

## LUMBAR LAMINECTOMY AND AFTERCARE

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### Abstract

Most of the population suffers from a back pain during their lives. The initial problem is the lack of the physical activity among people and the lack of knowledge about how to protect our back or about the principals of back school. Patients with back problems in general still increases and the intervention of specialists and the physiotherapists will be needed more. If conservative way of treatment does not help, the surgery is indicated. One of these surgical procedures is the laminectomy. It is a surgical intervention where the lamina or the part of it (hemilaminectomy) is removed or trimmed to widen the spinal canal and create more space for the spinal nerves. The laminectomy indications differ. But difficult degenerative disc disease, disc herniation, spondylosis, or spinal stenosis. The great role after the laminectomy plays proper physiotherapy.

**Keywords:** Laminectomy. Back pain. Aftercare. Interventions.

### 1 Introduction

People have always had back pain. Back pain was described in the distant past in old text from 1500BC. Today, back pain is a common problem and a recent systematic review concludes that the number of patients with the back pain is increasing and it leads to increasing number of people being on sick leave because of the chronic back pain. There is also increasing usage of anti-inflammatory medications all the same. We are able to say, that the chronic back pain has negative influence on the patient's health and psychic, as well as it has substantial social and economic consequences. The fundamental role in the back pain therapy is prevention at all levels - primary, secondary and tertiary. When all the conservative treatments options fail (school of the healthy spine program, aimed physiotherapy together with physical therapy along with pharmacotherapy) all that deem necessary is a surgical approach. Laminectomy is one of such approaches. It is a surgical intervention where the lamina or the part of it (hemilaminectomy) is removed or trimmed to widen the spinal canal and create more space for the spinal nerves. The laminectomy indications differ. But difficult degenerative disc disease, disc herniation, spondylosis, or spinal stenosis. The great role after the surgery plays proper rehabilitation.

### 2 Lumbar laminectomy

A laminectomy is a surgical procedure in which the surgeon removes a portion of the bony arch, or lamina, on the dorsal surface of a vertebra, which is one of the bones that make up the human spinal column. In most cases a laminectomy is an elective procedure rather than emergency surgery. A laminectomy for relief of pain in the lower back is called a lumbar laminectomy or an open decompression [1].

The goal of the surgical treatment in lumbar canal stenosis is to decompress all neurological structures at the index levels. To achieve this objective, resection of soft tissue (hypertrophic ligamentum flavum, synovial cysts and disk protrusions) and hypertrophic bone (facet joint osteophytes, laminae) has to be carefully done with a particular attention not to destabilize the lumbar spine [2].

### 3 Reasons for a lumbar laminectomy

As people age, the intervertebral disks begin to lose moisture and break down, which reduces the size of the foramina between the vertebrae. In addition, bone spurs may form inside the vertebrae and cause the spinal canal itself to become narrower. Either of these processes can compress the spinal nerves, leading to pain, tingling sensations, or weakness in the lower back and legs. A lumbar laminectomy relieves pressure on the spinal nerves by removing the disk, piece of bone, tumour, or other structure that is causing the compression.

The disks and vertebrae in the lower back are particularly vulnerable to the effects of aging and daily wear and tear because they bear the full weight of the upper body, even when one is sitting quietly in a chair. When a person bends forward, 50% involves the lumbar spine. The force exerted in bending is not evenly divided among the five lumbar vertebrae; the segments between the third and fourth lumbar vertebrae (L3-L4) and the fourth and fifth (L4-L5) are most likely to break down over time. More than 95% of spinal disk operations are performed on the fourth and fifth lumbar vertebrae [1]. Specific symptoms and disorders that affect the lower back include:

*Sciatica:* Sciatica refers to sudden pain felt as radiating from the lower back through the buttocks and down the back of one leg. The pain, which may be experienced as weakness in the leg, a tingling feeling, or a "pins and needles" sensation, runs along the course of the sciatic nerve. Sciatica is a common symptom of a herniated disk.

**Spinal stenosis:** Spinal stenosis is a disorder that results from the narrowing of the spinal canal surrounding the spinal cord and eventually compressing the cord. It may result from hereditary factors, from the effects of aging, or from changes in the pattern of blood flow to the lower back. Spinal stenosis is sometimes difficult to diagnose because its early symptoms can be caused by a number of other conditions and because the patient usually has no history of back problems or recent injuries. Imaging studies may be necessary for accurate diagnosis.

