Living Well With Spondylolisthesis

6th Edition

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DISCLAIMER

Nothing in this guide is a substitute for the advice of your personal health care practitioner. Dr. Lavine has never seen you or discussed your specific condition, so he can't possibly diagnose you or give you specific healthcare advice. Although we hope that the information provided will be helpful, never blindly follow the advice of any single book, article, website, or other source without input from your own health care provider and without paying attention to feedback from your own body.
About 1 in 15 adults have a particular defect of the architecture of the low back that can predispose them to low back pain.

The condition — spondylolisthesis - most commonly begins in childhood or adolescence. Most often, it doesn't cause any symptoms when you're young. Even as you mature, there's only a small chance that spondylolisthesis will progress to the point that it causes you pain or nerve problems.

If you have a low back problem and you've been told you have spondylolisthesis, you should learn all you can about it, and the simple measures you can take to protect your low back health.

And if you have a low back problem and still aren't sure what the complete diagnosis is, you definitely should learn all you can about spondylolisthesis, and the basic exercises and home care steps you can take to prevent it from getting worse.

The good news is that most people with spondylolisthesis can learn to co-exist with their condition and enjoy a wide range of physical activities. That's the purpose of this book.

It's written by an expert, Ronald Lavine, DC, in the art of conservative spine care using simple self-directed exercise, postural and ergonomic tips, and old-fashioned common sense.

There are a few different varieties of spondylolisthesis. These are outlined in more detail on Page 7. This e-book primarily discusses “isthmic spondylolisthesis,” though much of the material and many of the self-care tips would also apply to an individual with “degenerative spondylolisthesis.” But more about these distinctions later.

Section I: The Architecture of Spondylolisthesis

The structural defect of isthmic spondylolisthesis involves two components:

1. A stress fracture of part of the posterior arch of one vertebra, which allows for
2. Forward slippage of the vertebra relative to its neighbor to the south.

Let's look at each component in depth.

1. Vertebral Arch Fracture - Spondylolysis
**Spondylolysis** is the name given to the stress fracture of the vertebral arch. Spondylolysis is one of the components of isthmic spondylolisthesis. That's why isthmic spondylolisthesis is also known as “spondylolytic spondylolisthesis.”

Here's a picture of a typical intact vertebra of the low back (a lumbar vertebra) viewed from above. It will give you an idea of where the stress fracture of spondylolysis occurs.

Do you see the part labeled **facet joint** on the right side of the picture? The corresponding left facet joint is unlabelled.

With spondylolysis, a fracture occurs just behind the facet joint (toward the top of the picture.) This vulnerable part of the vertebra is also known as the **isthmus**, or the **pars interarticularis**.

Sometimes the fracture occurs from trauma - a motorcycle accident for instance. But more common is a gradual-onset **stress** fracture.

The fracture can occur on just one side of the vertebral arch (a unilateral fracture) or on both sides (a bilateral fracture.)
This is a picture of a bilateral fracture of the pars interarticularis viewed on a CT scan. This is from a 30 year old woman who was formerly a gymnast.

Here’s a diagram of a lumbar vertebra showing a fracture of the isthmus on one side only.

How does a stress fracture happen?

Repetitive activities at work, in sports, or from plain old poor posture, place ongoing stress on specific parts of the skeleton. The vertebral arch is particularly vulnerable to repetitive or forceful backward bending.

Combine the ongoing stress with other complicating factors - a genetic predisposition to bone weakness, poor diet, lack of sleep, bad circulation, certain medications, or
whatever – and sooner or later the bone can't take it anymore. A crack will develop.

A fracture on just one side of the arch – unilateral - has the potential to cause problems, but in most people a unilateral fracture won't lead to significant additional degenerative change. That's why we're concerned with the situation in which both sides are fractured. That happens in perhaps 4-6% of all people.

Once you have two-sided, bilateral spondylolysis, you've begun the path to spondylolisthesis. But not everyone with bilateral spondylolysis goes on to develop spondylolisthesis.

Something else still has to happen. The forward slippage.

2. Forward Shift of the Vertebra - Anterolisthesis

Even if you have bilateral spondylolysis and your vertebral arch has lost its integrity, there are still plenty of ligaments and other supporting structures to hold your vertebrae in their natural alignment.

Sometimes these remaining intact structures can do a good enough job. In many cases, the alignment of the bone never changes and you never get pain or other symptoms. Unless you happen to have an X-ray or MRI of your low back, you may never even know you have a structural defect.

But what if..?

• You're highly physically active in a way that strains the limits of flexibility. This would be the case with a gymnast, or a baseball player twisting like a Twizzler with every swing of the bat. Or,

• As part of the normal aging process, over the years your intervertebral disc and other supporting ligaments degenerate and lose their ability to respond resiliently to physical forces. You lose the back-up structural support for your vertebra. Or,

• Your general level of trunk muscular support is sketchy. Your posture has gotten even worse than it was when you were eleven years old when your mother was nagging you to stand up straight. Or,

• You gain a lot of weight. Or,

• You undergo a pregnancy, shifting your center of balance and loosening your ligaments.

