The Value of Short-Term Pain Relief in Predicting the One-Month Outcome of Lumbar Transforaminal Epidural Steroid Injections

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■ BACKGROUND: **Clinical management after epidural steroid injections of patients with radiculopathy secondary to a lumbar disc herniation is uncertain. It is the aim of this study to determine whether short-term alleviation of leg pain after computed tomography–guided transforaminal epidural steroid injections can predict the 1-month outcome.**

■ METHODS: **Prospective observational study of 57 patients at a tertiary radiological department. Study components were visual analog scale leg and back pain at baseline, 15, 30, 45 minutes, 1, 2, and 4 hours, on days 1–14, as well as at 1 month. Health-related Quality of Life and functional impairment were assessed with the Short Form-12 and Oswestry Disability Index. Patients who reported >80% persisting leg pain, as well as patients who underwent a second injection or an operation within 1 month, were defined as nonresponders. Logistic regression was used to analyze the effect size of the relationship between >50% pain relief at any given study visit and responder status.**

■ RESULTS: **Patients experiencing a >50% pain reduction 4 hours after the injection were 3.38 times as likely to be responders as those experiencing ≤50% pain reduction (odds ratio 3.38, 95% confidence interval 1.07–10.65). The effect decreased between days 1 and 2, reappeared on day 3, was strongest on day 6 (odds ratio 6.87, 95% confidence interval 1.99–23.72), and remained significant until day 14.**

■ CONCLUSIONS: **The results of this study can guide physicians in managing patients with lumbar disc herniation: a ≤50% leg pain relief within 1 week after a transforaminal epidural steroid injection predicts an unfavorable 1-month outcome and suggests that other treatment options may be considered.**

INTRODUCTION

Epidural steroid injections (ESIs) as a nonsurgical treatment option for radicular pain secondary to a lumbar disc herniation (LDH) have become more and more popular in the last decades[1]; however, their value remains controversial because the underlying mechanism is not completely understood[1] and scientific evidence of their efficacy is scarce, with only a few randomized controlled trials[2-14] and well-conducted studies[15-21] available. Both anti-inflammatory effects and wash-out effects have been suggested to have therapeutic impact.[1] Establishing a true placebo is notoriously difficult because "sham" ESI with saline solution have been shown to be similarly effective.[5,6] Outcomes vary significantly, and multiple aspects of clinical decision-making remain uncertain.

In terms of establishing predictive factors, Ghahreman et al.[22] analyzed nerve root compression degrees in patients recruited in a preceding controlled trial[3] for transforaminal epidural steroid injections (TFESIs). They found the success rate for patients with low-grade compression LDH to be 75%. This rate decreased to 26% for patients with high-grade compression LDH. A subgroup analysis[23] of another randomized controlled trial[6]

Key words
- Back pain
- Lumbar disc herniation
- Nerve root
- Radicular pain
- Tranforaminal epidural steroid injection

Abbreviations and Acronyms
CT: Computed tomography
ESI: Epidural steroid injection
HrQoL: Health-related Quality of Life
LDH: Lumbar disc herniation
MRI: Magnetic resonance imaging
ODI: Oswestry Disability Index
SF-12: Short Form-12
TFESI: Transforaminal epidural steroid injection
VAS: Visual analog scale

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revealed significantly different outcomes of efficacy and cost-effectiveness for contained and extruded LDH.

A retrospective analysis of magnetic resonance imaging (MRI) characteristics[24] showed that only location and degree of nerve root compression were predictive for treatment response; type,[24] hydration,[24] or size of the herniated disc[24,25] were not predictive. The question when to exactly declare ESI a failure remains. In a previous study, the response at 2 weeks post-TFESI was associated strongly with 2-month outcomes[20]; however, the response to TFESI within the first 2 weeks and its significance pertaining to the mid- and long-term outcome still is unknown.

