Failed Back Surgery Syndrome: Evaluation of 100 Cases

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Abstract

Background: Failed back surgery syndrome is a clinical syndrome of failure of long-term improvement after back surgery. It is a frequent condition with an incidence 5-50%. It is characterized by persistent back and/or leg pain after one or more lumbosacral spinal surgery. The most important causes of this syndrome are: Recurrent herniated disc, perineural fibrosis, spinal stenosis, spinal instability, inadequate decompression, infection or wrong diagnosis. The purpose of this study is to evaluate the outcome after spinal surgery and the possible etiology of failed back surgery to minimize the incidence of such condition.

Methods: The medical charts of 100 patients with failed back surgery syndrome in the interval from January 2006 to May 2009 were evaluated. The analyzed factors included were: Age, gender, pain-free interval, etiology and clinical picture with radiographic assessment.

Results: In this study the incidence of failed back syndrome was 28.7%. Analysis of offending etiology reveals: Recurrent disc herniation in 18.6% of cases, perineural fibrosis in 32% of cases, spinal stenosis and instability in 18% of cases for each, missed level of pathology in 5% of cases, discitis in 4% of cases and arachnoiditis in 1%, the etiology was unknown in 4% of cases. All cases of failed back syndrome had back pain and 79 cases had lower limb pain. The pain-free interval was average 7 months. The incidence of this syndrome was higher in males (36.8%) than in females (17.7%) with no specific age distribution. Finally the use of microsurgery did not alter much the incidence of failed surgery, in microdiscectomy the incidence of failure was 26.4% while in open discectomy it was 29.4%.

Conclusion: The failed back surgery syndrome remains a challenge for all spinal surgeons. Prevention of such syndrome is much easier than being confronted with it, this can be achieved by: Proper patient selection for primary surgery, correct preoperative diagnosis and adequate surgical procedures targeting the pathology.

Key Words: Failed back surgery – Recurrent disc – Epidural scarring – Spinal instability.

Introduction

FAILED back surgery syndrome, refers to failure to obtain long-term relief of back and/or leg pain after spinal surgery [1]. Failure of the lumbosacral spinal surgery has been attributed to the natural history of the underlying disease, to the technical aspects of surgery and to the methods of patients selection, which have been developed formally by the American Association of Neurological Surgeons [2] and the American Academy of Orthopedic Surgeons [3] including: 1) Failure of extended conservative therapy. 2) Abnormal myelogram computed tomography and/or magnetic resonance imaging demonstrating nerve root compression and/or segmental instability consistent with the patient's symptoms and signs. 3) Conformity of radicular pain complaints to physiological, dermatomal or sclerotomal patterns, and 4) Sensory loss, motor loss and/or deep tendon reflex abnormalities in corresponding segments. These criteria apply to primary procedures and reoperations. Patients undergoing lumbar spine surgery may develop failed back surgery syndrome with an incidence from 5% to 50% [4]. Failed back surgery syndrome is a heterogeneous entity that may result from incorrect diagnosis, poor patient selection, incomplete decompression or decompression at a wrong level, recurrent disc herniation, segmental instability, facet joint disease, permanent nerve root damage, epidural fibrosis or arachnoiditis [5-7]. Finally, an individual may be predisposed to the development of failed back syndrome due to systemic disorders such as diabetes, autoimmune disease and peripheral vascular disease. Smoking is a risk for poor recovery.

Treatment of failed back syndrome is difficult and it should be directed towards the etiology, other lines of treatment includes physical therapy,
behavioral medicine, non-steroidal anti-inflammatory drugs, antidepressants, spinal cord stimulation, intrathecal morphine pumps, epidural steroid injections and reoperation [8,9], but no clear guidelines are established and significant number of patients are left with pain and disability [7].

Material and Methods

This study includes 100 patients with failed back surgery syndrome out of 348 patients operated upon and followed up in the interval from January 2006 to May 2009. 206 cases with lumbar disc herniation, 44 cases with lumbar canal stenosis and 98 cases with combined canal stenosis and disc herniation. The study was performed in 2 hospitals: Kasr Al-Aini Hospital, Cairo University, Egypt, Neurosurgery and Orthopedic Departments and King Faisal Specialist Hospital and Research Center, Jeddah, Kingdom of Saudi Arabia, Neurosurgery Department.

Indications of the primary surgeries were failure of conservative treatment of 3 months duration, consisting of: Restriction of physical activity, non-steroidal anti-inflammatory drugs, muscle relaxants and physiotherapy.

The surgical techniques performed varied from laminectomy, hemilaminectomy combined or not with discectomy or microdiscectomy (open discectomy in 194 cases and microdiscectomy in 110 cases), with foraminotomy.

The included cases were 74 males and 26 females, with age range from 22 to 67 years old.

