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Efficacy of the Multimodal and Multilevel Radiofrequency Nerve Ablation for the Management of Low Back Pain Chronic

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: Low back pain is currently an important health problem that represents a significant socioeconomic cost in Western societies and is associated with higher rates of disability than any other disorder. Although most cases are treated successfully at the first level of care, it is estimated that around 15% become chronic, resisting conservative treatment.
Aims: to know the analgesic effects by means of the "visual analog scale" and functional effects (oswestry) in patients submitted to radiofrequency, the aim is to know the incidence of low back pain secondary to facet syndrome in the traumatology service, as well as the effectiveness rate of the procedure as a therapeutic method for chronic low back pain.

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Study Design: retrospective cohort analytical observational study design.
Place and Duration of Study: Sample: 48 patients with a diagnosis of lumbar facet syndrome treated by lumbar facet denervation (rhizolysis) by multimodal and multilevel radiofrequency between July 2021 and July 2022 at the Regional Military Hospital of specialties in Guadalajara, Jalisco were included.
Methodology: Sample: We included data from the 48 patients who underwent radiofrequency facet denervation of the lumbar spine from L1 to L5, and their functional evolution was evaluated using the Oswestry Disability Index (ODI) and their analgesic evolution using the Visual Analog Scale (VAS).
Results: Sample: Out of 48 patients, finding an average improvement of 5.6 ± 3.28 points in the visual analog pain scale and an improvement of 83.3% was obtained in patients with severe disability according to the Oswestry scale at 6 months of follow-up. There is a reduction of at least 3 points in VAS with a 50% reduction in pain and improvement in functional status. Effectiveness of 91.6% in the reduction of at least 16 points in ODI which represents the minimum score necessary to reduce 1 level of disability in the worst case scenario.
Conclusion: The incidence of patients presenting to the orthopedic office with facet syndrome is 32.87%. Radiofrequency rhizolysis is an effective and safe treatment for the management of chronic low back pain in patients with facet syndrome, with a high rate of effectiveness and low rate of complications. The effectiveness of the treatment lies in the correct selection of the patient including clinical and imaging criteria and positive diagnostic block.

Keywords: Radiofrequency; facet syndrome; lumbar; denervation.

1. INTRODUCTION

Pain is the most frequent cause of medical consultation, although it is defined in the latest update by the International Association for Pain, which says “Pain is an unpleasant sensory and emotional experience associated or similar to that associated with a real injury or potential" [1]. This reference makes us differentiate and pay attention to its duration, pathogenesis, location, course, intensity, mitigating factors and according to its pharmacology.

“Low back pain is currently an important health problem that represents a significant socioeconomic cost in Western societies and is associated with higher rates of disability than any other disorder. Although the majority of cases are successfully treated at the first level of care, it is estimated that around 15% become chronic, resisting conservative treatment (low back pain is considered chronic after 3 months)” [2].

“In Mexico, low back pain is a common problem that affects 80 out of every 100 people and 30% of people who suffer from low back pain in Mexico require disability. There are numerous potential causes of low back pain, including facet joints (prevalence 15-45%), sacroiliac joints, intervertebral discs, or paravertebral muscles, even though the cause is often mixed. The origin of this pain is, therefore, a fundamental step in the treatment of patients with low back pain” [3 -9].

Chronic low back pain originating in the facet joints was defined by Pérez-Cajaraville [10], as low back pain that radiates to the buttocks, groin or hips, non-specifically to the lower limbs but never to the feet. “This pain increases with prolonged standing and sitting, acute pain on palpation of the zygapophyseal joint (ZPJ), decreased lumbar mobility in all planes, especially lumbar spine extension and extension with lumbar rotation, negative neurological examination and Valsalva maneuver” [11].

In facet anatomy and syndrome, the importance of the medial branch of the dorsal branch of the spinal nerve is that it provides sensory innervation to the facet joints. The lumbar dorsal branches emerge from their corresponding foramen of conjunction.

