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EQ-5D-5L questionnaire as suitable assessment of quality of life after epiduroscopy

Multicenter randomized double-blind pilot study

Róbert Rapčan · Ladislav Kočan · Viktor Witkovsky · Juraj Mláka · Martin Griger · Miroslav Burianek · Simona Rapčanová · Anthony Hammond · Ľubomír Poliak · Róbert Tirpák · Jana Šimonová · František Sabol · Janka Vašková

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Summary
Background Epiduroscopy is a well-established diagnostic and to certain level therapeutic tool in complex situations, where conventional methods such as magnetic resonance imaging (MRI) lack power or resolution to detect pathological changes. Such a situation is primarily failed back surgery syndrome (FBSS) but also radicular pain without surgery. The aim of this study was to determine the effectiveness of epiduroscopic treatment in patients with FBSS.
Methods A total of 79 patients with FBSS were randomized into 2 groups. The first group underwent epiduroscopy and received mechanical lysis of adhesions only, the second group received also medication into the epidural space (methylprednisolone and hyaluronidase). Patients were subsequently followed for 12 months, with evaluation also after 6 months post-epiduroscopy. Patients were checked in terms of mobility, self-care, usual activities, pain/discomfort and anxiety/depression as defined in the 5-dimensional EQ-5D-5L questionnaire and to asses suitability of this questionnaire in chronic pain states. Data were collected using EQ-5D-5L questionnaire and also quality of life (QoL) questionnaire.
Results In the terms of ability to walk (dimension mobility) and also ability to do housework, study or leisure activities (dimension usual activity) patients improved in both groups after 6 and 12 months after epiduroscopy. In pain dimension there was improvement mainly after 6 months which correlated also with self-care dimension and quality of life self-assessment. Results in anxiety/depression dimension were mixed.
Conclusion Epiduroscopy appears to be a beneficial procedure for both patient groups, especially after 6 months, with some benefit remaining after

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12 months. The EQ-5D-5L questionnaire seems to be a suitable and comprehensive way to assess patient health in chronic pain states.

Keywords Back pain · Epiduroscopy · Failed back surgery syndrome · Hyaluronidase · EQ-5D-5L questionnaire

Introduction

Failed back surgery syndrome (FBSS) is one of the difficult to treat conditions that occur after spinal surgery and it is also believed to be one of frequent causes of neuropathic pain. Patients with FBSS often suffer from epidural, intraneural, or perineural fibrosis and scar tissue [1]. The potential pain source can be any anatomical structure that contains nociceptive fibres or their combination. Treatment of FBSS is very complex and often unsuccessful. Patients are suffering and their life is limited by a strong continual pain, disturbance of physical health, psychological state, level of independence, and social relationships. Quality of life for patients living with chronic disease is a priority. One of the ways how to measure and specify quality of life is to use the EQ-5D-5L questionnaire.

Currently, epiduroscopy is well established as a diagnostic tool for different back pain syndromes which cannot be explained by other diagnostic methods, such as magnetic resonance (MR) imaging [2, 3, 18]. It can also be used as a treatment modality in certain cases of radicular pain or failed back surgery syndrome [4, 5]. There are several mechanisms by which epiduroscopy can be a therapeutic, not only diagnostic, tool. For example, because epidural fibrosis or scar formation around nerves can be one of the possible causes of low back pain and/or radicular pain in FBSS [2] mechanical lysis of these adhesions reduces nerve oppression, improve nutrient supply, and thus contribute to the decrease of patient's pain. Epiduroscopy also allows for a more targeted delivery of drugs as compared to conventional routes [6, 7]. Moreover, infusion of normal saline used to open the epidural space may have a dilutional effect on inflammatory mediators released from disc or facet joints [3].

The aim of this study was to determine the effectiveness of epiduroscopic treatment in patients with failed back surgery syndrome in terms of mobility, self-care, usual activities, pain/discomfort and anxiety/depression as defined in 5-dimensional EQ-5D-5L questionnaire. As an extension of another ongoing study [8] the differences of quality of life between study groups were also analyzed.

Patients, material and methods

This study was a randomized, multicenter double blinded clinical trial with two parallel groups. Ethical approval for this study was provided by the University Hospital ethics committee in Košice (approval number: 75/EK/15). Registration was accomplished at clinicaltrials.gov with registration ID NCT PRS: NCT02459392. Permission for using the questionnaire for a study issue was given in February 2017 by EuroQol group. Participants also completed a quality of life (QoL) questionnaire. Overall health status was evaluated by the visual analogue scale (EQ-VAS) measured on the numerical scale 0–100 (100 means the best health and 0 means the worst health).

