Failed back surgery pain syndrome: therapeutic approach descriptive study in 56 patients

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Objective: The authors show the clinical evaluation and follow-up results in 56 patients diagnosed with a failed back surgery pain syndrome. Methods: Descriptive and prospective study conducted over a one-year period. In this study, 56 patients with a failed back surgery pain syndrome were assessed in our facility. The age ranged from 28 to 76 years (mean, 48.8 ± 13.9 years). The pain was assessed through a visual analog scale (VAS). Results: Postoperative pain was more severe (mean VAS score 8.3) than preoperative pain (7.2). Myofascial pain syndromes (MPS) were diagnosed in 85.7% of patients; neuropathic abnormalities associated or not with MPS were found in 73.3%. Drug therapy associated with physical medicine treatment provided ≥ 50% pain improvement in 57.2% of cases; trigger point injection in 60.1%, and epidural infusion of morphine with lidocaine in 69.3% of refractory cases. Conclusion: In patients with a post-laminectomy syndrome, postoperative pain was more severe than preoperative pain from a herniated disk. A miofascial component was found in most patients.

Keywords: Low back pain; intervertebral disk displacement; post-laminecтомy syndrome.

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INTRODUCTION

According to the International Association for the Study of Pain (IASP), the post-laminectomy syndrome is defined as a “low back pain of unknown origin, persisting at the same location as the original pain despite operative interventions or with a post-surgery onset. The low back pain may be associated with a referred or radiating pain”. This definition applies to all surgeries designed to treat pain arising from the low back spine, including those aiming to treat a herniated disk. Surgical management applied to herniated disks is a hemilaminectomy with a flavectomy, nerve root dislocation and a hernia excision. The many clinical manifestations of the post-laminectomy pain often overlap and have a low back pain as a common expression. The term “unknown origin” in the definition should not be strictly used, as although the post-laminectomy syndrome is complex and the pain can arise from various nosological entities affecting varied anatomical elements in the spine or away from the spine or even being a result from systemic conditions, its origin can be found in many cases.

Low back pain causes are varied and differential diagnosis is wide. The structure causing the pain is identified in less than 20% of cases. The herniated disks are the most common indication for laminectomy to treat low back pain. Over 300 thousand laminectomies are estimated to be carried out in the United States, with a failure rate higher than 40%. Misinterpretation of pain origin as resulting from a herniated disk seen in imaging studies, misidentification of spine instability and other mechanical causes, including incomplete removal of the herniated disk, and operative complications are blamed for the poor surgical results. Pain can also result from articular facet instability or from reduced intervertebral space due to structure abnormalities or intervertebral disk removal, with consequent change in the articular facet angle. Among non-mechanical causes for the failed back surgery pain syndrome, disk infection, peridural “fibrosis”, arachnoiditis and psychosocial factors should be mentioned. In this study, we aimed to assess the clinical features and the non-surgical management outcome in patients with a failed back surgery pain syndrome seen in a pain center.

METHODS

Fifty-six patients diagnosed with a failed low back surgery pain syndrome were prospectively followed over one year at the Neurological Clinic Pain Center of the Clinical Hospital of Universidade de São Paulo in a descriptive study. The design was approved by the Institutional Ethics Board (213/05). Every patient signed an informed consent form. Patients with a persisting low back pain or an early relapse within less than three months of a surgical herniated disk procedure were selected. The patients were admitted into a specific postoperative low back pain outpatient clinic according to a spontaneous demand in the unit. Patients with evidence of metabolic, inflammatory, and oncological diseases or a radiological segmental instability picture were excluded. No patients experienced a cognitive impairment. Out of 73 patients admitted into our unit, 14 were excluded by exclusion criteria and the follow-up was lost in three cases. We obtained data from history, general physical exam, neurological and physiatric evaluation in addition to pre- and postoperative imaging studies. Laboratory tests to rule out rheumatic or metabolic diseases (ANA, RF, ESR, CRP, blood cell count) were performed. The pain magnitude, characteristic, nature and location, as well as the radiating course in pre- (retrospectively) and postoperative periods. The pain intensity was assessed according to a visual analog scale (VAS) before and after treatment. The physiatric exam aimed specially to assess low back spine and paravertebral, low back, gluteal and lower limb muscle groups, consisting of muscle power assessment, miofascial trigger point presence, spasms, sensitivity, cutaneous changes, and trophism. Data collection was performed by using a standard protocol. The statistical analysis used Sigmastat 4 software.

