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"Blind" interlaminar epidural steroid injections in lumbar spinal stenosis; effective and safe technique in elderly patients

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Abbreviations

BESI – blind interlaminar epidural injection
ECG – electrocardiogram
ESI – epidural steroid injections
HD – herniated disc
G – gauge
LBP – low back pain
LSS – lumbar spinal stenosis
NIBP – non-invasive blood pressure
NSAIDs – nonsteroidal anti-inflammatory drugs
PA – physical activity
SEM – standard error of mean
VAS – visual analogue scale

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Abstract

Background and purpose: Blind interlaminar epidural steroid injection (BESI) is one of the treatment modalities for lumbar spinal stenosis (LSS). There are a growing number of elderly patients with LSS. The optimal timing and outcome of BESIs in this population are not well defined, which is the aim of this study.

Patients and methods: Thirty patients aged 67 ± 1.5 yrs, with diagnosis of LSS and refractory pain were recruited during year 2010 and followed up for 12 months. "Blind" epidural in corresponding interspace was performed with 18G Tuohy needle, using loss of resistance. The epidural mixture (10 ml) consisted of 80 mg of triamcinolone acetonide and 40 mg of lidocaine. Each patient received in total 3 BESIs every 3 weeks (BESI1, BESI2, BESI3). The pain was evaluated with visual analogue scale (VAS) before first BESI (VAS0) and after each treatment (VAS1, VAS2, VAS3). Subjective quality of performing the same physical activity (PA) was evaluated with simple 3-points scale (0 = no change, 1 = slight improvement, 2 = significant improvement).

Results: BESI resulted in significant reduction of VAS (VAS0 8.1 ± 0.3 , VAS1 5.8 ± 0.2 , VAS2 4.9 ± 0.2 , VAS3 4.4 ± 0.3 ; $F=87.57$, $P < 0.001$) – all pair-wise comparisons were significantly different in post-hoc analysis ($P < 0.001$), except VAS2 vs VAS3 having borderline significance ($P=0.06$). Subjective quality of physical activity significantly improved regarding baseline conditions (BESI1 PA score: 0=1/30, 1=7/30, 2=22/30 patients; BESI2 PA score: 0=1/30, 1=5/30, 2=24/30 patients; BESI 3 PA score: 0=4/30, 1=6/30, 2=20/30 patients; $\chi^2=3.7$, $p=0.45$). The average duration of successful BESI treatment was 6.3 ± 0.8 months (range 1–12). There were no reported complications.

Conclusions: Blind interlaminar epidural steroid injections (in total 3 injections every 3 weeks) resulted in significant reduction of pain and improvement of physical activity in elderly patients with LSS. It could be regarded as effective and safe procedure in this population.

INTRODUCTION

Chronic low back pain (LBP) is a very common symptom reported in all age groups (1). Mechanical LBP and herniated disc (HD) syndromes are the most frequent causes in younger patients while the lumbar spinal stenosis (LSS) primarily prevails in the middle-aged and older patient population with clinical symptoms generally occurring at

age of 50–60 (1,2). Besides, the prevalence of LSS is expected to increase significantly, together with increased life expectancy (3).

LSS is defined as narrowing of the spinal canal with encroachment on the neural structures by surrounding bone and soft tissue (4). Typically, it presents with so-called neurogenic claudication, which is described as pain, weakness, paresthesia, or heaviness radiating to lower extremities that occurs with walking or prolonged standing (5).

Standard therapy for LBP includes pharmacotherapy and various forms of physiotherapy maneuvers (6). In refractory cases epidural steroid injections (ESI) are used with intent to reduce inflammation. However, the ESI have been administered mostly in patients with HD syndrome, with good results (1). In LSS, there is some controversy about using ESI. Not only there are 2 approaches for ESI (interlaminar and transforaminal) (7), but there are also 2 ways for achieving proper epidural position for steroid injection – fluoroscopically guided and blind, depending only on the skills of the pain physician (8). Besides, there is a clinical dilemma about overall success of interlaminar epidural steroid injections in LSS (9,10).

The fluoroscopical guidance is not always available, especially in minor hospitals, and the pain physician is frequently forced to perform a blind epidural in a patient with LSS complaining of severe LBP. The role, as well as optimal timing, outcome and possible complications of blind interlaminar ESI (BESI) in LSS have not been well defined yet, which is the aim of this study.