Clinical assessment depends on proper history-taking pre and postoperative, empathizing the time onset of recomplaint, whether the patient had or had not postoperative symptom-free interval and if so, after how long the patient started to rec- complain, with detailed psychosocial, work history and the status of compensation or legal actions. In addition to thorough neurological examination and revision of all available hospitalization records.

Laboratory investigations to all failed back cases should include: Complete blood examination, erythrocyte sedimentation rate, rheumatoid factor, serum uric acid, antinuclear antibody, acid phosphatase (in males), alkaline phosphatase and HLA B27. These tests may be useful in detecting rheumatoid arthritis, ankylosing spondylitis, gout and other spondylarthropathies, neoplasm, infection or inflammation. In addition to the routine laboratory investigations.

Radiological investigations performed were: X-ray lumbosacral spine: Antero-posterior, lateral with dynamic views and both oblique views, magnetic resonance imaging without and with contrast fat suppression technique of the lumbosacral spine, to be done not before 3 months postoperative (Figs. 1,2).

(1)

![Fig. (1): Magnetic resonance imaging of the lumbosacral spine.](image)

(A): Sagittal T1-weighted image without contrast showing recurrent L4/5 disc herniation.
(B): Axial T1-weighted image without contrast at the level of herniation; it is difficult to differentiate between scar and herniated disc.
(C): Axial T1-weighted image with contrast at the level of herniation showing no contrast enhancement, suggestive of recurrent disc herniation.
Evaluation of the failed back surgery cases involved other specialists, such as radiologist, psychiatrists, rheumatologists and internists.

Follow-up of all cases was performed in the outpatient clinic 1 month postoperative and then at 6 months interval all through the study period. Follow-up is carried out clinically and in case of complaints, we proceed to laboratory and radiological investigations.

Results

In the interval from January 2006 to May 2009, 348 patients (201 males and 147 females) with different pathologies: 206 cases with lumbar disc herniation, 44 cases with lumbar canal stenosis and 98 cases with combined lumbar disc herniation and canal stenosis, were submitted to laminectomy, hemilaminectomy combined or not with discectomy or microdiscectomy (open discectomy in 194 cases and microdiscectomy in 110 cases), with foraminotomy. From all these cases 100 cases (28.7%) developed failed back surgery syndrome.

The analyzed 100 cases include: 74 males and 26 females with age range from 22 to 67 years old.

Analysis of the failed back surgery cases in relation to the total operated cases during the study reveals: Of the 206 cases operated upon for lumbar disc herniation, 64 cases (31%) developed failed back syndrome, of the 44 cases operated upon for lumbar canal stenosis, 14 cases (31.8%) developed failed surgery and of the 98 cases operated upon for combined lumbar disc herniation and canal stenosis, 22 cases (22.4%) had failed back syndrome.

Analysis of the etiology of failed back surgery syndrome (Table 1) reveals: 18.6% of cases developed recurrent disc herniation (all cases were at the same level and the same side of the primary pathology, 11 cases at L4/5, 4 cases at L5/S 1, and single case at L3/4) and 2 postoperative cases of lumbar canal stenosis developed new disc herniation, perineural fibrosis constituted 32% of cases, 18% of cases developed lumbar canal stenosis and another 18% of cases developed instability, discitis occurred in 4% of cases, arachnoiditis in 1% of cases, the level of pathology was missed in 5% of cases and finally, no etiology was detected in 4% of cases.

Table 1: Etiology analysis of 100 cases with failed back surgery syndrome.

<table>
<thead>
<tr>
<th>Etiology of failed surgery</th>
<th>Original diagnosis</th>
<th>Lumbar disc herniation (65 cases)</th>
<th>Lumbar canal stenosis (14 cases)</th>
<th>Lumbar disc herniation + canal stenosis (22 cases)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disc herniation</td>
<td>12</td>
<td>2</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Perineural fibrosis</td>
<td>20</td>
<td>5</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Canal stenosis</td>
<td>10</td>
<td>3</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Instability</td>
<td>11</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Missed level</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Arachnoiditis</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Discitis</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Unknown etiology</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
The clinical picture of the failed back cases reveals: Back pain in all cases and lower limb pain in 79 cases.

The average pain-free interval was 7 months. In disc herniation, it was average 18 months, in canal stenosis, it was average 6 months postoperatively, while in perineural scarring it was average 9 months.

From 119 cases operated upon by open discectomy, 57 cases (29.4%) developed failed back syndrome and from 110 cases operated upon by microdiscectomy, the failed back cases were 19 cases (26.4%).