For all patients, a drug therapy with a rehabilitation program using kinesiotherapy and muscle stretching was adopted and if a rehabilitation refractory myofascial component (MPS) was associated, these patients underwent needling with a 1% lidocaine injection. MPS was identified in 48 (85.7%) patients. Drug therapy consisted of amitriptyline 25 to 150 mg/day (mean, 64 mg/day), chlorpromazine 20 to 100 mg/day (mean, 48 mg/day), naproxen 1000 to 1500 mg/day (mean = 1150 mg/day), acetaminophen 2 to 4 g/day (mean = 2.4 g/day) and codeine phosphate 120 to 240 mg/day (mean = 184 mg/day) according to the requirements and tolerability in each case. All patients underwent physiatric follow-up.

In case there was not ≥ 50% original pain improvement (VAS) all over the follow-up, the patients were considered frankly refractory, undergoing a 2 mL infusion containing morphine 1 mg/mL and 2% lidocaine by catheter placement into the low back peridural compartment bid over two weeks.

RESULTS

Overall, 37 (60.5%) patients were male and their ages ranged from 28 to 76 years (mean, 48.8 years ± 13.9 years). The patients’ mean age at the original pain onset ranged from 22 to 66 years (mean = 37.2 years). The patients had undergone from one up to four low back laminectomies (mean = 1.5) to treat low back pain or lumbosaciatric pain. The mean symptomatology length was 96 months.

The length of the low back pain or lumbosaciatric pain complaints ranged from 8 to 168 months (mean = 36 months). Regarding the pain intensity, the patients with a radiculopathy persisting postoperatively were found with a higher pain score by the pain analog scale. Those
with a postoperative root pain diagnosed had a mean score of 8.7, compared with 6.6 for those with no radiculopathy (p = 0.001).

In 17 (30.3%) patients, the preoperative pain history was consistent with a root origin, in 9 (16.1%) with referred pain in musculoskeletal conditions in both lower limbs, in 22 (39.3%) with referred pain in one lower limb, in 2 (3.6%), the pain location was only the lower back region and in 6 (10.7%) the pain had polyneuropathy characteristics. Three (5.4%) patients who did not experience pain with root characteristics preoperatively had undergone a discectomy and spinal fixation.

X-ray studies disclose a one- or two-lumbar-segment hemilaminectomy unilaterally (L4 or L5) in 53 (94.6%) patients and bilateral lumbar laminectomy in 3 (5.4%). The lumbar spine dynamic study did not show instability in any patient. The computed tomography (CT) scan or magnetic resonance (MR) imaging did reveal a periradicular scar at the operative site in 32 (57.1%) cases.

The pain intensity before the operations ranged from moderate to severe, according to the VAS, scoring from 5 to 10 (mean = 7.2); the pain intensity at the first attendance to the Pain Center, Clinical Hospital, Universidade de São Paulo was severe, scoring from 7 to 10 (mean = 8.3).

Thirty-six patients (64.9%) had undergone physical therapy, 53 (94.6%) had been on nonsteroidal anti-inflammatory drugs (NSAIDs), and 17 (30.4%) had been on corticosteroids alone or in combination with B complex vitamins, four (7.1%) had been on opiates, and five (8.9%) had been on tricyclic antidepressive agents before and after the surgery. All of the patients had stayed at rest and were on tricyclic antidepressive agents before and after the surgery. All of the patients had stayed at rest and those exerting an occupational activity had been put away from work.

In 38 (67.9%) patients, uniradicular (53.7%) or multiradicular (14.3%) syndromes were shown. Ten (17.9%) patients had muscle pain and myofascial painful points in several body regions, sleep disturbances and depression, suggesting the fibromyalgia syndrome.

Trigger points characteristic of MPSs were identified in 48 (85.7%) patients. Out of 17 (30.3%) patients with preoperative nerve root pain, 15 (88.2%) had lumbar or gluteal MPSs (Table 1).

Satellite or secondary trigger points were found in 29 (51.8%) patients (Table 2).

The treatment outcome was rated as excellent (> 75% improvement over the original pain according to the VAS), good (50% to 75% improvement), fair (25% to < 50% improvement) and poor (< 25%).