When any of these events occur, separately or in combination, your skeleton can't cope with the range of movement or postural distortion it's subjected to. What's likely to happen is that the front part of the vertebra, the vertebral body, no longer anchored to the rear part, will glide forward, losing its natural alignment with the vertebra below.
That's called *anterolisthesis*.

The combination of the vertebral stress fracture (spondylolysis) with forward displacement (anterolisthesis) equals *spondylolisthesis*.

About one-quarter of people with spondylolysis eventually develop spondylolisthesis. Here's a picture of what happens:

This X-ray represents a side-view of an individual's low back. The bones show up as white shadows.

At the bottom of the picture is the sacrum, a part of the pelvis. The sacrum is the base of the spinal column.

Directly above the sacrum, the next vertebra - L5 - has displaced forward. And the rest of the vertebrae of the low back have gone along for the ride, too.

**Sub-varieties of Spondylolisthesis**

*Isthmic spondylolisthesis*

Up until now we've been talking about the most common variation of spondylolisthesis, which technically should be referred to as *isthmic spondylolisthesis*. The name comes from the fact that the spondylolytic fracture occurs just behind the facet joint through the part of the vertebral arch called the *isthmus*. That part of the vertebra is also called the
**pars interarticularis.** So sometimes a fracture in this area is called a *pars fracture* or a *pars defect*.

As previously mentioned, and to confuse things further, *isthmic spondylolisthesis* is sometimes also called *spondyloytic spondylolisthesis*. Spondyloytic spondylolisthesis most commonly starts in childhood or adolescence. Sometimes there can be pain right away. That would be typical if the fracture was the result of a specific traumatic experience. But more often, there is no pain at first, or even for many years.

Symptoms of isthmic spondylolisthesis begin later, when enough ligament and disc degeneration has occurred to allow for significant forward vertebral slide.

Isthmic spondylolisthesis most commonly affects the lowest lumbar vertebra (L5) in its relationship with the sacrum. The L4-L5 joint is the second most likely location.

**Degenerative spondylolisthesis**

A second common form of spondylolisthesis, *degenerative spondylolisthesis*, refers to forward slippage occurring without there being a vertebral arch fracture.

Degenerative spondylolisthesis most commonly begins when you're older - in your forties, fifties, or beyond. It most commonly affects the L4-L5 joint, though other spinal levels can also get into the act. It is associated with other aspects of low back joint degeneration affecting the discs and facet joints.

Degenerative spondylolisthesis is also associated with a specific architectural variation of your vertebrae - sagittal-facing lumbar facet joints. Here’s a picture.
This diagram shows two different anatomical variations of facet joint orientation. On the left, one vertebra meets its neighbor at a facet joint facing a 45-degree angle. On the right, the facet joints face almost straight front-to-back. The sagittally-facing joints on the right offer no additional restraint to forward slippage of one vertebra relative to another, so people with this facet joint orientation are more likely to ultimately develop spondylolisthesis.

**Less common varieties of spondylolisthesis**

Two less common variations of spondylolisthesis are

- **Congenital spondylolisthesis** - you were born that way, or

- **Neoplastic spondylolisthesis** - your vertebrae are distorted because of cancer.

This report is relevant primarily to the large majority of individuals who have isthmic or degenerative spondylolisthesis.

**Incidence of Spondylolisthesis**

Isthmic spondylolisthesis occurs in about 3-6% of Americans of European descent. African-Americans have a lower incidence. Men are two to three times more likely to have spondylolisthesis than women.

There is a family link: if you have spondylolisthesis, close family members are also at greater risk. But it is unknown how genetic, environmental, and behavioral factors interact to increase risk.

Participation in certain sports increases the risk of spondylolisthesis. Gymnastics and football are usually considered to put you most at risk, but other sports have been linked to an increased incidence of spondylolisthesis too.

**Diagnostic Tests for Spondylolisthesis**

Imaging tests of the low back are the most definitive indication of the presence of spondylolisthesis, and can often show both the pars defect (isthmic fracture) as well as the forward slippage of one vertebra over another.

Regular X-rays are most often used, especially oblique X-rays (taken on a diagonal), which are good at showing spondylolysis. Lateral X-rays (side views) are best at showing anterolisthesis, if it exists.

MRI’s, CT scans, and specialized bone tests to show fracture activity can also be used.

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Grades of Spondylolisthesis

Clinicians grade the severity of spondylolisthesis based on how far forward the vertebra has slid. This is usually based on a lateral X-ray and is known as the Meyerding classification.

Grade I  0 - 25% forward glide
Grade II  25 - 50% forward glide
Grade III 50 - 75% forward glide
Grade IV  75 - 100% forward glide

There's also the extreme case when the vertebra above has slid all the way forward - more than 100%. It figuratively “falls off the cliff” - lodging itself in front of the vertebra that should normally be below it. This extreme (and thankfully rare!) situation is called a Grade V spondylolisthesis. It's also given the altogether different name of spondyloptosis.

