ORIGINAL ARTICLE

Volume - 14 | Issue - 07 | July - 2025 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

PERSISTENT LOW-BACK PAIN AFTER SURGERY SYNDROME: WHY, WHAT, HOW TO APPROACH?

Neurosurgery

Al-Ali Osama	Neurosurgery Department, King Hussein Medical Center - Royal Medical Services, Amman-Jordan
Adaila Omar	Radiology Department, King Hussein Medical Center - Royal Medical Services, Amman-Jordan
Al Sokhni Amer	Aneasthesia Department, King Hussein Medical Center - Royal Medical Services, Amman, Jordan
Al Salman Salem	Medicine Department, King Hussein Medical Center - Royal Medical Services, Amman, Jordan
Al Zrigat Ala	Aneasthesia Department, King Hussein Medical Center - Royal Medical Services, Amman, Jordan
Alfarajat Mohammad	Pediatric Neurology Department, Queen Rania Medical Center - Royal Medical Services, Amman-Jordan
Al Otoum Heba	Pediatric Neurology Department, Queen Rania Medical Center - Royal Medical Services, Amman-Jordan
Abu- Rumman Khalid	Neurosurgery Department, King Hussein Medical Center - Royal Medical Services, Amman-Jordan

ABSTRACT

Introduction: Persistent low-back pain after surgery syndrome, or the post-laminectomy syndrome, is correspondingly recognized as failed back surgery syndrome (FBSS) and denotes persistent lumbar spinal pain and radiculopathy of unknown origin for more than 1 year in spite of one or more surgical interventions. According to cited analyses, nearly 10–40% of patients undergoing lumbar spinal intervention suffer from FBSS. We can categorize the risk factors causing FBSS into structural and nonstructural causes. Furthermore, complications, sagittal imbalance, and progressive spinal degeneration are associated with surgical intervention. Additionally, the limited availability of high-quality evidence-based medicine regarding the medical and surgical management of FBSS has made the situation unclear. Superior results correlated with FBSS will depend on the physician's more comprehensive knowledge to efficiently prevent, diagnose, and treat it. **Objectives:** This study focuses on the burden of this entity and on its causes and enumerates the different appraisal and management modalities. **Methods and Patients:** This study looked back at the medical records of all patients who had surgery for degenerative disc disease and lumbar spinal stenosis over a 5-year period (2022-2024). The Institutional Ethics Committee, Royal Medical Services, registered this study (IRB: 65/4/2025). **Results:** Data from 247-consecutive adult patients eligible for the final stage analysis of this study. The mean follow-up duration was 25.2 months (12-55 months). 44.1% of the examined patients showed good recovery, and 55.9% demonstrated no difference or worsening. The mean VAS score of back pain was 4.62±2.84 and leg pain was and 3.92±3.11. while the functional disability determined by RDQ and ODI was 11.9±4.9 and 31.3±19.8, correspondingly. On the other hand, the HADS results revealed that 29% had indicators fitting an elementary anxiety condition, and 30.77% demonstrated warning signs related to an underlying depression (HADS scores≥8). **Conclusion:** The term "failed" fails to illustrate accurately this clinical condition, and it is perhaps applicable to abort this term. The multidisciplinary team engagement between treating spine surgeons and other allied health professionals, such as psychologists and physiotherapists, is essential for favorable outcomes. The treatment armamentarium has multimodalities.

KEYWORDS

Failed back surgery syndrome, spine surgery, Pain, Post-laminectomy syndrome.

INTRODUCTION

The term failed back surgery syndrome (FBSS), or "post-laminectomy syndrome", implies obstinate lumbar spinal pain and radiculopathy of unknown origin for more than 1 year despite one or more surgical procedures [1]. FBSS was first described in 1991 by North et al. [2]. The acronym is indeed a misleading term since the presenting clinical picture possibly produced owing to a divergence from both the patient's and the surgeon's expectancies preoperatively [3]. In Approximately one-fifth of the patients undertaking primary spine surgery will require secondary surgery for persistent back pain or surgery-related complications during the following years [4]. Reports indicated that success rates falls to just 30% after the second spinal procedure, following the third spinal operation the rate diminishes markedly, around 15%, and further decline to nearly 5% after a fourth surgical intervention [5]. According to quoted analyses, nearly 10–40% of patients undergoing lumbar spinal intervention suffer from FBSS [2,6]. The reported incidence of FBSS is as high as 80,000 patients annually [7]. Numerous analyses examine risk factors and etiologies of FBSS [8-11]. The etiology of failed back surgery syndrome is still a matter of debate. Several reports support the multifactorial derivation of failed back surgery syndrome, grouping relevant factors into preoperative, operative, and postoperative categories [12]. One of the cardinal causes found to be misdiagnosis, reported in (58%) of cases of FBSS [13]. Furthermore, psychological factors, obesity, smoking, inappropriate surgical planning, wages, litigation, and workers' compensation may play a major role [10, 14]. We can divide the risk factors contributing to FBSS into structural and nonstructural reasons [8].

