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EPIDUROLYSIS IN THE TREATMENT OF CHRONIC BACK PAIN - RETROSPECTIVE ANALYSIS

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ABSTRACT

Background: Low back pain is the most common reason patients seek care at pain management clinics and represents a significant public health issue. The Ratz procedure, or epidurolysis, is a minimally invasive technique aimed at reducing pressure on spinal nerve roots to relieve pain intensity.

Methods: This retrospective study evaluated the effectiveness of epidurolysis in reducing both nociceptive and neuropathic pain. It included 50 patients treated at the Department of Anesthesiology, Intensive Care and Pain Therapy of University Hospital Centre Sestre milosrdnice (Zagreb, Croatia) over the past five years, for whom sufficient clinical data were available. Pain was assessed using two validated tools: the Numeric Rating Scale for nociceptive pain and the Pain Detect questionnaire for neuropathic pain. The study group consisted of 50 patients (14 men and 36 women) aged 28 to 85 years.

Results: Results showed a statistically significant reduction in pain intensity following epidurolysis. Three weeks after the procedure, mean pain scores were significantly lower compared to pre-treatment values ($p < 0.01$). Although there was a slight increase in pain at the six-month follow-up, it remained significantly lower than baseline levels ($p < 0.05$). Both nociceptive and neuropathic components of pain showed measurable improvement, indicating a broad therapeutic effect of the procedure.

Conclusions: This study confirms that epidurolysis leads to a significant reduction in low back pain, affecting both nociceptive and neuropathic components. These findings support the use of epidurolysis as an effective minimally invasive option for managing chronic low back pain in clinical practice.

Keywords: *Epidural adhesiolysis, epidurolysis, chronic radicular pain, low back pain.*

INTRODUCTION

One of the most common forms of chronic pain is low back pain (LBP), which is a leading cause of global disability and the most frequent reason for visits to pain clinics (1,2,3). It may be accompanied by radicular symptoms such as paraesthesia and motor deficits, often due to nerve compression, for example, of the lateral femoral cutaneous nerve (4,5). It is typically radiated down the leg with a positive straight leg raise test (6). The annual incidence of first-episode LBP ranges from 6.3% to 15.4%, with remission occurring in 54–90% of cases, although recurrences are common (24–80%) (7). Prevalence increases until around the age of 60, then declines. Although the percentage prevalence of LBP slightly decreased (from 8.2% to 7.5%), the total number of affected individuals rose from 377.5 million in 1990 to 577 million in 2017 (8). Disability due to LBP increased by 52.7%, with a higher burden among women and individuals aged 45–49 (8,9). Prevalence has doubled in the past decade, significantly impacting work capacity (10). Causes include intervertebral disc protrusion, spinal stenosis, disc degeneration, and osteoarthritis (11). Pain stimuli activate nociceptors that transmit signals to higher brain centers, and prolonged stimulation can cause peripheral and central sensitization, leading to chronic pain (10). While these causes are typically non-surgical, chronic pain may also arise from surgical complications such as epidural fibrosis (EF) (12). The most affected regions are L4–L5 and L5–S1, where approximately 90% of lumbosacral radiculopathies occur (8). Causes can be compressive, inflammatory, traumatic, infectious, vascular, or neoplastic (3). Epidural fibrosis (EF) is a common postoperative complication and a cause of failed back surgery syndrome (FBSS). It is associated with perioperative bleeding and poor hemostasis, and the risk increases with reoperations (up to 60%) (11,13,19). Differentiation between musculoskeletal and radicular pain is crucial in diagnosis (15,16). Conservative treatment methods (physical therapy, analgesics, NSAIDs, opioids) are the first step, followed by

minimally invasive procedures when unsuccessful. These include epidurolysis (epidurolysis), percutaneous laser decompression, radiofrequency ablation, spinal cord stimulation, ozone therapy, and transforaminal blocks (17). Epidural adhesiolysis or epidurolysis (epidurolysis), developed in 1989 (18), is used for FBSS, spinal stenosis, and radiculopathies caused by disc herniation (19). Its goal is to break down epidural fibrosis and improve medication distribution to affected nerve roots.

