

Results of Neurolysis for the Treatment of Neuropathic Pain in Patients with Sciatic Nerve Injury. Case Report

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ABSTRACT

Introduction: Sciatic nerve injury may cause paresthesias and hypoesthesias, severe neuropathic pain, and paralysis. Neurolysis can improve function, pain, and quality of life for these patients. The objective of this paper is to evaluate the clinical-functional outcomes of a series of patients with neuropathic pain due to sciatic nerve injury that was refractory to conservative treatment in whom neurolysis was performed. **Materials and Methods:** A retrospective case series of patients operated on for neurolysis of the greater sciatic nerve between March 2009 and June 2018 was analyzed. Preoperative and postoperative pain were evaluated using the visual analog scale (VAS) and the Likert scale. The type of postoperative pain was evaluated using the DN4 questionnaire, and the health-related quality of life was measured with the SF-36 questionnaire. **Results:** Eight patients were included. All patients evolved with a notable improvement in pain, with an average of 3 and 1.88 points on the VAS and Likert scales, respectively. The mean follow-up was 32 months (range 14–66). The DN4 questionnaire showed an average of 3.75 points (range 2–7). According to the SF-36, "Physical Health" was the variable with the worst results, with an average of 30.15. **Conclusions:** Sciatic nerve neurolysis in patients with neuropathic pain due to sciatic nerve injury and poor response to conservative treatment may improve pain and quality of life.

Keywords: sciatic neurolysis; neuropathic pain; SF-36 questionnaire; sciatic nerve injury.

Level of Evidence: IV

Resultados de la neurólisis como tratamiento del dolor neuropático en pacientes con lesión del nervio ciático. Reporte de casos

RESUMEN

Introducción: La lesión del nervio ciático puede ocasionar desde parestesias e hipoesthesias, hasta dolor neuropático severo y parálisis. La neurólisis suele mejorar la función, el dolor y la calidad de vida de los pacientes. El objetivo de este estudio fue evaluar los resultados clínico-funcionales de una serie de pacientes con dolor neuropático por lesión del nervio ciático que no respondieron al tratamiento conservador y fueron sometidos a neurólisis. **Materiales y Métodos:** Se analizó retrospectivamente una serie de pacientes sometidos a neurólisis del nervio ciático mayor entre marzo de 2009 y junio de 2018. El dolor pre- y posoperatorio se evaluó mediante la escala analógica visual y la escala de Likert. El tipo de dolor posoperatorio se evaluó con el cuestionario DN4 y la calidad de vida relacionada con la salud, con el cuestionario SF-36. **Resultados:** Se incluyó a 8 pacientes. A los 32 meses de seguimiento promedio (rango 14-66), el dolor había mejorado notablemente (promedio de 3 y 1,88 puntos en las escalas analógica visual y de Likert, respectivamente). El cuestionario DN4 arrojó un promedio de 3,75 puntos (rango 2-7). Según el SF-36, la "salud física" fue la variable con peores resultados (promedio 30,15). **Conclusiones:** La neurólisis, cuando se indica a pacientes con mala respuesta al tratamiento conservador, es un método que alivia el dolor y mejora la calidad de vida de los pacientes con dolor neuropático secundario a una lesión del nervio ciático.

Palabras clave: Neurólisis del ciático; dolor neuropático; cuestionario SF-36; lesión del nervio ciático.

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INTRODUCTION

Sciatic nerve injury is a rare but potentially devastating complication.¹ The most common etiologies are: traumatic, compressive, ischemic, neoplastic and idiopathic.² Total hip arthroplasty (THA) represents the main cause of sciatic nerve neuropathy.³ Its incidence varies from 0.08% to 3.7% in primary replacements and up to 7.6% in revision surgeries.³⁻⁵

Neuropathy secondary to THA can result from compression of the nerve by bruising or osteosynthesis material, excessive traction from inappropriately placed retractors, tension generated due to excessive lengthening of the lower limb, and thermal injury from extrusion of surgical cement.⁶ The consequences of such an injury can range from paresthesia and hypoesthesia in the nerve distribution zone, to severe neuropathic pain and paralysis.⁷ Initial management of sciatic nerve neuropathy usually consists of conservative treatment with physiotherapy and orthosis to avoid equinus deformity, hoping that function will be restored over time.^{8,9} The first-line drugs to treat neuropathic pain are tricyclic antidepressants (particularly amitriptyline), dual antidepressants (duloxetine) and antiepileptics, such as gabapentin and pregabalin, the latter being the only drug that is indicated to treat central neuropathic pain.^{8,9} In all cases, psychological counseling is suggested, since neuropathic pain is often associated with sleep disorders, anxiety, and depression.^{8,9}

If conservative treatment fails and the pain persists, neurolysis of the sciatic nerve can be performed to free it from adhesions and retractable scar areas along its path.¹ Timely neurolysis can improve function, pain, and quality of life for patients.¹

The objective of this study was to evaluate the clinical-functional outcomes of a series of patients with neuropathic pain due to sciatic nerve injury, who had not responded to conservative treatment and underwent sciatic nerve neurolysis.

