LUMBAR FORAMINOTOMY

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INTRODUCTION
The intervertebral foramina are the two tunnels between adjacent vertebra that allow the spinal nerves to leave the spinal canal and pass to the rest of the body. The width of this tunnel can be decreased by degenerative disc collapse, facet joint or vertebral body osteophytes, or intervertebral disc herniation. The decreased tunnel size can compress the spinal nerve and cause buttock or leg pain, paresthesia, weakness or numbness.

A foraminotomy is a minimally invasive procedure that enlarges the intervertebral foramen by removing the roof of the tunnel, and any other tissue seen pressing on the spinal nerve. The thick back muscles cover and protect the nerve after the small amount of bone is removed.

INDICATIONS
The indications for a foraminotomy are persisting leg pain, paresthesia or pins and needles, numbness or weakness, that has been shown by physical examination, radiography and spinal injections to be due to spinal nerve compression, and that has not responded to a reasonable period of conservative treatment, usually six weeks. If there is severe leg muscle weakness, or severe leg pain that is not controlled by strong pain relievers, your clinician may recommend immediate surgery to relieve the symptoms. A foraminotomy does not treat back pain, it only treats leg symptoms.

ALTERNATIVES
The alternatives to foraminotomy may be
- activity modification
- weight loss
- aerobic exercise, such as walking, cycling, and swimming
- strength and flexibility exercises
- physical therapy
- hydrotherapy
- heat and cold pads
- acupuncture
- pain-relieving medications such as acetaminophen or paracetamol, non-steroidal anti-inflammatory drugs, or steroid and local anesthetic injections.

INFORMED REFUSAL
It is your right to delay or refuse the recommended treatment for your condition. However, this delay or refusal may lead to the worsening of your symptoms, such as increased leg pain, pins and needles, weakness or numbness.

BEFORE
Before the foraminotomy
- a doctor will perform a medical examination and any necessary tests to ensure that your general health will permit an anesthetic to be given and the procedure to be performed
- you will be advised when to stop any medications that will increase your bleeding risk ie aspirin, non-steroidal anti-inflammatories, anti-coagulants, vitamin E, glucosamine and some herbal medicines
- you may be admitted into the hospital on the day before or on the morning of the procedure
- don't eat or drink anything for eight hours before the procedure
- wear loose-fitting clothes that are easy to take off and put on. Do not wear any jewelry
- before the procedure, the skin on your neck will be cleaned and you will be given a general health check. The skin on your neck may be shaved.
- an intra-venous line will be placed in to a vein in your arm to administer fluid and medications
- you may be given a sedating medication to make you drowsy before being given your anesthetic
- you will be given a general anesthetic that will put you to sleep
- let your doctor know if you develop a fever, cold or flu symptoms before your scheduled procedure.

GOALS
The goals of a foraminotomy are to remove the tissues pressing on the spinal nerve, while maintaining spinal
stability, motion and alignment. This should decrease the pain and weakness in the leg.

**TECHNIQUE**
You will be lying on your front. Your back will be cleaned. An incision will be made in the middle of the back. The overlying muscles will be moved to the side. The lamina and facet joint overlying the intervertebral foramen will be detached. The spinal nerve will be gently moved to the side, and any remaining bone compressing the nerve will be removed. The wound will be closed with sutures.

**NO SMOKING**
Smoking damages every part of your body and decreases the chance of a successful procedure. If you smoke, you should stop now.

**EXPECTATIONS**
The expectations of a foraminotomy are
- the procedure will take one to two hours
- 80% of clients receive good or excellent relief of leg pain
- some pain at the operation site can be expected, usually due to muscle spasm. This can be controlled with oral medication, and should decrease over time
- pins and needles usually begin to improve immediately
- muscle weakness may take several months to recover
- numbness is slow to recover, and may persist
- there will usually be some remaining back pain after the foraminotomy from pre-existing degenerative disease elsewhere in the back
- the procedure does not alter the risk of future episodes of back pain

