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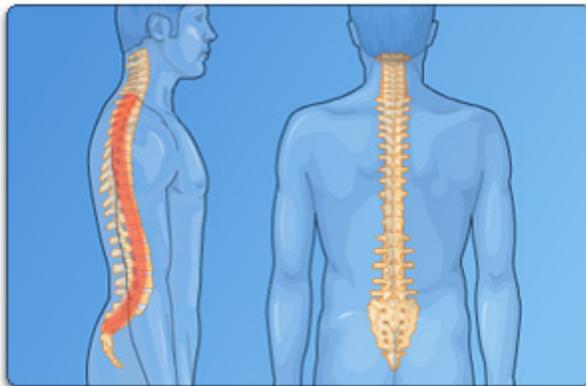
## **ANTERIOR CERVICAL DISCECTOMY & FUSION (ACDF)**

### **About Your Body**

#### **When is ACDF done?**

1. Most of the time, ACDF is done to relieve pain that runs down the arm.
2. Other times, it's done to treat problems like leg weakness and prevent them from becoming worse.
3. It is also used to treat certain types of neck pain.

#### **About the Spine**



Your spine begins at the base of the skull and runs down your back to your tailbone. Individual bones called "vertebra" are stacked to give your spine its "S" shape. Your vertebrae also help protect your spinal cord and nerves.

Your spinal cord is made up of millions of nerves that carry information to and from your brain. These nerves help control your body's movements and allow you to feel sensations like heat and pain.

The neck is also called the "cervical area." The 7 vertebrae here support your head and neck, and make a backward "C" shape. The spinal nerves in your neck control and give feeling in your arms, hands, and fingers.

Between the vertebrae are "discs." They're tough, flexible shock absorbers that cushion the vertebrae. The outside of the disc is a ring of tough fiber. And the center is soft and rubbery, sort of like gelatin.

### **What happens during ACDF?**

First, a problem disc is removed leaving an empty space. Then a piece of bone called a graft (or a small metal cage with bone graft inside of it) is placed in the empty disc space. The bones here grow together or "fuse" — so after this, there's no movement or motion between the 2 fused vertebrae.

### **About Your Condition**

**Dr. Aryan usually performs ACDF for one of 3 different conditions:**

1. **Radiculopathy:** pain, weakness, or numbness in your arm or hand
2. **Myelopathy:** arm or leg stiffness, heaviness, or trouble walking
3. **Axial neck pain:** a certain type of neck pain due to degenerated discs

All of these problems can be caused by a "herniated disc" or "bone spurs."

### **What's a herniated disc?**

When a disc herniates, the gelatin-like material inside the disc breaks through the wall. (It's kind of like what happens when you squeeze a jelly donut.) This can happen as discs age, or if the neck is suddenly jerked, like in a car accident.

The material that breaks through the wall of the disc can put pressure on (or "pinch") a nerve in your neck. This can cause pain, tingling, or numbness in your arm, hand, or wrist. Your hand may feel clumsy, making it hard to do things like button a shirt. Again, this condition is called radiculopathy.

Other times, this disc material puts pressure right on the spinal cord itself, causing numbness or weakness in the arms, hands, or legs, or difficulty walking. Pressure on the spinal cord is called myelopathy.

### **What are bone spurs?**

Small bumps that develop on the vertebrae are called "bone spurs." Bone spurs often develop as we age. And they can build up, causing the area around the spinal cord to narrow. This narrowing is called "spinal stenosis."

- Bone spurs can also pinch a nerve causing arm pain (radiculopathy).
- Or they can press on the spinal cord (myelopathy). Again, this can cause weakness in the arms or legs.

### **About Myelopathy:**

If you have myelopathy, your doctor may have already explained that pressure on the spinal cord is a serious problem. When myelopathy is not treated, people may:

- Develop difficulty walking or lose the ability to walk altogether
- Develop problems with sexual function
- Lose bowel or bladder control
- Become paralyzed from the neck down, where you can't move

But this surgery often prevents these kinds of severe problems from developing. And it may also improve any arm or leg weakness you have now.

