BACK HEALTH

Refractory Back Pain after Surgery: an Overview of the Failed Back Surgery Syndrome (FBSS)

ABSTRACT

"Lumbar spinal pain of unknown origin, either persisting despite surgical intervention or appearing after surgical intervention for spinal pain, originating in the same topographical location" is a description widely used to describe Failed Back Surgery Syndrome (FBSS). In reality, the syndrome is more often a mismatch between the patient's expectations and the surgical results. This review will describe the possible causes and presentation of FBSS and highlight the role of the multidisciplinary team approach in its management involving non-operative and surgical interventions. The most important objective is correct patient selection for surgery before the first operation.

KEYWORDS: Failed Back Surgery Syndrome, multi-disciplinary approach, spine surgery, low back pain, patient expectations





Introduction

"Lumbar spinal pain of unknown origin, either persisting despite surgical intervention or appearing after surgical intervention for spinal pain, originating in the same topographical location" is a description widely used to describe Failed Back Surgery Syndrome (FBSS).¹ In reality, the syndrome is more often a mismatch between the patient's expectations and the surgical results.² This review will describe the possible causes and presentation of FBSS and highlight the role of the multidisciplinary team approach in its management.



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Epidemiology and Etiology

The spine is not a rigid column but a supple structure with multiple curves. The lumbar lordosis and facet orientation allow the coupled bending and rotary movements necessary for walking and running. During heel strike energy is transmitted to the discs

FAILED BACK SURGERY SYNDROME HAS NO SINGLE CAUSE; THE ETIOPATHOGENESIS IS MULTIFACTORIAL AND CAN BE DIVIDED INTO PRE-OPERATIVE, INTRA-OPERATIVE, AND POST-OPERATIVE FACTORS.

> and linked vertebrae where it causes rotation and advances the contralateral pelvis and thigh in a manner necessary for normal gait. Movement in the lumbar spine tenses the dorsolumbar fascia allowing the truck to lift. To minimize energy while standing, the lumbar spine extends into lordosis tensing the anterior longitudinal ligament. Were it not for the mobile cervical spine, counter rotation between the pelvis and shoulder while running would produce unsustainable head movement. The price of major spine surgery with an extensive fusion may be the loss of this fine spinal coordination so necessary for normal function. Even a singlelevel lumbar fusion forces the remaining levels to absorb higher

stress when simply walking while a multilevel spinal fusion can not only prevent running but even the ability to jump off the ground.

The benefits of major spine surgery may come with an uncomfortable price that neither the patient nor the doctor foresees or appreciates. Low back pain imposes the highest direct and indirect costs on society of any orthopedic condition.¹ Failed Back Surgery Syndrome adds to the burden.

Since the available data comes largely from old and poorly designed studies, the exact incidence of FBSS is unknown.² Estimates range from 10% to 40% after surgical intervention with and without fusion.¹ Surgery for a herniated disc has the lowest incidence of the syndrome at between 8.4% to 19%.^{3,4} Failed Back Surgery Syndrome has no single cause; the etiopathogenesis is multifactorial and can be divided into pre-operative, intra-operative, and post-operative factors.

a) Pre-operative factors

Pre-operative factors mainly relate to patient characteristics. Back pain is exacerbated by anxiety, depression, hypochondriasis, and low social economic status.¹ Probably the most common pre-operative mistake is poor patient selection. A patient with predominantly axial pain is a poor candidate for decompressive surgery and patients who undergo multiple back surgeries have the lowest satisfaction rates and the highest risk of developing FBSS.² Nachemson et al. showed 50% success rate after the first reoperation, 30% after the second and 15% after the third.⁵ Obesity, smoking, osteoporosis, multilevel stenosis, nerve root fibrosis and multiple disc herniations can further hinder successful surgery and pain resolution.⁶ Modifiable variables including osteoporosis, obesity and smoking should be addressed and corrected before an elective surgical procedure. Proper patient selection and pre-operative optimization are key; they strongly influence the outcomes of spine surgery and possibility of developing FBSS.

