CHRONIC ELECTRICAL SPINAL CORD STIMULATION OF THE FOR FAILED BACK SURGERY SYNDROME*

E.D. Isagulyan, A.A. Tomskiy, V.A. Shabalov, E.M. Salova
N.N. Burdenko Neurosurgical Institute, Moscow, Russia

Objective. The objective of the study is to evaluate the results of chronic electrical spinal cord stimulation (SCS) in patients with pain syndromes that occurred after spine surgery.
Material and Methods. During 2001—2012, chronic SCS systems were implanted in 100 patients. Pain syndrome duration before application of neurostimulation averaged 5.5 years. In 12 patients, SCS was used in combination with peripheral nerve stimulation due to individual pain features. The indications for surgery included persistent neurogenic pain in the back and limbs and positive results of test stimulation. Pain severity, its influence on the quality of life, and analgesics requirement were assessed using the modified ten-point visual-analog scale. The Multivariate Verbal-Color Pain Test was used to assess the proportion of neuropathic, somatogenic, and psychogenic components of the pain syndrome. The results were assessed in the early postoperative period, in 6 and 12 months, and then once a year.
Results. In the early postoperative period, 45 patients reported excellent, 37 — good, and 18 — satisfactory results. In long-term follow-up, results remained excellent in 28 patients, good in 37 patients, and satisfactory in 15 patients.
Conclusions. Epidural spinal cord stimulation is a highly effective method, which allows managing pain syndrome during the long-term follow-up. Chronic stimulation effects are completely reversible and safe.
Key Words: failed back surgery syndrome, spinal cord stimulation, back pain.

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In the previous paper [3] we demonstrated the importance of the problem of treatment of back pain and radicular pain in the leg that can occur after spine surgery as a well-known failed back surgery syndrome (FBSS). Once again, we discussed the repeatedly proven effectiveness of chronic epidural spinal cord stimulation method (SCS) in treatment of this complex pain syndrome. We also reviewed the world literature data, which demonstrate the lack of effectiveness of reoperation and conventional conservative treatment without the use of SCS.

In this article, we report the results of FBSS treatment using the conventional SCS method.

The study is aimed at analyzing the results of SCS in patients with neurogenic pain syndromes in the lumbar region and lower limbs that occurred after spinal surgery.

Material and methods

From 2001 to 2012, SCS systems were implanted in 100 patients (43 males and 57 females) aged 31–74 years (mean age 44.2 years).

The average duration of pain before application of neurostimulation was 5.5 years (2 to 12 years). These data, as well as pain history duration and the number of operations before application of SCS are summarized in Table1. In 12 patients, SCS was used in combination with peripheral nerve stimulation because of features of pain syndrome.

Indications for surgery in all FBSS patients included persistent excruciating neurogenic pain in the back and limbs, which could not be controlled by analgesics, specific pain-relieving psychotropic pharmacotherapy, blockades, physiotherapy treatments, and acupuncture. Totally, there were 127 patients, who met these criteria in our series of observations.

There were no cases in our practice, neither we have found publications, where positive results in long-term follow-up were observed in patients with negative results of the test period. Therefore, in this paper we report only those cases (n = 100), where the results of the test period were positive, i.e. the severity of pain and its impact on the quality of life decreased by at least 30 % compared to baseline.

Patients were examined by standard methods, including the assessment of neurological status in combination with neuro-orthopedic examination. In most cases, patients have been already examined and therefore they had up-to-date CT scans, MRI, and spondylograms. In the cases where these examinations were not carried out during the last 6 months, we performed diagnostic imaging in order to rule out organic causes, requiring anatomical surgery. All patients were necessarily examined by neuropsychologist using scales described below.

In some cases, patients were also examined by neuropsychiatrist as

it was strongly recommended by neuropsychologist.

Scales. Severity of pain syndrome and its influence on the quality of life were assessed according to modified Brief Pain Inventory, named PQLC (Pain and Quality of Life Card). This test consists of ten-point visual-analog scales (VAS), which allow evaluating the intensity of pain along with intake of medicines, daily activities, impact of pain on the health, self-care, as well as other parameters of quality of life. In this way, patient's pain profile was developed (Fig. 1).

We used standard scales DN4, LANSS, and PAIN DETECT in order to determine neuropathic nature of pain. We also used a multi-dimensional color-verbal test [1], which enabled us to determine the percentage of neuropathic, somatogenic, and psychogenic components in the complex picture of pain. This test includes the scale of lies and aggravation, which helped us to select candidates for neurostimulation (Fig. 2).

The results were evaluated in the early postoperative period (the first month after discharge), 6, 12 months, and then once a year. Pain profile (pain and its influence on the quality of life) was evaluated on PQLC.

The result of SCS was regarded as great in cases where the intensity of pain decreased by 75 % compared to the baseline and consumption of analgesics was significantly reduced (or the patient discontinued analgetics uptake) and daily activities and quality of life in general significantly increased.

Decrease in pain severity by 50–75 % from the initial level along or with reduced intake of analgesics and improved quality of life was considered as good result.

Decrease in pain severity by 30–50 % compared to the initial level along or with increased daily activity and patient's satisfaction with quality of life regardless of the analgesic intake was considered as satisfactory result.

Decrease in pain severity by less than 30 % was considered as unsatisfactory result.