The procedure is performed under fluoroscopy; a catheter is inserted and rotated 15° for better targeting (20). Once position is confirmed, 1500 IU of hyaluronidase in 10 ml saline is administered, followed by a combination of 0.2% bupivacaine and 4 mg dexamethasone, with optional sufentanil (20). Hyaluronidase improves tissue permeability, and local anesthetics and corticosteroids provide analgesic and anti-inflammatory effects (21,22,23). Ropivacaine is used as a safer alternative. Clinical studies confirm the effectiveness of LOA; Ross et al. report radicular pain to be 3.2 times more common in the presence of EF (24). While Trescot et al. highlight additional benefits such as cytokine flushing and improved microcirculation (25). Manchikanti et al. reported pain reduction in 97% of patients at 3 months, 93% at 6 months, and 47% after one year (23,26). Most patients are discharged the same day after the procedure. Rehabilitation includes patient education on "neural flossing" exercises, performed twice daily on a firm surface without a pillow, along with gradual introduction of walking and aerobic activity (27).

While effective, epidurolysis carries potential risks, like those associated with epidural catheter use in obstetrics. Complications can arise from the procedure itself or from the drugs used. The most common include accidental dural puncture, drug administration into the subarachnoid/subdural space, catheter shearing, infections, and hemodynamic instability (28). Procedure-related complications occur immediately, while drug-related ones may appear later. Infections may affect the entry site, epidural space (abscess), or spread to cause meningitis. The catheter may pierce the dura, migrate into veins or other tissues, increasing the risk of fibrosis and irritation. Hemodynamic instability, though rare, may result from stress-induced cardiomyopathy triggered by elevated catecholamines from drug combinations. Due to these, albeit rare, risks, epidurolysis should be performed only in centers of excellence.

The aim of this study was to determine the extent to which pain in the lower back is reduced after the epidurolysis procedure, with a focus on nociceptive and neuropathic pain.

METHODS

A retrospective study was conducted at the University Hospital Centre Sestre milosrdnice in Zagreb with the primary aim of evaluating the clinical effectiveness of epidurolysis in reducing both nociceptive and neuropathic components of chronic low back pain. Chronic low back pain represents one of the leading causes of disability worldwide, and patients who fail to respond to conservative management options—including physical therapy, pharmacological treatment, and minimally invasive injections—pose a significant therapeutic challenge. Epidurolysis, also referred to as percutaneous adhesiolysis, has been increasingly adopted as a minimally invasive option designed to break down epidural adhesions, restore nerve root mobility, and improve drug delivery into the epidural space. This study sought to assess the degree of pain reduction achieved with epidurolysis and to evaluate its impact on medication use, with particular focus on opioid requirements, in a real-world clinical setting.

PAIN ASSESSMENT

Pain intensity was evaluated using two validated instruments. Nociceptive pain was measured with the Numeric Rating Scale (NRS), which ranges from 0 (no pain) to 10 (worst imaginable pain). Neuropathic pain was assessed with the standardized Pain Detect Questionnaire (PD-Q), which has a scoring range of 0–38. For interpretation, scores were categorized into three groups: 0–12 = negative for neuropathic pain, 13–18 = unclear, and ≥19 = positive for neuropathic pain. A validated Croatian version of the PD-Q was employed in this study to ensure linguistic and cultural accuracy.

ELIGIBILITY CRITERIA

Inclusion criteria comprised patients with chronic low back pain who had undergone epidurolysis and who had complete results from the NRS, PD-Q, and analgesic consumption records across all three time points. Patients were excluded if they had incomplete datasets or if they underwent additional pain-related interventions during the follow-up period, as these factors could confound the results.

ANALGESIC CONSUMPTION

Medication use was evaluated and categorized into four distinct groups: (1) never, (2) occasional use, (3) regular use of weak opioids, and (4) regular use of strong opioids. This categorization allowed for analysis of potential reductions in analgesic requirements following epidurolysis.

STATISTICAL ANALYSIS

Descriptive statistics were used to summarize patient demographics, pain scores, and analgesic use. To compare changes across the three assessment points and between subgroups, non-parametric statistical tests were applied, given the relatively small sample size and non-normal distribution of some variables. The tests included the Sign test, Friedman test, Wilcoxon Signed Ranks test, Mann–Whitney U test, and Spearman's rank correlation. Statistical significance was defined as $p < 0.05$. All analyses were conducted using IBM SPSS Statistics, version 21 (IBM Corp., Armonk, NY, USA).