And yes, it is possible to have both a pinched nerve and pressure on your spinal cord. But the good news is, ACDF can treat both of these at the same time.

### **Neck pain and Headaches:**

Many people with these conditions also complain of neck pain or headaches. But it's important to understand that sometimes ACDF relieves neck pain or headaches, but sometimes it does **not**. If you have any questions about how this surgery will treat your conditions, ask Dr. Aryan.

## **Before Your Surgery**

### **Tests and Health History:**

Getting ready for surgery starts a few weeks ahead of time. You may have some tests like an x-ray, MRI, CT scan, and an EMG (this tests the nerves in your arms and hands).

But even with all that information, your surgeon also needs to know about your overall health and medical history. So it's up to you to fill him in. Think of yourself as a key member of your healthcare team. When you give your doctor the information he needs, you increase your chance for success.

**Tell Dr. Aryan if:**

- You have any health conditions
- If you're allergic to anything like penicillin or latex
- You, or anyone in your family, has ever had a bad reaction to anesthesia

**Make a list of everything you take, including:**

- Aspirin
- Injections
- All prescription and over-the-counter drugs
- Herbal supplements
- Vitamins
- Recreational drugs

Why? You may need to get some medications out of your system in the weeks before surgery. Ask your doctor's office for a complete list.

Your doctor may ask you to stop taking anything that can increase the risk of bleeding, such as:

- Aspirin
- Anti-inflammatory drugs like Advil™ or Motrin®
- Prescription drugs like warfarin or Coumadin®
- Herbs like Ginkgo biloba.

**If you take a blood-thinner like Coumadin® or Plavix®, ask your primary doctor or cardiologist how to stop taking these drugs before surgery.**

### **No smoking or nicotine:**

Smoking and nicotine products can cause serious problems with the fusion as it heals.

- Most doctors ask patients to stop smoking for 6 weeks before and 3 months after surgery.
- This means no smoking, no chewing tobacco, and no nicotine patches or gum.
- If you slip up — don't hide it from your surgeon. He may want to change your treatment plan to improve your chances of healing well.

### **Planning for recovery:**

- Plan to stay in the hospital 1 to 4 days.
- Ask a family member or a friend to be there with you for comfort and support. Think of this person as your partner in care. Doctors and nurses like to have one person as the "go to" person for all communication. He or she should be able to speak up for you, ask questions, and give information about your health.
- Many people need to take 1 to 4 weeks off from work, sometimes longer.
- When you leave the hospital, you'll need someone drive you home and stay with you.
- The week after surgery, you may need someone to help you with things like grocery shopping or cleaning.
- If you have trouble getting around, you may be able to stay at the hospital's rehab center for a few days, where you can have nursing care. Ask your doctor if this is something that may need to be arranged.

### **Night before surgery:**

- You'll probably get a list of instructions telling you what to do.
- Do **NOT** eat or drink anything after midnight.
- If your doctor says it's OK to take a pill, just take it with a sip of water.

Why? Food in your stomach can be dangerous if you throw up during surgery. So make sure your stomach is **EMPTY**, or your surgery may need to be rescheduled.

## Your Procedure

Each surgery and each patient is different. This describes the surgery and recovery in a general way. But Dr. Aryan will have a specific plan for your operation and recovery.

This surgery takes anywhere from 2 to 4 hours, sometimes longer. It depends on your case and how many vertebrae are being fused.

### **Anesthesia**

1. This surgery is done under general anesthesia, which puts you into a deep sleep.
2. First, the anesthesiologist places an oxygen mask over your mouth and nose and asks you to take deep breaths.
3. Then you'll get the anesthesia through your IV. The medication may sting or burn a little as it goes in, but don't worry, that's normal.
4. Very quickly, you'll fall asleep. After this, you really won't remember anything about the procedure.
5. Most likely, you'll also get antibiotics through your IV to reduce the chance of infections. Once you're asleep, a tube is placed in your mouth and down your windpipe to help you breathe. You won't feel the tube going in.