Naturally, more severe grades of spondylolisthesis are more likely to cause symptoms, and the symptoms are likely to be more intense.

Stable Versus Unstable

An additional diagnostic issue with spondylolisthesis is how much, if any, the vertebra slides around during normal daily activity.

One diagnostic test for instability is to have Xrays made when you're bending forward or backward and compare them to Xrays taken in the neutral position. An excessive amount of vertebral displacement when you bend reflects instability.

Unstable spondylolisthesis is likely to create more severe symptoms than stable spondylolisthesis. And it will be trickier to treat.

Section 2: Symptoms of Spondylolisthesis

Each person experiences spondylolisthesis differently. Some people – perhaps most - with spondylolisthesis don’t even know they have it. At the other extreme, some have severe, even disabling pain and nerve problems.

There are two main mechanisms by which spondylolisthesis creates symptoms:

1. Altered Biomechanics - distortion of the muscles and joints due to bony displacement or instability.
The main symptom related to altered biomechanics of the low back is pain or stiffness. Oftentimes the pain is worse after exercise, particularly if the exercise includes backward bending.

The other category of symptom arises from

2. **Neurological Compromise** - pressure on the spinal cord and spinal nerves due to the bony misalignment.

In spondylolisthesis, when one bone is shifted forward, the spinal cord has to make a sharp turn as it passes down through the vertebrae. That can put pressure on the nerves.

Here's a picture that illustrates what happens:

This is a side view of the low back. This individual is facing to the left. The teal color represents the nerves of the spinal cord. Do you see the spot in the low back (between the 5th lumbar vertebra and the sacrum) where the ribbon of teal angles sharply to the back (toward the right)? If your spinal cord has to make a sharp turn like that, nerve impingement – affecting the nerves in the spinal canal - can be the result.

The most common symptoms related to nerve impingement of the spinal canal are numbness, weakness, or heaviness of the legs.

Even more rarely, the nerves to the bowel or bladder can become blocked, and you'll
lose control over bowel or bladder function. That's serious! Get yourself to an emergency room right away if that's happening to you.

**Paresthesia vs. numbness**

One common symptom of spondylolisthesis is a sensation of numbness, tingling, buzzing or altered sensation affecting the buttock or leg, even at times spreading to the foot and toes.

Many patients describe this sensation as numbness, but technically doctors distinguish between true “numbness” (a loss of sensation), and “paresthesia,” which refers to altered sensation. In medical terminology, numbness could also be called hypoesthesia (lessened sensation), or if it’s bad enough, anesthesia (total loss of sensation.)

A test for numbness would involve stroking the skin with a brush or feather (or a fingertip), or even gently poking it with a pin. With numbness, your ability to feel these sensations would be diminished, or, in a severe case, entirely absent.

With paresthesia, you might feel pins and needles in you leg (similar to when your leg “falls asleep”), but when tested with a brush or pin you’d be able to register the sensation normally.

Numbness results from direct impingement (pinching) of the nerves emerging from your spine. It’s actually uncommon for someone with spondylolisthesis. Paresthesia, which merely implies that those nerves have been irritated in some way without being pinched off entirely, is a far more common spondylolisthesis symptom.

**Section 3: Spondylolisthesis Combined with Other Common Conditions**

There are four other common low back conditions that often exist in combination with spondylolisthesis and can make your symptoms worse.

1. Degenerated, bulging, or herniated intervertebral disc

Wear and tear of the discs of the low back is a universal process. If disc degeneration proceeds far enough, it can result in a disc bulge or disc herniation. Bulging or herniated discs are common problems, even in people without spondylolisthesis, and they can cause pain and nerve problems.

The diagnostic puzzle of separating the issue of a bulging disc from the problem of spondylolisthesis is a challenge.
For one thing, disc degeneration makes spondylolisthesis worse, and vice versa.

Degenerated discs contribute to the biomechanical distortion of spondylolisthesis because the normal intervertebral disc is one of the primary structures that limits motion of the spinal bones. In fact, many experts believe that an intact disc protects you from ever having significant symptoms from spondylolisthesis. Only once your discs have degenerated to a significant degree does the mechanical derangement of spondylolisthesis have a chance to emerge.

The reverse effect also takes place. If you have a vertebral arch fracture (spondylolysis), it will cause much greater wear and tear of the intervertebral discs as they’re called on to stabilize the motion of your spinal joints. This could contribute to premature disc degeneration, bulging, or herniation. Oftentimes the discs that are most affected by spondylolisthesis are those a segment above or below the spondylolisthetic vertebra. This phenomenon can be called “Adjacent Segment Disease (ASD)”.

Secondly, the diagnostic distinction between a bulging disc and spondylolisthesis is complicated by the fact that the symptoms of each overlap.

