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Endoscopic Lumbar Laminotomy

Amanda Dowell, CST

An endoscopic lumbar laminotomy is the removal of portions of the bony bridge and/or spinal joints that are pressing on one's nerves. This pressure, known as stenosis, means Greek for "choking." In essence, the lamina is choking the cord nerve roots and cauda equina. With pressure being placed on the nerves, the patient can feel pain, numbness and cramping in the legs. As patients age, they may see changes to their spine, which can lead to degeneration of the vertebrae, discs, muscles and ligaments that make up the spinal column. All these changes can lead to spinal stenosis.

Although spinal stenosis is most common in men and women older than 50 years old, those who were born with a narrow spinal canal or who injure their spines may also get spinal stenosis. Other factors that may lead to spinal stenosis include osteoarthritis, tumors and calcium deposits on the ligaments that run along the spine.

The level of a patient's pain, where it radiates in the legs and an MRI will help decide if the patient is a good candidate for surgery. The most common levels of stenosis are L3-S1.

ENDOSCOPIC LAMINOTOMY VERSES SPINAL FUSION

With standard spinal fusions, the patient may go home with a 6-inch incision, if not larger. Their back is cut open, and the muscle, ligaments, and tissue are moved out of the way. The laminotomy is performed, and the rods and screws are inserted for stability. Spinal

LEARNING OBJECTIVES

- Recall the anatomy of the spine
- Compare the methods of an endoscopic laminotomy verses a standard spinal fusion
- Review the techniques used in an endoscopic lumbar laminotomy
- Examine the role of a surgical technologist during this type of procedure
- List the potential complications related to this surgery

fusions patients are at higher risk for blood clots and infection, not only of the large surgical area, but also in their bladder or kidney. Blood loss, heart attack or strokes during this surgery is also common. Post-operation, the patient generally will remain in the hospital from three to four days, and it can take as long as two years for one's back pain to diminish and function to return.

An endoscopic laminotomy procedure use endoscopes and small access tubes called tubular retractors. Endoscopes that are used for spine surgery are typically the size of a pencil (7-9 mm). The tubular retractor is inserted into the body through a small incision that splits the muscles. This opening is just big enough for the endoscope to fit through. Since the tubular retractor is directed straight into the affected area by splitting the tissue, a patient's muscles and ligaments are virtually undisturbed. The laminotomy is performed upon immediately entering the spine. The risk of infection is extremely low as antibiotics are ran continuously with irrigation through the procedure. With the irrigation, bleeding also is limited. The patient generally is up and walking within a couple of hours after surgery, and usually goes home the same day. The improvement in the patient's back and leg pain as well as function are immediate. Most of the patient's 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, which is about 10 pounds. The seven

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Back table set up for an endoscopic lumbar laminotomy

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 vertebrae 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.

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The function of the thoracic verterbrae 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 the lumbar region. 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 so they may absorb the stress of lifting and carrying heavy objects.

The sacrum connects the spine to the pelvis. 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 together and keep them aligned. The spinal column provides the main support for one's body, which allows a person to stand upright, bend and twist. Protected deep inside the bones, the spinal cord connects your body to the brain, allowing movement of your arms and legs. The spine is a combination of bones, flexible ligaments and tendons, large muscles and highly sensitive nerves. Throughout its length the spinal column has a large central canal through which the spinal cord descends, and openings to each side of the canal to allow the spinal nerves to escape at each level. The spinal cord only extends to the upper part of the low back, around T12. Below that are tiny contained nerve rootlets that loosely spread out – much like a horse's tail (cauda equine) – and are protectively enclosed in a long case. However, sometimes the lamina (the bridge connecting the left and right halves of the spinal joints and the thickening of the spinal joints) puts pressure on the spinal sac or nerve roots.

