



# THE EXPERIENCE OF DENERVATION OF FACET JOINTS IN THE LUMBAR SPINE

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**Objective.** To analyze the immediate and long-term results of denervation of facet joints for facet syndrome in the lumbar spine.

**Material and Methods.** The immediate and long-term results of the treatment of 59 patients with severe pain in the lumbar spine who underwent facet joints denervation were studied.

**Results.** On a MacNab scale, 39 (66.1 %) patients rated the treatment results as good, and 20 (33.9 %) as mediocre. According to the Nurick scale, the 2nd level results of treatment (improvement) were recorded in 55 (93.2 %) cases, the 3rd level ones (unaltered) — in 4 (6.8 %). The follow-up data were collected on 37 (62.7 %) patients from 1.7 months up to 1.5 years after surgery: 13 (35.2 %) of them rated the long-term treatment results as good, 8 (21.6 %) — as mediocre, and 16 (43.2 %) — as bad.

**Conclusions.** Denervation of facet joints is an effective minimally invasive method for treating facet syndrome caused by spondyloarthrosis. It allows significantly reducing pain and improving the quality of life of patients in the early and long-term postoperative period.

**Key Words:** joint denervation, facet syndrome, spondyloarthrosis, intervertebral joint.

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Degenerative diseases of the spine are ubiquitous and are diagnosed much more often than neoplasms, infectious and inflammatory diseases [1–5]. In degenerative diseases, pathological changes in the spine manifest as degeneration of intervertebral discs, which leads to the development of fibrosis and a decrease in the shock-absorbing properties of the discs, on one hand, and as lesions of facet joints, on the other hand [1, 2, 5, 6]. Decrease in the height of the intervertebral disc predisposes to subluxation of the facet joint, increases load on it, and can cause the development of pain syndrome.

Vertebrogenic pain syndrome is an important issue for modern healthcare, as it reduces the quality of life and performance and remains the leading cause for seeking medical treatment and primary disability [1–3, 7].

In developed countries, the economic losses associated with the treatment of patients with low back pain are enormous and occupy the first place among the diseases of working-age patients [3, 8, 9]. In addition to the

discoradicular conflict, the spondyloarthrosis (arthrosis of the facet joints) of the lumbosacral spine is a common cause of pain syndrome [4, 10–13]. According to the data of X-ray examinations and sectional findings, the frequency of spondyloarthrosis detection ranges from 24 to 82 % in patients under 40 years of age and reaches 100 % in patients over 60 years of age; it has no significant connection with the nature of the pain syndrome [14]. Spondyloarthrosis is the main cause of back pain in 80 % of people over 65 and 50 % of those over 50 years of age [1]. There are different names for this pathology: facet joint syndrome, facet pain syndrome, intervertebral arthrosis, spondyloarthropathic syndrome [1, 5, 11]. Pain syndrome in facet joint arthrosis is often bilateral, has paravertebral localization with sclerotomic type of spread and is not accompanied by nerve root symptoms. In spondyloarthritis, pain is exacerbated by movement, rotation and extension of the spine [1].

Non-steroidal anti-inflammatory agents are most often used for the

treatment of vertebrogenic pain syndrome, but these drugs increase the risk of gastrointestinal, cardiovascular and allergic complications, especially in elderly and senile patients [1, 2, 15]. Clinicians are dissatisfied with the results of conservative treatment of spondyloarthrosis, which explains the increased indications for surgical treatment and the improvement in minimally traumatic techniques [4]. Interventional methods of pain treatment show better results than conservative methods in the treatment of facet pain syndrome [3, 5, 12, 14, 16]. Interventional (puncture) approaches to pain treatment are widely spread nowadays: about 5 million interventions are performed in the US each year on the spine alone. The treatment of pain has evolved into a separate discipline. In Russia, interventional technologies are well known, but they are used less frequently and up to date they have been used only in large neurosurgical clinics and hospitals [17].

The aim of the study is to analyze the immediate and long-term results of facet joint denervation for facet pain syndrome in the lumbar spine.