Pain symptoms overlap because in both situations you've lost some of the biomechanical efficiency of low back movement. Your joints, muscles, and connective tissues experience increased stress.

The neurological symptoms overlap because in both situations there's abnormal pressure or irritation of the nerves.

In theory, there are differences in the neurological compromise that occurs with each condition.

- The typical effect of a bulging disc is pressure on the nerves as they emerge from the spine.
- With spondylolisthesis, the nerves are getting pinched before they leave the spinal canal.

That means that the nerve symptoms of spondylolisthesis are less specific and more diffuse than the symptoms of a pinched nerve root.

Though it's hypothetically possible to differentiate these distinct patterns of nerve impingement, in practice it can be a challenge to tease apart each of these various effects.

2. Spinal Stenosis

Another low back condition that emerges as part of the process of mechanical degeneration is spinal stenosis.

Stenosis is a medical term for the narrowing of any tubular structure. For instance, the arteries are one of the common anatomical parts that can become stenotic.
The spinal canal - the open space in your column of spinal bones through which the spinal cord runs - can also be narrowed. If the narrowing is in the low back (the lumbar region), you have *lumbar spinal stenosis*.

This picture shows how limited space in the central spinal canal leaves less room for the nerves of the spinal cord.

The effects of spinal stenosis and those of spondylolisthesis reinforce each other. If you have spondylolisthesis your spinal cord already has to take a few twists and turns to get where it needs to go. So spondylolisthesis is likely to be a contributing cause of stenosis and to make its symptoms worse.

The symptoms of degenerative spondylolisthesis, in particular, are closely related to stenosis. Typically, degenerative spondylolisthesis only becomes symptomatically relevant to the degree that the resulting stenosis - central spinal canal nerve impingement – causes pain or other nerve effects.

3. **Spinal Osteoarthrosis (also known as arthritis, degenerative joint disease, or spondylolisthesis)**

Osteoarthrosis of the spine refers to the gradual mechanical deterioration of the spinal joints. A modest degree of joint wear and tear is a nearly inevitable consequence of the aging process, but in some people the deterioration is more significant or has a more significant effect.

If you have spondylolisthesis, you've lost some of the natural stabilizing mechanisms of your low back, so it's natural that your spinal joint degeneration would be accelerated.
Conversely, with osteoarthrosis, the ligaments and cartilage designed to stabilize the joint aren't doing as effective a job. This makes your spondylolisthesis worse.

4. **Spina Bifida Occulta**

Spina bifida occulta (or SBO) is a hidden congenital defect in the formation of the posterior ring of one of the low back vertebrae, most usually L5, occurring in about 12% of people.

Most often, it’s considered totally benign. But it has been associated with a higher incidence of spondylolysis and spondylolisthesis, as well as a steeper pitch of the sacrum, which might predispose someone to spondylolysis or allow for more rapid progression of spondylolysis to spondylolisthesis.

**Section 4: Treatment of Spondylolisthesis**

A. **Bracing for early-stage spondylolisthesis**

If isthmic spondylolisthesis is detected early in its course, during childhood or adolescence, soon after the stress fracture has occurred, doctors can fit you for a brace that stabilizes the low back and allows healing of the fracture to occur.

During the initial stage of spondylolysis, the body will naturally respond by trying to heal the fractured segment. Blood flow and other metabolic activity will increase in the area. A test such as a bone scan can show if there is increased metabolism in the fractured area, implying that your body is actively trying to heal itself. If it is, bracing is the treatment of choice.

Bracing can result in a **permanent solution** to spondylolisthesis.

That's great.

But, unfortunately, many cases of spondylolisthesis go undetected until much later. By then, your body has given up spending its energy trying to heal the fracture. Even if you could hold the two fractured ends next to each other, no healing would take place. It's too late to erase the problem entirely.

B. **Epidural steroid injections**

Injections of steroids into the spine are used to treat low back pain, especially when there are signs of nerve impingement. They can be used in cases of spondylolisthesis, too.
Surgery can be a viable option for people with some combination of the following

- Significant, unrelenting pain
- Spondylolisthesis of a high grade
- Unstable spondylolisthesis - the bone slips excessively forward when you bend
- Symptoms that are rapidly worsening
- The occurrence of stenosis and significant neurological deficits along with the spondylolisthesis, including numbness, muscle weakness, or loss of bowel or bladder control
- Symptoms that aren't responding to a conservative care program, even after 3-4 months

Surgery has proven to yield positive results for spondylolisthesis patients whose symptoms warrant it.

There are a number of variations of surgery that can be used depending on the clinical situation. Variations include:

- Are the two neighboring vertebra fused together?
- If they are fused, does the surgeon use screws and plates or a bone graft of your own bone?
- Does the surgeon try to reduce the amount of forward slippage before performing a fusion?
- Does the surgeon try to increase the space in the spinal canal to alleviate the symptoms of stenosis?