The dorsal branch of the spinal nerve has a lateral branch, an intermediate branch and a medial branch that runs posteriorly and caudally passing above the transverse process of the vertebra and under the accessory mammillo ligament, embracing the neck of the superior articular process to finally give branches to the multifidus muscle, interspinous muscle, yellow ligaments and the superior and inferior facet.

“The L5 root has a particularity, since its medial branch of the dorsal branch does not run over

any transverse process, but rather over the notch between the sacral wing and the superior articular process of S1. Knowing the relationship of the medial branches with the transverse process is of utmost importance, since it is in this location where the blockade or subsequent neurolysis is performed" [4].

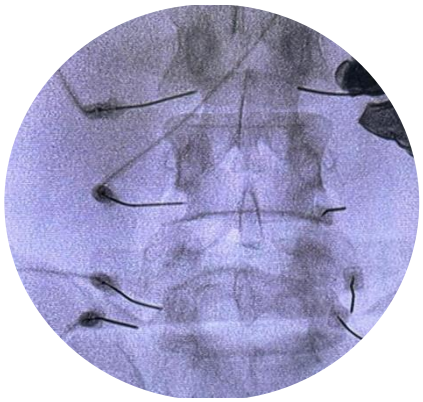

Fig. 1. Anteroposterior radiography of the lumbosacral column

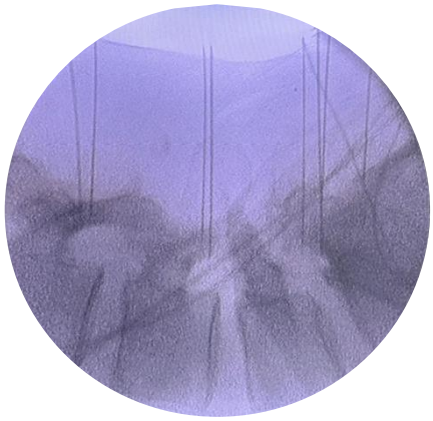

Fig. 2. Lateral projection radiography of the lumbosacral column

"Within the management, rhizolysis, which is a minimally invasive treatment, is increasingly used for chronic low back pain. It consists of generating small lesions in the nerves responsible for transmitting painful impulses from the site where the low back pain originates to the central nervous system" [11].

These injuries are produced through the percutaneous insertion of a radiofrequency cannula, that coming into contact with the nervous structure responsible for transmitting the painful impulse, generates a thermal injury. Prior to carrying out this procedure.

"The patients with the greatest probability of benefiting from it should be selected based on a complete physical examination, complementary imaging tests and/or the performance of an anesthetic nerve block with betamethasone 8 mg/2 ml and 160 mg of lidocaine 2% of the paravertebral muscles in the lumbar area" [2,8] (Figs. 1 and 2). "The technique used following the recommendations of the Spanish Pain Society, which aligns with the guidelines of the International Spine Intervention Society, the medial branch of the posterior primary division of the affected segments is located" [7].

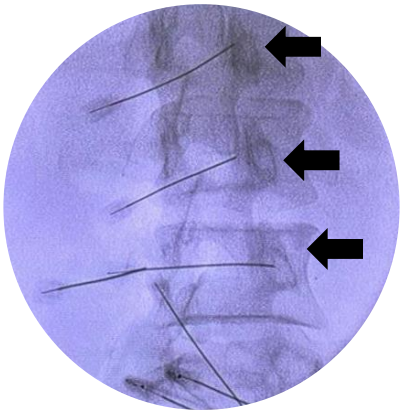

Fig. 3. Oblique projection radiography of the lumbosacral column

First, the image intensifier is moved in an oblique direction from the initial PA axis, approaching the facet joint and spinous process from the contralateral side, to obtain a good view of the so- called "Scottish dog" (Fig. 3).