The study participants with chronic pain caused by a previous spine surgery were recruited from pain clinics located in Košice, Bardejov and Bratislava in the Slovak Republic. Epiduroscopy was performed by EuroPainClinics® health company in Košice. Coordinator of the study was recruited from the medical faculty of Pavol Jozef Šafárik in Košice and data were collected in the encrypted cloud database. All medical visits were coordinated by independent coordinators from the East Slovak Institute for Cardiovascular Diseases. The inclusion criteria for patient enrolment were: patients with FBSS, up-to-date magnetic resonance imaging, lesions without serious spinal stenosis, lesions without serious radicular compression, lesions without serious intervertebral disc herniation, age of 18 years or older and signed written informed consent. Exclusion criteria were as follows: patients not capable of consenting, pregnant women or women of child-bearing age, cauda equine syndrome. After meeting the inclusion criteria, the patients were allocated according to computer randomization software into two groups, group A and group B. Each patient obtained a unique clinical trial ID number, which was generated by a computer software before epiduroscopy. The protocol and quality of life questionnaires were filled out by each involved participant before the operation. Blinding at the time of randomization was maintained with a sealed envelope given to the anesthesiologist managing the patient. Group A underwent epiduroscopy where only mechanical lysis of the epidural fibrotic attachments was performed by either laser, radiofrequency or balloon technique with 20 mL saline at the end of the procedure. Group B underwent epiduroscopy with the same types of mechanical lysis as in the previous group, but additionally, a solution of hyaluronidase (RIEMSER Pharma GmbH, Greifswald-Insel Riems, Germany, 150 I.U. in 10 mL of saline) and injectable corticosteroid methylprednisolone acetate 80 mg were administered to the epidural space precisely into the place of conflict (the depression in the spinal root by fibrosis). The coordinator of the study planned the first postoperative examination 6 months after the procedure and the second postoperative examination after 12 months following the procedure. The first and second postoperative examinations of the patient were performed by a different physician (not the one performing the actual procedure), or at a different pain management clinic. They performed a pain

Table 1 Characteristics of patients divided into groups according simple randomization

	Group A (min–max) med	Group B (min–max) med
Participants (n)		
Before procedure	40	39
6-month follow-up	40	38
12-month follow-up	40	38
Age (years)	(35–70) 54	(33–69) 46.5
Sex (F/M)	22/18	19/20
ASA	(1–3) 2	(1–3) 2
BMI	22	20
Pain in dermatomes according to examination before procedure		
L2	0	2
L3–L4	1	2
L4–L5	15	11
L5	7	8
L5–S1	9	7
S1	8	8
Mechanical therapeutic intervention		
Balloon	3	4
Laser	4	5
Radiofrequency	15	16
Complications		
Bladder paralysis	1	9
Neurological deficiency in dermatomes	1	0
Dura mater puncture	5	3
Infection, bleeding	0	0

(min-max) med (minimum-maximum) median, *ASA* American Society of Anesthesiologists physical status classification system, *BMI* body mass index

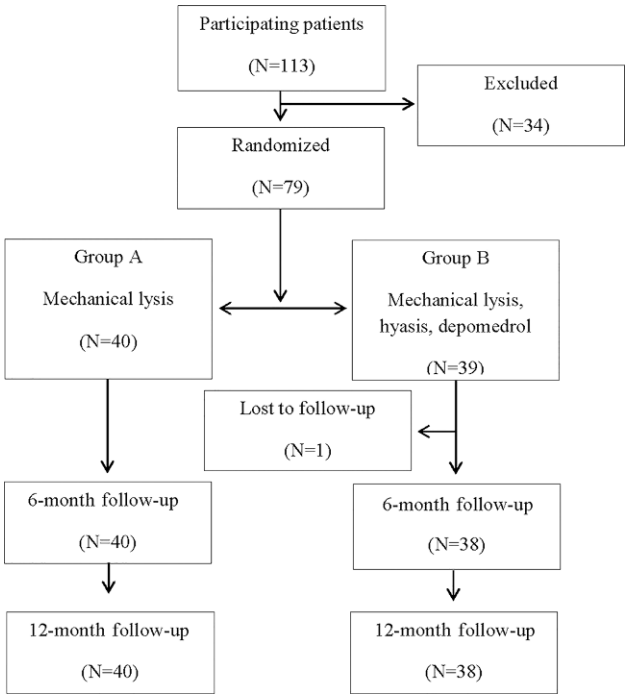

Fig. 1 Scheme of patient selection, enrolment, and follow-up in the study

assessment of the patient while blinded to which procedure they had undergone (endoscopy only including mechanical lysis or with the administration of the drugs) and completed the pain management protocol of the study. The study followed the details of patient selection as well as instrumental equipment, execution of the procedure according to Rapčan et al. [8].