There is still controversy as to which surgical techniques are optimal under which circumstances. A recent research study in Sweden, for example, compared groups of patients with spinal stenosis (with or without degenerative spondylolisthesis) who were surgically treated by decompression alone or decompression combined with fusion/stabilization. Both groups fared equally well after the two-year follow-up period.

Surgical techniques are constantly being refined and improved. Describing the range of surgical procedures and when each is indicated is beyond the scope of my expertise.

D. Conservative therapy - the mainstay of treatment for most people with spondylolisthesis

In most cases, spondylolisthesis is discovered too late in the game to permit permanent healing to occur by wearing a brace. And most cases aren’t severe enough, or aren’t accompanied by significant enough nervous system deficits, to warrant injections or surgery.

That leaves the vast majority of people who can benefit from conservative care.

Conservative care includes:
• Implementing good habits of postural alignment
• Building strong core trunk support
• Avoiding activities and postures that tend to aggravate spondylolisthesis, and
• Strategically improving spine health overall.

The rest of this e-book will cover the conservative care strategies, including therapeutic exercises, which will help the majority of people with degenerative or isthmic spondylolisthesis.

Section 5: Implementing Your Self-Care Plan

A. Develop an internal sense of proper alignment in the standing position

Posture is not a static attribute of your body. Posture is an active choice about how to organize your muscular effort to create balanced support. If you have a clear internalized picture of how an organized, balanced posture feels to you, you'll have a better chance to make positive postural choices.

Take a look at these three pictures:
One of these three pictures shows a standing alignment fairly close to ideal. The other two illustrate common postural misconceptions.

See if you can match each picture with the description of the postural distortion. It’s tricky! The differences are subtle.

1. In one picture, the weight of the pelvis is being carried forward of the vertical line of gravity. Consequently, her weight is balanced too far forward on her feet. The curve of her low back is accentuated.

   Avoid this type of postural misconception because the forward pelvic shift can exaggerate spondylolisthesis

2. In a second picture, the problem is that she's stretched too much through the front of her abdomen with a lifted rib cage. She isn't using her abdominals to knit together the pelvis and the ribcage. The curve of her low back is also accentuated.

   Avoid this type of postural misconception because the accentuated lumbar curve can exaggerate your spondylolisthesis.

3. In a third picture, the three main body masses - head, trunk, and pelvis - are well stacked on top of each other.

   This is the idea of proper stance that anyone with spondylolisthesis (and everyone else, too!) should strive to hold as a clear picture in his or her mind.

**ANSWER KEY**  \( A = 3 \quad B = 2 \quad C = 1 \)

When you compare these three pictures, you'll know some of the pitfalls to avoid as you create your own internalized image of proper stance.

It can be difficult to make a significant postural shift merely by looking at a few pictures. Our postural habits are deeply ingrained. That’s why working with a chiropractor, Feldenkrais or Alexander teacher, Pilates instructor, or other expert in movement and alignment can be useful.

### B. Avoid random, thoughtless positions that

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involve significant backward bending.

The potential problem with bending backward (also known as spinal extension) for someone with spondylolisthesis is that it can give the involved vertebra an opportunity to glide further forward on its neighbor below. As far as I’m aware, this potential phenomenon has never been systematically studied. But the warning to avoid spinal extension is based on a combination of tradition and common sense.

Backward bending occurs during routine daily activity. Reaching overhead to get something off a high shelf is one common example. Find a different way to go about it. For instance, you could get a stool to stand on instead.

Some physicians and physical therapists who work with spondylolisthesis patients try to make sure that you never ever move the spine into extension at all. They’ll recommend that when you lie on your back you keep your knees bent. That keeps the spine flexed. When you have to stand for a period of time, they recommend that you place one foot on a low stool – another strategy to keep the spine flexed. Based on this theory, you should never lie face down, either – that extends the spine.

My experience is that for most patients, this degree of spinal vigilance backfires. The low back is designed to move freely in a variety of directions. Controlled, mindful exercises that involve backward bending can be beneficial in maintaining the health of the low back, with or without spondylolisthesis.

There are a number of yoga poses that involve spinal extension. The cobra pose, for example, is one of the most basic.

Cobra Pose

You could benefit from an exercise like the cobra pose for two reasons. For one thing, you’re lying down. Your body can experience backward bending without the added issue of weight passing vertically through your spine – adding to the potential for forward slippage that occurs when you’re standing or sitting.
In addition, you can practice the cobra pose gradually, under your own control, while you’re paying attention to the way that it feels. It’s hard to do any harm to yourself when you’re exercising in a focused manner. On the other hand, if for any reason it doesn’t feel right to you, stop immediately! Don’t perform this exercise (or any exercise) because some supposed expert who never met you told you to do it – you’ve got to experience what works and what doesn’t for yourself.

