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FAILED BACK SURGERY SYNDROME (FBSS)

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ABSTRACT

Failed Back Surgery Syndrome (*FBSS)* is a serious health problem and a term used to describe persistent or recurrent pain (limited or radiating to the lower limbs) of the lower back, occurring after one or more surgeries. According to various sources, it affects 10-44% of operated patients and, due to the constantly growing number of spine surgeries, it shows an upward trend. The etiology of *FBSS* can be surgical and non-surgical, but the mechanism of pain is complex. The most common causes include: intervertebral foramen stenosis, discogenic pain, pseudoarthrosis, and recurrent disc prolapse syndrome. The pain is neuropathic in nature with allodynia, hyperalgesia and dysesthesia.

The aim of this work: FBSS in therapy is perceived as a huge challenge for both surgeons and other physicians, because due to the numerous causes and complex pathomechanism of pain, pain syndromes after unsuccessful spine surgeries often turn out to be resistant to treatment. As a result, it is important for a clinician to understand the problem and initiate appropriate treatment for a patient struggling with this syndrome.

Methods: Selected articles from the Pubmed database and specialized literature were analyzed in detail. We focused on the characteristics of the pain occurring in this syndrome, its diagnosis and treatment.

Conclusion: FBSS has various etiologies. Factors predisposing to the occurrence of chronic pain can be divided into preoperative, intraoperative and postoperative. Pain assessment is an important point in the decision-making process regarding management and treatment, which should be individual. The use of imaging tests is irreplaceable in diagnostics.

Keywords: Failed back surgery syndrome (*FBSS*)*, spine pain, treatment.*

INTRODUCTION

FBSS is a rather imprecise term that covers a heterogeneous group of diseases with persistent or recurrent low back pain with or without a radicular component, which appears in patients despite one or more surgical interventions in the spine. [1-4] This pain may be a consequence of surgery or may occur initially and be exacerbated or insufficiently alleviated after surgery. [5] The first such syndrome was described in 1991 by North and colleagues. [1] Currently, the term pain syndrome after unsuccessful spine surgery is considered quite inaccurate because it suggests that "something failed", "something went wrong", and is the result of complex pathological processes. [6] FBSS is diagnosed when a patient after successful spine surgery develops chronic back pain or back pain radiating to the lower limbs, lasting at least 6 months, and other causes of these ailments (infection, nerve pressure) have been excluded. [4,7] The assessment of the patient's clinical condition, physical examination, as well as psychological and economic assessment are very important because they allow us to determine the cause of the pain. This, in turn, is necessary for treatment. [3]

Pain syndrome after unsuccessful spine surgery has a complex etiology and due to the constantly increasing number of spine surgeries performed, the number of diagnosed cases of patients with FBSS is also increasing. [8]

At the same time, different patients have numerous and very diverse factors predisposing to the occurrence of chronic pain, which can be divided into preoperative, intraoperative and postoperative. [4]

Table number 1. Shows the identification of factors leading to FBSS.

Separation of factors leading to FBSS				
"bad" patient:	*"wrong" procedure:*	*"bad" technique:*	*failure to achieve the purpose of the operation:*	*disease progression:*
• *mental disorders,* • *wrong diagnosis,* • *inflated expectations,*	• *missed spinal stenosis,* • *incorrect location of pathology in diagnosis,*	• *pressure on nerve roots,* • *iatrogenic errors,*	• *pseudoarthrosis,* • *incomplete decompression,*	• *recurrent disc herniation,* • *spinal stenosis,*

Preoperative causal factors are divided into surgery-related and patient-related. According to the conducted research, surgical interventions may be negatively influenced by both the patient's poor psychological condition (anxiety, depression), as well as economic problems (salaries, court cases), which may prevent or significantly hinder and slow down the diagnostic process. It has been proven that patients receiving workers' compensation have a significantly poorer response to spine surgery. [4,9-13]. Based on another experience, it was also concluded that smokers were more likely to regularly take painkillers, had impaired walking ability, worse overall quality of life two years after surgery, and were more likely to have perioperative complications (difficult wound healing, more frequent infections and nonunions in spinal fractures) than in non-smokers. [14-17] Currently, one of the strongest negative prognostic factors for spine surgery is depression (which is why it is recommended to conduct pre-operative psychological tests), because patients with mental disorders usually experience more severe pain and weakness, which in turn may negatively affect the course of the procedure. Unfortunately, most surgeons treating spine disorders still do not use such an assessment. [9,12,18] Preoperative causative factors also include incorrect or incomplete diagnosis and inappropriate surgical treatment. The doctor should combine the symptoms reported by the patient with abnormalities in the physical examination and pathologies described in imaging studies. [10] Currently, the most common cause of FBSS (58%) is incorrect diagnosis (diagnosis of stenosis

at the wrong level or anastomosis in the wrong place). [9,11,15] Another type of inappropriate management is choosing an operation that does not address all of the patient's symptoms. It should also be remembered that a well-diagnosed pathology and an appropriately selected treatment procedure do not guarantee success if the procedure is incomplete. If the intended goals were not fully achieved, we talk about failed spine surgery. [10]