Table 1

Distribution of patients according to their sex, age, and history

Sex, n		Age, years			Duration of pain syndrome, years			Number of operations before neurostimulation, n		
M	F	Min	Max	Average	Min	Max	Average	Min	Max	Average
43	57	31	74	44,2	2	12	5,5	1	12	4

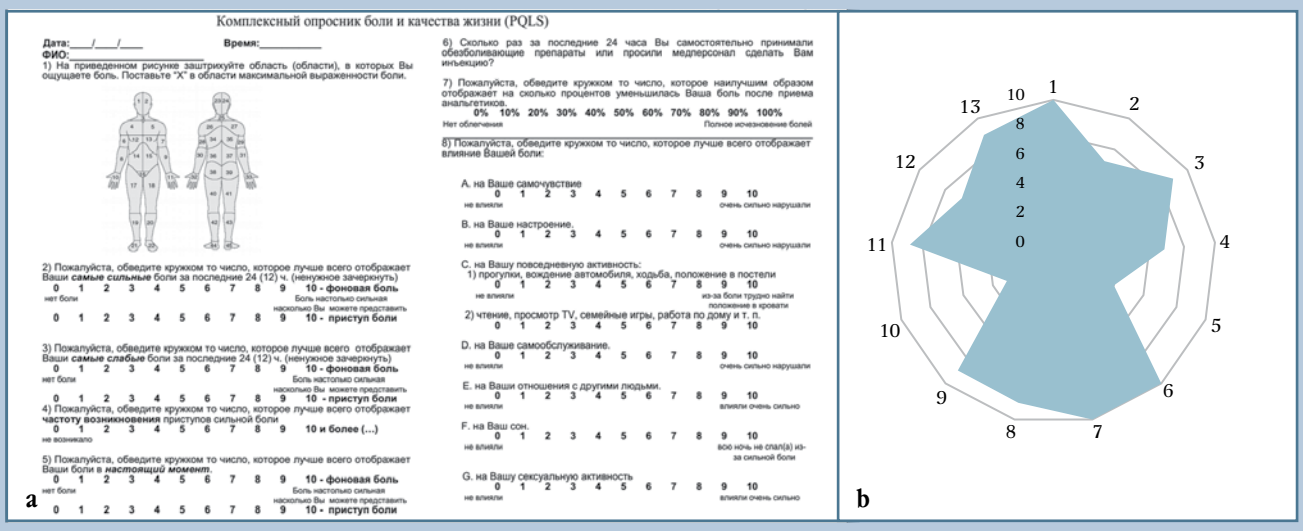

Fig. 1

Patients' pain profile: **a** — a complex questionnaire of pain and quality of life (PQLS); **b** — «Pain profile» radar chart developed based on the results of PQLS questionary: *1* — maximum pain; *2* — minimum pain; *3* — average pain; *4* — the incidence of severe pain attacks; *5* — the amount of analgesics per day; *6* — the impact of pain on well-being; *7* — the impact of pain on mood; *8* — the impact of pain on daily locomotor activity; *9* — the impact of pain on daily social activities; *10* — the impact of pain on the self-care; *11* — the impact of pain on communication with other people; *12* — the impact of pain on sleep; *13* — the impact of pain on sexual activity

In 78 patients, electrodes were implanted under local anesthesia in order to maintain adequate contact during intraoperative stimulation test. During intraoperative stimulation, we tried to achieve paresthesia covering a painful area as much as possible. The standard parameters of intraoperative electrical stimulation in the ventricumbent position of the patient included pulse width of 300-500 μs, frequency of 50–120 Hz, amperage (voltage) of 2.5–7 A (V). Most patients have noted that pain decreased when vibration occurred at the painful area; this happened when the patient still was on the operating table. In 12 patients, there was prolonged analgesic effect after electrical stimulation, which lasted from several hours to a day.

In most cases, the test period of 2 to 21 days (on the average 7–10 days) was carried out in the hospital. In several cases, the test period continued domiciliary, allowing us to extend it and make it as close as possible to the conditions of potential SCS.

If the results of psychological testing have shown that psychogenic component of the complex pain syndrome was minimal, then we preferred to use permanent electrode with a temporary lead(temporary connector was drawn out, while the electrode remained until implantation of the whole system).

In cases where a psychogenic component was significant, temporary electrode was implanted.

Implantation was conducted by means of spine puncture in the ventricumbent position of the patient. In all cases, we placed a bolster under patient's belly. Currently we use a rubber air pillow as a bolster. This allows us to use this position, which is unpleasant for patients, only during implantation. Pillow deflates during electrode fixation. According to the standard procedure, 4- and 8-contact electrodes were implanted to the posterior epidural space at the lumbar enlargement of the spinal cord. In the last two years, we mainly use 8-contact electrodes (including diagnostic ones).

During the first 1.5–2 years, we tried to implant cylindrical electrodes even in the presence of the stabilizing system on the way of the electrode, and then, in case of failure, proceeded with an open surgery. Later on (after several such attempts), in the case of severe scar adhesions verified on MRI, we a priori used open approach, microlaminectomy with implantation of a planar electrode (4-, 8-, 16-, and 20-contact ones). Open implantation was used in 22 patients. The operation was performed under general anesthesia guided by muscle contractions in the appropriate myotomes.