MATERIALS AND METHODS

A consecutive case series of eight patients who had failed conservative treatment and underwent neurolysis of the greater sciatic nerve between March 2009 and June 2018 was retrospectively analyzed. Conservative treatment had consisted mainly of physiotherapy, with muscle strengthening and transcutaneous electrical nerve stimulation for pain relief for 8-12 weeks along with first-line medication, such as pregabalin, in doses ranging from 150 to 300 mg/day.

All were operated on by the same surgeon. The data was extracted from the electronic medical record of our hospital. The study protocol was approved by the Ethics Committee for Research Protocols of our Institution (IRB 00010193).

Patients >18 years of age were included, with neuropathic pain due to sciatic nerve injury without response to medical-pharmacological treatment and with a minimum follow-up of 12 months.

At the most recent consultation, pre- and postoperative pain was assessed using a 10-point visual analogue scale (VAS), with 0 representing no pain and 10 representing the worst possible pain perceived by the patient. In turn, postoperative pain was evaluated using the 5-point Likert scale, where 1 represents “no pain”; 2, “little pain”; 3, “moderate pain”; 4, “severe pain” and 5, “extreme pain”. The amount of time that had passed until the change in pain type or absence of pain was assessed.

The DN4 questionnaire (Douleur Neuropathique 4)^{10,11} was also used to assess the type of postoperative pain, and a value ≥ 4 was considered positive for neuropathic pain. Although it is not part of the questionnaire, it was asked if the pain was identified or became more severe during the night. Physical activity and the subjective question “Is your current pain similar to what you were experiencing before the operation?” were used to assess postoperative pain.

The subjective degree of postoperative satisfaction was evaluated using the Likert scale (1 “very dissatisfied”, 2 “dissatisfied”, 3 “indifferent”, 4 “satisfied” and 5 “very satisfied”) and the 10-point VAS.

Health-related quality of life was analyzed using the SF-36 subjective sensation of well-being questionnaire (*Short Form-36 Health Survey*). In this study, the Spanish version of the Ware and Sherbourne SF-36 was used, adequately translated and validated under the name of *Cuestionario de Salud SF-36 estándar*.^{12,13} This survey evaluates eight dimensions of health status: physical functioning, limitation due to physical problems, bodily pain, social role, mental health, limitation due to emotional problems, vitality, energy or fatigue, and general perception of health.

Scores for each of these dimensions on the SF-36 range from 0 to 100. Values greater than 50 are considered positive health states, and a value of 100 indicates optimal health. Although the questionnaire is not designed for a

global index, cumulative scores can be obtained that describe health-related quality of life. These scores are analyzed by combining the following dimensions: cumulative measure of physical health (physical function, physical role, bodily pain, general health) and cumulative measure of mental health (emotional role, social function, mental health and vitality). **Table 1** summarizes the eight dimensions of the questionnaire.

Table 1. Content of the dimensions of the SF-36 questionnaire

Meaning of scores from 0 to 100			
Assessment	No. of Items	Worst Score (0)	Best Score (100)
Physical function	10	Very limited to carry out all physical activities, including bathing or showering, due to health	Carries out all kinds of physical activities including the most vigorous without any limitation due to health
Limitations due to physical problems	4	Problems with work or other daily activities due to physical health	No problem with work or other daily activities due to physical health
Limitations due to emotional problems	3	Problems with work and other daily activities due to emotional problems	No problem with work and other daily activities
Body ache	2	Very intense and extremely limiting pain	No pain or limitations due to it
General health	5	Evaluates own health as poor and believes that it may worsen	Evaluates own health as excellent
Vitality	4	Feels tired and exhausted all the time	Feels very dynamic and full of energy all the time
Social function	2	Extreme and very frequent interference with normal social activities, due to physical or emotional problems	Carries out normal social activities without any interference due to physical or emotional problems
Mental health	5	Feels anxious and depressed all the time	Feels happy, calm and peaceful all of the time

Taken from Vilagut G, et al. El Cuestionario de Salud SF-36 español: una década de experiencia y nuevos desarrollos (8,9,19)

Surgical technique

The patient was placed in the lateral or prone position, and general and spinal anesthesia was administered. In patients who had already undergone THA, the posterolateral approach was used for prosthesis replacement, extending proximally and distally. If the patient had not undergone a THA, a posterior approach was made following the gluteal fold from lateral to medial to the midpoint of the thigh where the approach was continued distally. At the proximal level, the intermuscular plane between the iliotibial band and the gluteus maximus was used to access the external rotators. The incision was continued distally over the posterior region of the thigh. The sciatic nerve was identified proximal, immediately distal to the quadratus femoris muscle insertion, and running between the gluteus maximus and the biceps femoris. The nerve was freed from surrounding scars and adhesions using microscopic binocular magnifying glasses at 3.5 magnification. When neuromas were visualized, a longitudinal epineurotomy was performed in order to perform fascicular decompression. Careful hemostasis was performed and the wound was closed in layers.