Discussion

Failed back surgery syndrome is one of the most difficult problems in medicine, when we confront a patient whose symptoms are unchanged or have deteriorated following laminectomy or discectomy, the range of estimated failure is wide (5% to 50%) [4]. While according to Burchiel, et al. [10], the range is narrower (5%-10%). In our study, the incidence of failed back syndrome was 22.8%.

Many schemes have been developed to classify failed back surgery syndrome [11-17]:

I- No improvement after surgery:

A- Wrong preoperative diagnosis: Tumor, infection, metabolic disease, late decompression (>6 months) or psychosocial factors, which can affect the outcome of surgery indirectly either due to atypical clinical presentation, misdiagnosis and inappropriate surgery with bad outcome [18] or misinterpretation of the outcome by the patient [19]. Wrong diagnosis is relatively uncommon with the advent of modern imaging techniques. Structural diagnosis is only made on the basis of clinical and laboratory testing [20].

B- Technical error: Missed level as in case of segmentation abnormalities or marked obesity, failure to perform adequate decompression as in misdiagnosis of canal stenosis during discectomy, conjoined nerve root or missed disc fragment and far lateral disc [21].

II- Temporary relief after surgery but with recurrence of pain:

A- Early recurrence of pain (within weeks) meningeal cyst or infections including: Discitis, osteomyelitis and epidural abscess [22-24], the incidence of infections is (0-12%), it tends to increase as the complexity of the procedure and operating time increases, or the usage of metal implants especially in presence of diabetes mellitus, obesity, malnutrition, immuno-deficiency, smoking, rheumatoid arthritis or previous infection [25-27].

B- Midterm failure (within weeks to months): Recurrent disc herniation, which is considered a common cause for failed surgery, it can occur at the same operated level or at another level, same side or contralateral, even the most complete surgical excision of herniated disc still leaves 30-40% in situ, that can herniate later on [28]. Perineural scarring about the dura and nerve roots after lumbar disc surgery is another important cause of failed surgery. Many theories have been postulated to explain pathogenesis of epidural fibrosis. According to Key and Ford [29], the annulus fibrosus is the source of postlaminectomy scar, and this type is usually located anteriorly. Retained disc fragment may provoke fibrosis, disc herniation is surrounded by scar tissue [30]. When nucleotomy is not performed, postlaminectomy scar is caused by damage to the erector spine muscles overlying the laminctomy site [31]. Epidural hematoma, epidural venous bleeding and arterial bleeding from paravertebral muscles occurring in the path of surgical dissection, is gradually absorbed and replaced by granulation tissue which matures into dense fibrous tissue [18]. Excessive cauterization of epidural veins inhibit nerve roots nutrition causing intraneural, epidural fibrosis and arachnoiditis. Excessive dural retraction, excessive end plate curettage, facet removal can cause postinflammatory epidural fibrosis. Retained cotton debris acts as a fibrogenic stimulus [32]. Fibrinolytic system defect [33,34]. Or spinal instability [1]. Arachnoiditis, paraspinal muscles denervation are less important causes for failed back surgery.

C- Long-term failure (within months to years): Spinal stenosis can be a late complication after laminectomy for disc herniation or for primary spinal stenosis, according to Zucherman and Schofferman [12], it is caused by postoperative settling with further facet imbrication and consequent lateral canal narrowing, also by degenerative spondylolisthesis developed by surgical violation and bony overgrowth. Postoperative radiologic stenosis is common in patients operated upon for lumbar spinal stenosis, but this did not correlate with the clinical outcome, so, it is important to evaluate the patient clinically and radiologically before making decision [35]. Spinal instability caused by extensive decompression, can cause failed back syndrome, Panjabi studies [36], revealed that sacrifice of more than 50% of both facets or sacrifice of entire single facet significantly alters the motion segment.
kinematics, however according to Garrido and Connaughton [37] in their study of unilateral complete facetectomy in 41 patients for lateral lumbar disc herniation, only one patient suffered instability and required lumbar fusion because of back pain, so the risk of instability was very low. Other factors that may affect stability: The patient age (younger at greater risk), sex (women at greater risk), disc space narrowing (lesser risk), level (L5/S 1 at lesser risk), pathology (degenerative spondylolisthesis at greater risk) [38]. In our study, perineural fibrosis constituted 32% of cases, recurrent disc herniation 18.6%, instability and canal stenosis accounted for 18% for each, missed level 5%, discitis 4%, arachnoiditis 1% and no etiology for the failure of surgery in 4% of cases, in this last group of patients, the etiology was considered psychosocial because of evidence of psychiatric troubles in all members of this group. Waguespack, et al. [39], reported the presence of foraminal stenosis in 29%, herniated discs in 10% and iatrogenic instability in 5% of cases. Ebeling, et al. [40], found 43% true recurrent herniation, 23% new herniations at different levels, and epidural fibrosis in 5% of cases. Skaf, et al. [7], reported that epidural fibrosis occurred in 34% of cases, spinal instability in 28%, recurrent herniated disc in 22% and inadequately performed previous surgery in 16% of cases. All these reported data are not in accordance with our results or with each others, possibly because of different referral patterns and different grouping categories when more than one radiological finding is identified.