In some cases, patients with severe scar adhesions still needed intraoperative electrical stimulation. The results of this procedure could determine not only the location of electrodes, but also their types and amount. Infiltration anesthesia with 0.5 % ropivacaine solution was insufficient in this case. In such cases, the "asleep-awake-asleep" anesthesia method was used, which allowed us to awaken the patient at the time of neurostimulation.

This variant of anesthesia was used in four patients, who underwent total intravenous anesthesia with controlled level of consciousness suppression by means of bispectral index (BIS) monitoring. Installation of I-gel laryngeal mask, artificial lung ventilation with 40% oxygen-air mixture, and propofol infusion were performed under the conditions of mask lung ventilation with 100 % O2. The cuff of the laryngeal mask is composed of a gel-like material, which adheres to the entrance to the larynx above the vocal cords.For this reason, it does not move when the patient is turned on his belly. Propofol injection rate wasadjusted based on BIS data. When the approach was formed under BIS monitoring, propofol injection rate was reduced to 0, allowing gradual awakening of the patient to the level of wakefulness. After the beginning of spontaneous breathing, voice instruction execution, and reaching saturation level of 97–100 %, BIS value was 87–95, which made it possible to remove the laryngeal mask. Adjustment of electrode position in the epidural

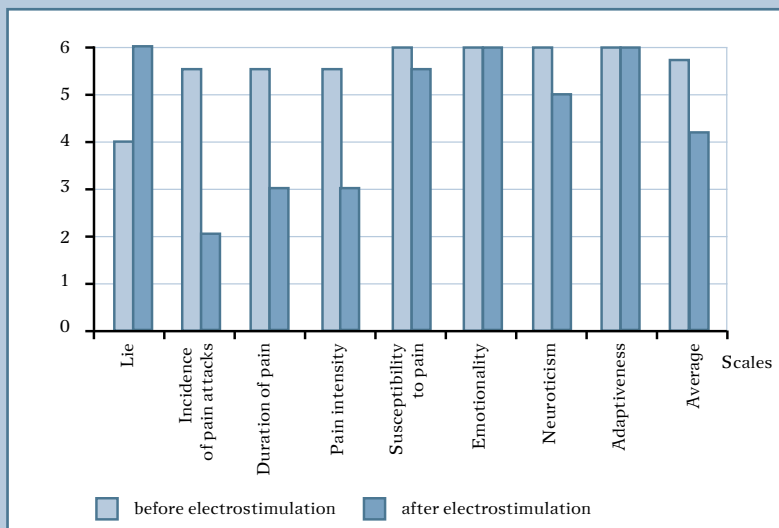

Fig. 2
The results of patient's diagnosis before and after chronic electrical stimulation on the spectrum of the multidimensional verbal-color test scales: despite the obvious decrease in the incidence and severity of pain, there are still high scores on neuroticism, emotional stress, and adaptation scales, which, together with increased lies score, is indicative of severe psychogenic component of a complex pain syndrome

space along with intraoperative electrical stimulation (BIS corresponded to the level of wakefulness) was started, when there was an adequate verbal contact. When optimal analgesic effect of test electrical stimulation had been obtained, indicating the correct positioning of the implanted electrodes, surgical wound was sutured. For this purpose, we started propofol infusion, adjusting its rate under BIS monitoring to the level of 60–75, corresponding to deep sedation. The patient was on spontaneous breathing with O2 inhalation through a nasal catheter. During the closure of the surgical wound, all patients had stable hemodynamic parameters. There were no signs of respiratory depression. At the stage of skin sutures, infusion rate was gradually reduced under BIS monitoring, allowing us to awaken patients during application of aseptic dressings. By the time when the patients were turned on back, their BIS level was 89–97, which corresponded to the wakefulness level. Taking into account the extracranial location of the pathology and the absence of hemodynamic problems and muscle relaxants, after surgery all patients were transferred from the operating room to the ward in satisfactory condition.

The development of ropivacaine, a local anesthetic that selectively (in dose-dependent way) inhibits pain sensitivity, while preserving the possibility of obtaining the responses related to deep sensibility, such as paresthesia, enables using epidural anesthesia in some cases.

The parameters of electrical stimulation test were adjusted individually, based on the therapeutic window, i.e. current settings, which provided a pleasant analgesic paresthesia (vibration) and were within the range between the first vibration sensations and unpleasant, painful paresthesia. These parameters varied mainly in amperage (or voltage) from 1.5 to 7 A (V) with an average of 3.4 A (V).

It is well known that pulse frequency determines the characteristics of paresthesia, from tapping one at the frequency of 2–10 Hz to rigid vibration at the frequency of 130 Hz and above. It is worth noting that vibration can be insensible at ultra-high frequencies (2 KHz). In the midrange (which corresponds to the frequency within 50–90 Hz), patient may feel massaging, tapping, and wavy vibration, which is normally more pleasant to patients.

The pulse width (measured in microseconds) was not typically used by patients themselves. We usually set it within the range 210 to 300 μs.

As previously mentioned, all the patients included in this study demonstrated positive results during the test period, i.e. decrease in severity of pain by at least 30 % compared to baseline and discontinuation or reduced consumption of analgesics. This allowed us to implant the receiver (the first 12 systems) or pulse generator in 100 patients.