## Material and Methods

Clinical studies were conducted in the Neurosurgical Center of the City Clinical Hospital No. 39 (Nizhny Novgorod). The immediate and long-term results of the treatment of 59 patients (30 men and 29 women) with severe pain in the lumbar spine who underwent facet joint denervation were studied. All persons involved in the study gave informed consent. The follow-up data were collected on 37 (62.7 %) patients from 1.7 months up to 1.5 years after surgery.

A diagnostic neurosurgical complex was used for dynamic observation, which included general clinical and neurological studies, MSCT (32 spirals) and MRI (1.5 or 3.0 Tesla) data.

To interpret the MRI data, we used the Fujiwara classification of the degree of degenerative changes in facet joints [18]:

I: absence of hypertrophy of facet joints, hypointense signal on T1-weighted and T2-weighted scans;

II: absence of hypertrophy of facet joints, hypointense signal on T1-weighted scan and hyperintense signal on T2-weighted scan;

III: absence of hypertrophy of facet joints, hyperintense signal on T1-weighted scan and/or hyperintense signal on T2-weighted scan;

IV: hypertrophy of facet joints, hypointense signal on T1-weighted and T2-weighted scans.

Weishaupt arthropathy grades were used to make the assessment of the intensity of facet joint arthrosis based on MSCT results more objective [19]:

Grade A: normal facet joint space, 2–4 mm;

Grade B: narrowing of the facet joint space to <2 mm, and/or the presence of small osteophytes, and/or mild facet joint hypertrophy;

Grade C: narrowing of the facet joint space, and/or the presence of moderate osteophytes, and/or moderate facet joint hypertrophy, and/or bone erosion;

Grade D: narrowing of the facet joint space, and/or large osteophytes, and/or severe facet joint hypertrophy, and/or bone erosion, and/or subchondral cysts.

Diagnostic blockades of the facet joints of the lumbar spine were performed in 48 (81.4 %) patients. The diagnosis of facet syndrome was made on the basis of the positive effect of the diagnostic blockade of the affected facet joint.

The dynamics of pain syndrome was studied in detail using VAS, the level of anxiety and depression was studied using the hospital anxiety and depression scale, HADS. Oswestry Lumbar Pain Disorder Questionnaire was used to assess the quality of life.

The overall health and the effectiveness of the treatment were assessed using a patient satisfaction scale: Grade 1 corresponded to significant improvement; Grade 2, to clear improvement; Grade 3, to moderate improvement; Grade 4, to minimal improvement; Grade 5, to no improvement.

Treatment outcomes were evaluated using MacNab and Nurick scales.

The data obtained from the study were statistically processed using Microsoft Excel 2007 and SPSS Statistics 17.0 software packages. Variation statistics with calculation of arithmetic mean and standard deviation ( $M \pm m$ ) were evaluated, differences at  $p < 0.05$  were considered to be statistically significant. Information-analytical processing of the accumulated database and computing operations were performed on a personal computer.

## Results and Discussion

Average age of patients was  $56.4 \pm 8.2$  years. The period of time from the first onset of back pain was up to 1 year in 16 (27.1 %) cases, 1–3 years in 8 (13.6 %), 4–7 years in 2 (3.4 %), 8–10 years in 10 (16.9 %), more than 10 years in 23 (39.0 %) cases.

Neurological examination revealed flattened lumbar lordosis, tension and palpatory tenderness of paravertebral muscles at palpation in 59 (100.0 %) patients. Decreases in range of motion of the lumbosacral region ( $2.80 \pm 0.66$  points) were noted in 100 % of cases. Lasegue syndrome was observed in 22 (37.3 %) patients, while sensitive disorders in the form of hypoesthesia were

observed in 11 (18.6%). In 19 (32.2 %) cases, the Achilles reflex was reduced or absent (Table 1).