**Cauda equine syndrome (CES):** Cauda equine syndrome is a rare disorder caused when a ruptured disk, bone fracture, or spinal stenosis put intense pressure on the cauda equine, the collection of spinal nerve roots at the lower end of the spinal cord. CES may be triggered by a fall, automobile accident, or penetrating gunshot injury. It is characterized by loss of sensation or altered sensation in the legs, buttock, or feet; pain, numbness, or weakness in one or both legs; difficulty walking; or loss of control over bladder and bowel functions. CES is a medical emergency requiring immediate treatment. If the pressure on the nerves in the cauda equine is not relieved quickly, permanent paralysis and loss of bladder or bowel control may result [1].

**Herniated disk:** The disk between the vertebrae in the spine consists of a fibrous outer part called the annulus and a softer inner nucleus. A disk is said to herniate when the nucleus ruptures and is forced through the outer annulus into the spaces between the vertebrae. The material that is forced out may put pressure on the nerve roots or compress the spinal cord itself. In other cases, the chemicals leaking from the ruptured nucleus may irritate or inflame the spinal nerves. More than 80% of herniated disks affect the spinal nerves associated with the L5 vertebra or the first sacral vertebra [1-3].

**Osteoarthritis (OA):** OA is a disorder in which the cartilage in the hips, knees, and other joints gradually breaks down, allowing the surface of the bones to rub directly against each other. In the spine, OA may result in thickening of the ligaments surrounding the spinal column. As the ligaments increase in size, they may begin to compress the spinal cord [1].

Tests are usually performed before surgery to aid diagnosis. These tests may include plain spinal x-rays, myelogram (rarely performed), computerised tomography scan, magnetic resonance imaging scan [3].

Surgery for lower back pain is considered a treatment of last resort, with the exception of cauda equine syndrome. Patients should always try one or more conservative approaches before consulting a surgeon about a laminectomy. Some conservative approaches that have been found to relieve lower back pain include analgesic or muscle relaxant medications, epidural injections, rest, appropriate exercise, losing weight, occupational modifications or change, physical therapy, osteopathic manipulative treatment, transcutaneous electrical nerve stimulation [1-3].

#### 4 Laminectomy procedure

There are seven steps of the procedure [4]. The operation generally lasts 1 to 3 hours.

**Step 1 - prepare the patient:** After induction of general anaesthesia, a gravity-draining Foley catheter is placed, and a single-shot preoperative antibiotic is given. The patient is converted to a knee-chest position (or placed on a Wilson frame), and care is taken to make sure the belly hangs free to reduce pressure on the venous structures, which aids in minimizing blood loss [2].

**Step 2 - incision:** With incision of the cutaneous and subcutaneous spaces, the lumbodorsal fascia is identified approximately 1 cm parallel to the spines of L5 and S1. The spines of L5 and S1 are identified by palpation and an incision is made parallel to these spines in the lumbodorsal fascia to expose the paraspinal muscular groups [5].

**Step 3 - laminectomy:** The surgeon removes the bony spinous process. Next, the bony lamina is removed with a drill or bone-biting tools. The thickened ligamentum flavum that connects the laminae of the vertebra below with the vertebra above is removed [fig. 1]. This is repeated for each affected vertebrae [2, 4].

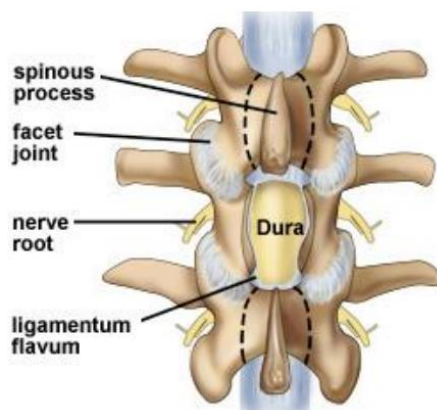


Figure 1 Laminectomy [4]

*Step 4* - decompress the spinal cord: Once the lamina and ligamentum flavum are removed, the protective covering of the spinal cord (dura mater) is visible. The surgeon can gently retract the protective sac of the spinal cord and nerve root to remove bone spurs and thickened ligament [4].

*Step 5* - decompress the spinal nerve: The facet joints, which are directly over the nerve roots, may be undercut (trimmed) to give the nerve roots more room. Called a foraminotomy, this maneuver enlarges the neural foramen (where the spinal nerve exits the spinal canal). If a herniated disc is causing compression, the surgeon will perform a discectomy [4].