Neurostimulator implantation was typically conducted under general anesthesia. During the first 5–6 years, we implanted pulse generator or receiver to the iliac region, but in recent years we implant pulse generators more frequently to the outer quadrant of the inferior lumbar-gluteal region, which is primarily due to requests of patients. It should be noted that this eliminates the need for extension cable (connector) and the need to turn the patient to the lateral position during operation. This

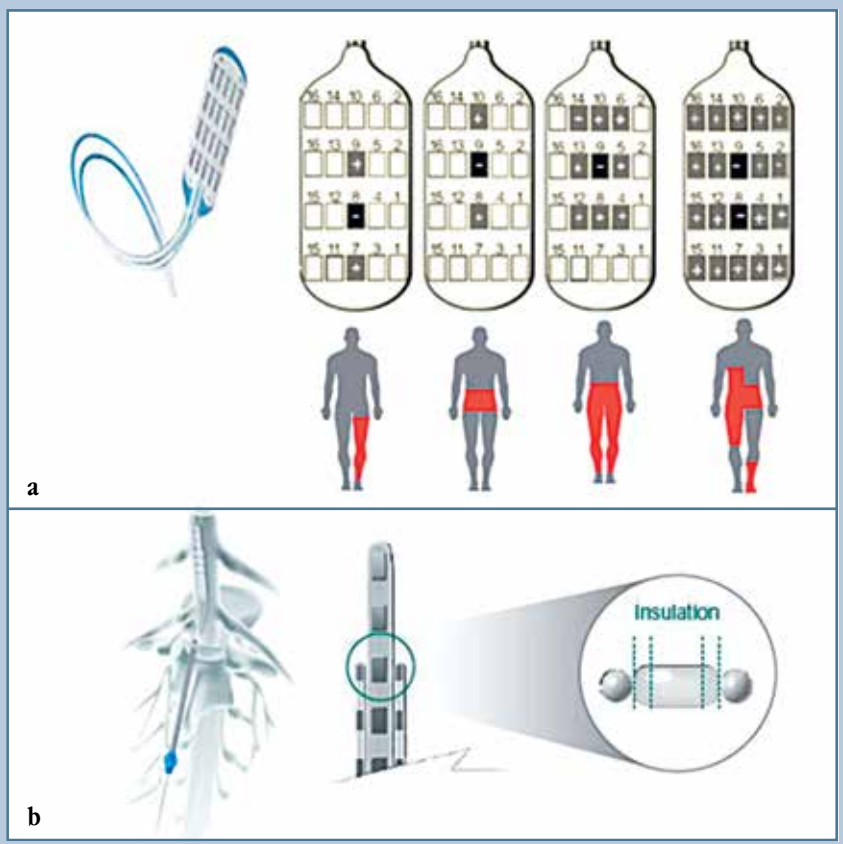

Fig. 3
Modern multi-contact electrode systems in many cases cover wide painful areas with paresthesia: **a** —new five-row electrode Penta and paresthesia options(red areas), **b** — combination of electrodes consisting of a new 8-contact planar-cylindrical electrode S-Type and two 4-conact electrodes; this combination provides full coverage of waist and both legs with paresthesia

is especially significant in those cases, when a temporary electrode should be changed to a permanent one or position of the permanent electrode should be adjusted based on the results of the test period.

In most cases, electrostimulation parameters after implantation of the whole system corresponded to those used during the test period. However, while only bipolar distribution of the electric pulse can be programmed during stimulation test (between "+" and "-" on the electrode), chronic electrostimulation enables monopolar configuration, where the field is generated between cathode on one or more electrode contacts, and anode, whose role is played by the case of simulator itself. In practice, this provides wider field, which can be moved toward the maximum severity of pain, which is impossible in the case of bipolar configuration.

As previously noted, 12 patients were implanted with both spinal and subcutaneous electrodes directly to the painful area. This was due to the fact that in some patients it is extremely difficult to cover accurately the painful area with paresthesia in the inferior lumbar region without causing discomfort in other areas. Over the last 5—6 years, many different electrodes have been developed, including multi-contact cylindrical, planar-cylindrical, planar three-row, and five-row ones (Fig. 3).This improved the possibility of using electrical stimulation in such difficult situations. However, there were patients who were very difficult to achieve paresthesia directly in the postoperative scar and the surrounding areas of the inferior lumbar region. In such cases, we use a combination of a spinal electrode to control the pain in patient's leg (or legs) and a subcutaneous electrode placed in the lumbar region (Fig. 4).

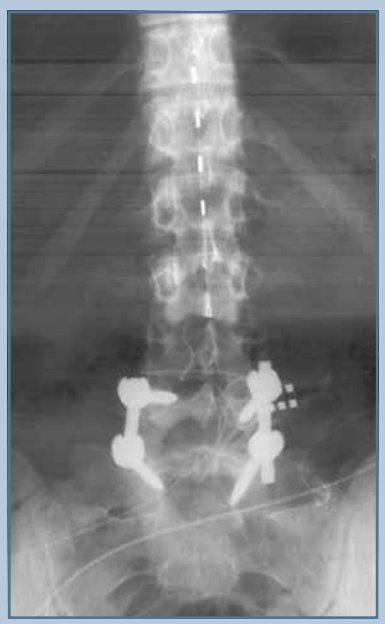

Fig. 4
X-ray picture of 21-years-old FBSS patient N. after three operations (L_4—L_5, L_5—S_1 herniae, stabilization), having pain in her lumbus and both legs, more pronounced on the right, L_5-radiculopathy-like, spreading on the whole leg. The top of the radiograph shows a four-contact electrode in the posterior epidural space at the median line of Th_2–L_1, which provides analgesia in the legs; the bottom of the radiograph shows the same electrode implanted subcutaneously, directly to painful area, at the postoperative scar

Results

In the early postoperative period, 45 patients demonstrated excellent, 37 patients – good, and 18 patients – satisfactory results of SCS. In all patients, decreased nocturnal and background pain, increased daily activity, and decreased analgesics consumption were observed (Fig. 5–7, Table 2). Thirty seven patients completely discontinued analgesics uptake. The average consumption of analgesics was reduced by 80.5 % compared to the baseline. Daily activity increased on average by 70 %.