On admission to hospital, the intensity of pain syndrome on the VAS was estimated at an average of  $46.94 \pm 15.0$  mm. The Oswestry Disability Index of low back pain amounted to  $48.6 \pm 8.4\%$ , which corresponds to severe disorders, in which the pain becomes major issue, affecting the daily life activities.

The study of anxiety and depression revealed subclinical anxiety/depression in 44 (74.5 %) patients, and clinically significant anxiety and depression in 15 patients (25.4%) with a long history of pain.

According to X-ray and MRI of the lumbosacral spine, all patients have signs of degenerative disorder: 100 % of patients had protrusions of intervertebral discs at different levels and spondyloarthrosis (Table 2), 8 (13.6 %) patients had spinal canal stenosis, 9 (15.3 %) suffered from instability in the spinal motion segment at the lumbosacral level in the form of retrolisthesis and antelisthesis.

In all cases, the indication for surgery was the absence of a stable positive effect of the previously conducted conservative treatment over at least 6 weeks. The purpose of the surgery was to switch off the pathological impulse from the capsule of the facet joint. For diagnostic purposes, anesthetic facet joint nerve blockade was carried out before the denervation. The surgeries were performed under local anesthesia and under the control of the electro-optical converter. In 6 cases denervation of the facet joints was performed at one level (L4–L5), in 11 cases, at two levels (L3–L4, L4–L5), and in the remaining cases, at three levels (L3–L4, L4–L5, L5–S1; Fig.). Denervation was performed precisely under strict X-ray control to avoid spinal nerve root injury, perforation of the dura mater, injection of drugs into the epidural or subdural space, vascular damage with intravascular injection. No complications were registered in the nearest postoperative period (during hospitalization).

Upon discharge, all patients showed an increase in the range of movement in the spine, however intermittent low back

pain persisted ( $13.38 \pm 5.44$  mm VAS;  $p < 0.05$ ). In the assessment of overall health and treatment effectiveness, 30 (50.8 %) patients chose Grade 2 (clear improvement), 20 (34.0 %), Grade 3 (moderate improvement), and 9 (15.2 %), Grade 4 (minimal improvement).

On a MacNab scale, 39 (66.1 %) patients rated the treatment results as good, and 20 (33.9 %) as mediocre.

According to the Nurick scale, the 2nd level results of treatment (improvement) were recorded in 55 (93.2 %) cases, the 3rd level ones (unaltered) – in 4 (6.8 %).

It should be noted that six patients with minimal treatment outcomes were treated with denervation of the facet joints at one level (L4–L5). It is known that each facet joint has overlapping innervation from two adjacent segments, i.e. each spinal nerve innerves two facet joints at adjacent levels and adjacent soft tissues [20], which may be a predictor of unsatisfactory outcomes.

A questionnaire survey of 37 (62.7 %) patients was conducted. The time that passed after the surgery was  $7.6 \pm 4.2$  months. Poor treatment outcomes were reported by 43.2 % of the interviewed patients (Table 3): 7–10 days after the discharge, their pain syndrome began to intensify and at the time of the interview it was estimated to be 20–30 mm according to VAS, which was higher than prior to the denervation of the facet joints. Six months after the denervation, the patients were operated on for the removal of the hernia of the intervertebral disc. In addition, upon hospitalization of the patients with unsatisfactory outcomes, high rates of disorders on the Oswestry scale ( $56.00 \pm 3.46$  %) and clinically significant anxiety/depression were noted.

21.6 % of respondents rated the outcomes of treatment as a mediocre: after 2–3 months their pain syndrome began to intensify, but the level of pain was estimated at 10–20 mm VAS, i.e. lower

**Table 1**

Clinical-neurological signs of spondylarthrosis in clinically examined patients

Sings	Patients, n (%)
Tension and palpatory tenderness of paravertebral muscles in the lumbar spine	59 (100.0)
Flattened lumbar lordosis	59 (100.0)
Sensitive disorders	11 (18.6)
Lasegue's symptom	22 (37.3)
Acute onset	23 (39.0)
Gradual onset	36 (61.0)
Rapid progression	15 (25.0)
Slow progression	44 (74.6)
Reduced pain after warm-up	55 (93.2)
Flexion-extension symptom	54 (91.5)
Increased pain in case of rotation in the lumbar spine	48 (81.4)
Increased pain in verticalization of the body or the in case of axial load on the lumbar spine	41 (69.5)

than prior to the denervation of the facet joints.