Postoperative factors are divided into disease progression and surgery-related factors. Lack of relief of back pain or its recurrence may be a consequence of progressive degeneration of the spine, the development of new abnormal changes located within the already pathologically changed spine, as well as injury or tension of adjacent muscle groups. Spine surgeries lead to biomechanical changes that increase the load and thus accelerate the development of degenerative changes in the fusion. [1,9,10] Knowing the potential sources of symptoms in a patient with *FBSS* and making the correct diagnosis is crucial to choosing the appropriate treatment for the condition. Failure to implement such a procedure or basing it on an incomplete or incorrect diagnosis will worsen the symptoms. [10]

METHODS

The presented manuscript contains a concise description of a disease with a complex etiology, FBSS. Selected articles from Pubmed and specialist literature were used in this review. We focused on showing the diversity of etiology, diagnosis and treatment. Management of this disease should be multidisciplinary. It is important to know the basics of this disease in the everyday work of surgeons and others.

RESULTS AND DISCUSSION

PAIN

Pain assessment is an important point in the management and treatment decision-making process. First, we should consider the nature of the pain - nociceptive or neuropathic? Both imaging and EMG tests as well as nerve conduction tests can be used for this purpose.

If we are dealing with nociceptive pain due to a reactive cause, the need for corrective surgery should be ruled out. It would be useful to use a tool that would enable mapping of painful areas of the back and would determine not only the location, but also the triggering factors, changes in pain intensity, the predominant component (neuropathic/nociceptive) and guide treatment options. [10] In this way, several patient populations were identified: the first with postoperative neuropathic pain in the lower back and the joints to which the pain radiates; the second one, which would include potential candidates for reoperation, and the next one including patients with spinal pain that developed mechanically, but over time developing features of neuropathy. The last and largest group of patients would be composed of FBSS patients with pain in both the low back and knee joints, but with a predominance of one of the components ("back dominant" or "leg dominant" subgroup). In this group, both mechanisms (nociceptive and neuropathic) clearly intertwine. Depending on the membership in particular groups, the procedure varies. The ultimate goal of assessing the type of pain is to isolate the so-called real FBSS patients (not requiring surgery) and potential FBSS patients who are not actually FBSS patients because the putative pain triggers cannot be treated. [10,19]

Table 2. Division of patients with FBSS into groups.

Failed Back Surgery Syndrome		
only leg pain	*leg and back pain*	*only back pain*
	• *predominant leg pain,* • *predominant back pain,*	

DIAGNOSTICS

Diagnostics for *FBSS* always begins with taking an interview and conducting a physical examination of the patient, which serves to determine the intensity and location of the pain, as well as to determine the temporal relationship between the occurrence of pain and the surgical procedure, because if preoperative radiating and radicular pain persists also immediately after surgery may indicate an incorrectly performed or incomplete surgery. However, if radicular symptoms appear for the first time after surgery, incorrect screw placement (which justifies immediate reoperation) may be suspected, as well as hematoma or abscess.

However, it should be remembered that a physical examination is only intended to help determine the cause

of pain, but because in most cases it does not provide us with a clear diagnosis, it cannot serve as a basis for diagnosis in itself. Due to existing limitations, the doctor should also use imaging tests and diagnostic procedures. [9]

When it comes to imaging tests, the first step in the diagnosis of chronic postoperative back pain are most often X-rays of the entire spine in a flexed and extended position, which enable the assessment of possible spinal deformations, vertebral displacements, and abnormal changes within physiological curvatures. At the same time, they are used to visualize spondylolisthesis (spondylolisthesis). [4,9] Unfortunately, the X-ray examination is not three-dimensional and does not allow for visualization of soft tissues, so we will not see postoperative adhesions, scars, fibrosis, deformation of intervertebral discs, damage to nerve roots or narrowing of the spinal canal (the most common pathological symptom of FBSS). [4,9,20,21]