Participants who voluntarily signed the informed consent and were eligible for this study were randomly assigned to one of two groups in January 2016 before their operation. Computer-generated random numbers were evoluted as a single sequence of random assignments based on simple randomization (Table 1). Patients in group A underwent only mechanical lysis of adhesions and fibrosis in epidural space. Patients in group B underwent mechanical lysis joined with drugs administration into the epidural space: corticoid and enzyme hyaluronidase, as stated in Rapčan et al. [8]. The interventional pain management specialist was informed about the next advance after the beginning of the operation which was based on previous randomization. Unique ID was given to each participant. The first follow-up examination took place at the pain clinic after six months and the second follow-up after twelve months (Fig. 1). Physicians and patients were blinded in both cases. Patients at each of the three meetings with the physician completed EQ-5D-5L questionnaire. Each dimension of the questionnaire (mobility, self-care, usual activities, pain/discomfort and anxiety/depression) is scored on a scale of 5 levels (I, II, III, IV, and V), with level I indicating the least severe (optimal health) state and level V indicating most severe (critical health) state.

Nonparametric statistical methods were used for statistical processing of the EQ-5D-5L questionnaire data. In particular, the analyses are based on the Wilcoxon rank-sum test and the nonparametric estimator of the reliability parameter R. Wilcoxon rank-sum test is a nonparametric test of the null hypothesis that it is equally likely that a randomly selected value (the questionnaire response) from one group will be less than or greater than a randomly selected value from a second group. The reliability parameter R is a parameter well-known in stress-strength modelling and is frequently used also in medicine for treatment comparisons. R is defined as a probability $Prob(X < Y)$, with values from the interval (0, 1), where X and Y are random variables associated with the considered probability distributions. Under null hypothesis $Prob(X < Y) = Prob(X > Y)$ the estimated confidence interval covers the expected value 0.5 with stated probability. Otherwise, if the estimated confidence interval does not cover the value 0.5, it was concluded that the alternative is to be preferred. In a nonparametric set-up, the estimator of the reliability

Table 2 Patients' answers distribution in percentage

Level/time (months)		Group A					Group B				
		I	II	III	IV	V	I	II	III	IV	V
Mobility	0	0.0	47.5	42.5	10.0	0.0	0.0	43.60	51.30	5.10	0.0
	6	5.0	52.5	32.5	10.0	0.0	10.50	39.50	26.30	23.70	0.0
	12	2.5	42.5	45.0	10.0	0.0	7.80	21.0	41.0	30.20	0.0
Self care	0	5.0	22.5	62.5	10.0	0.0	8.7	20.5	67.8	3.0	0.0
	6	10.0	35.0	47.5	5.0	2.5	10.5	36.8	44.7	5.4	2.6
	12	7.5	22.5	55.0	12.5	2.5	15.8	18.4	55.3	7.9	2.6
Usual activities	0	0.0	17.5	75.0	7.5	0.0	0.0	17.9	71.8	10.3	0.0
	6	5.0	35.0	47.5	12.5	0.0	7.9	34.2	50.0	7.9	0.0
	12	2.5	5.0	77.5	12.5	2.5	5.0	34.2	52.9	7.9	0.0
Pain/ discomfort	0	0.0	12.5	67.5	17.5	2.5	0.0	11.9	77.9	5.1	5.1
	6	5.0	17.5	50.0	20.0	7.5	5.2	23.7	63.2	7.9	0.0
	12	2.5	7.5	75.0	10.0	5.0	7.7	23.7	62.2	3.2	3.2
Anxiety/ depression	0	17.5	75.0	5.0	2.5	0.0	7.7	69.0	23.3	0.0	0.0
	6	15.0	77.5	7.5	0.0	0.0	8.9	87.5	3.6	0.0	0.0
	12	25.0	50.0	20.0	5.0	0.0	29.0	63.5	7.5	0.0	0.0

parameter R is functionally related to the Wilcoxon rank-sum test statistic. For more details see Kotz et al. [9] and Zhou [10]. Analyses using MATLAB (R2018b) with Statistics and Machine Learning Toolbox Version 11.4 (The MathWorks, Inc., Natick, MA, USA) were performed. A p-value less than 0.05 was considered statistically significant. For analysis of the Quality of Life (QoL) questionnaire data, Shapiro-Wilk, Levene, and paired t-test, using SPSS Version 11.0 statistic software package, were performed. P values of less than 0.05 were considered significant.