Drug therapy combined with physical rehabilitation measures provided an excellent outcome in 5 (16.1%) patients, a good outcome in 23 (41.1%), a fair outcome in 16 (28.6%) and a poor outcome in 12 (21.4%).

In 48 patients, MPS was found and trigger point injections were performed by using 1% lidocaine 0.5 mL.

By comparing the pain improvement scores, patients with MPS had worse outcomes over post-laminectomy syndrome without MPS. The immediate results were excellent in 5 (10.4%), good in 17 (35.4%), fair in 18 (37.5%) and poor in 8 (17.8%). The results were satisfactory for 68.75% of patients with MPS versus 75% in patients without MPS, but the difference was not statistically significant (p = 0.2).

At the end of treatment, significant improvement (excellent and good outcomes) occurred in 34 (60.1%) patients, while 13 (23.2%) had a fair outcome. However, the outcome was considered poor in 8 (17.5%) patients. Regarding the pain intensity at the final follow-up, we found a reduced general mean in the visual analog scale from 7.2 to 4.7 (p = 0.01).

A peridural catheter for spinal infusion of a morphine and lidocaine solution was placed in thirteen patients; all of them had a MPS, being considered refractory after a rehabilitative treatment attempt. The outcome was excellent in 4 (30.8%) patients, good in 5 (38.5%), and poor in 4 (30.8%), meaning the outcome was excellent or good in 9 (69.2%) patients treated with a peridural infusion.

**Discussion**

Low back pain is present at some point in life and constitutes a serious public health problem in 40% to 85% of individuals. Treatment cost, compensation, and lost productivity are high. The patients’ mean age at pain onset was 37.2 years, with the individuals within this age group usually exercising their occupational activity to a very great extent.

<table>
<thead>
<tr>
<th>Muscle</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lumbar quadrates</td>
<td>33</td>
<td>69</td>
</tr>
<tr>
<td>Gluteus medius</td>
<td>9</td>
<td>19</td>
</tr>
<tr>
<td>Gluteus minimum</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Piriform</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>48</td>
<td>88</td>
</tr>
</tbody>
</table>

**Table 1 – Patient disposition according to muscles affected more severely by the myofascial pain syndrome**

<table>
<thead>
<tr>
<th>Muscle</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gluteus medius</td>
<td>17</td>
<td>35</td>
</tr>
<tr>
<td>Gluteus minimum</td>
<td>6</td>
<td>11</td>
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<tr>
<td>Lumbar quadrates</td>
<td>3</td>
<td>5.5</td>
</tr>
<tr>
<td>Piriform</td>
<td>3</td>
<td>5.5</td>
</tr>
<tr>
<td>Vastus lateralis</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Vastus medialis</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Gastrocnemius</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Levator ani</td>
<td>1</td>
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</tr>
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**Table 2 – Affected muscle distribution by MPS satellite or secondary trigger points**

MPS, myofascial pain syndrome
In most cases, the course is favorable, even when no care measures are taken. However, low back pain becomes chronic in 15% to 20% of individuals. In 13.8% of patients studied by Frymoyer, the pain lasted more than two weeks and in 22% it was severe. In 21.2% of Deyo and Tsui’s patients, the pain was mild; in 43.4%, it was moderate and in 35%, severe; in 40% of cases, the low back pain irradiated to lower limbs and in only 1% a true sciatic pain could be found. In our series, preoperative pain was severe, with a 7.2 score according to the VAS; 45.4% had a low back pain and referred pain to lower limbs history before the surgery. In only 30.3%, the history suggested a true sciatic pain, and these findings indicate selection criteria for the surgery were likely inappropriate in most cases.

According to Hanley et al., the operative treatment outcome of herniated disks is poor in 14% of cases. The number of spine surgeries to relieve pain have steadily grown in the United States, with 170 thousand operations in 1974, 300,413 in 1994 reaching 392,948 in 2000, with 80 thousand cases of failed back surgery pain syndrome per year. According to Deyo and Tsui, the main reason for an increasing number of laminectomies is the growing number of surgeons operating the spine in each country. In different countries and different regions, the frequency of operation indications is variable, and this is not explained only by the different prevalence of low back pain or lumbosciatic pain; in 3% or 4% of individuals, herniated disk surgeries are indicated in the USA, but only in 1% of individuals in Sweden and Denmark.