Furthermore, complications, sagittal imbalance, and progressive spinal degeneration are associated with surgical intervention. Additionally, the limited availability of high-quality evidence-based medicine regarding the medical and surgical management of FBSS has made the situation unclear. Additionally, the limited availability of high-quality evidence-based medicine regarding the medical and surgical management of FBSS has made the situation unclear. This study examines the burden of FBSS, its causes, and lists the various appraisal and management modalities.

MATERIALS AND METHODS

Ethics

The electronic hospital database provided patient reports that were analyzed over a 2-year period (2022-2024). The Institutional Ethics Committee at Royal Medical Services registered this study (IRB:65/4/2025) on the 25th of March 2025. We waived the requirement for patient consent because this study was a retrospective analysis. We processed patients' records and data in accordance with the Declaration of Helsinki (2013) and the Health Insurance

Portability and Accountability (HIPAA) actions.

Study Design

This study looked back at the medical records of all patients who had surgery to treat degenerative disc disease and lumbar spinal stenosis.

Patients

All patients who had undergone primary lumbar spine surgery between January 2022 and January 2024 were selected from the electronic hospital database (1867 patients). Patients who met the inclusion/exclusion criteria were recruited. Patients underwent serial physical examinations, radiological assessment, and psychometric measurements. We also assessed potential risk factors such as smoking status and obesity, considering them probable contributing factors.

The study registered data from 247 consecutive adult patients who qualified for the final stage analysis.

Inclusion/ Exclusion Criteria

Inclusion Criteria:

1) History of primary degenerative disc disease, lumbar spinal stenosis.
2) History of ≥ 1 lumbosacral spine surgery.
3) Chronic low-back pain, with or without leg pain, lasting ≥1 year after index surgery.
4) Age >18.

Exclusion criteria were:

1) The follow-up was not adequately documented.
2) Definite iatrogenic injury.
3) Severe or progressive psychotic disorders
4) Oncology cases scheme.
5) Infection and congenital deformities are present.
6) History of instrumented lumbar, cervical, or thoracic fusion
7) History of spine trauma surgery.

Patient Outcome Measurements

For the primary outcome measure, which was the operation good recovery, a dichotomized Likert scale applied; for good recovery ("complete recovery" and "nearly complete recovery") and in case of bad recovery ("slight recovery" to "worse than ever") [15]. Secondary outcome measures assessed were the postoperative scores of the visual analogue scale (VAS) of low-back pain (0-10 cm) and VAS leg pain (0-10 cm) [16]. VAS is a self-reported scale of symptoms that are recorded with a single mark placed at one point along the length of a 10-cm line that represents a continuum between the two ends of the scale "no pain" on the left end (0 cm) of the scale and the "worst pain" on the right end of the scale (10 cm) [16]. Roland-Morris Disability Questionnaire, a self-rated physical disability questionnaire (RMDQ) used for functional assessment (0–23 with higher scores indicating worse functional status) [17,18]. For a disease-specific measurement for patients with LBP, the Oswestry Disability Index (ODI) (the scores range from 0 to100, a higher index on the ODI indicates more severe disability) was utilized [19]. Assessment of anxiety or depression was documented by the Hospital Anxiety and Depression Scale (HADS) [20]. The HADS is a self-rating scale that assesses psychological distress in non-psychiatric patients and consists of a seven-item depression scale and a seven-item anxiety scale. The score ranges from 0–21 with a high score being indicative of depression/anxiety. The outcomes were measured by written forms acquired during the follow-up evaluations in the outpatient clinic.