PATIENT AND METHODS

Thirty patients aged 67 ± 1.5 yrs, with diagnosis of LSS and refractory pain were recruited during year 2010 and followed up for 12 months. The patients' characteristics are shown in Table 1. The inclusion criteria were severe pain refractory to combined pharmacotherapy, as well as severe pain or the presence of paresthesias after 5-minute standing and longer walking.

Before the procedure, every patient completed a consent form. The day before procedure a patient was visited and examined by an anesthesiologist, but received no premedication. All ESI were done in the operating theatre under strict sterile conditions. Firstly, intravenous cannula was inserted and infusion of 500 ml of Ringer solution was administered. The ECG and NIBP were monitored. Then "blind" epidural in corresponding lumbar interspace was performed by a trained anesthesiologist (NE) using midline approach and 18-G Tuohy disposable needle inserted in the sitting position. Entrance into the epidural space was determined using the loss of resistance method. Epidural mixture consisted of triamcinolone acetonide 80 mg (Kenalog, Krka, Novo Mesto, Slovenia) and lidocaine 40 mg (Lidokain 2%, Belupo, Koprivnica, Croatia) diluted in normal saline to a total volume of 10 ml, and injected into the epidural space (L2–L3, L3–L4, L4–L5 or L5–S1 interspace).

TABLE 1

Characteristics of patients with lumbar spinal stenosis that underwent 3 blind interlaminar epidural steroid injections (n=30).

Age (yrs, mean \pm SEM, range)	67 \pm 1.5 (54–77)
Gender (M/F)	9/21
Level of LSS (n, %)	
L2/L3	1 (3.3)
L3/L4	9 (30.0)
L4/L5	13 (43.3)
L5/S1	7 (23.3)
Time to BESI (months, mean \pm SEM)*	7.9 \pm 1.3
Pharmacotherapy (n, %) [†]	
NSAIDs	30 (100.0)
Tramadol	30 (100.0)
Morphine derivates	14 (46.7)
Gabapentin	10 (33.3)
Antidepressant	2 (6.7)
Physiotherapy (n, %) [†]	
TENS	30 (100)
Magnetotherapy	18 (60.0)
Laser	10 (33.3)

* Takes into account only time from the first admission to Pain Clinics till the first epidural steroid injection

[†] Many patients were administered several treatments (either pharmacotherapy or physiotherapy) at the same time

After the procedure all patients were observed during 60 minutes, along with clinical evaluation and NIBP monitoring.

Each patient received in total 3 BESIs every 3 weeks (BESI1, BESI2, BESI3). The pain was evaluated with visual analogue scale (VAS) (11) before first BESI (VAS0) and after each treatment (VAS1, VAS2, VAS3). Subjective quality of performing the same physical activity (PA) regarding baseline conditions was evaluated with simple 3-points scale (0 = no change, 1 = slight improvement, 2 = significant improvement).

The results were analyzed using Statistica 8.0 (StatSoft, Inc., Tulsa, USA). VAS variable was analyzed with one-way ANOVA followed by Bonferroni post hoc correction. One-way ANOVA and post hoc analyses were used to provide information for all pair-wise comparisons of interest, both against baseline (VAS0), and between different VAS scores during the protocol. The comparison of data on an ordinal scale (PA score) was done using χ^2 -test. Data were presented as mean \pm SEM. $P < 0.05$ was considered statistically significant.

RESULTS

Blind interlaminar epidural steroid injections resulted in significant reduction of pain as measured by visual analogue scale (VAS0 8.1 ± 0.3 , VAS1 5.8 ± 0.2 , VAS2

TABLE 2

Visual analogue scale and physical activity scores before and after 3 blind interlaminar epidural steroid injections in 30 patients.

Time point	VAS (mean \pm SEM)	PA score (n, %) ^{††}		
		0	1	2
BESI 0	VAS 0 = 8.1 \pm 0.3*	N/A	N/A	N/A
BESI 1	VAS 1 = 5.8 \pm 0.2*	1 (3.3)	7 (23.3)	22 (73.3)
BESI 2	VAS 2 = 4.9 \pm 0.2* [†]	1 (3.3)	5 (16.7)	24 (80.0)
BESI 3	VAS 3 = 4.4 \pm 0.3* [†]	4 (13.3)	6 (20.0)	20 (66.7)

* One-way ANOVA ($F=87.57$, $P<0.001$); pair-wise comparisons were significantly different in post-hoc analysis, $P<0.001$ (VAS0 vs VAS1, VAS 0 vs VAS2, VAS0 vs VAS3, VAS 1 vs VAS2, VAS1 vs VAS 3)

[†] post-hoc analysis, $p=0.06$ (VAS2 vs VAS 3)