Results

The following notation was used for the specific groups of patients: A0, A6, A12, B0, B6, B12. Two basic groups of patients (A patients with mechanical lysis only and B patients with mechanical lysis joined with drug administration) were considered. Each group of patients was observed at three different time periods (0 at the beginning of the study, 6 after 6 months from the beginning of the study, and 12 after 12 months from the beginning of the study). The responses of the patients of the two groups to the 5-dimensional EQ-5D-5L questionnaire at all three times are summarized in Table 2.

The effectiveness of epiduroscopic treatment in patients with failed back syndrome was assessed by testing statistical hypotheses on equality of probability distributions of the questionnaire responses in the considered (sub) groups of patients against the prespecified one-sided alternative hypotheses. The hypotheses assume that the distribution of response levels is stochastically smaller, with better health status for one group that the other, in terms of mobility, self-care, usual activities, pain/discomfort and anxiety/depression as defined in 5 dimensional EQ-5D-5L questionnaire. Moreover, as a summary compound measure, we have also considered the comparisons of the combined (weighted) questionnaire values, with carefully prespecified weighing for each questionnaire dimension, which combines the information from all 5 dimensions of the EQ-5D-5L questionnaire. For each subject the combined value Q was calculated by the following formula: $Q = 1 - w_0 - w_1 - w_2 - w_3 - w_4 - w_5$, with the weights specified in the Table 3. For more details on the different weighing strategies see e.g. Szende et al. [11].

For specific sub-groups of patients, denoted by A0, A6, A12, B0, B6, and B12, we tested the hypotheses on pairwise comparisons. For comparison of any two groups of patients based on the observed questionnaire responses we computed the p-value from the Wilcoxon rank-sum test for testing the null hypothesis of equality of distributions of the questionnaire responses against the (specified) one-sided alternative hypothesis. Moreover, we also estimated the reliability parameter R together with the associated two-sided 95% confidence interval, calculated from the bootstrap distribution of the responses in group 1 and in group 2 (in this study we have used the bootstrap samples of size $N = 1000$). Table 4 presents the observed p-values of the Wilcoxon rank-sum test and the estimated reliability parameter R with the 95% confidence interval for each considered hypothesis on equality of probability distributions of the questionnaire responses in the considered groups of patients. For example, the notation B6 < A6 indicates testing the null hypothesis about equality of the distributions for groups B6 and A6, i.e. H0: B6 ~ A6, against the alternative hypothesis HA: B6 < A6 (i.e. better health status in the considered dimension for the patients in group B6 than in the group A6).

As is shown in Table 4, there was improvement in mobility after 6 months with statistical significance at $p = 0.0637$ and after 12 months ($p < 0.05$) in

Table 3 The weights used for computing the weighted questionnaire value Q, which combines the information from all 5 dimensions of the EQ-5D-5L questionnaire

Weight	Value	EQ-5D-5L dimension	Condition
w_0	0.1279	All	Any level in questionnaire is II or III
w_0	0.2288	All	Any level in questionnaire is IV or V
w_0	0.0000	All	Otherwise
w_1	0.0659	Mobility	Mobility level is II or III
w_1	0.1829	Mobility	Mobility level is IV or V
w_1	0.0000	Mobility	Otherwise
w_2	0.1173	Self-care	Self-care level is II or III
w_2	0.1559	Self-care	Self-care level is IV or V
w_2	0.0000	Self-care	Otherwise
w_3	0.0264	Usual activities	Usual activities level is II or III
w_3	0.0860	Usual activities	Usual activities level is IV or V
w_3	0.0000	Usual activities	Otherwise
w_4	0.0930	Pain/discomfort	Pain/discomfort level is II or III
w_4	0.1639	Pain/discomfort	Pain/discomfort level is IV or V
w_4	0.0000	Pain/discomfort	Otherwise
w_5	0.0891	Anxiety/depression	Anxiety/depression level is II or III
w_5	0.1290	Anxiety/depression	Anxiety/depression level is IV or V
w_5	0.0000	Anxiety/depression	Otherwise
For each subject the value Q was calculated by the formula $Q = 1 - w_0 - w_1 - w_2 - w_3 - w_4 - w_5$, with the specified weights			

group A. In group B, we recorded a statistically significant improvement in mobility after 6 and 12 months ($p < 0.05$). There was a significant improvement in the performance of normal daily activities in patients, in all groups A and B after 6 and 12 months ($p < 0.05$). Following the pain parameter, group B included patients with significantly smaller pain A0 vs. B0 ($p < 0.05$). Subsequently, the reduction in pain was recorded only in A6 and A12 groups ($p < 0.05$) during further measurements. In groups B6 and B12 this trend was not recorded; however, the differences in the pain parameter between A and B after 6 and 12 months were not recorded. Improvement in self-care was observed only in group A after 6 months ($p < 0.05$). After 12 months no improvement in self-care was observed in either group compared to pre-operative baseline. An improvement in the sense of anxiety and depression in a given disease varied in both groups. Significant improvements were seen in group A and B after 6 and 12 months ($p < 0.05$). The statistical weighting of values, based on index demographic conversion, showed improvement in group B after 6 and 12 months and group A after 12 months ($p < 0.05$).