**REHABILITATION**
- you should be able to get out of bed after one or two hours
- dissolving sutures, surgical staples or steri-strips are used to repair the incision. The dissolvable sutures will disappear over time. The surgical staples will need to be removed. The steri-strips will fall off by themselves.
- you will spend about an hour in the recovery room before being taken to your ward bed
- you may spend a few nights in hospital
- a soft collar is worn for comfort if required
- your bowels won't open for a few days after the procedure
- use your prescribed pain medication, muscle relaxers and laxatives as directed
- you must avoid bending, lifting, twisting and sudden movements. Don't lift anything heavier than a milk carton for four to six weeks.
- most people can resume light work after four weeks and heavy work or sports after two to three months.
- you should be safe to drive in a few weeks
- your clinician may recommend that you start a daily exercise program, usually not until six weeks after the procedure. A physical therapist will show you how to do the exercise program.
- check your wound twice a day. If you notice any redness, swelling, green or yellow discharge, or opening of the wound, see your family doctor immediately
- you should keep the wound dry. Baths and showering are permitted, but avoid swimming and creams for one week. The incisions should be cleaned gently using regular soap and water. Only rub gently and don’t use perfumed soaps.
- you should have your wound reviewed by your family doctor one week after the procedure
- a follow-up appointment with your clinician will be booked for six weeks after the procedure

ON-GOING CARE
You have a weak spot in your back, and surgery can never return it to full strength. You will need to engage in lifelong back care to reduce the risk of further neck problems. You should always maintain correct posture, lose any excess body fat, continue your daily exercise program and avoid unnecessary stresses on your back.

POTENTIAL COMPLICATIONS OF A LUMBAR FORAMINOTOMY
ALLERGIC REACTION TO MEDICATION
An allergic reaction to the medications used can occur. This can cause a rash, swelling of the eyelids, hands, joints and throat, difficulty breathing, low blood pressure and death. These reactions are easily controlled with the right equipment and medications.

BACK PAIN
Back pain after the procedure is to be expected. This may be similar or different to the original back pain. It is usually temporary. Sometimes the original back pain can persist, or it can be worse.
CAUDA EQUINA SYNDROME
The cauda equina is the bundle of nerves below the spinal cord in the spinal canal. They transmit movement and sensation information to and from the lower body and also manage the bladder, bowels and sexual function. Cauda equina syndrome occurs when pressure is applied to these nerves, and they are inhibited. If the pressure is not removed quickly, permanent nerve damage can occur. Cauda equina syndrome can cause leg paralysis and numbness, impaired bladder or bowel control, loss of sexual sensation and other problems. The pressure on the nerves can be due to damaged disc or bone, tumour, infection or bleeding. The longer and more severe the compression, the longer and less likely the recovery. Severe compression greater than 24 hours may never recover. Milder compression may take several years to recover. Post-operative cauda equina syndrome is usually due to an epidural haematoma, and requires an urgent procedure to remove the collection of blood.

CEREBROSPINAL FISTULA
A tear in the dura, which contains the spinal cord and the cerebrospinal fluid, can allow cerebrospinal fluid to leak out through the wound, and onto the skin. This is called a cerebrospinal fistula. It may cause headache when standing, back or limb pain, nausea, vomiting, dizziness, ringing in the ears or eye pain from bright light. There is a risk of infection and meningitis. The dural tear may reseal spontaneously, or it may require bed rest, a blood patch procedure, drainage, or surgery to repair.

DEATH
No surgeon can guarantee a risk-free operation. All operations have some risks. Some risks are minor inconveniences, while some are major disabilities. The risks increase with repeat operations on the same area of your body. Your entire medical staff will do their best to eliminate all risks to you, before, during and after your surgery. However sometimes, even after the surgery goes well, serious problems can arise that can result in death. These include pneumonia, pulmonary emboli, heart attack and stroke. You should discuss these risks with your Surgeon and your Anesthesiologist.

DEEP VEIN THROMBOSIS
A blood clot that forms inside the large deep veins of the legs is called a deep vein thrombosis, or DVT. Any surgery can put you at an increased risk of deep vein thrombosis because the blood’s clotting mechanism is
switched on by the body trying to stop the bleeding associated with the operation. As well, injury to blood vessels, immobility and anesthetic effects during and after the surgery make it easier for clots to form and grow. Also some people have additional DVT risks such as age greater than fifty years, varicose veins, previous heart attack, cancer, atrial fibrillation, ischemic stroke, diabetes, previous DVT, heart failure, combined oral contraceptive pill use, smoking, obesity, leg weakness, and inherited clotting abnormalities. You should tell your doctor if you think you have any clotting problems.

A DVT can cause two problems. It blocks the blood flow from the legs back to the heart, causing swelling of the legs and pain. If the clot doesn’t dissolve properly, the swelling and discomfort can become permanent. Secondly, and more seriously, a part of the clot in the leg can break off and travel up the veins to the lungs, where it blocks the smaller lung blood vessels and stops the blood flow. This is called a pulmonary embolus, or PE. If the PE is large enough or there are many of them, it can cause death. It is important to minimize your risk of deep vein thrombosis and pulmonary embolism. Two preventative techniques are used. The first applies mechanical means to increase the blood flow through the legs, and includes support stockings, sequential compression devices, leg exercises in bed, and getting out of bed as soon as possible. The second technique uses chemical means to slow down the blood’s clotting process. These include heparin and coumadin. However medications that thin the blood to prevent clotting will also increase the risk of bleeding and hematoma formation. Your doctor will discuss the use of these medications with you. It is normal to use some method to minimize clot formation during and immediately after spinal surgery.