Poor outcome of operative treatment might result from an incorrect diagnosis. Among the identified causes for low back pain, the following could be highlighted: rheumatic conditions, primary or secondary spine tumors, vascular conditions, hematological abnormalities, endocrine conditions, pelvic or abdominal viscus diseases (endometriosis, ovarian cyst torsion, pelvic inflammatory disease, prostatitis, cystitis, pancreatopathy, nefropathy, kidney disease, peptic ulcer, urinary tract, biliary or duodenal conditions), mechanical abnormalities (herniated intervertebral disk, articular facet injury, segmental instability or sacroiliac joint instability), systemic conditions (fibromyalgia, myositis, autoimmune or immune-allergic diseases), psychiatric diseases and other conditions (hip joint disease, trochanteric bursa injury, polyradiculoneuritis, meningeval irritation signs). Because of the great number of possibilities, the high surgical therapeutic failure rate is justifiable in care provided to these patients, but it also indicates there must be a more judicious semiologic evaluation.

Surgery that does not meet the indication criteria to treat a herniated disk can result in maintenance or worsening of pain and preoperative deficits. A herniated disk misinterpreted as a cause for low back pain is the most common reason for indicating spine surgeries that progress to a post-laminectomy chronic pain syndrome with an early onset postoperatively. This is partly due to overvaluating the anatomical findings not related to the low back pain that are shown in imaging studies, but those usually do not warrant the pain and the surgical intervention. In 35% of asymptomatic individuals studied by Hitzelberg and Wihen, the x-ray imaging revealed abnormalities suggesting a herniated disk. In 35% of asymptomatic individuals studied by Wiesel et al., a spine CT scan found abnormalities; in 20.2% of cases, there was a herniated disk evidence. Boden et al. observed 60% of asymptomatic individuals had a herniated disk on magnetic resonance imaging. Therefore imaging studies can confirm a herniated disk clinical diagnosis, but they are not the main determinants for indicating a surgery, since asymptomatic herniated disks are so commonly seen.

Even in symptomatic conditions, there is a progressive absorption of the herniated disk fragment, a phenomenon accompanied by symptom improvement in most cases. Hakelius observed 38% of patients with a herniated disk not undergoing a surgery, but having been on medical treatment, were clinically improved within a month, 52% within two months, and 73% within three months. Saal and Sall conducted a retrospective study involving 58 patients with a radiculopathy resulting from a herniated disk; 52 underwent a conservative treatment, resulting in improvement in over 90% of cases; only in three cases surgical ablation of extruded fragments was required. This means the indication criteria for diskectomy, represented by a cauda equina syndrome, marked acute or progressive motor deficit or lumbosciatic pain occurrence and evident radiculopathy, characterized by sensory, motor and deep tendon reflexes deficits over one or more nerve root territory, nerve root irritation evidence, translated as a positive straight leg raising maneuver and consistent imaging study findings in patients achieving no improvement after symptomatic drug therapy with physical medicine measures during a period of over 6 to 12 weeks, are not always met. Only 64.9% of patients included in the current casuistry had undergone physical medicine treatment and only 8.9% had undergone a tricyclic antidepressant therapy before the operations, suggesting medical methods had not been adopted in most cases.

Mechanical causes are responsible for 90% of post-laminectomy pain cases. Among them, residual or relapsed herniations, spinal instability, post-vertebral fixation pseudarthrosis, articular facet abnormalities, spinal canal stenosis, meningocele and pseudomeningocele are highlighted. In no patient of ours a spinal instability or residual herniation was found. In addition to the discectomy, a spinal fixation and fusion was proposed. However, there is little evidence the spinal fusion is useful in patients with no actual spinal instability. This occurred in 5.4% of study subjects. Postoperative imaging of a residual disk herniation does not imply this is necessarily the cause for a persisting pain, as postop-
rative imaging studies often show similar abnormalities in individuals whether they are symptomatic or not\textsuperscript{24}. Periural scar occurring after a laminectomy is a frequent postoperative finding. Newly formed tissue can involve, distort and/or compress the nerve root. However, epidural fibrosis is often shown on CT scan or MRI postoperatively in cases there is no pain\textsuperscript{7}. In 57.1\% of patients in this study, a periuricular scar was found.

The patients included in our study had underwent up to 4 surgical lumbar spine surgical procedures with no improvement; the mean was 1.5 operations per patient. Many patients undergoing further operations to treat persisting or residual pain get frustrated. The improvement rate in reoperations is low, around 30\% after the second surgery, 15\% after the third surgery and 5\% after a fourth procedure with up to 20\% of worsening\textsuperscript{13}.