Statistical Study

Data were registered into the Microsoft Excel sheet, and analysis was performed using statistical software SPSS Statistics Version 28.0. The categorical data were demonstrated in frequency and percentages, while the scale data were stated employing illustrative statistics such as mean and standard deviation for continuous variables. We calculated the RMDQ, ODI, HADS-anxiety, and HADS-depression scores for each included patient. Pearson's correlation coefficients were calculated to analyze the association between the different outcome measures and preoperative patient characteristics (gender, age at surgery, body mass index, smoking status, number of previous surgeries). An alpha level set at 0.05 is deemed statistically significant.

RESULT

The study's final stage analysis included data from 247 consecutive adult patients.

While twenty-five were excluded. Eight patients were excluded due to inadequate follow-up, two patients had tumors, three patients had congenital deformations, seven patients had a history of instrumented lumbar, cervical, or thoracic fusion, and five patients had a history of spine trauma surgery. Patients' demographic and clinical features (viz., age (years), gender, weight(kg), height(cm), body mass index (BMI), smoking status, initial diagnosis, and operated segment) are revealed in (Table 1). Patients were allocated into two groups according to gender; no significant differences were detected statistically between the two groups.

Table.1: Patients' Demographic Data.

Parameter	Male group	Female group	P value
Number of patients	134	113	0.799
Age (years)	57.9 ± 7.7 (41–73)	56.9 ± 7.5 (42–72)	0.529
Weight (kg)	77.2 ± 8.2	76.3 ± 8.9	0.581
Height (cm)	164.9 ± 6.5	165.8 ± 6.5	0.472
BMI (kg/m2)	23.8 ± 2.0	23.2 ± 2.1	0.134
Smoking	74	43	
Working capability			0.428
Normal	94	96	
Moderate	19	14	
Nearly incapable	14	2	
Completely incapable	7	1	
Diagnosis			0.775
LDH	126	74	
LSS	27	26	
DDD	10	13	
Operation level			0.790
L1/L2	1	3	
L2/L3	5	4	
L3/4	30	22	
L4/5	75	61	
L5/S1	76	63	
Operation time (min)	133.1 ± 15.2	136.5 ± 17.1	0.260
Intraoperative blood loss (ml)	450.6 ± 38.6	458.1 ± 39.7	0.314
Incision length (cm)	7.2 ± 0.7	7.1 ± 0.8	0.243
Postoperative hospital duration (day)	5.9 ± 0.9	6.4 ± 0.9	0.015
Etiology of FBSS			
Previous discectomy	106	28	
Previous laminectomy	44	35	
Adjacent level disease	14	13	
Instability	8	5	
Others	3	2	
Number of previous surgeries			
One surgery	88	103	
Two surgeries	34	7	
Three surgeries	12	3	
LDH Lumbar disc herniation, LSS Lumbar spinal stenosis, DDD degenerative disc disease,			

The mean follow-up duration was 25.2 months (min. 12 months, max. 55 months). Of the examined patients, 44.1% showed good recovery, and 55.9% demonstrated no difference or worsening. The mean VAS score of back pain was 4.62±2.84 and leg pain was and 3.92±3.11. while the functional disability determined by RDQ and ODI was 11.9±4.9 and 31.3±19.8, correspondinglyHowever, the HADS assessment showed that 29% of people had signs of basic anxiety, and 30.77% showed signs of possible depression (HADS scores ≥ 8) (Table 2).

Table 2: Postoperative Assessment of Outcome Measures

Parameter	Cohort Population
Likert Good recovery Bad recovery	 109 (44.1%) 138 (55.9%)
Mean VAS low-back pain (mm)	4.62±2.84
Mean VAS leg pain (mm)	3.92±3.11
Mean RDQ RDQ<8 RDQ≥8	11.9±4.9 52(21.05%) 195(78.94%)

Mean ODI (%)	31.3±19.12
ODI<25% disability	68(27.53%)
ODI≥25% disability	179(72.47%)
HADS anxiety	
< 8	171(69.23%)
≥ 8	76(30.77%)
HADS depression	
< 8	175(70.85%)
≥8	72(29.14%)

DISCUSSION

Repeated spinal surgery is a valid option with declining gains. While primary spinal interventions are successful in more than 50% of cases, this rate declines to less than 5% after the fourth surgical procedure [5,21]. Nevertheless, individuals with failed back surgery syndrome (FBSS) and chronic neuropathic pain experience higher levels of pain, as well as lower quality of life scores and physical functionality, compared to those with conditions such as osteoarthritis, rheumatoid arthritis, complex regional pain syndrome, and fibromyalgia [6]. The term "failed" fails to illustrate this clinical condition, and it is possibly more suitable to abort this term completely [22]. The likely widespread occurrence of this condition requires careful assessment of these difficult patients to effectively address their symptoms and provide the best management strategies.