**DISCITIS**

Discitis is an infection of the intervertebral disc. It can occur spontaneously, without any surgical procedure. Post-operative discitis can occur up to six weeks after a disc operation or injection, and most commonly causes worsening pain after an initial period of relief. Risk factors include age, smoking, obesity, diabetes, malignancy, chemotherapy, immune suppression, malnutrition, indwelling venous catheters, concurrent infections and extended hospitalization. Discitis is treated with antibiotics. Often a prolonged (months) course of antibiotics is required. Discitis with infection of the adjacent bone, or osteomyelitis, can be very difficult to cure, even with antibiotics. Discitis
can lead to an epidural abscess that can cause spinal cord compression or cauda equina syndrome, and may require an operation to cure.

DUROTOMY
The dura is a thin layer of tissue that forms a sac containing the brain, spinal cord and nerve roots. The sac is filled with cerebrospinal fluid or CSF. The dura can be torn during spinal surgery leading to a leak of the fluid from the sac. This complication is more difficult to avoid during repeat surgery at the same location, or when operating on severe spinal narrowing or a large disc herniation. A dural tear with the leakage of cerebrospinal fluid, can cause a headache when standing, back or limb pain, nausea, vomiting, dizziness, ringing in the ears or eye pain from bright light. A continuing leak can lead to a cerebrospinal fluid cyst under the skin, or a leakage of fluid from the wound. Dural tears can reseal spontaneously, or it may require bed rest, a blood patch procedure, drainage, or an additional operation to repair.

DYSESTHETIC LEG PAIN
Sometimes a burning hypersensitivity leg pain occurs after the procedure. This is called dyesthetic pain. This pain may resolve over a few days, but can be permanent. The cause is not clear.

EPIDURAL HEMATOMA
If bleeding occurs into the epidural space around the spinal cord, it may form a collection of blood, called an epidural hematoma. If the hematoma is large, it can compress the spinal cord and nerve roots leading to pain, weakness, numbness and bowel and bladder problems. A surgical procedure may be required to stop the bleeding and remove the hematoma.

EYE INJURY
During the general anesthesia, all care is taken to protect your eyes. They will be taped closed to reduce the risk of drying or scratching the surface of the eye. Should this happen, it usually heals over a day or two. A more serious, and much more rare complication is blindness from pressure on the eyeball or decreased blood flow through the eye, known as ischemic optic neuropathy. Blindness due to ION is a 0.1% risk, and is associated with emboli, prolonged spine surgery in patients greater than seventy years old, prone (face down) position, diabetes, intra-operative blood loss/hypotension, and ankylosing spondylitis (poor position because of neck
deformity). Your Anesthesiologist will do all they can to eliminate risk of these problems.

HEMATOMA
During any surgery, some blood vessels will be cut. Your surgeon will stop all significant bleeding before suturing the wound shut. Sometimes bleeding recommences after the operation, forming a collection of blood in the tissues, called a hematoma. The hematoma can cause pain, pressure on adjacent tissues or become infected. It may need to be removed by inserting a drainage tube or performing a surgical operation.

HEMORRHAGE
During surgery, blood vessels must be cut to access the desired location in your spine. Your surgeon will plan the surgical route to avoid large blood vessels, and will ensure bleeding has stopped before finishing the operation. Sometimes, one of these cut blood vessels begins re-bleeding after the operation. If the amount or location of the bleeding is causing you a problem, your surgeon may need to perform a further procedure to stop the bleeding and remove the accumulated blood.

INFECTION
Infections occur in less than one percent of spinal operations. If the wound becomes more painful or tender, red, hot or swollen, oozes a clear or yellow fluid and doesn’t heal, or if you have fever or chills, the wound may be infected. Your Surgical Team will use sterile instruments, aseptic techniques, antibiotics and regular wound care to minimize this risk. Infections can be: superficial, involving the skin. These infections usually respond to oral antibiotics and washing the site. Sometimes the wound needs cleaning and re-suturing in the operating theatre. deep, involving the vertebrae or spinal cord. This is more serious and may require intravenous antibiotics, and further operations to drain the infection. Rarely, infected bone graft or hardware may need to be removed. Wound infections are more likely if you smoke, have diabetes, are overweight, or if the wound took a while to heal or there was a hematoma. If you have any concerns, you should contact your doctor immediately.