Normal distribution of EQ-VAS on the numerical scale (0–100) was evaluated with the Shapiro–Wilk test. Homogeneity of variances was estimated using the Levene test. When conditions of homogeneity and normality of variances were met between both groups, for comparing the means we used paired t-test (Table 5, Fig. 2). The comparison shows that significant changes were found in both groups at the 6-month period measurement following the procedure.

Interpretation of previous medications in all included patients was extremely difficult and not suitable for statistical evaluation due to the irregular drugs intake, different dosing in all drugs, and high variability of dosing per day even in a single patient. Some of the patients, despite strong pain, did not use any opioids because of opioid intolerance occurrence, which was noticed in around 60% (Fig. 3 and 4).

Discussion

Chronic pain especially related to FBSS is very difficult to assess properly, as it affects the life of individuals on various levels. Typically used is the measure of pain in the form of visual analogue pain score (VAS), Oswestry disability index and patient's status score as appropriate parameters of dynamic changes in the patient health; however, it could have some limitations. Visual analogue pain score seems to be prone to bias and therefore not very suitable for solitary assessment of these conditions [12]. Neuropathic pain is a complex problem relating to pain centralization in the central nervous system, changes in pain perception, long-term suffering and subsequent behavioral changes [13]. Use of different outcome domains or combination of VAS and another multilevel tool is recommended [14] to assess this condition. Another suitable complementary description method of global patient health evolution after epiduroscopic intervention is EQ-5D questionnaire. It is not specific to one disease, available for self-completion, easy to complete and covers all important aspects of chronic pain states. The longer 5-level version was used, as it pro-

Table 4 Mobility (left) vs. self-care (right) *p*-values, usual activities (left) vs. pain/discomfort (right) *p*-values, anxiety/depression (left) vs. weighted questionnaire (right) *p*-values of the Wilcoxon ranksum test for testing the null hypothesis of equality of distributions of the questionnaire responses against the specified one-sided alternative, and the estimated reliability

Hypothesis	*p*-value	R	Lower	Upper	Hypothesis	*p*-value	R	Lower	Upper
Mobility					*Self-care*				
A6 < A0	0.0637	0.5954	0.4691	0.7118	A6 < A0	0.0497*	0.5984	0.4878	0.7053
A12 < A0	0.0301*	0.6164	0.5053	0.7355	A12 < A0	0.2474	0.5401	0.4257	0.6638
A12 < A6	0.4052	0.5156	0.3944	0.6389	A12 < A6	0.7830	0.4522	0.3470	0.5703
B6 < B0	0.0474*	0.6049	0.4895	0.7298	B6 < B0	0.1828	0.5540	0.4318	0.6646
B12 < B0	0.0199*	0.6272	0.5145	0.7271	B12 < B0	0.5325	0.4956	0.3826	0.6093
B12 < B6	0.4052	0.5156	0.3885	0.6371	B12 < B6	0.7830	0.4522	0.3359	0.5741
B0 < A0	0.5653	0.4904	0.3811	0.6093	B0 < A0	0.1947	0.5481	0.4349	0.6545
B6 < A6	0.5022	0.5000	0.3719	0.6233	B6 < A6	0.5022	0.5000	0.3726	0.6222
B12 < A12	0.5022	0.5000	0.3688	0.6240	B12 < A12	0.5023	0.5000	0.3830	0.6212
Usual activities					*Pain/Discomfort*				
A6 < A0	0.0129*	0.6273	0.5141	0.7283	A6 < A0	0.0019*	0.6694	0.5589	0.7674
A12 < A0	0.0228*	0.6132	0.5092	0.7220	A12 < A0	0.0033*	0.6546	0.5457	0.7546
A12 < A6	0.6104	0.4834	0.3705	0.6028	A12 < A6	0.6584	0.4778	0.3743	0.5859
B6 < B0	0.0139*	0.6282	0.5277	0.7291	B6 < B0	0.0520	0.5870	0.4818	0.6835
B12 < B0	0.0236*	0.6147	0.5155	0.7257	B12 < B0	0.0856	0.5698	0.4706	0.6680
B12 < B6	0.6104	0.4834	0.3580	0.6011	B12 < B6	0.6584	0.4778	0.3705	0.5838
B0 < A0	0.5561	0.4929	0.3942	0.5939	B0 < A0	0.0378*	0.5981	0.4910	0.6990
B6 < A6	0.5023	0.5000	0.3802	0.6184	B6 < A6	0.5024	0.5000	0.3850	0.6056
B12 < A12	0.5023	0.5000	0.3802	0.6163	B12 < A12	0.5026	0.5000	0.3920	0.5994
Anxiety/Depression					*Weighted questionnaire*				
A6 < A0	0.7800	0.4655	0.3786	0.5493	A6 < A0	0.1597	0.5625	0.4484	0.6878
A12 < A0	0.1647	0.5523	0.4378	0.6595	A12 < A0	0.0368*	0.6112	0.4869	0.7297
A12 < A6	0.0417*	0.5876	0.4896	0.6863	A12 < A6	0.1726	0.5581	0.4322	0.6731
B6 < B0	0.0423*	0.5830	0.4882	0.6687	B6 < B0	0.4459	0.5081	0.4001	0.6201
B12 < B0	0.0031*	0.6518	0.5439	0.7395	B12 < B0	0.0102*	0.6407	0.5331	0.7470
B12 < B6	0.0417*	0.5876	0.4875	0.6863	B12 < B6	0.0159*	0.6316	0.5114	0.7521
B0 < A0	0.9812	0.3933	0.2984	0.4936	B0 < A0	0.1827	0.5554	0.4436	0.6910
B6 < A6	0.5035	0.5000	0.4259	0.5755	B6 < A6	0.4545	0.5072	0.3816	0.6230
B12 < A12	0.5024	0.5000	0.3878	0.6153	B12 < A12	0.1167	0.5740	0.4516	0.6980