RESULTS

Eight patients were included in the study (2 men and 6 women; mean age at injury: 49 years [range 19-73]). Three died from causes unrelated to treatment and one was lost to follow up. The demographic variables evaluated are summarized in [Table 2](#).

Table 2. Demographic data.

Patient	Sex	Age at injury (years)	Age at time of surgery (years)	Time from injury to surgery (months)	Comorbidities	Cause of neurological injury
1	M	50	51	14	Smoking	Total hip replacement
2	M	19	19	1	-	Gunshot wound
3	F	53	59	78	Obesity	Total hip replacement
4	F	54	55	17	Smoking	Revision of total hip replacement
5	F	33	39	66	Smoking, diabetes	Acetabular fracture
6	F	54	58	46	Liver-kidney transplantation, chronic renal failure	Hip fracture
7	F	73	74	13	Obesity	Total hip replacement
8	F	64	64	8	-	Total hip replacement

M = male; F = female

50% of the patients suffered a sciatic injury due to elongation in a THA. One had a partial laceration secondary to a displaced acetabular fracture and another a compression injury secondary to a hematoma from a hip fracture. Three of the four patients included in the final evaluation were smokers. After an average of 32 months (range 14-66), pain had improved by more than 5 points in all patients: mean VAS score of 9.63 before surgery and 3 postoperatively. The score on the Likert scale for postoperative pain at the last follow-up was, on average, 1.88 (0-7/10). In the immediate postoperative period, pain had improved in 50% of patients ([Table 3](#)).

The DN4 questionnaire, the degree of postoperative satisfaction, and health-related quality of life were determined only in those patients included in the final evaluation. The DN4 questionnaire revealed neuropathic pain in only one patient (total mean 3.75 points; range 2-7). The four patients under follow-up reported preoperative nocturnal pain and continued to have pain during physical activity in the postoperative period. Only one patient remained with postoperative nocturnal pain. However, when compared to the preoperative period, all reported pain of lesser intensity and with different characteristics ([Table 3](#)).

The degree of postoperative satisfaction was, on average, 4.75 points according to the Likert scale and 9 points on the VAS ([Table 3](#)).

Table 3. Pre- and postoperative pain outcomes

Patient	VAS Pre-op pain	VAS Post-op pain	Likert scale - Post-op pain	Time until pain change	DN4 Questionnaire	Night pain Pre-op	Night Pain Post-op.	VAS Post-op satisfaction	Likert scale Post-op satisfaction	Activity post-op pain
1	10/10	3/10	2	Immediate post-op period	3/10	Yes	No	10/10	5	Yes
2	10/10	6/10	3	Immediate post-op period	-	-	-	-	-	-
3	10/10	0/10	1	9 months	-	Yes	-	-	-	-
4	10/10	2/10	1	Immediate post-op period	2/10	Yes	No	10/10	5	Yes
5	9/10	7/10	3	3 months	7/10	Yes	Yes	6/10	4	Yes
6	9/10	0/10	1	1 month	-	-	-	-	-	-
7	10/10	6/10	3	3 months	-	-	-	-	-	-
8	9/10	0/10	1	Immediate post-op period	3/10	Yes	No	10/10	5	Yes

VAS = visual analog scale; pre-op. = preoperative; post-op. = postoperative; DN4 = Douleur Neuropathique 4 Questionnaire

The results of the SF-36 are summarized in [Table 4](#). 75% of the patients had severe limitations in work activities and daily life activities due to physical problems; the results in these dimensions were 0%. With an average percentage of 31.25% (range 25-40%), all demonstrated physical function below the positive state of health. One patient had severe limitations due to emotional problems, two achieved a positive state of health and another reached an optimal level. In the “vitality” dimension, one patient reported being exhausted and tired most of the time. Regarding the “mental health” field, none qualified it as bad and all maintained that it could possibly improve. The item “body pain” failed to reach a positive state of health in any of the three patients; however, all considered themselves to have acceptable “general health” ([Table 4](#)).