The gold standard in spine imaging and FBSS diagnostics is MRI using gadolinium, which will detect soft tissue abnormalities and differentiate causes of pain such as intervertebral disc herniation or fibrosis. However, computed tomography is often necessary to optimally and completely assess the spine. In rare cases when MRI is contraindicated (implanted device or metal implants), CT myelography or discography may be necessary. [4,9,20,21] Other tests may also be useful in diagnosing the etiology of FBSS and helping to distinguish it from other causes of low back pain. For example, to exclude a possible infection, C-reactive protein and ESR can be used. [4] In the past, selective nerve root blocks were also used for diagnostic purposes to identify specific roots associated with a patient's symptoms. Currently, they are used in therapy in combination with steroids. [4,9,10]

Table number 3. Diagnostic methods for FBSS.

Method	Comment
interview and physical examination	*assessment of symptoms, mitigating and exacerbating factors*
X-ray image	*assessment of bony deformations of the spine*
MRI	*assessment of disc herniations, stenosis, and cadavers*
computed tomography	*assessment of bone changes*
discography	*allows for the isolation of a specific intervertebral disc*
diagnostic injections	*assessment of the pathology of a specific nerve root or joint as the cause of pain*

CONTENT OF THE REVIEW

It is difficult to determine the single most appropriate treatment method because each patient presents a personal, if not unique, collage of health problems. Therefore, it is difficult to talk about the optimal method of treatment that would guarantee therapeutic success for everyone. The patient is faced with countless traditional and alternative treatments. We distinguish non-surgical and surgical solutions. Of course, medications are commonly used to complement both strategies. Non-surgical methods focus on interventions aimed at pain relief and are aimed at the physical and economic improvement of the patient. [22,23]

These types of methods include: conservative treatment. Physical therapy and pharmacotherapy are the basis in the treatment of primary relapse of *FBSS*. Their main goal is to improve gait, posture and muscle strength. Conservative treatment also includes psychotherapy, stress reduction and behavioral therapy, as well as acupuncture. [9,23]

Oral drug treatment is based on combining different classes of drugs. In the first line, non-steroidal anti-inflammatory drugs (NSAIDs) are used to treat lower back pain, while muscle relaxants are used to treat pain associated with muscle spasm. [11] In addition to those mentioned above, pharmacotherapy also includes antiepileptic drugs (gabapentin, pregabalin), steroids, opioids and antidepressants. Currently, there is an increasing emphasis on minimizing or even completely avoiding opioid drugs in the treatment of long-term pain, which is associated with a large number of side effects (including immunosuppression, addiction), but also with increased morbidity and mortality of patients taking drugs from this group. [9,11,13] However, oral opiates (i.e. morphine, oxycodone and methadone) are still used for refractory pain. [11] As psychosocial factors are considered one of the causes of *FBSS*, the use of antidepressants (amitriptyline, venlafaxine, duloxetine) is also recommended. [9] When it comes to interventional pain relief

procedures, the most frequently performed procedures are epidural steroid injections (ESI). They are indicated in cases of radiculopathy. There are three routes of steroid supply: transforaminal, interlaminar or caudal. ESI can be used both to treat radiating pain after surgery but also as a tool to delay the need for surgery. [9,23] Of course, the formation of postoperative scars is a natural part of the tissue healing process after any surgical procedure, but it should be remembered that the resulting adhesions may be the cause of up to 36% of *FBSS* cases and cause pain. In such a situation, lysis of adhesions should be considered by administering hyaluronidase with hypertonic saline solution into the epidural space, or epiduroscopy should be performed, which will directly visualize the formed adhesions. Radiofrequency ablation is also used as a treatment method. Currently, spinal cord stimulation (SCS) has the greatest potential in the treatment of *FBSS*. It involves implanting electrodes and generating subcutaneous impulses in the epidural space. This is a method that inhibits the release of neurotransmitters and prevents pain. [9,11] Surgical treatment of *FBSS* should be reserved for patients with a documented anatomical or pathological cause of pain (who have failed medical therapy) and used as a last line of treatment because it is associated with high morbidity and a low success rate. It concerns, among others, recurrent intervertebral disc herniations. [9,11] The simplest treatment approach is to find the cause and, if possible, correct it surgically. If the dominant symptom is back pain and tests do not indicate infection, malignancy has been ruled out and *FBSS* is suspected, surgical fixation of the existing instability or discopathy should be considered. If the main complaint is pain in the lower limbs, we order MRI with or without the use of gadolinium and CT myelography to diagnose pressure on the nerve roots caused by a herniated intervertebral disc, tissue hypertrophy or narrowing of the intervertebral foramen and, in order to alleviate or completely remove the pain, refer the patient to a compressive excision procedure. a fragment of tissue with or without stabilization. [22]