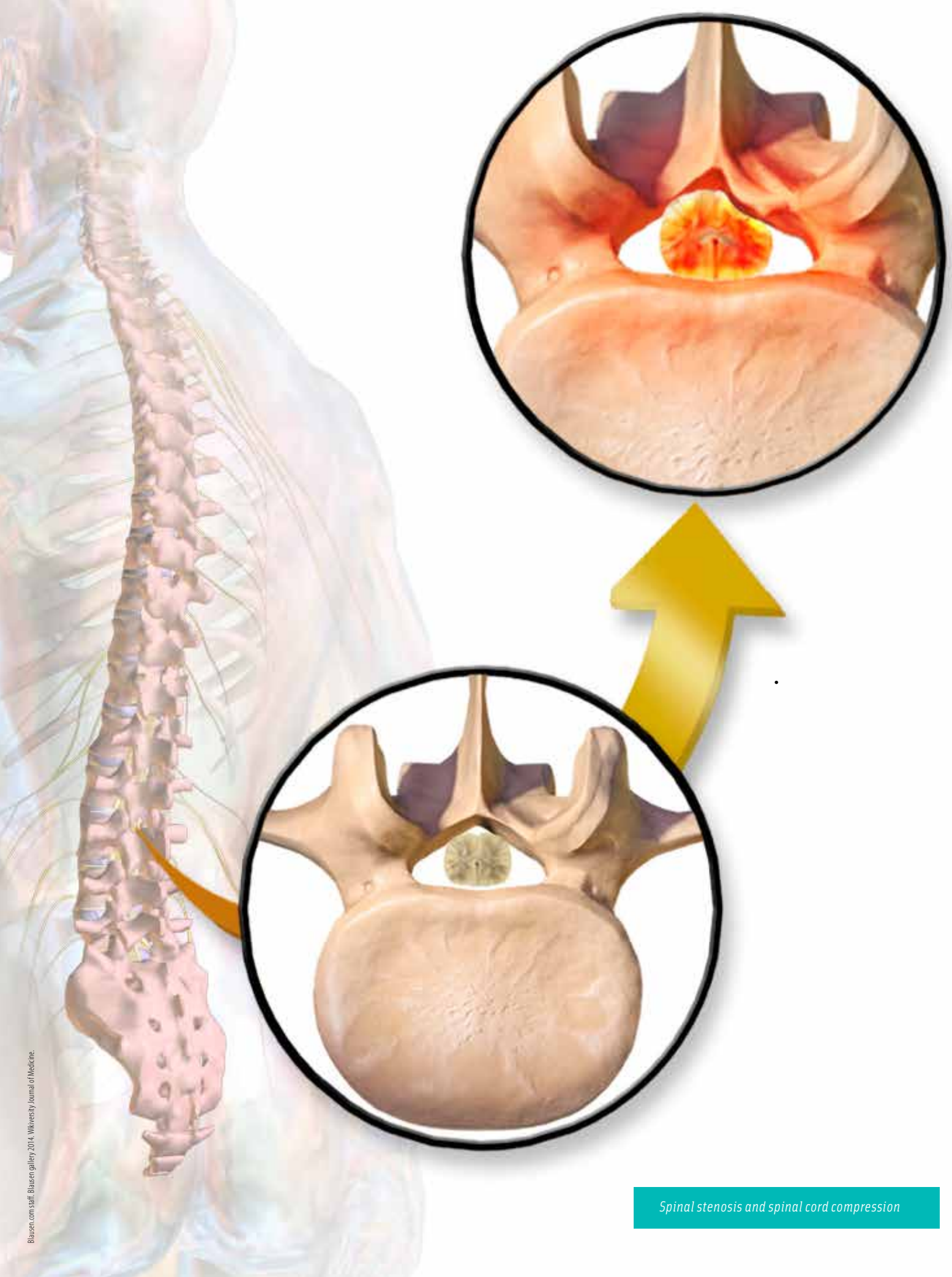
PATIENT POSITIONING, PREPPING AND DRAPING

The patient will be intubated in the supine position on a stretcher used to bring them into the operating room. Once they are asleep, they will be moved into the prone position on a radiolucent table. A radiolucent spinal frame will be used to elevate the patient's midsection so their back is flat. This frame also will help to stabilize the patient's chest and abdomen while they are lying in the prone position. Their head will be secured by a prone headrest.

Once the patient is properly positioned on the table, the circulator will prep with an iodine scrub three times. Once the scrub is complete, the circulator will finish with two iodine paintings. The prep area extends from T4 to the tailbone and from table edge to table edge. After the paint has been applied, the back will be blotted dry with a sterile towel. The surgical technologist will then drape four sterile towels in a box around the intended incision, and place a chest/breast drape over the patient. The final drape is an iodine-impregnated incision drape. This drape has a clear pocket all of the way around it to catch all of the irrigation.

PROCEDURE

The surgical tech will place a C-arm drape over the fluoroscope 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-inch needle to determine the exact location of operation. The needle stylet will be removed and then 0.25% bupivacaine hydrochloride with epinephrine will be injected into the area. A #11 blade will be used to make a .3-mm-.4-mm incision and Iris scissors will be used to dissect down to the lamina. A 7-mm dilator will be inserted and used as a guide for the tubular retractor with fluid adaptor. Once the tube is placed, the surgical technologist will hand the endoscope to the surgeon with the light cord, irrigation tubing and endoscopic camera attached. The surgical tech will hold a 4"x4" gauze so the



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Spinal stenosis and spinal cord compression

scope can be white balanced. Once white balancing has been tested, the 4"x4" will be moistened so the straight bi-polar electrode can be tested. At this point, the surgeon will place the scope into the tubular retractor.