Table 4. Results of the SF-36 questionnaire

Assessment	SF-36 questionnaire (%)			
	Patient 1	Patient 4	Patient 5	Patient 8
Cumulative measure of physical health				
Physical function	35	25	40	25
Limitations due to physical problems	0	25	0	0
Body ache	12.5	45	35	35
General health	40	65	60	40
Cumulative measure of mental health				
Limitations due to emotional problems	0	100	66.7	55
Vitality	20	60	50	50
Mental health	60	76	60	60
Social function	25	25	75	25

In terms of cumulative measures, “physical health” had the lowest average of 30.15 points, compared to the cumulative measure of mental health (50.48); a positive global health status was obtained (Table 4).

DISCUSSION

Sciatic nerve palsy has an uncertain prognosis.¹⁴ The nature of the original nerve injury, as well as the duration of the aggression, are critical factors in determining prognosis.¹⁴ This prognosis is also influenced by the patient’s age, the duration of denervation, the anatomical level of the injury, and the associated injuries.¹⁵ Favorable results have been described in patients <64 years of age.³ Younger people have better nerve recovery because they have more neuronal growth and plasticity.¹⁵ In our study, the youngest patient had the worst recovery and the oldest had the best recovery. However, this could be due to the nature of the injury and the time evolution from the original injury to the procedure. The patient who had the greatest postoperative pain had sustained sciatic nerve injury from a displaced acetabular fracture secondary to high-energy multiple trauma. Azcuénaga et al. published a series of patients with acetabular fracture in the context of high-energy trauma.¹⁶ Two of these patients had sciatic nerve neuropraxia that completely reversed in an average of three months, but clinical outcomes were unfavorable.¹⁶

Although sciatic nerve injuries are often treated conservatively in the first instance, it is important to consider whether early intervention may benefit the patient.¹⁶ Following a maximum of four months of follow-up, surgical treatment should be considered.⁷ However, most authors agree that positive outcomes can be obtained up to 12 months after injury.³ The time from injury to neurolysis in our series varied greatly, with patients treated within 14 months of injury showing marked improvement compared to those treated later.

Neuropathic pain is caused by a somatosensory system injury, such as structural damage to the nociceptive pathways, peripheral receptors, or conduction pathways. This determines that a stimulus is not necessary for the pain to manifest.¹⁷ Complex regional syndrome, especially type II with an identifiable nerve injury (causalgia), is one of the differential diagnoses to consider with neuropathic pain.¹⁸ Its diagnosis is primarily clinical and is based on the Budapest Diagnostic Criteria, which the patients in this study did not meet.¹⁸

Pritchett et al. concluded that both sympathectomy and neurolysis could be beneficial in reducing dysesthetic pain by producing marked improvement in properly selected patients in whom conservative treatment has failed.¹⁹

Regardless of the time of evolution, 88% of the patients evaluated had a notable change in both the intensity and the characteristics of the pain after surgery. Only one continued to have moderate postoperative pain, with a VAS score of 7/10. This is consistent with the results obtained in the DN4 questionnaire, in which 75% obtained values below 4, absence of postoperative nocturnal pain and exacerbation during physical activity, which was interpreted as absence of neuropathic pain.

As previously reported in other series,^{2,19} the degree of postoperative satisfaction assessed using the Likert scale and the VAS reached a high level, indicating that the patients were satisfied with the surgical treatment regardless of the results obtained.

In terms of functional outcomes, the SF-36 revealed a significant decrease in the four patients’ cumulative measure of “physical health.” This implies a limitation in carrying out work and other daily activities, either due to pain or physical disability, in which the patient perceives a lower performance, greater difficulty, or even impossibility. Although one patient reported severe interference of emotional problems in the usual socio-professional life, acceptable scores in the areas of general health, vitality, and mental health can be observed in the other three patients; this implies that, after the surgery, they did not see their perspective of health or their feeling of energy diminished, reaching a cumulative measure of positive “mental health”. It is important to note that the SF-36 measures the general health perceived by the patient and is not disease specific; thus, the comorbidities or associated conditions of patients undergoing sciatic neurolysis can be seen reflected in the questionnaire results.

The limitations of this study are those inherent to its retrospective nature. Likewise, and despite being a low-prevalence complication, we have a low number of patients, so it is not possible to perform a statistical significance analysis. On the other hand, we do not have a control group with conservative treatment.

However, we believe that patients treated with sciatic nerve neurolysis will perceive a relief of neuropathic pain even in late stages of the condition.

CONCLUSION

Neurolysis for those who do not respond to conservative treatment is a method that improves pain and quality of life in patients with neuropathic pain secondary to sciatic nerve injury.

Conflict of interest: The authors declare no conflicts of interest.

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