Out of 56 patients analyzed in the present study, 85.7\% had MPS not found previously on physical exam. There is evidence that MPS is involved in low back pain genesis or maintenance\textsuperscript{29}. However, MPS diagnosis is frequently disregarded\textsuperscript{22}. Many lumbar muscles affected by MPS and the operative injury would result in pain worsening. Although physiatically speaking lumbar and gluteal muscle MPS is considered the most important cause for low back pain, bone, tendonous, nerve, disk and bursa conditions are still valued as symptom causes\textsuperscript{26}. The muscle fiber injury is not necessarily a cause for pain, since in patients with primary degenerative conditions, as in Duchenne muscular dystrophy, there is a disruption in a large amount of myofibrils and the sarcoplasmic reticulum, but there is no pain, suggesting MPS symptoms result from nonstructural muscle fiber changes or dysfunctions\textsuperscript{26}. The main electrophysiological abnormality seems to be a neuromuscular dysfunction in the motor endplate.

The energy crisis theory postulates there is an increased calcium concentration in the sarcoplasm due to a sarcoplasmic reticulum, sarcolemma and or muscle cell membrane disruption. The sarcoplasmic reticulum function is storing and releasing ionized calcium, which activates contractile elements and causes sarcomere shortening. Sustained sarcomere contraction results in increased metabolism, causes localized ischemia and generates a localized energy crisis. The combination of electrophysiological and histopathological theories generated the neuromuscular endplate multiple dysfunction concept. The potentials recorded as spontaneous activity or spikes in trigger points would result in abnormal acetylcholine release by the nervous ending. Acetylcholine release would accentuate depolarization and calcium release from the sarcoplasmic reticulum, causing sarcomere contraction and small-caliber vessel compression. Increased depolarization due to acetylcholine release and sarcomere contraction would cause increased energy demand, which, if associated with hypoxia resulting from reduced muscle blood flow, would then cause the energy crisis. This energy crisis generates metabolites which sensitize nociceptores and referred pain from trigger points\textsuperscript{24}. The abnormalities in nerve fibers responsible for supplying the muscle could cause localized muscle contraction and MPS\textsuperscript{27}. The referred pain from the trigger point is due to a sensory neuron sensitization in the spine cord posterior horn and may have a distribution similar to that in the radiculopathic pain. This referred pain associates with tingling and numbness\textsuperscript{26}. In 88.2\% of 17 patients with preoperative nerve root pain history, lumbar and gluteal MPS was identified.

The ages of patients included in the study when firstly seen at the Pain Center ranged from 28 to 76 years (mean age, 48.8 years). The mean symptom length was 96 months and the mean pain intensity was 8.3, showing the magnitude and the extended distress the patients went through. The postoperative pain was also shown more severe than the preoperative pain.

The chronic pain treatment should involve a multidisciplinary team and pharmacological, physiatric, psychotherapeutic, and neuroanesthetic procedures; functional neurosurgical procedures should be performed if required\textsuperscript{28}. The treatment with analgesic drugs, whether they are anti-inflammatory drugs or not, psychotropic drugs and physical medicine provided > 50\% original pain improvement in 57.2\% of patients evaluated in this study. Myofascial trigger point treatment consists of using analgesic drugs, psychotherapeutic agents, muscle relaxant drugs, refrigerant vapor, dry needling, local anesthetic injection and stretching, as well as correction of causal or perpetuating factors\textsuperscript{29},\textsuperscript{26}.

In 69.4\% of patients undergoing administration of a morphine and lidocaine solution via peridural route in our study, the original pain had > 50\% improvement.

The pain in patients with failed back surgery pain syndrome is severe, affects individuals in the fullness of their activities, is often found as a lumbar and/or gluteal MPS and, less frequently, has a neuropathic pattern alone or associated with MPSs\textsuperscript{29}.

**Conclusion**

The failed back surgery pain syndrome evaluation and management is challenging for the medical team. Analgesic drugs and physical medicine provide major improvement in most cases. The pain intensity in post-laminectomy syndrome is worse than the herniated disk preoperative pain. The injection of myofascial trigger points and opiate infusion into the lumbar spine compartment can be required in refractory pain cases.

**References**