Although controlled, mindful backward bending can be beneficial, here’s an example of a postural habit I’m confident is not beneficial:

![Example of a Postural Habit](image)

This woman is passively sagging forward into her low back, creating spinal extension. She’s not engaging her spinal support muscles or paying attention to how her spine is feeling. Avoid this type of mindless and repetitive spinal extension.

C. **Avoid extreme or prolonged forward bending (also known as spinal flexion)**

Forward bending can also put a stress on the vertebral joints – especially the intervertebral discs - and negatively affect someone with spondylolisthesis.

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Stretching forward to touch the toes from the standing position is an example of extreme spinal flexion, as is reaching forward to touch the toes from a sitting position on the floor.

I recommend avoiding these stretches.

Even moderate forward bending can be a problem, too, especially if the posture is held for a prolonged time. Bending over the sink to brush your teeth, for example, is a seemingly minor, thoughtless activity that can take its toll on your low back.

D. Alleviate pain with a suitable resting position

Vertical posture – sitting or standing – creates a constant downward and forward force affecting the low back vertebrae. It can be valuable to get off your feet and adopt a beneficial rest posture periodically throughout the day.

It could take as simple a form as lying on your back with your knees bent up an your feet flat on the floor.

Another variation of a rest position involves gently flexing the low back. Try this rest strategy:

Start Position

Begin by lying on your back. Fold your thighs in toward your chest. Then use your arms to pull them in and allow the low back to curl, the tailbone lifting off the floor.

End Position

Rest in this position for 15-30 seconds, then repeat the maneuver 2-3 times.

E. Build core strength of the abdominals

Forget about sit-ups, curl-ups and crunches.
For one thing, they don't even target the most important abdominal muscles - the obliques and transverse abdominals.

On top of that, these types of exercises can put undue pressure on the discs of your low back and make your condition worse.

Instead, stick with the plank pose and its variants.

Here's the basic plank pose:

![Ye Olde Planke Pose](image)

Ye Olde Planke Pose

All you've got to do is keep your trunk in line and hold the position. Just to be sure you know what I'm talking about, I'll show you a wrong way to perform the exercise:
Start with a hold time in the plank position of 30 seconds, and gradually develop your strength until you can hold the position for 90 seconds. Once you get to 90 seconds, instead of spending more and more time to get more and more fit, you can make the position harder to increase your challenge level.

Here’s one way to increase the difficulty of the plank pose:
The steeper angle makes your abdominals work harder and can give you an effective workout in less time.

On the other hand, perhaps you're shamefully weak in your abdominals to begin with. Then you may need an easier version of the plank pose for starters. In that case, you can also use a stool or low platform to change the angle in your favor.

Here are two easier variations:

![Easy Plank Pose](image1)
![Super Easy Plank Pose](image2)

Another more challenging variation you’ll want to work into your personal exercise mix is the side plank:

![Side plank](image3)
F. Strengthen your gluteal muscles and spinal extensors

In addition to strengthening your abs with the plank pose, you also need to strengthen the muscles of your butt and back. Here are two strategies you can use:

**Supine Bridge**

![Supine Bridge](image)

Start by lying on your back. Keep your heels and the back of your shoulders against the floor, then press your butt up into the air as far as it will go. (It won't go very far.) Hold for 30 seconds.

**Reverse Low Back Extension**

![Reverse Low Back Extension](image)

Start Position  |  Active Position
Begin with your upper body supported on a stool, bench, or even the edge of your bed. Your legs dangle down. Keep your knees bent and cross your ankles in order to allow enough room for your legs to hang freely.

Lift your pelvis and legs until your trunk is straight. (Don't lift so far as to arch your back).

Repeat 6-8 times.

**Squat**

As you gain strength and muscle control, you could also incorporate the squat exercise, a mainstay of strength training. Squats will help you build gluteal and spinal strength even further.

**G. Stabilize trunk rotation**

Your body doesn't just move in forward or backward directions. In order to develop maximal trunk stabilization power, you also have to practice twisting to the right and left.

Here are two easy ways to do it.

**Seated Isometric Trunk Rotation**

Sit with your back close to a wall. Use a broomstick, painting pole, or other handy bar. Hold it at shoulder height.

Twist to the right until the bar engages the wall. Continue to exert isometric effort, attempting to rotate even further, despite the fact that the wall won't let you. Press for 15 seconds. Then twist to the opposite side and press.
Maintain an erect posture and utilize your deeper abdominal muscles throughout the exercise.

**Kneeling lunge with rotation**

Kneel on one knee with the other foot forward in a lunge position. Your trunk is vertical. Maintain the lunge while you rotate your trunk.

The further forward your lunge, the more challenging the exercise. Narrowing your base of support also makes the exercise harder.

Another way to make the exercise harder is to hold a weight in your out-stretched arms, or use resistance band or cable. Here’s a picture:

![Kneeling lunge using cable to add resistance](image)

**H. Elongate the hip flexor muscles without extending the low back**

The psoas muscle, one of the main hip flexors, attaches to the front of the vertebrae of your low back and reaches down into the top of your thigh.