"A 25 G gauge needle (G) is used to infiltrate only the superficial tissues, taking care to not reach the bone due to the danger of anesthetizing the medial branch itself, thus avoiding its subsequent localization by stimulation" [2,9]. A radiofrequency needle with a gauge of 20 G and 100 millimeters (mm) in length, with a 10 mm active tip (Fig. 4), is then inserted along the angle of the x-ray beam to touch the "eye of dog" in the tunnel view (Fig. 5). Radiofrequency electrodes are placed to perform facet denervation of the L1 to L5 vertebrae bilaterally.

Once located in the correct position, it is checked using a hyperbolic projection and the depth is regulated using a complete lateral projection (without exceeding the articular pillar). The nerve passes through the junction between the transverse process and the articular pillar superior. The needle is guided to the appropriate

point in “tunnel view” using an oblique view [2]. Once all the electrodes are placed, pulsed radiofrequency is applied for 90 seconds at a temperature of 45 degrees Celsius. At the end of the pulsed radiofrequency cycle, thermal radiofrequency is immediately initiated for 180 seconds at a temperature of 80 degrees Celsius on each of the electrodes.

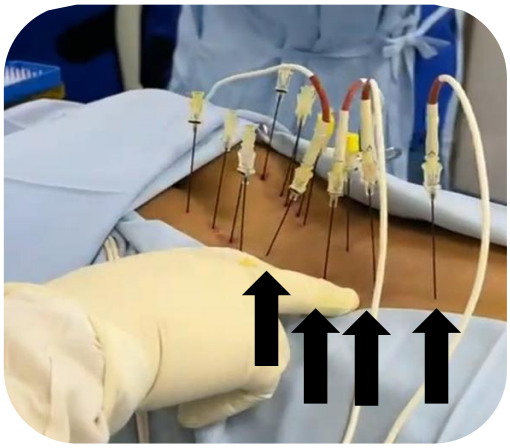

Fig. 4. Lumbosacral column

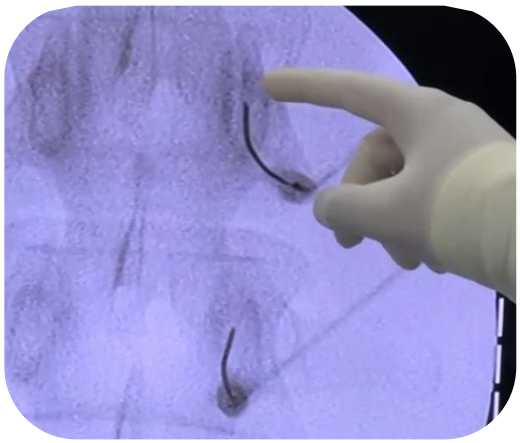

Fig. 5. Anteroposterior radiography of the lumbosacral column

2. MATERIALS AND METHODS

Through a retrospective analytical cohort-type observational study over a period of one year, 48 patients with lumbar facet syndrome were observed managed by lumbar facet denervation (rhizolysis) by multimodal and multilevel radiofrequency (Fig. 3) in the traumatology and orthopedics service of the military hospital. regional specialty of Guadalajara.

Data were collected from the clinical record where the care of 2,364 patients was observed in the outpatient clinic of the traumatology and orthopedics service in a period from July 2021 to July 2022, of these, 648 patients had unspecified low back pain as a reason for consultation. 146 patients from this sample were classified as having chronic low back pain and underwent diagnostic block of the paravertebral muscles as initial treatment, of which 98 responded adequately to the treatment and 48 required management through facet denervation for chronic pain management with multilevel and multimodal radiofrequency.

Inclusion criteria:

a) Low back pain of at least 3 months of evolution, refractory to medical and rehabilitation treatment (chronic) + Pérez - Cajaraville criteria and Kobayashi distribution [10,7].
b) 3 of 5 positive lumbar facet provocation tests (spinous processes compression test, rotation, lateralization, extension and lumbar flexion tests).
c) Improvement in diagnostic block > 70% and persistence of chronic pain after 12 weeks
d) 1 grade or more in the Pathria criteria [6].