### **Bone Graft**

The first thing your surgeon needs is a bone graft. You can talk with him about your choices. Sometimes bone substitute or a graft from a bone bank is used. Other times, some bone is taken from just above your hip. Dr. Aryan prefers to use synthetic cages packed with your own bone taken at the time of surgery.

### **Once the graft is ready, the operation on your neck can begin.**

1. First, a new x-ray is taken to check the position of your head and identify the correct disc and vertebrae.
2. A 1 or 2 inch opening is made on the right or left side of the neck. If he can, your surgeon will make the opening in a crease in your neck to help hide the scar. If more than one disc is removed, a longer, slanted opening may be made instead.
3. Special tools hold your windpipe and other structures in your neck out of the way. This is one reason why you may have a hoarse voice or sore throat afterwards.

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4. The disc is then carefully removed, leaving an empty space between the 2 vertebrae. He'll also make this space larger to help take pressure off any pinched nerves or the spinal cord.
  5. Dr. Aryan removes any bone spurs and widens the area around the nerve roots.
  6. This empty space needs to be filled in. This can be done:
    - With the bone graft alone
    - With small metal cages filled with bone graft
    - Sometimes surgeons use "BMP," which is like artificial bone fertilizer. BMP may be used along with a bone graft or instead of a bone graft.

All of these do the same thing. They take the place of the disc, give your spine height, and help your body grow new bone so the vertebrae can fuse together.

7. After the graft is in position, a lightweight metal plate may be screwed in. This plate stays in your neck to help keep the graft or cage from moving as the bone heals. On occasion Dr. Aryan will use an absorbable plate that dissolves away with time.
8. Once he's finished, your surgeon closes the opening with stitches, staples, or surgical tape. These are removed in about 10 to 14 days. Some types of stitches simply dissolve on their own.
9. He may place another small tube to drain any extra fluid. This is also removed before you go home.
10. He may bathe the area with local pain medication, so you're more comfortable when you wake up.
11. A neck brace or collar may be placed on your neck.

