

The Case for Endoscopic Lumbar Laminotomy

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An endoscopic lumbar laminotomy is the removal of the bony knot. The pressure is also known as stenosis, which is Greek for “choking.” In essence, the lamina is choking the spinal cord. With pressure being placed on the cord, the patient can feel pain, numbness, and cramping in the legs. The level for surgery is determined not only by an MRI, but also by where the pain radiates to in the legs. The most common levels of stenosis are L3-S1.

Spinal stenosis is most common in men and women over 50 years old. Younger people who were born with a narrow spinal canal or who injure their spines may also get spinal stenosis. Reasons for stenosis include aging, osteoarthritis, tumors, and calcium deposits on the ligaments that run along the spine.

ENDOSCOPIC LAMINOTOMY VERSES SPINAL FUSION

With standard spinal fusions, the patient can leave with a six-inch incision, if not larger. The back is cut open, and muscle, ligaments, and tissue are removed. The laminotomy is performed, and rods and screws are inserted for stability. Spinal fusions also have high risks such as blood clots and infection not only of the large surgical area but also within the bladder or kidney. Blood loss, heart attack or strokes during surgery is also common. After the surgery, the patient generally

LEARNING OBJECTIVES

- ▲ Compare endoscopic lumbar laminotomy versus spinal fusion
- ▲ Detail the benefits of an endoscopic lumbar laminotomy
- ▲ Recall the anatomy of the spine
- ▲ Evaluate the steps the CST provides during an ELL
- ▲ Review the set up and equipment needed for this procedure

remains hospitalized for two to three days. The improvement in back pain and function continues up to two years after spine fusion surgery.

Endoscopic laminotomy procedures use endoscopes. Endoscopes used for spine surgery are typically the size of a pencil (7-10mm). The endoscope is inserted into the body through a small incision that is just big enough for the endoscope to fit through. Since the tube is directed straight to the affected area, muscles, ligaments, and tissue are virtually undisturbed. The laminotomy is done immediately upon entering the spine. The risk of infection is extremely low, as antibiotics are run continuously with irrigation during the entire procedure. With the irrigation, bleeding is all but nonexistent. The patient generally is up and walking within a couple of hours after surgery and goes home the same day. The improvement in back pain and function are immediate, and most preoperative symptoms are alleviated upon leaving the surgery center.

ANATOMY OF THE SPINE

Vertebrae are the 33 individual bones that interlock with each other to form the spinal column. The vertebrae are divided into regions: cervical (7), thoracic (12), lumbar (5), sacrum (5 fused into 1), and coccyx (4 fused into 1). Only the top 24 bones are moveable; the vertebrae of the sacrum and coccyx are fused. The vertebrae in each region have different features that help them perform their own functions.

The main function of the cervical spine is to support the weight of the head (around 10 pounds). The seven cervical vertebrae are numbered C1 to C7. The neck has the highest range of motion because of two vertebrae that connect to the skull. The first vertebra is a ring-shaped vertebra called the atlas. The atlas connects directly to the skull. This joint allows the head to shake up and down or make the “yes” motion. The second vertebra is the peg-shaped vertebra called the axis. The axis has a knot called the odontoid that the atlas pivots around. This joint allows for the side-to-side or “no” motion of the head.

The thoracic, or mid-back’s, function is to hold the rib cage and protect the heart and lungs. The 12 thoracic vertebrae are numbered T1 to T12. The range of motion in the thoracic spine is limited.

The lower back is called the lumbar. The main function of the lumbar spine is to bear the weight of the body. The five lumbar vertebrae are numbered L1 to L5. These vertebrae are much larger to absorb the stress of lifting and

The spinal cord only reaches the upper part of the lower back. Below that the tiny, contained nerve rootlets descend loosely spread out – like a horse’s tail – and are protectively enclosed in a long case. However, sometimes the lamina puts pressure on the spinal sac or nerve roots.

carrying heavy objects.

The sacrum connects the spine to the hip bones. There are five sacral vertebrae, which are fused together. Along with the iliac bones, they form a ring called the pelvic girdle.

The four fused bones of the coccyx or tailbone provide a place of attachment for ligaments and muscles of the pelvic floor.