MALIGNANT HYPERTHERMIA
Malignant hyperthermia is a rare life-threatening condition that is triggered in genetically-predisposed people by some drugs used for general anesthesia. In susceptible people, the drugs cause an uncontrolled
increase in skeletal muscle calcium levels and muscle contraction, leading to decreased blood oxygen and increased blood carbon dioxide and body temperature. This can lead to circulatory collapse and death if not quickly treated. Susceptible people may have multiple episodes of anesthesia without developing malignant hyperthermia. Symptoms usually develop within one hour of drug administration. There is no simple test to diagnose susceptibility to malignant hyperthermia. It is usually found during drug administration or suspected if a family member develops the symptoms. While treatment is effective, if you or a family member have experienced malignant hyperthermia, you must avoid the potential trigger drugs. There are safe alternative medications available.

NERVE INJURY – LUMBAR
Because the vertebrae surround the spinal nerve roots, operations on the vertebrae can injure the nerve roots within the spinal canal or as they leave the spinal canal through the intervertebral foramen. The nerves can be bruised, stretched, torn or cut while accessing or repairing the damaged vertebra. Locating, protecting and mobilizing the spinal nerves are the most difficult and time-consuming part of most spine surgeries. Your surgeon will be very careful to avoid any injury to the spinal nerves. If a nerve is damaged, the injury can cause temporary or permanent pain or bladder and bowel dysfunction as well as partial or complete loss of sensation or movement in your leg.

NERVE INJURY – ULNAR
While under anesthesia, your body will be immobilized in a certain position to allow access to the injured region, and to keep your arms out of the way. Sometimes the ulnar nerve in your arm can be inadvertently compressed or stretched at the elbow, leading to pain, numbness or weakness in the hand after the procedure. These symptoms can appear one to four days after the procedure, and usually disappear over a few weeks. Your medical and nursing staff will take all care to minimize risk of this complication.

PARAPLEGIA
The spine surrounds and protects the spinal cord. Surgery to the spine can damage the spinal cord. Damage to the thoracic, lumbar or sacral spinal cord can cause loss of movement and sensation in the lower half of the body, known as paraplegia. Paraplegia may be complete, with no movement or sensation below the level of the spinal cord injury, or incomplete with some movement or sensation.
Some people with incomplete paraplegia can work unsteadily, but most require wheelchairs or other supports. Urinary and fecal incontinence and impotence are common, and require the use of urinary catheters and a bowel management program (suppositories, enemas, digital stimulation). Paraplegics are at increased risk of pressure sores, thrombosis and pneumonia. Your surgeon and staff will take the utmost care to protect your spinal cord during and after your procedure.

PERFORATION
There are a number of important structures next to your operation site. These include the spinal cord and nerves and their cover – the dura, and arteries and veins. Depending upon the site of your surgery, they also include the intestine in the abdomen, the lungs in the chest, and the esophagus and trachea in the neck. Your doctor will take every care to protect these structures, but they can be accidentally perforated during the procedure. If they are injured, they will be repaired as best as possible.

PRESSURE SORES
Prolonged lying down during the procedure and the post-operative recovery can lead to skin pressure sores over prominent bones. Your medical and nursing staff will carefully place, pad and move you, to prevent this occurring.

RESIDUAL PAIN
Some pain remaining after the procedure is very common. In most cases, surgery can not restore the spine back to a pre-diseased state. Some pain should be expected to come from the area of the operation. In addition, pain from adjacent areas already damaged by the disease, or by their own degenerative problems will most likely continue. Usually any residual pain is mild, but it may be severe or even worse than the original problem.

This article was written with the assistance of the following surgeons.

Dr Paul Licina. Dr Licina is spinal orthopedic surgeon, and co-founder of Brisbane Orthopaedic Specialist Services in Brisbane, Queensland, Australia. www.brisbaneorthopaedics.com.au/paul_licina.html

Dr Matthew McDonald. Dr McDonald is a spinal neurosurgeon based at Wakefield Hospital, Adelaide, South Australia, Australia. www.wakefieldneurosurgery.com.au

Dr Richard Parkinson. Dr Parkinson is a spinal neurosurgeon based at St Vincent’s Clinic, Sydney, New South Wales, Australia. www.svph.com.au/index.php?option=com_content&task=view&id=145&Itemid=178

Dr Lali Sekhon. Dr Sekhon is a spinal neurosurgeon, and founder of Nevada Neurosurgery in Reno / Carson City, Nevada, USA. www.nevadaneurosurgery.com