b) Intra-operative factors

Determining the exact cause of spinal pain is frequently difficult, especially in patients who have undergone previous surgery and/ or those exhibiting a centralized pain disorder. Operating on the wrong level or missing additional pain generators can obviously lead to surgical failure. Accurately determining the source(s) of pain is vital. The incidence of failed operations due to surgical complications is reported to be 2.1%-2.7%.7 Poor surgical technique, such as inadequate exposure or conversely excessive decompression, can lead to

persistent pain from complications such as residual stenosis, epidural fibrosis or spinal instability.⁸ Screw misplacement is a common surgical complication with rates reported from 5% to 41% in the lumbar spine and from 3% to 55% in the thoracic spine.⁹

c) Post-operative factors

Failed surgery may lead to worsening of preexisting pain or the onset of new symptoms from disease progression or surgical complications. Recurrent disc herniation at the operated level or disc degeneration at adjacent levels after fusion occurs in up to 23% of cases.^{10,11} Residual sagittal imbalance, with incomplete restoration of sagittal alignment after fusion, results from a mismatch between the lumbar lordosis and the alignment of the pelvis. This misalignment puts excessive loads on the discs involved, hastening symptomatic spinal degeneration and reoperation.^{12,13,14} New radicular pain may arise from nerve root entrapment or intra-operative trauma leading to epidural fibrosis or a battered root syndrome.^{1,15}

Clinical presentation

Due to its multi-dimensional origins, FBSS presents with marked heterogeneity. An established algorithm can avoid missing conditions that need aggressive treatment while



providing all patients with appropriate management. (Figure 1) All patients should undergo a detailed history and thorough physical exam with necessary imaging and laboratory studies.

a) History and physical exam

A correct diagnosis is crucial. A detailed pain history compares the pre-operative to the postoperative symptoms. New radicular pain can indicate a surgical complication while a failure to relieve or an exacerbation of the preexisting pain suggests that the operation missed the correct target. The timing of the onset of new symptoms after surgery has diagnostic importance. Debilitating pain in the immediate postoperative period, 1-5 days, may be due to an abscess, hematoma or misplaced screw, all of which warrant immediate reoperation.9,16

Red flags include: saddle anesthesia or bowel/bladder incontinence indicative of Cauda Equina Syndrome; fever, chills and night sweats suggesting infection; signs of malignancy such as unexplained or unexpected weight loss.² Yellow flags are the psychosocial factors associated with FBSS including fear-avoidance behaviour, hopelessness for recovery, reliance on passive treatment, depression, low morale, social withdrawal and financial problems.^{2,17}

The physical examination may be helpful in deciding the proper course of treatment. New muscle weakness or the recent loss of a tendon reflex may indicate the need for decompression of a nerve root. A positive straight leg raise suggests irritation from a disc herniation.² In association with a positive history of pain disorder such as sleep disturbance, placing blame and the yellow flags, the physical Waddell signs (assessed in pairs with only one element in each pair recorded) of superficial and non-anatomic tenderness, simulation of axial loading and acetabular rotation, regional sensory disturbance and nonphysiological weakness, distraction and overreaction corroborate the presence of a pain-focused behaviour.¹⁸ Further surgery is extremely unlikely to succeed.

b) Laboratory and imaging evaluation

If infection is suspected, obtain a complete blood count, erythrocyte sedimentation rate, and C-reactive protein.

Imaging evaluation includes standing and dynamic radiographs to evaluate sagittal balance, spinal instability and the changes in spinal curvature.¹⁹ Gadolinium enhanced MRI is necessary to visualize the neural elements.²⁰ T1weighted images can be used to differentiate between postoperative fibrosis and disc herniation. Obtaining a CT scan with a 3D reconstruction can evaluate osseous changes and deformities, measure root canal dimensions and assess hardware placement.²⁰ The optimal protocol for a global evaluation of the postoperative spine combines CT and MRI.²

The optimal protocol for a global evaluation of the post-operative spine combines **CT** and **MRI**.

Facet or sacroiliac injections with an anesthetic and/or contrast medium or discography may implicate a particular structure as the pain generator but diagnostic injections have a false positive rate of 40% and are particularly unreliable in patients with psychological problems, which includes everyone with a Failed Back Surgery Syndrome.^{1,21}

Treatment

Treatment is multimodal and ranges from physiotherapy for exercise and lifestyle modification to psychological counselling to extensive reoperation.

a) Non operative treatment

The treatment strategy depends in large measure on the pain characteristics. Is the persistent post-surgical pain nociceptive (arising from a structure within the spine such as a herniated disc), neuropathic (arising from pathology in the nervous system itself such as a damaged nerve root) or nociplastic (arising from a centralized pain response in the absence of any peripheral stimulation). Pain originating for continuing pathology in the spine needs direct intervention. Pain located centrally will only be made worse by another operation and management depends on a combination of physical and psychological support.