Ligaments and muscles connect the bones and keep them aligned. The spinal column provides the main support for the body, allowing the body to stand upright, bend, and twist. Protected deep inside the bones, the spinal cord connects the body to the brain, allowing movement of arms and legs. The spine is a combination of bones, flexible ligaments and tendons, large muscles and highly sensitive nerves. The length of the spinal column has a large central canal through which the spinal cord descends, and holes to each side of the canal to allow the spinal nerves to escape at each level. The spinal cord only reaches the upper part of the lower back. Below that the tiny, contained nerve rootlets descend loosely spread out – like a horse’s tail – and are protectively enclosed in a long case. However, sometimes the lamina (the knot on the backside of the vertebral body) puts pressure on the spinal sac or nerve roots.

PATIENT POSITIONING

The patient is intubated in the supine position on the stretcher used to bring them into the OR. Once the patient is asleep, they are flipped over into the prone position on a radiolucent table. A Kambin Radiolucent Spinal Frame is used to elevate the patient’s midsection, so the back is flat. This frame also helps to stabilize the chest and abdomen

EQUIPMENT

Kambin frame

Headrest

C-arm fluoroscopy and monitor

Cautery machine

0.9% sodium chloride irrigation tower

Suction

Drill machine

Monitor for endoscope

SUPPLIES

Ioban drape

Irrigation tubing

Suction tubing

Chest/breast drape

Mayo cover

Yankauer

2 5cc syringes with 25 x 1" needle filled with 0.25% bupivacaine with epinephrine

3-0 nylon suture

#11 Blade

Raytech sponges

C-arm cover

Medicine basin

22 x 3.5" needle

INSTRUMENTS

Pituitary rongeur

2mm, 3mm, and 4mm Kerrison rongeurs

45-degree up-biting grasper

Basket punch

Curette

Chisel

Penfield dissector

9.4-mm dilator

Endoscope

10.5-mm tubular retractor



In endoscopic spinal surgery there are few complications. The most common is nerve or spinal cord injury. However, this only occurs in 1 out of 5,000 patients.

while lying in the prone position. The head is secured by a prone headrest.

PREPPING AND DRAPING

Once the patient is properly positioned on the table, the circulator preps with ChloroPrep then waits the allotted three-minute dry time. The prep area is from around T4 to the tailbone and from table to table. The Certified Surgical Technologist will drape four sterile towels in a box around the intended incision. Next, the CST will place a chest/breast drape over the patient. The final item to drape is an Ioban drape. The Ioban used has a clear pocket all of the way around it, which catches the fluid used to irrigate.

SURGICAL PROCEDURE

The CST will place a C-arm drape over the arm and allow the circulator to move the machine into position. Once the surgeon has found the general location, he will use a 22 gauge x 3.5" needle to determine the exact location of operation. The stylet will be removed and then 0.25% bupivacaine with epinephrine is injected into the area. An #11 blade is used to make a .3 mm-.4 mm incision and Iris scissors are used to dissect down. A 9.4mm dilator is inserted and used as a guide for the tubular retractor with fluid adaptor. Once the tube is placed, the CST will give the endoscope to the surgeon. Attached will be the light cord, irrigation tubing, and endoscopic camera. The CST will hold a 4x4" gauze so the scope can be white balanced. Once white balancing has been tested, the 4x4" will be moistened so the straight bipolar can be tested. At this point, the surgeon will place the scope into the 10.5 mm tubular retractor.

The pituitary rongeur is used to remove ligamentum flavum, which is an elastic tissue that runs from the axis to the sacrum. The ligamentum flavum connects the lamina and fuses with the facet joint. Ligamentum flavum translates into yellow ligament. This is because it looks yellow due to the collagen found in the flavum. Over one's life span, ligament loses elastin causing the flavum to push into the spinal canal. The CST will clean the flavum and lamina off the rongeur each time the surgeon removes it from the tubular retractor.