Pain syndrome after unsuccessful spine surgery is a pathology with a complex pathomechanism, which consists of numerous causes and a largely unknown etiology. It is believed that *FBSS* constitutes an extremely difficult clinical problem and is one of the greatest challenges faced by primary care physicians and specialists dealing with spine diseases and pain treatment. Additionally, it is worth mentioning that medicine is a science based on scientific evidence and research, and in the case of FBSS, there are still no clear studies that would suggest a standard strategy for the care and treatment of patients with this problem. Therefore, a precise and accurate diagnosis is very important, and the therapeutic treatment should be multidirectional, varied, but at the same time accepted by the patient. The patient should be informed about the risks and benefits of the suggested treatment option.

CONCLUSIONS

FBSS is characterized by a challenging pathology with multiple causes and a largely unknown etiology. Accurate diagnosis is crucial and its treatment should be multidisciplinary. Treatment of FBSS is difficult and prescription of an antidepressant or antiepileptic drug is recommended as first-line treatment. Tramadol is recommended as first-line treatment in cases involving nociceptive access and in certain pain episodes. Morphine should be used as second-line treatment after failure of first-line treatment. Neuromodulation in the form of spinal cord stimulation is considered a treatment option in some cases where mental disorders are present and medications are good for the health and functional impairment of patients with FBSS. It also provides a unique method of using opioid analgesics whose safety profile can be determined by post-use test results. Further randomized controlled trials and long-term follow-up are necessary.

REFERENCES

1. Sebaaly A, Lahoud MJ, Rizkallah M, Kreichati G, Kharrat K. Etiology, Evaluation, and Treatment of Failed Back Surgery Syndrome. Asian Spine J. 2018 Jun;12(3):574-585. DOI: 10.4184/asj.2018.12.3.574 Epub 2018 Jun 4. PMID: 29879788; PMCID: PMC6002183.
2. Thomson S. Failed back surgery syndrome - definition, epidemiology and demographics. Br J Pain. 2013 Feb;7(1):56-9. DOI: 10.1177/2049463713479096 PMID: 26516498; PMCID: PMC4590156.
3. Flávio Freinkel Rodrigues, Diego Cassol Dozza, Claudio Russio de Oliveira, Ricardo Gomes de Castro; *FAILED BACK SURGERY SYNDROME*; Arq Neuropsiquiatr 2006;64(3-B):757-761] Valerie C. Anderson
4. Orhurhu VJ, Chu R, Gill J. Failed Back Surgery Syndrome. 2023 May 1. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan–. PMID: 30969599
5. Rigoard P, Gatzinsky K, Deneuville JP, Duyvendak W, Naiditch N, Van Buyten JP, Eldabe S. Optimizing the Management and Outcomes of Failed Back Surgery Syndrome: A Consensus Statement on Definition and Outlines for Patient Assessment. Pain Res Manag. 2019 Feb 18;2019:3126464. doi: 10.1155/2019/3126464. PMID: 30911339; PMCID: PMC6398030.
6. Tronnier, V. SCS als therapeutische Option beim Postnukleotomiesyndrom. *Orthopäde* 45, 738–743 (2016). DOI: 10.1007/s00132-016-3310-5
7. Jae Hwan Cho, MD, Jae Hyup Lee, MD, PhD, Kwang Sup Song, MD, PhD, Jae-Young Hong, MD, PhD,

Yoon-Suk Joo, MD, Dong-Ho Lee, MD, PhD, Chang Ju Hwang, MD, PhD, and Choon Sung Lee, MD, PhD; Treatment Outcomes for Patients with Failed Back Surgery; Pain Physician 2017; 20:E29-E43