RESULTS

The study sample consisted of 50 patients, including 14 men (28%) and 36 women (72%), with a mean age of 56 years. No statistically significant sex-related differences were observed in baseline characteristics or outcome measures; therefore, analyses were performed on the total cohort. Pain intensity, assessed with the Numeric Rating Scale (NRS), demonstrated a significant change across the three evaluation time points. Prior to epidurolysis, the mean NRS score was 7.12, reflecting a high level of pain intensity. At the three-week follow-up, a marked improvement was observed, with the mean NRS score decreasing to 2.94. This reduction was both clinically relevant and statistically significant ($p < 0.01$). At the six-month follow-up, a slight increase in pain intensity was noted, with the mean NRS score rising to 3.68. Despite this increase compared to the three-week results, the score remained significantly lower than the pre-procedure baseline ($p < 0.01$), indicating sustained benefit from the intervention (Figure 1).

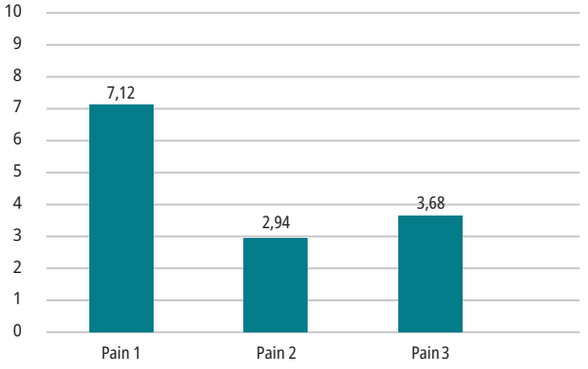

Figure 1. Mean pain intensity values across three time points (NRS scale)

A comparable trend was observed in the evaluation of neuropathic pain using the Pain Detect Questionnaire (PD-Q). Both total and final scores demonstrated a statistically significant reduction following epidurolysis ($p < 0.01$). The highest PD-Q scores, reflecting more pronounced neuropathic pain characteristics, were recorded prior to the procedure. At the three-week follow-up, the scores decreased to their lowest values, indicating a substantial alleviation of neuropathic pain symptoms. By six months, a mild increase in PD-Q scores was noted; however, the values remained significantly lower than baseline, confirming a sustained therapeutic benefit.

According to PD-Q categorization (0–12 = negative neuropathic pain, 13–18 = unclear, ≥19 = positive neuropathic pain), the distribution of patients shifted favorably after treatment. Prior to epidurolysis, a substantial proportion of patients scored within the "positive neuropathic pain" range. At three weeks, the majority transitioned into the "negative" or "unclear" categories, consistent with the observed clinical improvement. At six months, although some scores increased, the distribution continued to indicate reduced neuropathic pain compared to baseline. These trends are illustrated in Figure 2, further supporting the effectiveness of epidurolysis in addressing neuropathic pain components. A validated Croatian version of the PD-Q was applied in all assessments.

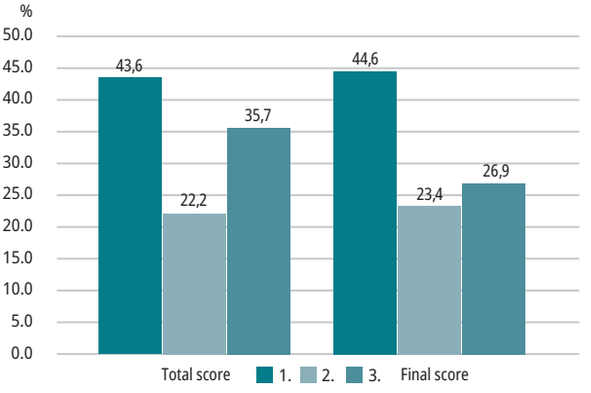

Figure 2. Mean Pain Detect questionnaire scores across three time points (baseline, 3 weeks, and 6 months).

A weak but statistically significant negative correlation was found between patient age and pain intensity three weeks after the procedure, indicating that older patients reported lower NRS scores at this time point ($p < 0.05$). Conversely, age was positively correlated with neuropathic pain, as older participants demonstrated higher PD-Q scores ($p < 0.05$). These findings suggest that while older patients may experience greater relief in nociceptive pain following epidurolysis, neuropathic pain features may persist or be more pronounced in this subgroup. A validated Croatian version of the PD-Q was employed in all assessments, with categorical interpretation applied as follows: 0–12 = negative neuropathic pain, 13–18 = unclear, ≥19 = positive neuropathic pain.