*Step 6* - fusion (if necessary): Fusion is the joining of two vertebrae with a bone graft held together with hardware such as plates, rods, hooks, pedicle screws, or cages. The goal of the bone graft is to join the vertebrae above and below to form one solid piece of bone. There are several ways to create a fusion. The most common type of fusion is called the posterolateral fusion. The topmost layer of bone on the transverse processes is removed with a drill to create a bed for the bone graft to grow. Bone graft, taken from the top of your hip, is placed along the posterolateral bed. The surgeon may reinforce the fusion with metal rods and screws inserted into the vertebrae. The back muscles are laid over the bone graft to hold it in place [2-4].

*Step 7* - closure.

## 5 Lumbar laminectomy aftercare

Aftercare following a laminectomy begins in the hospital. Most patients will remain in the hospital for one to three days after the procedure. During this period the patient will be given fluids and antibiotic medications intravenously to prevent infection. Medications for pain will be given every three to four hours, or through a device known as a PCA (patient-controlled anaesthesia). To get the lungs back to normal functioning, a respiratory therapist will ask the patient to do some simple breathing exercises and begin walking within several hours of surgery [1-2].

Prevention of venous thromboembolism: After during the hospital stay is also intended to lower the risk of a venous thromboembolism (VTE), or blood clot in the deep veins of the leg. Prevention of VTE involves medications to thin the blood and wearing compression stockings or boots [1].

For surgical patients, the incidence of VTE is affected by pre-existing factors and by factors related to the procedure itself. It is therefore appropriate to perform a prophylaxis in surgical patients. In elective spine surgery, there are no firm recommendations. It is reasonable to use ES (elastic stockings) alone, LDUH (low-dose unfractionated heparin) alone, or the combination of the two, intraoperative plus postoperative IPC (intermittent pneumatic compression) may also be effective. For spine surgery patients with additional thromboembolic risk factors, prophylaxis with one of these options is suggested. Spinal surgery includes many surgical procedures for a variety of pathologies, and involves a highly heterogeneous class of patients. A careful analysis in terms of thromboembolic risks is therefore required in each individual case. There is no unique risk factor, because spinal surgery does not take one single form; it is therefore not possible to suggest a standardized thromboprophylaxis for spinal surgery, as can be done for hip and knee surgery. Moreover pharmacological prophylaxis has never met the approval of spine surgeons, due to the possibility of haemorrhagic complications [6].

Most surgeons prefer to see patients one week after surgery to remove stitches and check for any postoperative complications. Patients should not drive or return to work before their check-up. A second follow-up examination is usually done four to eight weeks after the laminectomy.

Patients can help speed their recovery by taking short walks on a daily basis; avoid sitting or standing in the same position for long periods of time; taking brief naps during the day; and sleeping on the stomach or the side. They may take a daily bath or shower without needing to cover the incision. The incision should be carefully patted dry, however, rather than rubbed [1].

In post-surgical populations, evidence suggests that early and increased walking improves functional outcome and reduces the rate of post-operative complications. It is therefore likely that increased walking immediately following lumbar spinal surgery leads to similarly improved outcomes [1].

Accelerometers are becoming an increasing popular method of quantifying physical activity, and have been shown to provide an accurate measure of step count, time spent walking and distance walked. Two recent studies have used accelerometry to describe the improvement in physical activity following lumbar spine surgery. Mobbs et al. reported a significant improvement in step count and distance walked three months after lumbar spinal surgery, and Schulte et al. reported a significant improvement in step count three months after surgery for lumbar stenosis. There are however, no known studies describing walking immediately following spinal surgery, or how the amount of walking in this period impacts longer-term functional recovery [7].

*Postoperative complications:* Risks associated with a laminectomy include: bleeding, infection, damage to the spinal cord or other nerves, weakening or loss of function in the legs, blood clots, leakage of spinal fluid resulting from tears in the dura, the protective membrane that covers the spinal cord, worsening of back pain [1].

Normal results depend on the cause of the patient's lower back pain; most patients can expect considerable relief from pain and some improvement in functioning. There is some disagreement among surgeons about the success rate of laminectomies, however, which appears to be due to the fact that the operation is generally done to

improve quality of life – cauda equine syndrome is the only indication for an emergency laminectomy. Different sources report success rates between 26% and 99%, with 64% as the average figure. According to one study, 31% of patients were dissatisfied with the results of the operation, possibly because they may have had unrealistic expectations of the results [1, 3].

## **6 Conclusion**

Today, back pain is a common problem and a recent systematic review concludes that the number of patients with the back pain is increasing and it leads to increasing number of people being on sick leave because of the chronic back pain. The fundamental role in the back pain therapy is prevention. There are many physiotherapeutical concepts dedicated to treat spinal disorders. When all the conservative treatments options fail it is necessary a surgical approach - laminectomy. Laminectomy is one of such approaches. The great role after the surgery plays proper rehabilitation.

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