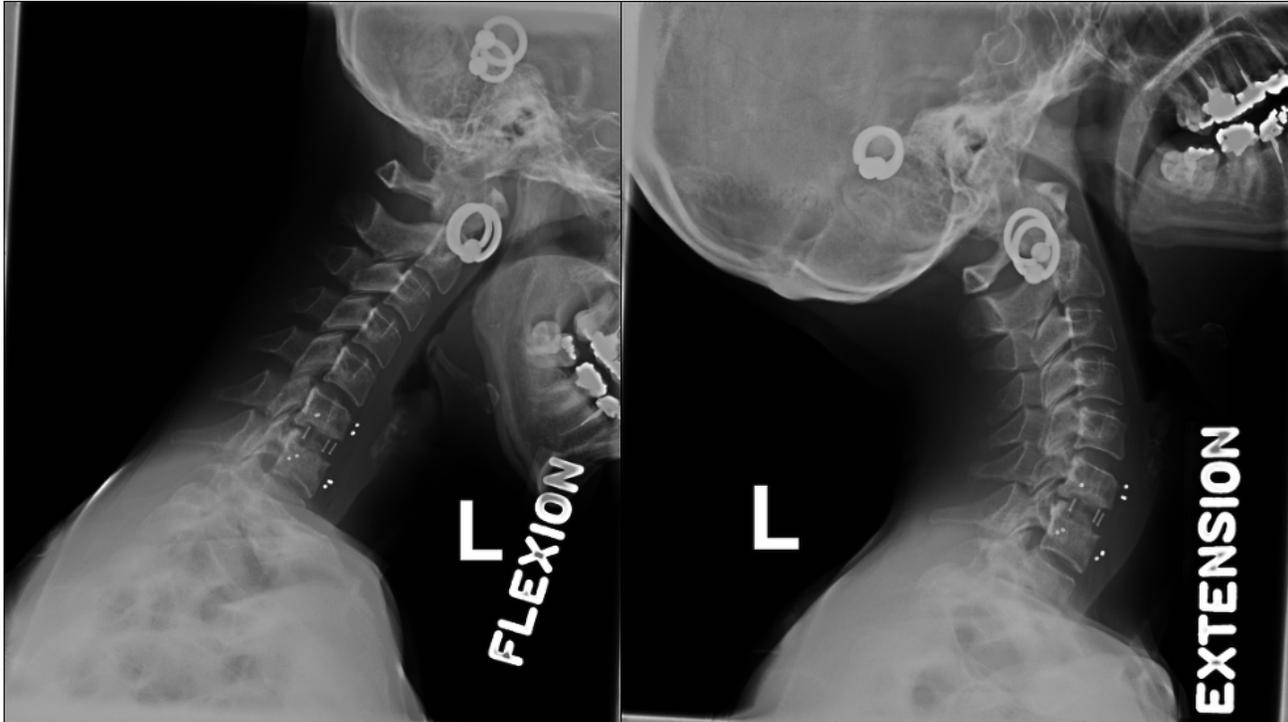
As your body heals, the bone graft will grow between the 2 vertebrae to form a bone bridge. It will be as if the 2 vertebrae were welded together. As you know, once the area is fused, there's no movement in that area. So your neck may be a little stiffer when you move your head up and down. But you should feel very little stiffness when you move it from side to side. Most people can't tell any difference after surgery unless they have many areas in their neck fused. And it's pretty common to get more than one set of vertebrae fused. Ask your doctor what will be done for you.



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## **After Your Surgery**

After surgery, you'll wake up in the recovery room or the intensive care unit (ICU).

- You may be hooked up to some monitors and your IV line for medication and fluids.
- There may be special hose or compression boots on your legs or feet to help lower the risk of blood clots.

### **How will I feel when I wake up?**

- The good news is, if you had arm pain, this may already be gone or much better.
- It usually takes longer for any numbness, tingling, or weakness in your arm to improve.
- It's common to have achy joints and some temporary pain between your shoulders.
- Your throat will probably feel sore and your voice will sound hoarse. It may feel like there's a lump in your throat, or it may be painful to swallow. This may take weeks or months to improve.
- If a bone graft is taken from your hip area, this area will be sore. For many people this area hurts the most.

Of course, you'll get pain medication, and this will help with any discomfort.

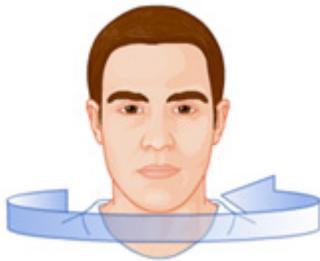
### **Later that day:**

Your nurses will help you get up and walk around. They'll encourage you to walk a little farther each day. Once your doctor thinks you're ready, you can go home. Again, just make sure you have someone drive you home and stay with you.

### **Do NOT:**

- No driving for at least 2 weeks.
- No baths, showers, pools, or hot tubs until your doctor says it's OK. (Take sponge baths instead.)
- For at least the first 6 weeks, your surgeon will most likely ask you to avoid anti-inflammatory drugs like Advil®, or blood-thinners like aspirin. These can cause problems with bleeding.

If your doctor has you stop taking a take a blood-thinner like Coumadin® or Plavix®, ask him when you should start taking it again. This is really important, so make sure you understand his instructions.



Turn your body and your shoulders (instead of turning your neck)



Do **NOT** bend over.



Do **NOT** lift or pick anything up off the floor.