Once the ligamentum flavum has been removed and the bone is reached, a drill is used to dig past the lamina. Also, a 4 mm 90° Kerrison rongeur, 45° up-biting grasper, basket punch, and chisel with mallet can be used to remove lamina. When the surgeon thinks he has removed enough flavum

and lamina, a blunt dilator, aka, Penfield dissector, is used in conjunction with fluoroscopy to see how much progress has been made. If all looks well, the surgeon will check to make sure the nerve rootlets are intact and that the spinal cord has palpations. If not, more drilling and removal of the lamina is performed. The endoscope is removed along with the tubular retractor. The CST makes a small tear in the Ioban around the incision and dries the area with clean 4x4" gauze. At this time the CST passes the 3-0 nylon suture. Since the incision is so small, only two to three sutures are placed. The drapes are removed, and the CST will cover the incision with sterile 4x4" gauze and soft cloth surgical tape.

POST-OPERATIVE

The patient will be transferred to recovery via a stretcher after extubation. The patient will be monitored until they are able to become aware of their surroundings. Their feet and legs will be checked for movement, and then the patient will be moved to the edge of the bed with assistance. The patient will be required to take several steps to reach a wheelchair. Upon reaching the wheelchair the patient will be taken to the restroom to void. After this is achieved, and the patient is oriented enough to leave, they will be discharged. The process from extubation to discharge usually lasts between two and three hours.

FOLLOW-UP CARE

Two weeks after the procedure, the patient will return to the office for a follow up visit. The stitches will be removed, and the incision is checked. Reflex and vital signs are also checked.

COMPLICATIONS

In endoscopic spinal surgery there are few complications. The most common is nerve or spinal cord injury. However, this only occurs in 1 out of 5,000 patients. Injuries to nearby anatomical structures are rare. Since irrigation is run during the entire case and the surgical field is better visualized, abnormal bleeding is all but nonexistent. Dural tears and spinal fluid leaks occur in about 1% of endoscopic spinal surgeries. This can lead to a headache lasting two to three days but will heal itself.

RECOVERY

As with any surgery, recovery is one of the biggest worries for the patient. In traditional open spinal surgery, it

takes approximately three to six months before a patient can begin to assess the impact of surgery. In endoscopic spinal surgery, the recovery time is two to three weeks.

Photos courtesy of Dr Marion R McMillan of Synergy Spine Center

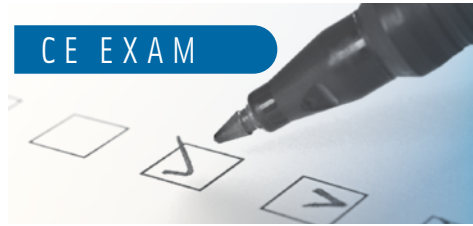


ABOUT THE AUTHOR

Amanda Dowell, CST, graduated cum laude from her surgical technologist program in February 2014 and has been employed with Synergy Spine Center in Seneca, South Carolina since April 2014. She has advanced to Lead CST and OR Supervisor. Amanda lives on beautiful Lake Keowee in South Carolina with her husband. For more information and videos about spinal surgery, please visit SynergySpineCenter.com

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1. Endoscopes used for spine surgery are typically the size of what?
 - a. Spoon
 - b. Pencil
 - c. Ruler
 - d. Brush
2. How many regions are the vertebrae divided into?
 - a. 3
 - b. 4
 - c. 5
 - d. 6
3. The _____ vertebrae are numbered C1 to C7:
 - a. Cervical
 - b. Lumbar
 - c. Sacrum
 - d. Coccyx
4. The sacrum connects the spine to the ____?
 - a. Ribs
 - b. Hip bones
 - c. Tailbone
 - d. Neck
5. Which position is the patient once they are under anesthesia?
 - a. Supine
 - b. Trendelenburg
 - c. Lateral
 - d. Prone
6. Which instrument is used to remove ligamentum flavum?
 - a. Kerrison rongeur
 - b. Up-biting grasper
 - c. Pituitary rongeur
 - d. Chisel
7. The most common complication is nerve or spinal cord injury, which occurs in 1 out of ___ patients?
 - a. 5,000
 - b. 15,000
 - c. 30,000
 - d. 50,000
8. How many individual bones make up the vertebrae?
 - a. 19
 - b. 26
 - c. 33
 - d. 42
9. With standard spinal fusions, incisions can be ___ or larger.
 - a. 3 in
 - b. 4 in
 - c. 5 in
 - d. 6 in
10. Along with the iliac bones, which vertebrae forms a ring called the pelvic girdle?
 - a. Lumbar
 - b. Coccyx
 - c. Sacral
 - d. Cervical

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