^{††} χ^2 -test; $\chi^2=3.7$, $p=0.45$

VAS = visual analogue scale; VAS 0 = VAS before the 1st blind interlaminar epidural steroid injection (BESI 0); VAS 1 = VAS after 1st blind interlaminar epidural steroid injection (BESI 1); VAS 2 = VAS after 2nd blind interlaminar epidural steroid injection (BESI 2); VAS 3 = VAS after 3rd blind interlaminar epidural steroid injection (BESI 3);

PA score = physical activity scores after blind interlaminar epidural injections in certain time points (BESI1, BESI2, BESI3); 0 = no improvement, 1 = slight improvement, 2 = significant improvement; N/A = not applicable

4.9 \pm 0.2, VAS3 4.4 \pm 0.3; $F=87.57$, $P<0.001$). All pair-wise comparisons were significantly different in post-hoc analysis ($P<0.001$), except VAS2 versus VAS3 having borderline significance ($P=0.06$) (Table 2).

Subjective quality of physical activity significantly improved regarding baseline conditions, but the achieved improved physical score did not change significantly during the follow-up of all patients (Table 2).

The average duration of successful BESI treatment was 6.3 \pm 0.8 months (range 1–12 months). There were no reported complications, either while performing epidural steroid injection or post procedurally.

DISCUSSION

In this study, three interlaminar epidural steroid injections, administered without fluoroscopic guidance every three weeks, reduced significantly the pain as measured by VAS and improved physical activity in this group of older patients with LSS.

We consider LSS as an important health problem. Recent advances in imaging technology, improvement in diagnostic methods, and aging of the population have all contributed that LSS is a very frequent diagnosis for pain physician (12). Not only it is a disabling disease, which significantly reduces quality of life, but it also represents a huge economic burden on health system (13). Optimal treatment regimen has not been determined yet (14), and

there is ongoing study trying to evaluate the effectiveness of surgery compared with non-surgical interventions in adults with symptomatic LSS (12). We hope that our study might also help in determining optimal strategy for the treatment of LSS.

The role of epidural injection therapy in chronic LBP is still controversial and was evaluated in many studies. In a systematic review about lumbar interlaminar epidural injections in managing chronic LBP, out of the 3 evaluations studying the effectiveness of blind lumbar interlaminar epidural injections in spinal stenosis, none were shown to be positive for short-term or long-term relief (15). Another systematic review found moderate evidence for interlaminar epidurals in the cervical spine and limited evidence in the lumbar spine for long-term relief (16). However, the review from the Cochrane Database covering 18 trials (1179 patients) stated that injection therapy could be effective for particular subgroup of patients, but there is still insufficient evidence to support or refute the use of injection therapy (17). According to authors corticosteroids seem to be the most logical therapeutic agent, while local anesthetics are only useful for diagnostic purposes. In this study we have chosen the combination of corticosteroid and local anesthetic with obviously good results. We are also quite satisfied with average duration of successful epidural steroid therapy (6.3 \pm 0.8 months). Furthermore, we have chosen the regimen of 3 epidural injections every 3 weeks. When analyzing results, one should note that VAS after 3rd injection was not significantly less than VAS after 2nd epidural injection (although we can speculate about borderline significance). However, at the same time, PA score did not improve significantly (Table 2), and even after 3rd injection, 4 out of 30 patients did not report any improvement. Nevertheless, since blind interlaminar epidural injection is an invasive procedure, and taking into account aforementioned facts, our opinion is that only 2 epidural steroid injections might be quite adequate.

Much of the literature on lumbar interlaminar epidurals has been negative except in recent years when fluoroscopic guidance was utilized (1). Fluoroscopically guided caudal epidural steroid injections reduced bilateral radicular pain and improved standing and walking tolerance in patients with LSS (18). However, we think that in specific circumstances blind interlaminar technique should be strongly supported, as seen in this study. In this group of 30 patients (i.e. 90 epidural injections) we reported no complications, despite using "blind" interlaminar approach. As stated before, the fluoroscopic guidance is not always available in our hospital. Besides, we consider this technique much simpler and the pain physician is not exposed to harmful X-ray radiation. In addition, it is performed by anesthesiologist, very experienced in performing not only epidural blocks, but also in administering epidural anesthesia in every day work.

In conclusion, blind interlaminar epidural steroid injections (in total 3 injections every 3 weeks) resulted in

significant reduction of pain and improvement of physical activity in elderly patients with LSS. It could be regarded as effective and safe procedure in this population.

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