Assessment

A systematic and detailed assessment is essential, with a thorough history being the foremost phase. A comprehensive pain history evaluation is critical in demarcating the possible basis of the patient's pain. The assessment should match the preoperative clinical picture with the current symptomatology. Upon the immediate onset of pain, one should suspect either an intraoperative or a postoperative complication. If the pain is similar to the preoperative pain in its distribution, it strongly suggests that either the primary pathology was not addressed or that the wrong level was treated [3]. Pain reproduced due to repetitive movements is suggestive of discogenic origin of pain. Foraminal stenosis, inadequate decompression, epidural fibrosis, or recurrent disc herniation can cause radicular pain [23]. On the other hand, if radicular pain starts suddenly, it might indicate a problem during surgery, like misplaced instruments or bleeding that occurs after the operation.

It is of paramount importance to point out any "red flags" that may mandate urgent further investigation and intervention, including signs of any sphincteric disturbance, or any new evolving deficit, or signs of impending infection. History should also consider "yellow flags" or psychological factors [24]. These psychosocial issues suggest that these chronic pain syndromes involve prolonged chronicity and disability entities [3].

Leading Factors

1. Patient Factors

Several factors should be contemplated as they have been linked with higher rates of failed back surgery syndrome. A patient's psychosocial condition plays a substantial consequence on treatment result and pain incident, as well as those patients requesting workers' compensation or receiving disability support allowance. Research has shown that both groups are knowingly more likely to experience poorer outcomes after spinal surgery [25-27].

Likewise, smoking patients are more liable to develop poorer outcomes after spinal interventions [28], while higher rates of postoperative complications were correlated to obesity [29].

2. Operative Factors

Poor outcomes correlate with inappropriate surgical choice. Reports revealed that the number of prior spinal surgeries is a significant predictor of the postoperative outcomes for subsequent spinal interventions [2, 5, 6, 30]. Reports revealed that the number of prior spinal surgeries is a significant predictor of the postoperative outcomes for subsequent spinal interventions [2, 5, 6, 30].

While single-level laminectomy in the presence of unknown multi-level spinal involvement harbor relieves the patient's presenting symptoms. The effectiveness of decompressing surgery for patients primarily experiencing mechanical pain is uncertain.

Additionally, wrong-level surgery is the most stated complication during spinal surgery [30].

Each new intervention harbors the potential to induce new segmental instability and cause additional pain [30].

3. Postoperative Factors

- Early

Numerous factors may lead to operative failure immediately following surgery, such as epidural or subdural hematoma formation, nerve injury, infection, and pseudomeningocele.

-Late

This could lead to altered biomechanical segmental stability. Changes in how weight is distributed may speed up the wear and tear in the areas next to the lumbar surgery, which could cause more neuropathic pain [31,32].

Clinical Examination

A full and detailed neurological evaluation is mandatory to confirm the absence of any evolving neurological deficit on one hand and, on the other hand, to confirm a baseline prior to any supplementary intervention. Systemic clinical evaluation for patients with failed back surgery syndrome should eliminate the presence of any threatening or missed diagnoses in the past [33,34].

Investigations

The original convincing diagnosis and the previous management strategies determine which imaging modality is needed for cases of FBSS. X-ray images are used first to check the alignment of the vertebrae, how much surgery has been done before, and to find any significant wear and tear modifications [30]. Researchers have proven the superiority of dynamic radiographs (with extension/flexion views) over magnetic resonance imaging in identifying spondylolisthesis [35]. Nevertheless, magnetic resonance imaging remains the gold standard in FBSS owing to its superior contrast enhancement sensitivity compared with computed tomography scans [36]. Magnetic resonance imaging with gadolinium can differentiate between epidural fibrosis, perineural scar tissue, and recurrent disc herniation as a source of pain [30, 34] while still being the best modality for spondylodiscitis detection [36].