The duration of follow-up averaged about five years (8 months to 7 years). During the follow up, excellent results were retained in 28 patients, 37 patients had stable good effect, and 15 patients had satisfactory effect. All patients with positive results of chronic SCS significantly reduced their doses of anal-

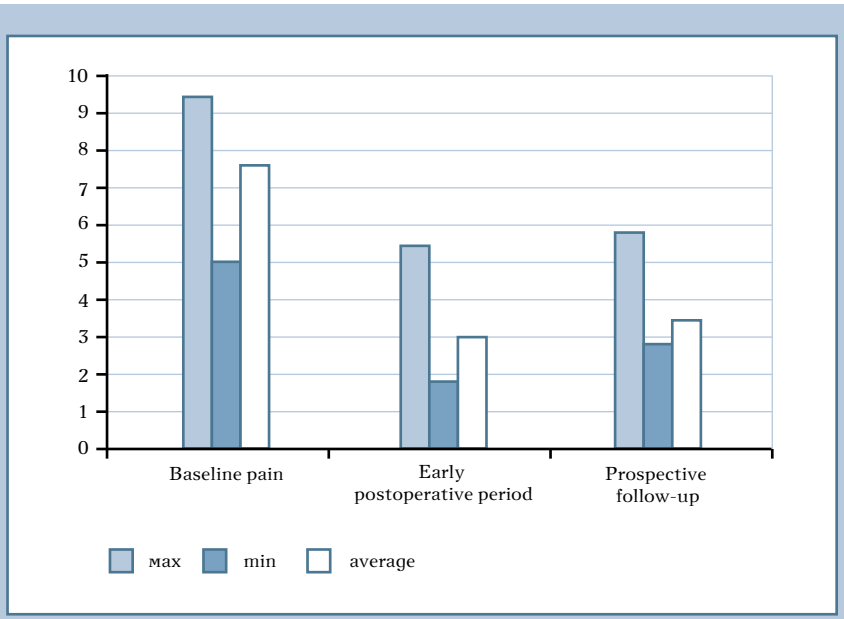

Fig. 5
Dynamics of pain according to VAS in examined patients (n = 78)

gesics (on average by 75 %) or completely discontinued them.

In 20 patients, the analgesic effect of SCS gradually leveled. For this reason, stimulator was removed in 12 of them at different times after the implantation. The remaining 8 patients rated the results of SCS as unsatisfactory, however, they refused to remove the stimulator (Table 3).

The patients were questioned, to what extent SCS has solved the problem of back and/or leg pain. 78 % of patients answered positively within the range from«excellent» to «satisfactory» (Fig. 8a).

The patients were also questioned, whether they would repeat the implantation procedure. Positive answer was given not only by all the 80 patients with positive results, but also by three of the eight patients who believed that their results were unsatisfactory (Fig. 8b).

In general, our results are comparable to those of leading clinics dealing with neurostimulation[6]. We believe that some prevalence of positive results compared to published data is associated with very strict selection criteria and the fact that all these results were evaluated in patients, who have passed the test period (Table 4).

Pulse generator replacement due to battery depletion or replacement of pulse receiver by generator was required in 47 patients. In 15 cases, the replacement was performed twice, and in 5 cases it was performed three times during 10 years. In the past three years, we mainly use rechargeable systems designed with operating life of 9–10 years.

Table 2

The results of patient interviewing (n = 78) using the daily activity questionnaire of Belgian insurance system, %

Parameters	No problem		Minor problems		Moderate problems		Significant problems		Impossible	
	Baseline	With SCS	Baseline	With SCS	Baseline	With SCS	Baseline	With SCS	Baseline	With SCS
Weight lifting	–	–	5	7	8	18	37	33	50	42
Sitting for more than 30 minutes	3	12	5	33	27	31	35	19	30	5
Walking 500 m	–	5	–	35	15	41	38	12	47	7
Dressing without assistance	5	15	17	38	28	27	36	17	14	3
Going 10 steps upstairs	–	12	7	18	28	31	35	27	30	12
Hygienic procedures without assistance	5	17	19	34	26	29	36	17	14	3