Medication usually necessitates combining drugs of diverse therapeutic classes. Non-steroidal anti-inflammatory drugs may be helpful for chronic low back pain but a recent Cochrane metaanalysis showed lower efficacy in the treatment of chronic radicular pain.^{22,23} The use of paracetamol/ acetaminophen in patients with spinal pain is controversial. A recent meta-analysis by Machado et al. showed, no significant change in pain reduction and disability compared to placebo in patients with chronic low back pain.²⁴ Nevertheless, paracetamol/ acetaminophen, often adding tramadol, remains widely used.²⁵

Anti-depressants such as duloxetine, venlafaxine or amitriptyline seem to have an independent analgesic effects.²⁶ The neuropathic component of spinal pain can be addressed using GABA analogues like gabapentin and pregabalin. Binding to calcium channel subunits, they inhibit the release of painful neurotransmitters.¹ However a recent meta-analysis showed this class of drug is ineffective for treating chronic low back pain without a neuropathic component.²⁷

Analgesic spinal injections, with or without steroids, into the epidural space or facet joints are of dubious value but may offer temporary pain relief.² Major complications have been reported particularly after CT guided cervical and lumbar foraminal injections.²⁸

Spinal cord stimulation (SCS) may be a last resort. The exact mechanism of action is not well understood but is believed to act via the gate-control mechanism.²⁹ Several studies have showed efficacy of this technique, chiefly in patients with radicular symptoms, over conventional medical management alone but a recent meta-analysis showed only limited evidence that SCS is effective in reducing back pain intensity when compared with a placebo intervention.³⁰

Surgical treatment:

Surgical treatment of FBSS should be reserved for patients with



SUMMARY OF KEY POINTS

- 1. Fusing even a short segment of the spine can have significant, possibly deleterious effects, on the complex spinal functions.
- 2. The Failed Back Syndrome is often a mismatch between the patient's expectations and the final result rather than a failure of surgical technique.
- 3. The poor result may be the result of preoperative, intraoperative or postoperative factors. All three areas must be assessed.
- 4. Correct patient selection is as important or even more important than the surgical approach.

documented mechanical problems, recognizing that the chance of success decreases with every additional operation. The most common indications for surgical re-intervention are a recurrent disc herniation, loss of the normal physiological lumbar lordosis with a surgically produced flat back and the improper placement of instrumentation.

According to the literature, minimally invasive disc removal has a 3% chance of wrong-level surgery and a 4% chance of a recurrent disc herniation at the same level.³¹ There is no optimal strategy for the recurrent herniation; some advocate only disc removal for the first recurrence and posterior interbody fusion for the second while others prefer to instrument and fuse at the first recurrence.³² Any repeat surgery is associated with higher risk of dural tear.^{2,32}

Malpositioning of spinal instrumentation, ranging from 0.1% in lumbar degenerative surgery to 2% to 3% in deformity surgery, is usually only a minor breach of the spinal canal.⁹ Repositioning the screw usually eliminates most of the patients' symptoms.

Post-operative flat back is a common and serious complication which occurs when the surgeon fails to restore the normal lumbar lordosis and creates a painful spinal imbalance. It is not widely recognized the almost half of the lumbar lordotic curve occurs at just the two lowest vertebrae. Even a small miscalculation can have a major impact. The patient may present with disabling low back pain as soon as the first month after surgery.³³ The malalignment can lead to instrumentation failure, nonunion, and both proximal and distal junctional kyphosis.33,34 Treatment is challenging. The correction protocols and techniques are beyond the scope of this review but may be extensive enough that they involve

сме Post-test Quiz

Members of the College of Family Physicians of Canada may claim MAINPRO-M2 Credits for this unaccredited educational program. completely transecting the spine to reestablish the proper contour.¹²

Conclusion:

Failed Back Surgery Syndrome is common and problematic, requiring careful analysis and comparison of the pre and post-surgery history and physical examination, detailed imaging, and a complete understanding of both the physical and the psychological problems. Treatment is multi-disciplinary frequently involving non-operative and surgical interventions. The most important objective is correct patient selection for surgery before the first operation.

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The incidence of Failed Back Surgery Syndrome ranges from 10-40% after a major spinal operation.

Setting the preoperative expectations with a full discussion between the patient, referring physician and operating surgeon plays a key role.

There are three periods – pre-operative, intra-operative, post-operative – in which FBSS can arise.

Proper patient selection and pre-operative optimization of all modifiable factors improve outcomes and decrease the possibility of FBSS.

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