### The first 6 weeks:

- Treat the fused area gently as it heals.
- Your surgeon may have you wear a collar so you don't turn your head and neck. He'll tell you how long you need to wear it.
- If you aren't given a neck brace — turn your body and your shoulders (instead of turning your neck).
- Do **NOT** bend over.
- Do **NOT** lift or pick anything up off the floor.
- Make sure anything you carry isn't heavy. If you need to get something heavier than a Sunday newspaper or a gallon of milk, ask someone to get it for you.

### Tips

- If you have a neck brace, you may want to sleep in a reclining chair.
- Don't spend too much time in bed. That will actually slow your recovery.
- Daily activity like walking is some of the best medicine — it builds strength and helps you heal. And although it's normal to have a little discomfort with any activity, pain is a sign to stop. Listen to your body.

## **Physical therapy**

In the weeks or months after surgery, you may also need some physical therapy. But each person is different, so ask your doctor what he thinks is best for you.

## **Returning to activity**

- It takes a good 2 to 3 months for the bone graft to heal fully. Around this time, your surgeon may let you slowly return to most sports. But he may still want you to avoid heavy lifting or contact sports for a while.
- Over the course of one year, many people regain their strength and can return to all activities.

## **Possible new pain in the future**

The discs around the fusion now have to do extra work. So over time (anywhere from 5 to 25 years), new pain can develop. Your doctor may call this "adjacent segment disc degeneration." But don't feel too discouraged by this because there are things you can do to help prevent problems. Ask your doctor what he recommends for you.

If you have any problems during recovery, please call your surgeon.

## **Call your doctor right away if you have:**

- A fever of 101° F or higher
- Painful, burning, or frequent urination
- Pain, redness, or swelling in one or both of your legs (especially pain in your calf or the back of your knee)
- Nausea or vomiting
- Redness, swelling, or drainage from the cut on your neck
- New or increased pain, numbness, or weakness in your neck, arms, or feet

## **And, call or get emergency help if:**

- You have any new difficulty walking
- If you lose control of your bladder or bowels, or develop any problems with sexual function
- You have sudden shortness of breath or chest pain

If you experience anything unusual that I haven't covered here, or if something just feels wrong, call.

### **Risks and Benefits**

**If you have arm pain from radiculopathy**, the main benefit is usually pain relief. And after you recover, you can return to work and an active life.

**If you have myelopathy** where there's pressure on your spinal cord, ACDF may improve problems like leg weakness, especially with physical therapy. And ACDF can prevent truly serious problems, like paralysis, from developing.

While it's important to focus on success, like any surgery, there are some risks. This goes over some of the risks, but it isn't meant to scare you. Understanding what's involved is an important part of surgery. And keep in mind that your age, past surgeries, and other medical conditions can make a difference. So ask your surgeon how these risks relate to you. Also, there are some unusual risks that will not be covered here. So do not consider this list complete.

**There is a risk of injury to the nerves that control your vocal cords. In some cases, hoarseness, a change in the sound of your voice, or difficulty swallowing may be permanent.**

Because your surgeon needs to work very close to the nerves that control your vocal cords, there's a chance a nerve in this area could be stretched or injured. While many people have a hoarse voice, or pain or trouble swallowing in the weeks and months after surgery, most of the time these problems are temporary. Sometimes hoarseness or a change in the sound of the voice can get better with treatment. Unfortunately, sometimes the nerve does not recover and these problems are permanent. And while it's rare, if pain or problems swallowing never go away, you may need to permanently switch to a soft diet.