A significant influence of patients sex on the outcome was observed, 74 males out of 201 operated upon male patients (36.8%) had failed surgery, while only 26 females out of 147 operated upon female patients (17.7%) had failed surgery. In relation to the total number of failed back surgery, we have 74% males and 26% females. According to Fritsch, et al. [1], in their retrospective study performed of 182 revisions of failed back surgery syndrome, 72% of cases were males and 28% were females. This significant sex difference may be due to difference in the level of activity and in job description.

No significant difference in the age distribution between the group of patients with failed back surgery syndrome and recurrent surgery and those with primary pathology coinciding with Fandino, et al. [41].

The incidence of failed back syndrome does not vary between open discectomy (29.4%) and microdiscectomy (26.4%) much coinciding with Katayama, et al. [42].

Regarding the clinical picture, in our study, all cases had back pain while only 79 cases had lower limb pain. Back pain denotes local problem, while lower limb pain signifies nerve root irritation. Dvorak, et al. [43], in 4-17 years follow-up of 371 patients who underwent lumbar disc surgery for the first time, 70% still complained of low back pain, 23% of constant heavy pain, 45% had residual sciatica, 35% still receiving treatment, 14% were receiving a disability pension and in 17% repeated operations were performed. Skaf, et al. [7], reported radicular pain in all cases while only 28% of cases had predominant back pain. This remarkable difference reported in different study refers to as the clinical picture of failed back syndrome cases varies according to the etiology of failed back surgery.

The period of postoperative pain-free interval can assist in the differential diagnosis of the etiology of failed back surgery. In our study, the pain-free interval was average 7 months; in disc herniation, it was average 18 months, in canal stenosis, it was average 6 months, while in perineural scarring, it was average 9 months. Scar tissue formation takes place from 6 weeks to 6 months postoperative [44]. Finnegan, et al. [45], reported that a pain-free interval of less than 12 months was associated with extensive fibrosis, and a longer pain-free interval indicates a lesion other than fibrosis. The absence of any pain-free interval usually means that the previous procedure did not target the lesion. Many authors have reported that successful outcome may be related to the length of the pain-free interval, according to Biondi, et al. [46], a pain-free interval longer than 6 months was correlated with a successful outcome.

Radiologically, standard plain X-ray radiographs with standing lumbosacral flexion and extension lateral views, antero-posterior and both oblique views are used to assess the extent of bone removal in previous surgery, spinal alignment and segmental instability [47]. Unenhanced computed tomography shows accurately bony details, but its density measurements are unreliable in the postoperative back, enhanced studies can differentiate scar (enhancing) from disc (unenhancing), its accuracy is almost equal to the unenhanced magnetic resonance imaging [48]. Contrast enhanced computed tomography has an accuracy of 67% to 100% in distinguishing scar from disc [49]. Postoperative myelography, rarely done nowadays, is unreliable for distinguishing disc from scar tissue, with the addition of computed tomography scan, neural compression is clearly demonstrated but it does not add much in the differentiation of disc from scar.
tissue [47,50]. Currently, contrast-enhanced magnetic resonance imaging is the standard radiographic investigation in evaluating failed back syndrome. Multiplanar imaging capability, superior soft tissue contrast resolution, and excellent tissue characterization are its major advantages to delineate the changes caused by surgical intervention and to differentiate scar tissue from recurrent or residual disc herniation [51-53]. Gadolinium-enhanced magnetic resonance imaging has been found to be 96% accurate in differentiating scar tissue from disc [44,54,55]. On non enhanced T1-weighted images, epidural scar and disc material are indistinguishable, on T2-weighted images, scar tends to show higher signal intensity [56]. Contrast enhanced T1-weighted images performed immediately after injection shows homogenous scar enhancement, while disc material does not enhance, in addition, a disc can exert mass effect while, a scar usually does not [57], on delayed imaging after injection, contrast can diffuse into a disc herniation, causing it to be confused with enhancing scar. Fat-suppression technique is useful as both enhancing epidural scar and fat are bright on non fat-suppressed T1-weighted images [58].

Summary:
Failed back surgery syndrome is a challenging condition, the best treatment of which is prevention as possible. Proper selection of patients for lumbar spinal surgery is the primary determinant of a successful outcome and meticulous revision of the preoperative clinical, radiological and psychosocial condition of the patients will diminish the number of failed back syndrome cases. As treatment of such condition is difficult and involves multidisciplinary approach in many cases.

References