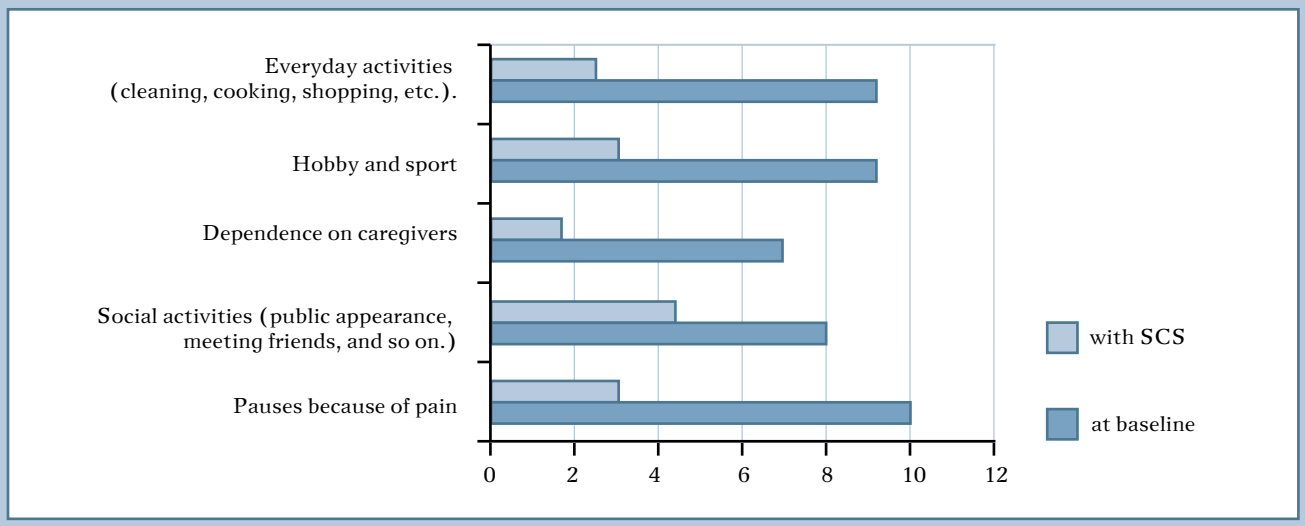

Fig. 6

The impact of pain on daily social activity of examined patients (n = 78) over time: the lower the score, the less the impact of pain (0 — pain does not affects the activity, of 10 — pain makes it virtually impossible)

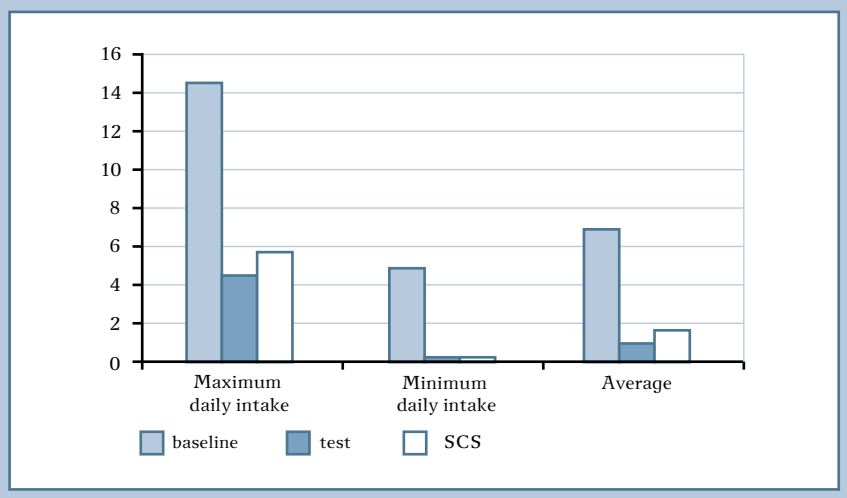

Рис. 7
Dynamics of analgesics intake in the examined FBSS patients (n = 78)

Table 3
The outcomes of chronic epidural stimulation of the spinal cord, %

Outcomes	Early period	Follow-up
Excellent	45	28
Good	37	37
Satisfactory	18	15
Unsatisfactory	0	20

Complications. The number of complications was generally quite large. We performed 30 revisions and adjustments of electrode positions. In three cases, adjustment of the pulse generator position was required because of painfulness in the area of its implantation. In one case, pressure sore was observed in the area of pulse generator, and in another one case, pressure sore was observed near to the subcutaneous electrode. However, 80 % of these complications occurred in the first 5 years of our experience. The improvement of systems, occurrence of new options for electrode fixation, multi-contact electrodes, and capabilities of programming systems resulted in minimization of the number of such complications. During the past 3 years, we performed only 7 reoperations in FBSS patients. At the same time, in 75 % of all FBSS patients, SCS system was installed during the last 4 years.

There were no neurological complications and only one case of suppuration of subcutaneous electrodes in a patient with immunodeficiency (due to HIV). We observed no failures of the systems themselves. However, failure of patient's remote control occurred in three cases, and they were replaced.