In addition to pain outcomes, a statistically significant shift in analgesic consumption patterns was observed across the study period ($p < 0.01$). Prior to epidurolysis, most patients reported regular use of strong opioids. By six months post-procedure, this reliance had markedly decreased: approximately two-thirds of patients used analgesics only occasionally, 28% were taking weak opioids on a regular basis, and only 6% remained on strong opioids. These changes, summarized in Table 1, highlight the impact of epidurolysis not only on pain reduction but also on decreasing the need for high-dose opioid therapy.

Table 1. Distribution of analgesic use by category at baseline and 6 months after epidurolysis

Analgesic use category	1st measurement		2nd measurement (6 months after epidurolysis)	
	N	%	N	%
never	0	0%	0	0%
occasionally / as needed	0	0%	33	66.0%
regular use, weak opioids	5	10.0%	14	28.0%
regular use, strong opioids	45	90.0%	3	6.0%

For each patient, comorbidities, diabetes, and history of spinal surgery were recorded. Most participants had no prior spinal surgery (62%), no comorbidities (64%), and did not have diabetes (93%) (Table 2).

Table 2. Distribution of comorbidities, diabetes, and prior spinal surgery

Variable		No	Yes
Prior surgery	N	31	19
	%	62%	38%
Comorbidity	N	32	18
	%	64%	36%
Diabetes mellitus	N	46	4
	%	92%	8%

DISCUSSION

A retrospective study was conducted at the University Hospital Centre Sestre milosrdnice with the primary aim of evaluating the effectiveness of epidurolysis in reducing both nociceptive and neuropathic components of chronic low back pain. A total of 50 patients met the inclusion criteria, and pain intensity was systematically assessed at three distinct time points: before the procedure, three weeks after the intervention, and six months following the treatment. Nociceptive pain was measured using the well-established Numeric Rating Scale (NRS), while neuropathic pain was evaluated using the standardized Pain Detect Questionnaire (PD-Q), which has been extensively validated and is widely used in both clinical practice and research settings. Data were retrospectively extracted from the hospital information system. For interpretation of PD-Q results, standard cut-off categories were applied: 0–12 = negative neuropathic pain, 13–18 = unclear, and ≥19 = positive neuropathic pain. To ensure cultural and linguistic appropriateness, a validated Croatian version of the questionnaire was employed.

The results demonstrated a clear and statistically significant reduction in pain intensity following epidurolysis ($p < 0.01$). At baseline, the mean NRS score exceeded 7, reflecting severe pain and substantial impairment in daily functioning. Three weeks after the procedure, the mean score had dropped to below 3, representing a dramatic and clinically meaningful improvement. At the six-month follow-up, a slight increase was observed, with the mean score rising to just under 4. Despite this small rebound, the level remained significantly lower than baseline ($p < 0.05$). It is noteworthy that several patients reported complete absence of pain (NRS = 0) at three weeks, an outcome that was not observed in any patient before treatment, when all reported pain levels above 4. These findings highlight not only the rapid onset of pain relief but also its sustained effect over time.

In terms of neuropathic pain, a similarly favorable trend was observed. The mean PD-Q score decreased from 16.96 at baseline (within the "unclear" category) to 8.88 three weeks after the procedure, moving the group average into the "negative" category. At six months, scores rose modestly to 10.24 but remained well within the negative range. These reductions were statistically significant ($p < 0.05$), underscoring that epidurolysis can achieve meaningful and lasting improvement in neuropathic pain features in addition to nociceptive pain. While the slight increase between the second and third assessments suggests some degree of symptom recurrence, the overall trajectory remained strongly favorable, reinforcing the durability of the treatment's benefits.

Analgesic use was also markedly reduced at six months after the intervention. Prior to treatment, most patients required regular administration of strong opioid analgesics, reflecting the severity and refractory nature of their pain. Following epidurolysis, however, most patients shifted to taking medication only on an as-needed basis. At six months, just 6% of patients continued to rely on strong opioids, nearly one-third were using weak opioids regularly, and the remainder required no medication or only occasional doses. These changes are clinically significant, as they reflect not only improved pain control but also a reduced dependence on opioids, which are associated with substantial risks including tolerance, dependence, and adverse side effects. Comparable outcomes were reported by Manchikanti et al., who noted a decrease in opioid use from 74% to 40% within 12 months of epidurolysis, lending further external support to these findings (29).