*Statistically significant at $p < 0.05$

Table 5 Comparison of differences in patients' status within and between groups according to QoL questionnaire

Parameters	Time interval	A			B				
Comparison between the groups	–	*Mean*	*SD*	–	*Mean*	*SD*	–	*CI 95%*	*p*
	Before procedure	43.67	13.94	–	43.56	14.657	–	–2.931–3.136	0.946
	6-month follow-up	50.97	17.977	–	50.37	16.643	–	–7.572–8.783	0.882
	12-month follow-up	47.32	16.639	–	42.66	18.745	–	–1.982–11.298	0.164
Comparison inside the groups	–	*SD*	*CI 95%*	*p*	*SD*	*CI 95%*	*p*	–	–
	Before procedure vs. 6-month follow-up	18.891	–13.79 to –1.71	0.013*	15.435	–11.495 to –1.348	0.015*	–	–
	Before procedure vs. 12-month follow-up	17.763	–8.33 to 3.03	0.351	13.924	–0.761 to 8.393	0.100	–	–

*Statisitically significant at $p < 0.05$
SD standard deviation, *CI* confidence interval

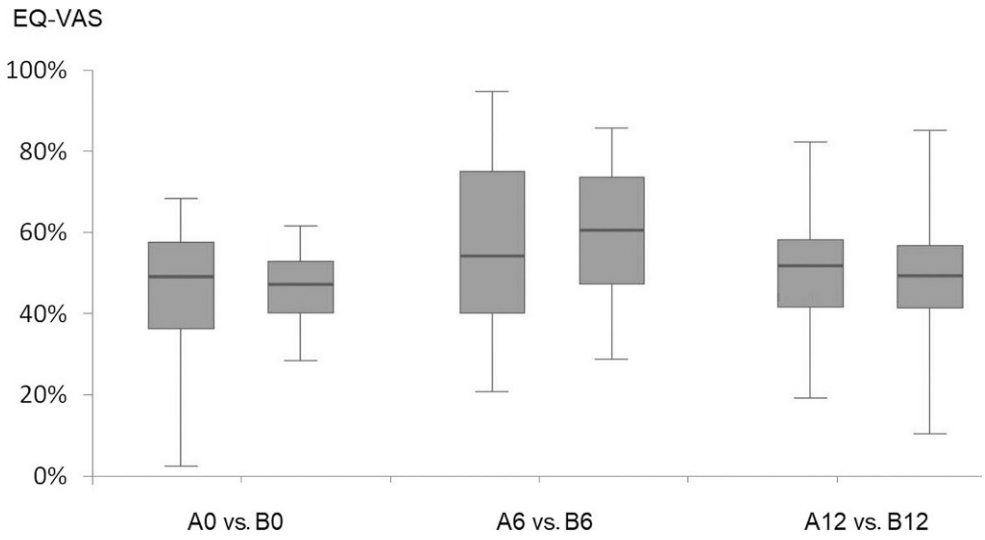

Fig. 2 Evaluation of patients' Quality of life between both groups before treatment, 6 and 12 months after treatment