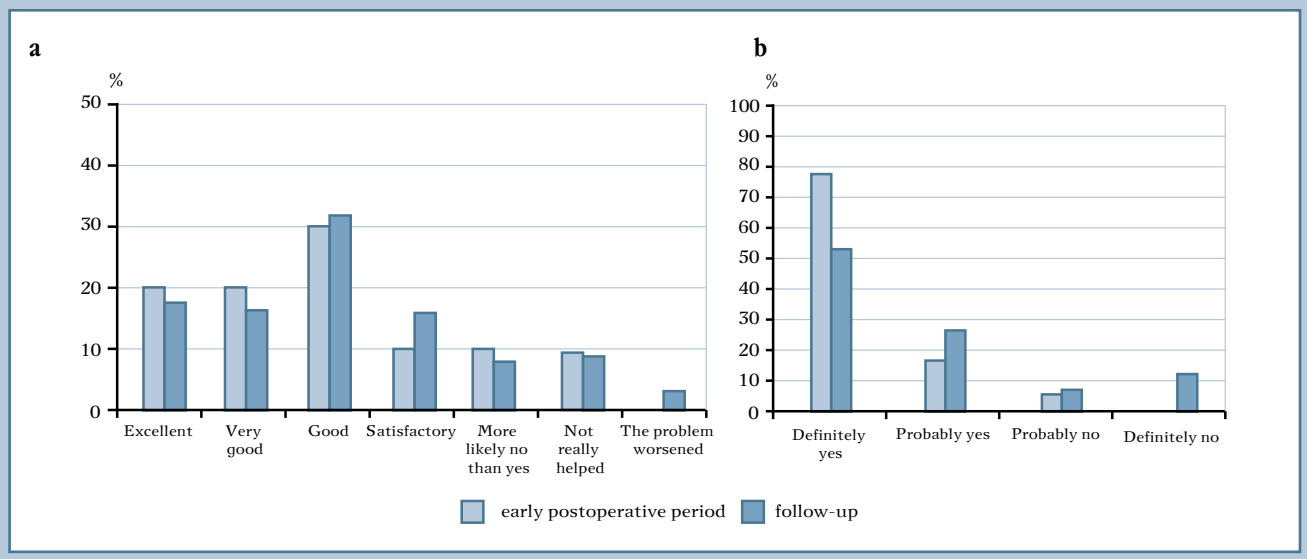

Fig. 8
Evaluation of treatment outcomes based on the data of patient interviewing (n = 78): **a**—to what extent SCS has solved the problem of back and/or leg pain in FBBS patients; **b**— whether the patient would repeat the operation of neurostimulator implantation for chronic SCS

Table 4
Comparative analysis of the outcomes of treatment of FBSS according to the literature

Researchers	Year	Patients, n	Duration of follow-up	Reduction of analgesics	Percentage of positive outcomes (pain reduction by >50%)
Lazorthes et al. [11]	1995	692	2 to 20 years (on the average 10)	Not reported	1st series — 54.0 %, 2nd series —52.0 %
Rainov et al. [14]	1996	29	2 to 3.5 years	not reported	86,2 %
Barolat et al. [5]	2001	41	6 and 12 months	not reported	6 months — 91.6 %; 12 months — 88.2 %
Van Buyten et al. [15]	2001	254	48 months	Most patients	68,0 %
Cameron [6]	2004	3679	Decisive predominance of good outcomes in patients, who underwent only one surgery before SCS		
North [12]	2005	45	3 years	The use of opioid analgesics is higher in the group of repeated anatomical operations compared to the group of spinal cord stimulation	In the group of repeated anatomical operations — 3 (11.5 %) of 26 patients; in the group of spinal cord stimulation — 9 (56.0 %) of 19 patients
Kumar et al. [10]	2007	100	On the average 12 months	28,0 %	50,0 %
V.A. Shabalov, E.D. Isagulyan [4]	2005	10	18 months	75,0 %	8 из 10 (80,0 %)

Discussion

When analyzing the follow-up results of FBSS patients over time, we have found that stable positive results of SCS were observed in the following cases:

1) pain was not directly related (!) to the spine movement;

2) neuropathic pain syndromes with relatively limited painful areas;

3) there were concomitant spinal and/or radicular prolapses, when the duration of the medical history, degree of injury of the spinal cord and/or roots (the severity of deafferentation symptoms), the severity of the psychological component of a complex pain syndrome with gain from illness signs are of particular importance;

4) reoperations for the degenerative diseases of the spine, when results directly depended on the number of surgeries and duration of pain history: more surgeries (such as meningoradiculolysis) and longer pain history were associated with worse long-term results of SCS (Fig. 9, 10).

All negative results, as well as the deterioration of positive results during follow-up were obtained in patients with severe psychogenic component of a complex pain syndrome. Young and Rinaldi [16] said on this issue: «When a patient needs psychological care, he will not obtain stable satisfactory result without this care, whatever available treatments are used».

We observed improvement of SCS results during follow-up in those patients who independently and systematically adjusted electrostimulation program, from time to time changing it according to varying internal and external conditions.

Thus, epidural electrical stimulation of the spinal cord (as well as its combination with subcutaneous electrical stimulation) is a highly effective and less traumatic method. The effects of chronic electrical stimulation are completely reversible and safe. We observed no serious complications when using this technique. SCS provides consistent pain control during long-term follow-up. The compliance with selection criteria is of primary importance to improve the results of the method and extend its effectiveness. The most important ones are the following:

1) duration of pain history: SCS should be applied earlier;

2) obvious predominance of continuous neuropathic pain, which is not associated with spine movement; dynamic pain is not manageable by means of SCS;

3) the number of open spinal surgery prior to neurostimulation: the more such operations, the worse the SCS outcome;

4) high psychogenic component of a complex pain syndrome and higher score on the «lies and aggravation» scale are extremely adverse factors;

5) sufficient intelligence and education level of patients, necessary skills for easy remote control management.