Subgroup analyses provided additional insights. Patients with medical and psychiatric comorbidities initially reported higher pain scores compared to those without such conditions. However, after treatment, these differences diminished, with

pain levels becoming comparable between groups. Psychiatric comorbidities such as depression and anxiety, which are commonly associated with chronic pain syndromes, are known to heighten the subjective perception of pain and complicate management strategies (30,31). The findings highlight the importance of adopting a multidisciplinary approach that not only addresses the physical aspects of pain but also provides psychological and behavioral support to optimize outcomes.

Patients with a history of spinal surgery, comprising 38% of the study sample, demonstrated slightly higher pain scores at six months compared with those without prior surgery (mean NRS = 4.32 vs. 3.29). Although this difference was statistically significant ($p < 0.05$), it did not exceed the commonly accepted threshold for clinical relevance, defined as a ≥2-point change on the NRS. A similar pattern was observed in neuropathic pain scores (10.37 vs. 8.13). These findings are consistent with the hypothesis that scar tissue formation and structural alterations following spinal surgery may reduce the effectiveness of epidurolysis. This interpretation is supported by previous research on failed back surgery syndrome (FBSS), where adhesions have been implicated as a cause of persistent pain in 20–36% of patients (32). The results of this study agree with international evidence, supporting the role of epidurolysis as a valuable treatment option for patients with refractory chronic low back pain. Donato et al., in a prospective cohort study of 234 patients, reported significant long-term improvements in both pain and function, with benefits sustained over 48 months and most pronounced at the three-month mark (33). Another comparative study demonstrated that endoscopic adhesiolysis produced superior short-term outcomes compared to the percutaneous approach (34). Furthermore, in a randomized, double-blind trial, Manchikanti et al. reported significant improvements in pain relief, functionality, and psychological well-being in 80% of patients at three months, with benefits maintained in 56% at six months, and without significant adverse effects (29). These findings, taken together, strengthen the case for epidurolysis as an effective and well-tolerated intervention.

LIMITATIONS

This study has several limitations that must be considered. Its retrospective design limits the ability to control for confounding variables and introduces potential bias. The absence of a control group makes it difficult to attribute improvements exclusively to the intervention. In addition, the modest sample size restricts statistical power and reduces the generalizability of the results. Nonetheless, this study contributes meaningful real-world data and adds to the growing body of evidence supporting epidurolysis. Future research should focus on prospective, randomized controlled trials with larger sample sizes and longer follow-up durations to confirm these findings and to better define the patient populations most likely to benefit from the procedure.

CLINICAL IMPLICATIONS

Epidurolysis should be considered in patients with chronic low back pain who do not respond adequately to conservative therapies such as pharmacological treatment, physical therapy, or minimally invasive injections. The procedure not only provides meaningful reductions in pain but also reduces opioid dependence, supporting safer long-term management strategies. Careful patient selection remains essential, particularly in individuals with psychiatric comorbidities or prior spinal surgery, as these groups may experience slightly less pronounced benefits. Incorporating epidurolysis into a multidisciplinary pain management program may optimize outcomes by addressing both physical and psychological components of chronic pain.

CONCLUSIONS

Epidurolysis represents a safe, effective, and minimally invasive therapeutic option for patients with chronic low back pain who are unresponsive to conventional conservative treatments. The procedure was shown to significantly reduce both nociceptive and neuropathic pain, with improvements sustained for at least six months after treatment. In addition to reducing pain intensity, epidurolysis contributed to enhanced quality of life and functionality, while also markedly decreasing reliance on opioid analgesics—an outcome of increasing clinical relevance given the risks of long-term opioid therapy. Although certain subgroups, such as patients with psychiatric comorbidities or a history of spinal surgery, demonstrated slightly higher residual pain scores, the overall clinical outcome remained favorable, with most patients reporting meaningful pain relief and reduced analgesic consumption. These findings support epidurolysis as a valuable component of multidisciplinary pain management strategies. However, the retrospective nature and limited sample size of this study underscore the need for future prospective randomized controlled trials with larger populations. Such studies will be essential to confirm these results, better define the long-term benefits, and identify the patient subgroups most likely to achieve optimal outcomes.

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