Exclusion criteria:

a) Hypersensitivity to local anesthetic
b) Coagulation disturbance

Demographic data (age, sex, time of progression of low back pain) we`re recorded and graphed for all patients undergoing facet denervation and they were requested to fill out a questionnaire prior to the intervention, and subsequently at 6 months.

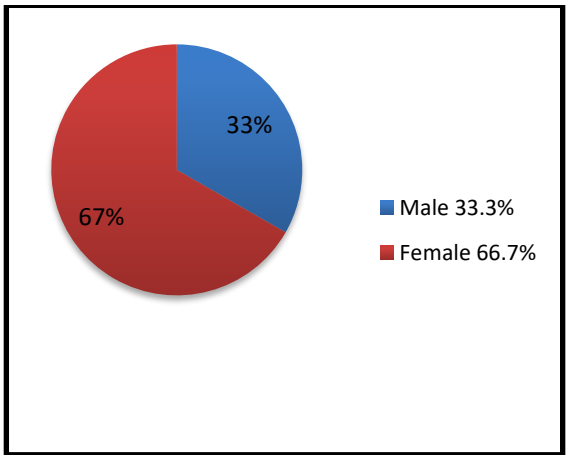

Fig. 6. Gender

The questionnaire involved the degree of impairment, measured through the Oswestry Disability Index (ODI), which evaluates the following 10 variables: pain intensity, standing,

personal care, sleeping habits, transportation of objects, work performance, ambulation, social life, sitting and ability to travel; the VAS for pain, both lumbar and radiating to the lower limb, and evolution of the analgesia used. Satisfaction with the treatment received was also evaluated by asking whether the patients would undergo the intervention again after knowing the results obtained

3. RESULTS

The results obtained in the demographic and descriptive data of 48 patients undergoing radiofrequency facet denervation from the L1 to L5 vertebrae bilaterally, a higher prevalence of lumbar facet syndrome in females was found in a 2:1 ratio (Fig. 6). The average age of the population admitted for the study was 55 years with a range of 27 to 78 years. The mean duration of pain was 48.25 months with a range of 8 to 144 months.

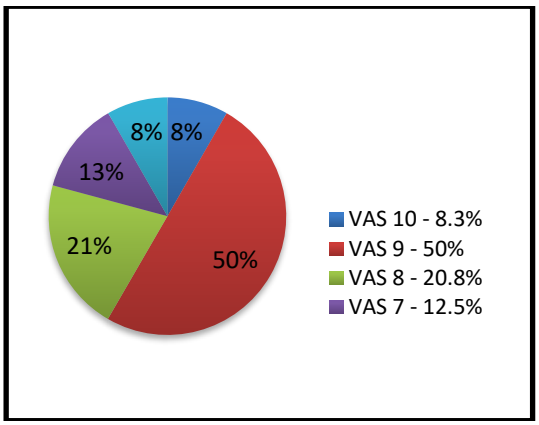

Fig. 7. Pre-radiofrequency VAS

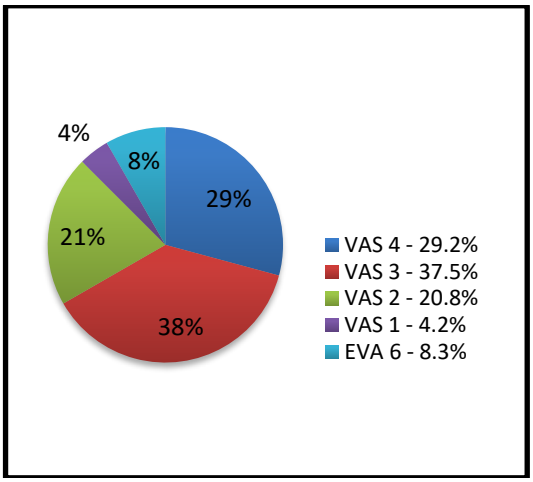

Fig. 8. Post-radiofrequency VAS

To evaluate the real effect of changes in the visual analog pain scale before and after multimodal and multilevel radiofrequency denervation, the results of the VAS questionnaire previous to radiofrequency were taken into account, where we found an average of 8.3, with a range from 6 to 10 (Fig. 7).