If it's tight, it will arch your low back forward and make your spondylolisthesis worse.

The challenge is that many of the stretches commonly suggested for the psoas involve arching the back. This could actually make your problem worse. Here's an exercise I developed that avoids that problem and safely allows you to elongate your hip flexors:
Proper Spondylolisthesis -- Safe Stretch for Hip Flexors

Lie on your back and use a foam roll, a small pillow, or even a rolled up towel under your pelvis.

The roll under the pelvis keeps your pelvis flexed on the low back while you actively reach out with your left foot.

You'll feel the stretch in the top of the upper left thigh. It doesn't have to feel like an intense stretch. But it does have to be targeted to the right area. Hold for 30-60 seconds. Then repeat on the other side.

Be careful not to tip the low back when you perform this stretch. Here's a picture to show you what I mean:
Take a look at the top line of her pants and compare it to the picture of the exercise done correctly. In the incorrect version, the red pant line is close to vertical. That means she’s allowed her pelvis to tip forward. That can put a stress on your spondylolisthetic vertebra.

I. **Use proper technique when lifting and carrying**

You’ve probably seen a picture like this, showing the wrong way to lift something:

![Ouch!](image)

And you probably have seen pictures of how to keep the spine straight, too, flexing instead at the hip joints. Here’s a picture of better technique:
There's a more subtle way that people distort their spinal alignment when carrying. Take a look at this picture:

![Improper Carrying](image)

**Improper Carrying**

This individual is pitching the spine way back to counter-balance a heavy weight in front. This method could definitely add to the wear and tear of a spondylolisthetic vertebra. Here's an example of improved technique:
Like a True Professional

This guy has the weight suspended in front of him, rather than propped up in front of him. That's a more favorable biomechanical use of the spine.

**Brushing your teeth and other routine tasks**

Protecting your spine when bending forward takes on far more subtle forms. You don't have to be lifting a heavy package to place a load on the low back. Even if you simply bend forward over your bathroom sink to brush you teeth, the discs of your low back experience increased stress.

The same principles of proper spinal mechanics apply to these everyday situations, too. Keep your spine straight, use your knees, and flex at the hip joint. It's just a lot easier to forget these guidelines when you're merely washing dishes or brushing your teeth, though.

**J. Lose weight if you have to**

If you're carrying around extra flab, so are your lumbar vertebrae and discs. Extra weight can make your spondylolisthesis symptoms worse, and will make it harder for you to recover.

I don't have a secret new miracle weight loss plan. There's no escaping the basic formula that you have to eat less and increase your activity level. Losing weight and keeping it off can be hard to do - but it's worth it. Making a small but sustained change in your attitude toward eating can make a big difference. Even a small weight loss is beneficial.

**K. Wear a lumbosacral support during activities known to be stressful**

A lumbosacral support cinches you around the waist and takes pressure off the low
back. There are a few variations on a theme, but here’s a picture to give you the general idea:

![Lumbosacral Support]

Lumbosacral supports are available in many drug stores or online.

**L. If you have trouble sleeping, or wake up with more pain, try these ideas**

**Proper mattress**

Finding the right mattress to support your spine at night can be tricky, but it can pay big dividends. Unfortunately, the companies that sell mattresses make it challenging to compare one mattress to another. In fact, there’s no single type of mattress that’s good for everyone. You just have to try out some of the possibilities for yourself and choose one that feels good.

**Firm versus soft**

What works for most people is a mattress that is locally compliant (soft) but globally firm. That way, the mattress accommodates to each separate body part — it cradles your hip or shoulder, for instance — without sagging overall and throwing your spinal alignment off.

A firm coil/spring mattress with a pillow top can work this way. And so can a memory foam mattress — the foam molds around each individual body part but has a firm, unyielding base.

**Lumbar roll cushion**

Here’s another way to make sure your low back doesn’t sag into an unfavorable
alignment while you’re sleeping:

This strategy will keep your spine in reasonable alignment throughout the night and may reduce your discomfort.

**M. Chiropractic, massage therapy, physical therapy**

Any of these methods could be helpful to you.

Chiropractic can mean many different things; each practitioner is different. One of the methods that is most commonly associated with chiropractic is *spinal manipulation*, also known as a *spinal adjustments*.

There is no contraindication to adjustments (or manipulation) just because you have spondylolisthesis. In general, these methods might help you.

If you have an advanced spondylolisthesis (Grades III or above) or an unstable spondylolisthesis, your doctor of chiropractic might be limited in the methods he or she can use at the affected level. But treatment above or below the problem zone shouldn’t be an issue even then.

I have become aware of some doctors of chiropractic claiming to be able to fix the alignment of the vertebrae involved in spondylolisthesis. I don’t know how widely this claim is made by chiropractors. Even though in most cases chiropractic care could be a big help, I’m skeptical that spinal adjustments could actually fix the misalignment associated with spondylolisthesis.
Massage therapy is also likely to be helpful. What’s wrong with relaxing, getting your muscles to release, and feeling great afterward?

