a meta-analysis of randomized controlled trials. Spine J. 2017;17(11):1770–80.

13. Lee CE, Simmonds MJ, Etnyre BR, Morris GS. Influence of pain distribution on gait characteristics in patients with low back pain: part 1: vertical ground reaction force. Spine (Phila Pa 1976). 2007;32(12):1329–36.

14. Barzilay Y, Segal G, Lotan R, Regev G, Beer Y, Lonner BS, Mor A, Elbaz A. Patients with chronic nonspecific low back pain who reported reduction in pain and improvement in function also demonstrated an improvement in gait pattern. Eur Spine J. 2016;25(9):2761–6.

15. Davis RB, Ounpuu S, Tyburski D, Gage JR. A gait analysis data collection and reduction technique. Hum Mov Sci. 1991;10(5):575–87.

16. Backer D, Fairbank J. The Oswestry Disability Index revisited. Spine 2000; 25 (22): 2940-53. In: Rroland M, Jenner J, editors. Back pain: new approaches to rehabilitation and education. Manchester: Manchester University Press; 1989. p. 174–86.

17. Fairbank J. Use of Oswestry Disability Index (ODI). Spine. 1995;20(13):1535–7 (**PMID: 8623078**).

18. http://www.sf-36.org/demos/SF-12.html

19. Paulsen RT, Carreon L, Busch F, Isenberg-Jørgensen A. A pilot cohort study of lumbar facet joint denervation in patients with chronic low-back pain. Dan Med J. 2019;66(3):A5533.

20. Manchikanti L, Kaye AD, Soin A, Albers SL, Beall D, Latchaw R, Sanapati MR, Shah S, Atluri S, Abd-Elsayed A, Abdi S, Aydin S, Bakshi S, Boswell MV, Buenaventura R, Cabaret J, Calodney AK, Candido KD, Christo PJ, Cintron L, Diwan S, Gharibo C, Grider J, Gupta M, Haney B, Harned ME, Helm Ii S, Jameson J, Jha S, Kaye AM, Knezevic NN, Kosanovic R, Manchikanti MV, Navani A, Racz G, Pampati V, Pasupuleti R, Philip C, Rajput K, Sehgal N, Sudarshan G, Vanaparthy R, Wargo BW, Hirsch JA. Comprehensive evidence-based guidelines for facet joint interventions in the management of chronic spinal pain: American Society Of Interventional Pain Physicians (ASIPP) guidelines facet joint interventions 2020 guidelines. Pain Physician. 2020;23(3S):S1–127.

21. Cohen SP, Doshi TL, Kurihara C, et al. Multicenter study evaluating factors associated with treatment outcome for low back pain injections. Regional Anesth Pain Med. 2022;47:89–99.

22. Cohen SP, Bhaskar A, Bhatia A, Buvanendran A, Deer T, Garg S, Hooten WM, Hurley RW, Kennedy DJ, McLean BC, Moon JY, Narouze S, Pangarkar S, Provenzano DA, Rauck R, Sitzman BT, Smuck M, van Zundert J, Vorenkamp K, Wallace MS, Zhao Z. Consensus practice guidelines on interventions for lumbar facet joint pain from a multispecialty, international working group. Reg Anesth Pain Med. 2020;45(6):424–67.