After the multimodal and multilevel radiofrequency, the patient's visual analogue pain scale is performed again, where average results of 2.75 with a range between 0 to 4 are obtained (Fig. 8). The treatment was validated by the significant decrease in the mean obtained through the VAS after rhizolysis.

To evaluate functionality, the disability scale for low back pain was used using the ODI prior to treatment, to later be re-evaluated 6 months after the procedure. The evaluation with the Oswestry scale prior to radiofrequency obtained results of:

- 10 patients with inability moderate 3. 4 patients with severe disability and 4 disabled patients (Fig. 9).

The disability caused by pain in facet syndrome decreased significantly after multilevel and multimodal radiofrequency rhizolysis, reflecting a notable improvement by reducing the disability caused by low back pain.

A new assessment was carried out with the ODI after 6 months of having performed the radiofrequency with an effectiveness rate of 83.3% of the patients reclassifying them as having a disability, and only 16.6% of the patients still have a moderate level of disability (Fig. 10).

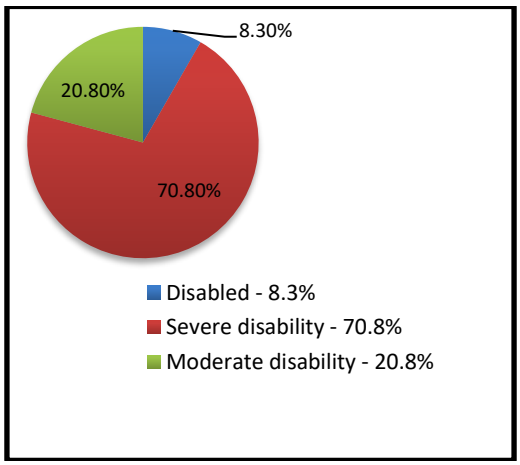

Fig. 9. Oswestry disability index

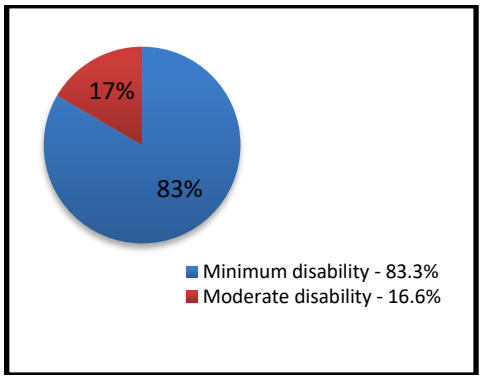

Fig. 10. Oswestry disability index

All patients going under multimodal and multilevel radiofrequency were asked for their opinion after 6 months and were asked if any of them would undergo radiofrequency again after observing the results obtained, where 95.8% of patients mentioned that they would return to endure the procedure or that they would recommend it to a family member after observing the benefits of the treatment.

4. DISCUSSION

It was observed that patients with severe disability were the most benefited by the treatment, likewise, an effectiveness of 91.6% was demonstrated in the reduction of at least 16 points, which represents the minimum score necessary to reduce 1 level of disability at the worst. of the scenarios. (Fig. 11).