The remaining 35.2 % of the interviewed patients rated the long-term outcomes of treatment as good. 18.9 % of them did not complain of back pain, and 13.5 % still had mild pain ( $14.0 \pm 4.18$  mm VAS). All patients with good treatment outcomes still had subclinical anxiety/depression.

The high level of unsatisfactory outcomes may be associated with other causes of pain syndrome: discogenic pathology, cicatrical adhesion, secondary myofascial pain syndromes, which requires a more thorough selection of patients for denervation of facet joints [16, 21]. The cause of pain recurrence may be reinnervation of the joint capsule within a year after surgery [11]. Another reason for the incomplete pain relief is incomplete denervation. Such patients undergo a second denervation, which completely eliminates pain in 30 % of cases [21].

In the absence of the effect of conservative treatment of degenerative diseases of the lumbosacral spine, minimally inva-

sive techniques are the most effective. Their use allows to reduce the number of patients staying in a specialized hospital, improves treatment outcomes. The purpose of the denervation of facet joints is to block the pain impulse from the affected area [6, 13, 22]. According to the literature [10, 12, 21–23], their effectiveness amounts to 70–80 %. The results of our study are consistent with the results obtained by other authors.

## Conclusion

Facet joint denervation is an effective minimally invasive method for treating facet syndrome caused by spondylarthrosis. It allows significantly reducing pain and improving the quality of life of patients in the early and long-term postoperative period. Back pain syndrome is polyethyological, which requires a careful selection of patients for this type of intervention.

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Table 2

Distribution of patients by severity of facet joint arthrosis, n (%)

Severity	According to Fujiwara [18] classification	According to Weishaupt [19] classification
I/A	15 (25.4)	17 (28.8)
II/B	28 (47.5)	29 (49.2)
III/C	16 (27.1)	13 (22.0)
IV/D	—	—

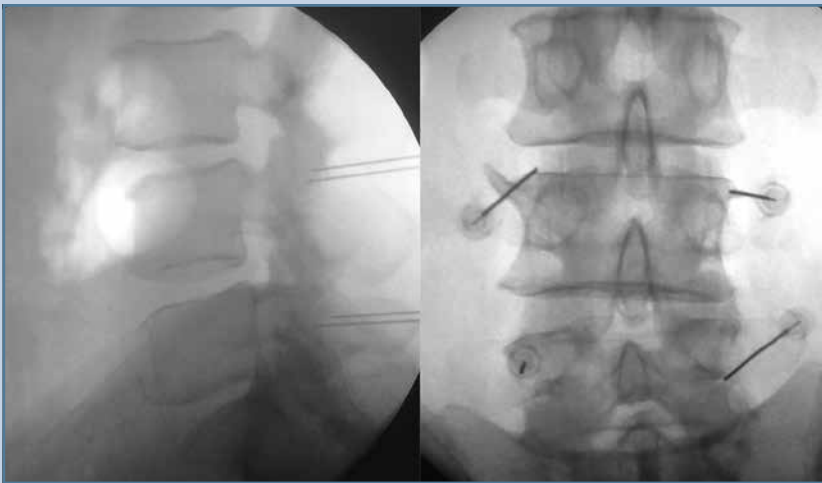


Fig.

X-ray control of facet joint denervation in the antero-posterior and lateral projections

Table 3

Distribution of patients by treatment outcome on MacNab, n (%) scale

Outcome of treatment	At discharge (n = 59)	At follow-up (n = 37)
Good	39 (66.1)	13 (35.2)
Mediocre	20 (33.9)	8 (21.6)
Poor	0 (0.0)	16 (43.2)

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