**As your spine heals, there's a risk the vertebrae will not fuse together. Sometimes, more surgery is needed.**

Sometimes, the bones in the spine do not fuse together. It's not always clear why this happens. How your body heals, previous surgery, or trying to fuse more than one area

can all lead to healing problems. Other times, too much movement in the neck in the weeks and months after surgery can cause a cage, screw, or some other piece of hardware placed in the spine to come loose, move, or (very rarely) break. A failed fusion is also more common in people who smoke, are obese, have diabetes, use anti-inflammatory drugs while the bone is still healing, or are being treated with chemotherapy or radiation for cancer. The type of bone graft that is used can also increase this risk. Many times, this isn't a big problem because the scar tissue that forms after surgery can also help stabilize the spine. So any arm pain may still go away or become less painful. When this happens, nothing needs to be done. But if problems return or continue, more surgery may be needed.

**There is a risk of infection. In rare cases, more surgery may be needed to treat an infection.**

Although your doctor will take great care to prevent infections, you may still get an infection around your surgical area. Signs of a wound infection include: redness, swelling, fluid drainage, or pain that gets worse. You may also experience fever or chills. If you feel any of these things, please call your doctor right away. Most of the time, small doses of antibiotics get rid of infections. However, sometimes one or more surgeries are needed to clean out an infection, along with many weeks of treatment with IV antibiotics. You may also get an infection in other parts of your body — like in your lungs or bladder. Again, most of the time antibiotics work to clear up infections. If very bad infections are left untreated, it could lead to other more serious problems and even death.

**If a blood transfusion is needed, there's an extremely small risk you could get a virus or develop other problems.**

With any surgery, there's a risk of bleeding during and after the operation. If there is bleeding, in most cases your doctor will be able to control it. In some cases, if you lose too much blood, you may need a blood transfusion. Although blood banks check all blood to make sure it's clean and free of disease, there is still an extremely small chance that your body could reject the blood or that you could get a virus like HIV/AIDS or hepatitis.

**There is a risk of injury to the dura (a fluid-filled membrane that surrounds the spinal cord and nerves). In rare cases, more surgery or treatment may be needed.**

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Because your surgeon needs to work very close to the spinal cord and nerves, a "dural tear" can occur, allowing spinal fluid to leak out. If this happens, it's usually not a serious problem and your surgeon simply seals the tear during surgery. If spinal fluid continues to leak out, you can experience painful headaches. If this happens, call your surgeon right away. To give the tear time to heal on its own, you may need to lie flat on your back for a couple of days. In the rare event that a leak does not seal itself off quickly, another surgery may be needed to fix the tear.

**There is a risk of blood clots that, in rare cases, can be life threatening.**

Blood clots can form in one or both your legs during or after surgery. Rarely, a blood clot can travel to your heart or lungs. This can be very dangerous and can even result in death. The key to prevention is to keep blood flowing. So to help prevent clots, your surgeon may use things like compression boots or TED® support hose. Signs of blood clots include sudden shortness of breath, chest pain, and painful swelling in one or both legs. If you have any of these signs, call your surgeon or get emergency help right away.

**There is a risk of numbness, tingling, or weakness. There's also a rare risk of other serious problems including paralysis.**

If a nerve is injured during surgery, you may have numbness, tingling, or weakness in your arms. Or, you may not be able to move some muscles in your arms. These problems may go away within months. But in some cases, they may be permanent. And while it's rare, if there is an injury to the spinal cord, or if a large blood clot puts pressure on the spinal cord after surgery, there's a risk of paralysis. Paralysis is the inability to move from the waist or the neck down. Injury to the spinal cord could also cause the loss of control of your bladder, bowel, or sexual functions. Again, this condition could be temporary or permanent. And again, this is very rare.

**For some people, this surgery does not relieve or reduce pain or symptoms. And there's a risk you may develop new pain or problems.**

In some cases, even though the vertebrae fuse, people continue to have pain or develop new pain. Why? Well, many different things can cause back and neck pain. And in some cases, no one is sure what causes or cures it. So no one can say what

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your pain will be like or how much you'll be able to do after surgery. While it's rare, more surgery may be needed if you still have pain or if you develop new problems. For the best results, follow your doctor's instructions about exercise, medication, and not smoking. And follow through with any physical therapy.