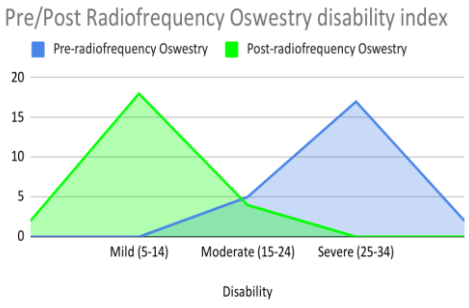

Fig. 11 Pre and post radiofrequency oswestry disability index

The effectiveness of the treatment lies in the strict use of the inclusion criteria used in this study for the selection of patients candidates for facet denervation by radiofrequency, which were the Pérez-Cajaraville criteria, Kobayashi distribution, facet provocation maneuvers, Pathria criteria in imaging studies as well as the use of confirmatory diagnostic blocking which help us to correctly identify facet syndrome and exclude other similar pathologies [1,10,7,12].

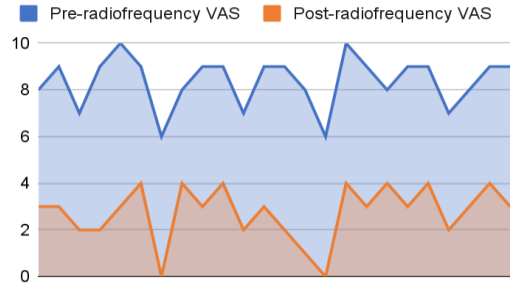

Fig. 12. Pre and post radiofrequency VAS

Regarding pain, a result is considered clinically significant if there is a reduction of at least 3 points on the VAS or the pain scale numerical rating (NRS), or at least a 50% reduction in pain and an improvement in functional status, criteria established by Rajesh N Janapala et al. [13] that in this case all 3 considerations are met showing a reduction in pain average of 5.6 ± 3.28 points on VAS. (Fig. 12) The statistical analysis obtained for a Confidence Index (CI) of 95% and significance of 0.05. (Fig. 13) [14-18].

According to the statistical tests carried out, it can be concluded with the sign test that the median values for VAS scores after performing the radiofrequency treatment are between 5 and 6 points less, the decrease is at least five points considering the median. According to the statistical tests carried out, it can be concluded with the “T” sign test that the median values for VAS scores after performing the radiofrequency treatment are between 5 and 6 points less, the decrease is by at least five points considering the midpoint [19-21].

Variable	Confidence Index (CI) for the median.	P-value in the sign test, for the CI	CI for the mean	P-value in the T-test for CI.
Post-radiofrequency VAS score.	-6,-5	0.000, 0.004	-6,-5	0.000, 0.023
Post-radiofrequency ODI score.	-23,-16	0.001, 0.001	-22,-17	0.007, 0.019

Fig. 13. Statistical analysis of confidence index

The same happens for the score on the Oswestry scale, the median value is between 16 and 23 points less, decreasing by at least 16 points. Regarding the test, it is concluded that the VAS values on average after radiofrequency treatment decrease in an interval of between 5 and 6; at least five points on average; Regarding the ODI, the average is between 17 and 22 points less; the average score decreases by at least 17 points.

The complications that developed after multilevel and multimodal radiofrequency were entirely transient, corresponding to 4.16% of the 48 patients included in the study, with one case of hematoma and another of increased radiated pain, compared to others hospitals with a similar study model such as the University Hospital of Cabueñes, Spain, where they report a complication rate of 3.2% of the total sample, equally transitory [2].

5. CONCLUSION

The incidence of chronic low back pain in patients treated at RMHSG is 22.5%, of which 32.87% is of facet origin. Radiofrequency rhizolysis is an effective and safe treatment for the management of chronic low back pain in patients with facet syndrome, with a high effectiveness rate (91.6%) and low complication rate (4.16%). The effectiveness of the treatment lies in the correct selection of the patient including clinical and imaging criteria and positive diagnostic blocking.

CONSENT

All authors declare that written informed consent was obtained from the patient for publication of this case report and accompanying images. Participants had the right to withdraw from the study at any time without giving any reason.

ETHICAL APPROVAL

It is not applicable.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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