It should be noted that complete mutual understanding between doctor and patient is required in order to achieve positive results in each specific case. A neurologist, who send a patient to neurostimulation, should explain the patient the real possibilities of this method as early as at the ambulatory stage. It is important to keep in mind that in our reality, FBSS patients usually have undergone several operations and tried many different pharmaceutical and drug-free therapies. For this reason, when they come once again to the neurologist, they are already greatly disappointed. For these reason, when offering this method, we cannot put inadequate hopes on it as a miraculous remedy and pain relief. It is necessary to tactfully explain to the patient that this method is only supposed

to alleviate suffering, reduce pain, help to control it, but in no case it allows eliminating the pain completely, once and for all. In the case of early treatment, this option is possible. However, the full control of pain is more probable in patients who previously underwent only one operation and were treated no later than 3–6 months after it. Patients who come with too high expectations and get pain relief owing to neurostimulation, would be extremely dissatisfied with the results of treatment, if they planned to get rid of pain. It must be emphasized that an adequate assessment of the prospects of treatment requires, on the one hand, detailed patient explanation given by a doctor, and, on the other hand, patient's willingness and ability to cooperate. If patient's reluctance is caused by severe depression due to long-term suffering and series of disappointments, neuropsychiatrist's support could be required to manage depression and anxiety.

In all cases, testing is required before neurostimulator implantation. It is the period, during that patient's reasonable expectations should be justified, and the patient should feel the control over his own pain. During the test period, the patient can evaluate not only pain control, but also possibilities of the method depending on varying external and internal conditions.

Before implanting a stimulator, we should make sure that the patient knows exactly how much he can control pain using electrostimulation sessions, what regimen of electrical stimulation sessions should be used to feel comfortable, how much does it improve sleeping, daily activities, and well-being right now. This is very important, because some patients, who want to implant a stimulator, consider this method as a last resort and suggest further improvement of stimulation results. In this case, we should explain to the patient that eventual improvement of stimulation results is possible, but we should not put hopes on it from the very beginning. We should rely on realistic possibilities achieved during the test period. Moreover, the patient should be warned that anesthetic effect may somewhat decrease in the future (usually by 10–15 %), because during the first few days and sometimes during the whole test period the primary analgesic effect is amplified by placebo effect.

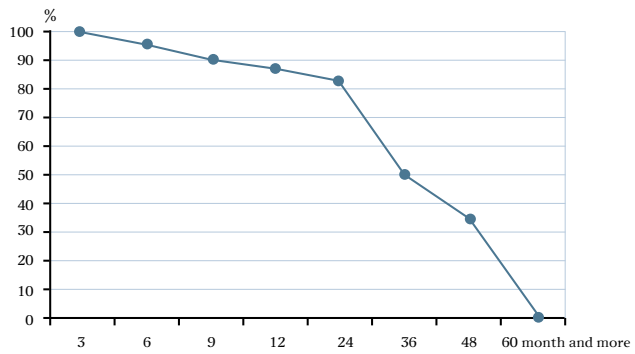

Fig. 9
Relationship between treatment outcomes (patient satisfaction) and the duration of pain history, i.e. the time elapsed since the first spinal surgery until SCS

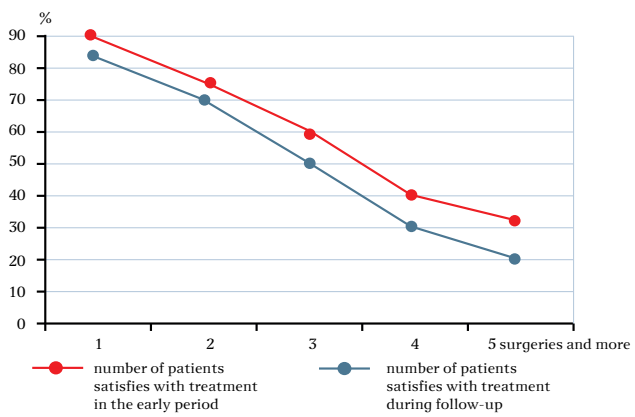

Fig. 10
Relationship between treatment outcomes (patient satisfaction) and the number of previous anatomical spine surgeries before admission for SCS

Conclusion

What is the difference between FBSS patients and patients suffering from other pain syndromes? These are patients, who have been harmed by surgery, as stated in their diagnosis. It is important to keep in mind this psychological aspect when choosing a treatment [2, 7, 8].

Despite all the possible causes of FBSS, including aforementioned ones, and psychological characteristics of a patient, up to severe mental disorders, further extension of this syndrome can be prevented only by spinal surgeons, who often believe that the next surgery will solve the problem [2].

In fact, the solution of this problem lies in the plane of multidisciplinary approach and continuity of treatment of severe chronic pain syndromes, such as FBSS. Complex problems require a comprehensive approach and methods of functional neurosurgery often play an important role in dealing with these problems [4, 9, 12, 13].

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Address correspondence to:
Isagulyan Emil Davidovich
N.N. Burdenko Neurosurgical Institute,
4th Tverskaya-Yamskaya str., 16,
Moscow, 125047, Russia,
EIsagulyan@nsi.ru

Emil Davidovich Isagulyan, MD, PhD; Aleksey Alekseyevich Tomskiy, MD, PhD; Vladimir Alekseyevich Shabalov, MD, DMSc, Prof.; Ekaterina Mikhaylovna Salova, MD, PhD, N.N. Burdenko Neurosurgical Institute, Moscow, Russia.