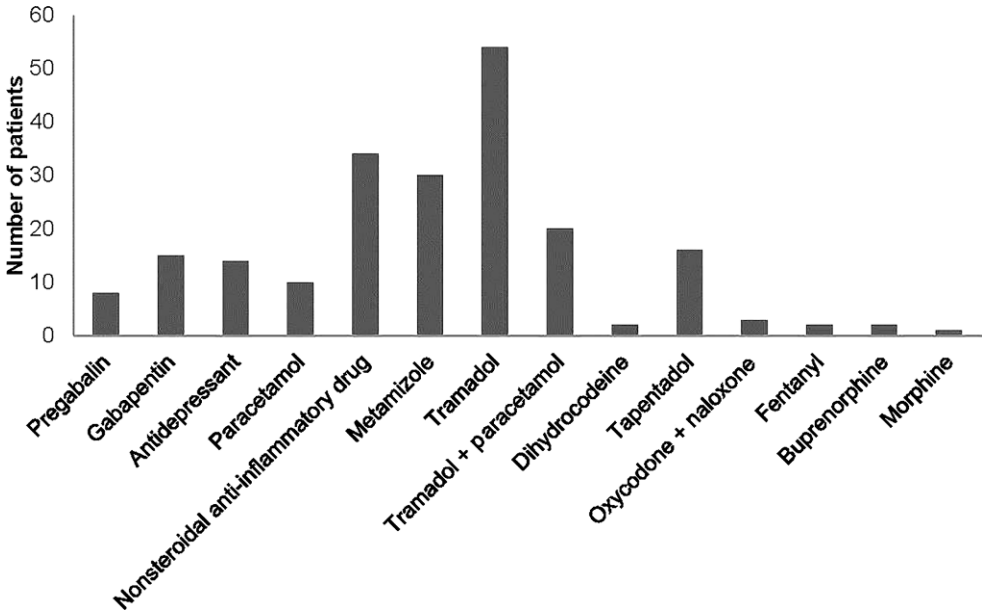

Fig. 3 Analysis of analgesic medication treatment in all included patients before epiduroscopy

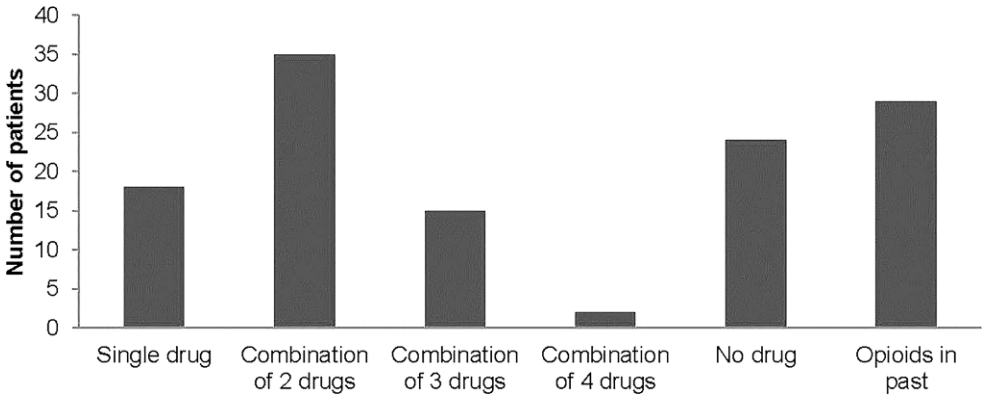

Fig. 4 Strategy of previous analgesic medication treatment in all included patients before epiduroscopy

vides better sensitivity in detecting subtle changes as compared with its original 3-level version [15].

Aim of this multicenter pilot double blinded trial was to investigate the health state in the five dimensions of mobility, self-care, usual activities, pain/discomfort, and anxiety/depression of subjects with FBSS after epiduroscopy. In this paper, we have suggested weigths derived from EQ-5D-3L European weights constructed using data from 6 countries: Finland, Germany, The Netherlands, Spain, Sweden, and the UK. Although not all of the studies included were representative of the country in which they were carried out and the data from other European countries were not available, there are sufficient data from different European regions to make European dataset moderately representative for Europe. Statistical extrapolation from EQ-5D-3L to EQ-5D-5L was determined as a next step. This may lead to slightly different average quality of life values in individual Central European countries. Previous partial results from our investigation showed improvement in Oswestry disability index and numerating rating scale (NRS) for leg and back pain after epiduroscopy in group A (mechanical lysis) and group B (mechanical lysis and administrated drugs, Hyasis and Depomedrol) after 6 months. Improvement was only noted on the NRS for back pain at the 1-year follow-up ($p < 0.05$). These partial results were processed on the relatively small size of patients: 22 in A group and 22 in B group. [8].