A computed tomographic scan is used when an MRI can't be done because of metal implants or incompatible heart devices, and in those cases, CT–myelography can be used [33]. Computed tomographic scan is very important for finding pseudoarthrosis because it provides better detailed images of bones and issues with facet joints [37].

Laboratory tests are done to rule out any chance of infection after surgery, these evaluations should include a full blood count, white cell differential, erythrocyte sedimentation rate, and C-reactive protein test [12].

Management

Conservative

Conservative management is the cornerstone of first-line management of non-emergency cases of patients with FBSS. This includes physiotherapy exercise programs aiming to improve patients' core strength and spinal range of motion.

Pharmacological therapy for axial pain includes painkillers and nonsteroidal anti-inflammatory drugs [38]. Other drugs have gained recognition for neuropathic pain treatment, such as the anticonvulsant. The most commonly prescribed medications are gabapentin (Neurontin) and pregabalin (Lyrica) [39].

Pregabalin plays a role in the prevention of preoperative and postoperative pain, with its effect evidently increasing with time [40]. On the other hand, cognitive behavioral therapy leads to a reduction in pain scores in the immediate postoperative period and during long-term disability [41].

Interventional Pain Procedures

One of the most performed interventional pain procedures is epidural steroid injections around the world [42]. These can be administered primarily by three approaches: transforaminal, interlaminar, or caudally, and are indicated for symptoms of radiculopathy. The patient with a failed back exhibits radicular symptoms. Epidural steroid injections play a cardinal role in alleviating the postoperative symptoms of radicular back pain and in avoiding or delaying the need for revision surgery. According to a recent meta-analysis, the administration of epidural steroid injections delayed surgery for spinal pain in 30% to 50% of cases in the short term; however, the evidence

for this is stronger in patients who have not had prior surgery [43].

As the natural process of tissue healing A scar may form postoperatively. We refer to this scar formation as postoperative adhesions. Generally, these adhesions are asymptomatic; however, in some cases, they may cause a mass effect that results in back and leg pain by compressing nerve roots, decreasing the range of motion in the back, and inducing pain during movement [44, 45]. Adhesiolysis can theoretically be accomplished by administering hyaluronidase with hypertonic saline into the epidural space [46]. For more sustained pain relief, radiofrequency ablation of the nerves is commonly utilized, as it generally outlasts the effects of diagnostic or therapeutic injections [47]. The arsenal of FBSS treatment includes neuromodulation and several neuromodulation approaches. Patients with principal neuropathic limb pain have recognized and demonstrated favorable results from these semi-invasive procedures when compared to conventional medical management [48]. A large retrospective analysis of 16,455 cases with failed back surgery syndrome (FBSS) compared revision surgery to neuromodulation techniques, specifically spinal cord stimulation implantation, and found that patients who received spinal cord stimulation experienced less than half the complications of those in the revision groups after three months of follow-up (6.5% versus 14.4%) [49].

Revision Surgery

The necessity for spinal revision surgery is confined to a limited set of absolute indications. These indications include any evolving and disabling neurological deficits associated with sphincteric dysfunction, impending cauda equina syndrome, confirmed sagittal imbalance, or spinal instability that requires revision [42].

The non-randomized, non-blind, retrospective, single-center cohort design of this study may increase the likelihood of selection bias.

CONCLUSION

The term "failed" fails to illustrate accurately this clinical condition, and it is perhaps applicable to abort this term. The multidisciplinary team engagement between treating spine surgeons and other allied health professionals, such as psychologists and physiotherapists, is essential for favorable outcomes. The treatment armamentarium has multimodalities.

Future Work: A prospectively randomized controlled study, including more patients in multicenter will be performed to properly evaluate the role and effectiveness of each modality of treatment.

Final Approval of Manuscript: All authors

Agree to be Accountable for all Aspects of the Work: All authors.

Acknowledgments: We extend our heartfelt gratitude to Dr. Rami Alqroom, for his invaluable guidance, support, and inspiration throughout this work. His expertise and encouragement have been instrumental in its success.

Conflicts of Interest: The authors certify that he has no affiliation with or any direct or indirect involvement in any organization or entity with any financial interest, or non-financial interest in the subject matter or materials discussed in this manuscript.

Funding: Authors disclose no external funding sources.

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