**There is a risk of bad or allergic reactions to the anesthesia or medications that are used. In unusual cases, you can die from these reactions.**

You may have a reaction to the anesthesia or medications used during or after surgery. Signs of bad reactions can vary. You may have a minor reaction like a rash. Or you may have more serious symptoms like dizziness, a swollen tongue or lips, or trouble breathing. If you feel any of these things, stop your medications and contact your doctor or get emergency help right away. An allergic reaction can be very serious, and in rare cases, people can die. Please tell your doctor if you have ever had an allergic reaction to anything. Also tell your doctor if you, or anyone in your family, has ever had a bad reaction to anesthesia.

**If any bone graft used comes from a bone bank, there is an extremely small risk you could get an infection or a virus.**

Although bone banks check all grafts to make sure they're clean and free of disease, there is still an extremely small chance you could get an infection or a virus-like illness. Antibiotics and more surgery may be needed to clean out an infection.

**If a bone graft is taken from your hip area, there is a small chance the bone here may be fractured, or that you may develop chronic pain in your hip or thigh area.**

When a small piece of bone is taken from the hip area to be used as a graft, there is a small chance the bone may fracture. A nerve in this area can also be injured, causing pain, numbness, or tingling in the hip, or numbness or burning pain in the thigh. These problems may go away over time, but in some cases they're permanent. These risks increase when a larger bone graft is needed.

**There is a risk of a stroke, heart attack, or death.**

How your body handles surgery depends on what kind of condition your body is in. Some bodies are stronger and can handle surgery better than others. Age, illnesses, heart conditions, past strokes, and other things like obesity may make it harder to

perform surgery successfully. It is possible you could have a stroke or a heart attack during surgery or as you recover. These attacks can be mild or severe. Although the risk of death is small, you may die during surgery or the recovery period from any of the risks I mentioned earlier, or for other reasons.

### **Alternatives**

#### **ALTERNATIVES FOR RADICULOPATHY:**

##### **No surgery:**

- One option is not to have surgery and wait and see if your arm pain gets better. This is called "watchful waiting."
- Other treatments like medication, physical therapy, or epidural steroid injections (nerve blocks), can ease or improve your arm pain.
- You may get relief by taking pressure off the pinched nerve. This can be done by using a special neck pillow at night or with traction. With traction, a device attaches to your head and pulls your head up, taking pressure off any pinched nerves in your neck.
- If you want to see a chiropractor, the best thing to do is have your surgeon check you out first. You want to make sure that you don't have the kind of neck problem that would make this kind of treatment unsafe.

##### **Other surgery (foraminotomy):**

Most likely, you've already tried everything to get rid of your arm pain (radiculopathy). If nothing else has given you relief, surgery may be your best bet. And there's another surgery for a pinched nerve called a "foraminotomy." With this, an opening is made in the back of the neck and the bony tunnel around the nerve is widened, giving it more room.

##### **Feeling sure about your decision to have surgery**

If you have radiculopathy, I know you may have a lot of daily pain in your arm or shoulder. But if you don't feel sure that you're ready for surgery, or that ACDF is the right procedure for you, get a second opinion. Your surgeon may even encourage you

to do this so you feel confident that you're making the right decision.

### **ALTERNATIVE SURGERIES FOR MYELOPATHY:**

If there's pressure on your spinal cord, it needs to be treated with surgery. There are 3 other surgeries.

1. **Corpectomy:** 2 discs, and the bone between them, are removed. Then, a large bone graft is placed. This will fuse together, forming one long bone bridge.
2. **Laminectomy:** A piece of bone is removed from the vertebrae, taking pressure off the spinal cord.
3. **Laminoplasty:** The back of the vertebra is carefully bent open. A small piece of bone graft is placed, and metal plates may be screwed in (but sometimes this surgery is done without these). This makes the space around the spinal cord permanently larger.