The first instrument used will be the pituitary rongeur. This is used to remove soft tissue and muscle overlying the lamina. Next, the ligamentum flavum — which is an elastic tissue that runs from the axis to the sacrum — is identified. The ligamentum flavum connects the lamina and fuses with the facet joint. Ligamentum flavum translates into "yellow ligament" because it looks yellow due to the collagen found in the flavum. As people age, the ligament loses elastin, causing the flavum to thicken and push into the spinal canal. The surgical technologist will clean the flavum and lamina off of the spoon each time the surgeon removes it from the tubular retractor.

Once the ligamentum flavum has been removed and the bone is reached, a drill will be used to carefully remove portions of the lamina. A 4mm 40° and 90° Kerrison rongeur, and chisel with mallet will be used to remove the lamina. When the surgeon thinks he has removed enough flavum and lamina, a blunt dilator will be used in conjunction with fluoroscopy to see how much progress has been made. If all looks well, the surgeon will ensure the nerve rootlets are intact and that the spinal cord has pulsations. If not, more drilling and removal of the lamina will be performed. Once that step is complete, the endoscope will be removed along with the tubular retractor with fluid adaptor. The surgical technologist will make a small tear in the iodine-impregnated incision drape around the incision and dry the area with clean 4"x4" gauze. At this time, the surgical technologist will pass 3-0 nylon suture. Since the incision is small, usually only two sutures will need to be placed.

POST-OP

Following the operation, the patient will be transferred to recovery via a stretcher after extubation. The patient will be monitored until they are 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, and then taken via a wheelchair to a 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.

One week after the procedure, the patient will return to

EQUIPMENT:

- Radiolucent spinal frame
- Headrest
- C-arm fluoroscopy and monitor
- Bipolar electro-cautery machine
- 0.9% sodium chloride
- Suction
- Drill machine
- Monitor for endoscope

SUPPLIES:

- Iodine-impregnated incision drape
- Irrigation tubing
- Suction tubing
- Chest/breast drape
- Mayo cover
- Yankauer suction catheter
- 2 - 5cc syringes with 25x1" needle filled with 0.25% bupivacaine hydrochloride with epinephrine
- 3-0 nylon suture
- #11 Blade
- Raytech sponges
- C-arm cover
- Medicine basin
- Scrub basin with sterile water
- 22-gauge x 3.5" needle

INSTRUMENTS:

- Pituitary rongeur
- 2-mm, 3-mm and 4-mm Kerrison rongeurs
- 45-degree up-biting grasper
- Basket punch
- Curette
- Chisel
- Blunt dissector
- 7-mm dilator
- Endoscope
- Tubular retractor with fluid adaptor
- Drill, shaft, handpiece and drill cord
- Camera
- Light cord
- Straight and curved bi-polar with handle and cord
- Hammer
- Adson with teeth
- Needle driver
- Straight Mayo scissors
- Iris scissors
- Nerve hook
- Trephine

the office for a follow-up visit. Their stitches will be removed and their incision will be checked. Their neurologic functions and vital signs will be checked and the patient will be able to ask any further post-op questions.

COMPLICATIONS

In endoscopic spinal surgery, there are very few complications. The most common is dural tear which occurs in less than 5% of patients. Dural tears and spinal fluid leaks can lead to a headache lasting two to three days but will usually heal itself. Their nerve or spinal cord injury is more serious, and only occurs in 1 out of 5,000 patients. Injuries to nearby anatomical structures are rare. Since irrigation is used during the entire case, abnormal bleeding is all but nonexistent.

RECOVERY

As with any surgery, recovery is one of the biggest concerns for the patient. In a traditional open spinal surgery, it takes approximately three to six months before you can begin to assess the impact of the surgery. In endoscopic spinal surgery, the recovery time is two to three weeks, and an assessment can be performed much sooner.

ABOUT THE AUTHOR

Amanda Dowell, CST, graduated cum laude from her surgical technology program in February 2014 and has been employed with Synergy Spine and Surgery Center in Seneca, South Carolina, since April 2014. Amanda lives in Pickens, South Carolina, with her husband, Daniel, and their 10-year-old son, Bo.

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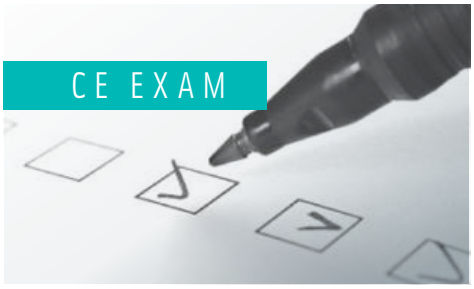

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