We present an enlarged examination of 79 patients randomly divided into the 2 groups focused on health-related quality of life measured by EQ-5D-5L questionnaire and quality of life by the NRS. In the mobility dimension focused mainly on the persons' walking ability, we recorded improvement in all groups 6 and 12 months after epiduroscopy. These findings demonstrate the positive effect of the procedure, which could be caused not only by releasing the fibrotic compression in the epidural space, but also with the possible suppression of the cytokine cascade by saline flush. Spinal stenosis and fibrotic processes in the epidural space have in general a negative major impact on the patient quality of life. Moreover, the cytokine reduction may have a short-term effect by reducing cytokine pain mediators, such as prostaglandin E2, but it could also slow down the fibrotic formation by reducing the focal aseptic inflammatory reaction as a long-term effect.

Usual activities measures performance in work, study, housework, family or leisure activities and they are certainly closely connected to the mobility, which brings the same improvement in the observed result for all groups after 6 and 12 months. By comparing the entry data (in the time period 0) for the dimension of pain/discomfort between group A and group B, a statistically significant difference was found. We did not find statistically significant differences by comparing the entry data (in the time period 0) of other dimensions (mobility, self-care, usual activities, and anxiety/depression). This event was caused by a fact that majority of the participants in group A marked the level of their pain as number IV, participants in group B marked the level of their pain as number III. This phenomenon could be visible only by using EQ-5D-5L questionnaire. On the other hand, this situation would probably be undetected by EQ-5D-3L questionnaire form. Randomization bias was recorded only in the pain dimension. In all other parameters, randomization was done appropriately. As a result of this event, improvement of the pain parameter was noticed only in all A groups; however, the pain intensity between groups A6 and B6 and also between groups A12 and B12 was not significant, which is indicated on the same intensity of pain in groups after 6 and 12 months. In the future, this bias will probably be eradicated by enrolling larger number of participants.

Self-care dimension is related to the ability to wash or dress oneself. Results describe only improvement in group A after 6 months which can be related to pain improvement. Insignificant improvement in group B after 6 months followed pain relief in the observed group and may be related to the fact that the pain intensity B0 vs. B6 was not significantly altered by the procedure, which was transferred to the self-care dimension. This also correlates with the results of the quality of life measured by 100-point numerical rating scale ($p < 0.05$). Mixed results for anxiety and depression show how difficult and complex the problem of treating neuropathic pain is in adults, which can subsequently indicate the need to use co-analgetic drugs such as andipressant drugs (tricyclic antidepressants, selective serotonin reuptake inhibitors or serotonin-norepinephrine reuptake inhibitors) or anticonvulsants to effectively help to improve the outcome in indicated cases [16]. The results of our study, well described and summarized in weighted statistical analysis, have been considered as a positive outcome. Improvement after endoscopic treatment in patients with chronic low back pain is not so distinct in comparison with the treatment of acute low back pain, but our results follow conclusions of clinical trials focused on spinal cord stimulation treatment of failed back surgery syndrome [17]. Standard treatment in patients with failed back surgery syndrome is chosen based on the current magnetic resonance imaging examination. According to this result the need for a neurosurgical intervention is either confirmed or rejected. After the exclusion of a surgical operation, all patients undergo a clinical examination and precise interventional diagnostics to exclude other sources of pain, such as Z-joint syndrome, sacroiliac joint or intervertebral disc pain source. If nothing is found, epiduroscopy is indicated. Alongside interventional and other pain diagnostic methods, all patients are considered to get full suitable pharmacological and physio-rehabilitation treatment [18, 19].

Conclusion

Epiduroscopy appears to be a beneficial procedure for both patient groups, especially after 6 months, with some benefits remaining after 12 months. A disadvantage at this stage may be the relatively low number of patients, which limits the possibility to distribute and evaluate patients according to decades (20–30 years, 31–40 years, 41–50 years, 51–60 years, 61–70 years, 80 years and over); however, the results of the study clearly show that the quality of health was improved after 6 and 12 months in almost all parameters. This is not consistent with the VAS where a previous study showed improvement after 12 months in group B alone, and only isolated in back pain (paradoxically, the expectation was greater for lower limb pain). This indicates that the VAS is a subjective parameter prone to bias and is clearly not sufficient for a comprehensive assessment of a chronic pain states. The EQ-5D-5L appears to be a convenient and comprehensive way to evaluate a patient with chronic pain.

Conflict of interest R. Rapčan, L. Kočan, V. Witkovsky, J. Mláka, M. Griger, M. Burianek, S. Rapčanová, A. Hammond, Ľ. Poliak, R. Tirpák, J. Šimonová, F. Sabol, and J. Vašková declare that they have no competing interests.

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