8. Slipman CW, Shin CH, Patel RK, Isaac Z, Huston CW, Lipetz JS, Lenrow DA, Braverman DL, Vresilovic EJ. Etiologies of Failed Back Surgery Syndrome, *Pain Medicine*, Volume 3, Issue 3, September 2002, Pages 200–214, DOI: 10.1046/j.1526-4637.2002.02033.x
9. Hoy D, March L, Brooks P, Blyth F, Woolf A, Bain C, Williams G, Smith E, Vos T, Barendregt J, Murray C, Burstein R, Buchbinder R. The global burden of low back pain: estimates from the Global Burden of Disease 2010 study. Ann Rheum Dis. 2014 Jun;73(6):968-74. DOI: 10.1136/annrheumdis-2013-204428. Epub 2014 Mar 24. PMID: 24665116.
10. Guyer RD, Patterson M, Ohnmeiss DD. Failed back surgery syndrome: diagnostic evaluation. J Am Acad Orthop Surg. 2006 Sep;14(9):534-43. DOI: 10.5435/00124635-200609000-00003
11. Gum JL, Glassman SD, Carreon LY. Is type of compensation a predictor of outcome after lumbar fusion? Spine (Phila Pa 1976). 2013 Mar 1;38(5):443-8. DOI: 10.1097/BRS.0b013e318278ebe8. PMID: 23080428.
12. Anderson JT, Haas AR, Percy R, Woods ST, Ahn UM, Ahn NU. Clinical depression is a strong predictor of poor lumbar fusion outcomes among workers' compensation subjects. Spine (Phila Pa 1976). 2015 May 15;40(10):748-56. DOI: 10.1097/BRS.0000000000000863. PMID: 25955092.
13. Nguyen TH, Randolph DC, Talmage J, Succop P, Travis R. Long-term outcomes of lumbar fusion among workers' compensation subjects: a historical cohort study. Spine (Phila Pa 1976). 2011 Feb 15;36(4):320-31. DOI: 10.1097/BRS.0b013e3181ccc220 PMID: 20736894.
14. Sandén B, Försth P, Michaëlsson K. Smokers show less improvement than nonsmokers two years after surgery for lumbar spinal stenosis: a study of 4555 patients from the Swedish spine register. Spine (Phila Pa 1976). 2011 Jun;36(13):1059-64. DOI: 10.1097/BRS.0b013e3181e92b36. PMID: 21224770.
15. Krueger JK, Rohrich RJ. Clearing the smoke: the scientific rationale for tobacco abstention with plastic surgery. Plast Reconstr Surg. 2001 Sep 15;108(4):1063-73; discussion 1074-7. DOI: 10.1097/00006534-200109150-00042 PMID: 11547174.
16. Fang A, Hu SS, Endres N, Bradford DS. Risk factors for infection after spinal surgery. Spine (Phila Pa 1976). 2005 Jun 15;30(12):1460-5. DOI: 10.1097/01.brs.0000166532.58227.4f. PMID: 15959380.
17. Glassman SD, Anagnost SC, Parker A, Burke D, Johnson JR, Dimar JR. The effect of cigarette smoking and smoking cessation on spinal fusion. Spine (Phila Pa 1976). 2000 Oct 15;25(20):2608-15. DOI: 10.1097/00007632-200010150-00011 PMID: 11034645.
18. McKillop AB, Carroll LJ, Battié MC. Depression as a prognostic factor of lumbar spinal stenosis: a systematic review. Spine J. 2014 May 1;14(5):837-46. DOI: 10.1016/j.spinee.2013.09.052. Epub 2013 Oct 25. PMID: 24417814.
19. P. Rigoarda, M.J. Desaic, R.S. Taylord; Failed back surgery syndrome: What's in a name? A proposal to replace "FBSS" by "POPS"..; Neurochirurgie 61 (2015) S16–S21
20. Baber Z, Erdek MA. Failed back surgery syndrome: current perspectives. J Pain Res. 2016 Nov 7;9:979-987. DOI: 10.2147/JPR.S92776. PMID: 27853391; PMCID: PMC5106227.
21. Chan CW, Peng P. Failed back surgery syndrome. Pain Med. 2011 Apr;12(4):577-606. DOI: 10.1111/j.1526-4637.2011.01089.x. Epub 2011 Apr 4. PMID: 21463472.
22. Hazard RG. Failed back surgery syndrome: surgical and nonsurgical approaches. Clin Orthop Relat Res. 2006 Feb;443:228-32. DOI: 10.1097/01.blo.0000200230.46071.3d PMID: 16462446.
23. Amirdelfan K, Webster L, Poree L, Sukul V, McRoberts P. Treatment Options for Failed Back Surgery Syndrome Patients With Refractory Chronic Pain: An Evidence Based Approach. Spine (Phila Pa 1976). 2017 Jul 15;42 Suppl 14:S41-S52. doi: 10.1097/BRS.0000000000002217. PMID: 28505029.

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