In case of a temporary positive response to ESI, it is unclear if and when repeat ESI should be performed or whether surgical treatment should be recommended. A key task in managing patients with radicular pain is to avoid unnecessary surgery, but at the same time, disabling pain and incapacitation for work should not be prolonged if nonsurgical treatment does not show the desired effect. Identifying ESI responders and non-responders clinically at an early stage is desirable to prevent chronification of pain and depression, as well as financial burdens of sick leave and health care expenditures. Hence, the current study addresses the question whether short-term pain relief after lumbar TFESI for LDH is a predictor of the subsequent 1-month outcome.

MATERIALS AND METHODS

We prospectively screened all patients between 18 and 70 years of age with lumbar radicular pain, with or without findings of radiculopathy, secondary to a single-level LDH who were referred to the Department of Radiology at Cantonal Hospital St. Gallen in Switzerland between August 2013 and December 2014 for study inclusion. Referring physicians were general practitioners, pain physicians, rheumatologists, orthopedic surgeons, and neurosurgeons. For study inclusion, MRI had to show a LDH, which corresponded with clinicial symptoms of radicular pain. Before inclusion, diagnoses and imaging findings were confirmed by A.N., a radiologist with special interest and more than 20 years of expertise in ESI, who also performed all the interventions. Study exclusion criteria are listed in Table 1.

Baseline Parameters

Before TFESI, we collected patient demographic data and profession according to the International Standard Classification of Occupation,[26] work capacity, current use of opioids and symptom duration, as well as baseline intensity of leg and back pain measured with the visual analog scale (VAS) (0–100 mm). Health-related Quality of Life (HrQoL) and functional impairment were assessed with the Short Form-12 (SF-12) questionnaire and the Oswestry Disability Index (ODI). For intraspinal and foraminal LDH, the degree of nerve root compression was rated in accordance with the standards set by Pfirrmann et al.[27] and Lee et al.,[28] respectively. Like Ghahreman et al.[22] we broke the grading system down to either low-grade (grades 0 and 1) or high-grade compression (grades 2 and 3).

Injection Technique

All injections were performed under computed tomography (CT) guidance (Siemens Somatom Emotion, Munich, Germany) in CT fluoroscopy mode. The transforaminal technique, which has been shown previously to be equally[8,29] or even more effective[4,12,17] than the interlaminar technique, was used in accordance with our standardized protocol. An illustration of the procedure is shown in Figure 1. The patient was in prone position and the correct level was determined with a lateral CT topogram. The posterior entry point was marked, disinfected with isopropyl and propyl alcohol with 2-phenylphenol (Kodan forte; Schülke & Mayr AG, Zurich, Switzerland), and draped in a sterile manner. 1% lidocaine (Lidocain Streuli; Streuli Pharma AG, Uznach, Switzerland) was applied as local anesthesia with a Terumo Agani Needle, 18G, Short Bevel (Zhejiang Kindly Medical Devices Co., Ltd., Zhejiang, China; Shanghai International Holding Corp. GmbH [Europe], Hamburg, Germany). A Chiba needle (Ecojekt 23G, 15 cm length; HS Hospital Service S.p.A., Aprilia, Italy) was used as a stylet and

Table 1. Exclusion Criteria for Study Participation

Patient Characteristics/History	Comorbidities	Imaging
Age <18 or >70 years	Allergy against steroids or local anesthetics	Multilevel disc herniations
VAS leg pain < 20/100 mm	Known bleeding diasthesis	Spinal/foraminal stenosis
Pseudoradicular pain	Thrombocytes < 50.000/μL	Severe scoliosis
Red flag: greater motor deficit (BMRC 0–3)	Quick <50%, INR >1.5, PTT >38 seconds	Myelopathy
Red flag: cauda equina syndrome	Continued anticoagulants (acetylsalicyclic acid and clopidogrel may be continued)	Spinal fracture
Previous spinal surgery of the affected segment	Active neoplasm	Discrepancy between imaging findings and symptoms
Previous injection of the affected segment	Rheumatic disease	
History of spinal infection/spondylodiscitis	Local or systemic infection	
Pregnancy		
Significant language barrier		

VAS, visual analog scale; BMRC, British Medical Research Council; INR, international normalized ratio; PTT, partial thromboplastin time.