Ironically, though, I’ve had a few spondylolisthesis patients who seemed to be worse after getting a massage. I doubt that the problem lies with the massage itself. What seems more likely to me is that you have problems from lying face down for the extended period of time typical of a massage treatment.

This may not even arise as an issue for you at all. But if it does, make sure your therapist knows of your limitations and varies your positioning on the table so you’re not staying too long in an adverse position.

Physical therapy should also be helpful. A skilled therapist can help you devise a personalized exercise program and address muscular and skeletal imbalances that contribute to your condition.

Your Lifetime Plan

You're going to be living with spondylolisthesis for a long time. It isn't going to go away. Now is the time to commit to maintaining the health of your low back. If you're consistent with your self-care plan, you can enjoy many pain free years of full spinal function.

Even if it turns out that your spondylolisthesis deteriorates and you'll eventually need surgery, the self-care tips offered in this report will still help you immeasurably. I'm convinced you'll be a better candidate for surgery, and you'll get superior, longer-lasting results if you enter into surgery with improved postural awareness and spine fitness.

I'll hope you'll share your spondylolisthesis story by sending me an e-mail at drlavine@askdrlavine.com, or by posting a comment on my blog article about spondylolisthesis at www.yourbodyofknowledge.com/lumbar-spondylolisthesis-and-spondylolisthesis-exercises.

Best wishes to you.

Ronald Lavine, DC

DISCLAIMER - Nothing in this guide is a substitute for the advice of your personal health care practitioner. Dr. Lavine has never seen you or discussed your specific condition, so he can’t possibly diagnose your condition or give you specific healthcare advice. Although we hope that the information provided will be helpful, never blindly follow the advice of any single book, article, website, or other source without input from your own health care provider and without paying attention to feedback from your own body.
Bonus Supplement

Survey of the Latest, Most Important Research Findings in Spondylolisthesis

Edited by Ronald Lavine, DC
Survey of the Latest, Most Important Research Findings in Spondylolisthesis

Edited by Ronald Lavine, DC

For your convenience, I've grouped these articles into three sections:

The first group of articles covers the anatomy, natural progression, and conservative management of spondylolisthesis. These articles will be of greatest use to the typical reader of this book.

The second group of articles compares the outcomes of patients treated surgically with those treated conservatively without surgery.

The third group describes the use of surgical techniques for spondylolisthesis or compares the outcome of one surgical technique to another. Most of these articles will, fortunately, be of little use to the typical reader, but are included here as a convenient resource should a future need arise.

Within each section, I've arranged the articles based on their year of publication, with the newest articles first. Each article is tagged as pertaining to isthmic spondylolisthesis, degenerative spondylolisthesis, or another type, and is listed with its year of publication, title, lead author, and name of publication. Then follows a brief summary.

**Anatomy, natural progression and conservative management of spondylolisthesis**

2014 – degenerative spondylolisthesis

Anatomic risk factors for mobile degenerative spondylolisthesis at L4/5

Lead author: Grannum S  
Publication: Bone Joint J

The purpose of this study was to determine what factors could predict the occurrence of mobility (instability) of the vertebra in L4-L5 spondylolisthesis.

Measurements of spinal alignment in general did not predict vertebral instability. But the orientation of the facet joints, and the amount of degeneration of the disc and intervertebral joints did. The authors also concluded that taking X-rays in the standing position was valuable, because more examples of vertebral instability would show up.

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Ronald Lavine, DC.....Page 36
2014 – isthmic spondylolisthesis

**Comparison and correlation of pelvic parameters between low-grade and high-grade spondylolisthesis**

Lead author: Min WK  
Publication: Journal of Spinal Disorders & Techniques

The authors compared the X-rays of a group of low-grade spondylolisthesis patients with a group of high-grade spondylolisthesis patients. They found that a number of measures of spinal alignment pertaining to pelvic tilt were correlated were correlated with the spondylolisthesis grade.

2014 – degenerative spondylolisthesis

**Outcomes of fluoroscopically guided lumbar transforaminal epidural steroid injections in degenerative lumbar spondylolisthesis patients**

Lead author: Kraiwattanapong C  
Publication: Asian Spine J.

The conclusion was that epidural injections were an effective treatment for patients with degenerative spondylolisthesis and neurological symptoms.

2014 – isthmic spondylolisthesis

**Adjacent disc and facet joint degeneration in young adults with low-grade spondylolytic spondylolisthesis: a magnetic resonance imaging study**

Lead author: Hsieh C  
Publication: Journal of the Formosan Medical Association

This study showed that young people with spondylolisthesis were more likely also to have disc degeneration at the same level or at neighboring levels.

2014 – isthmic and degenerative spondylolisthesis

**Prevalence of lytic spondylolisthesis in combination with degenerative spondylolisthesis**

Lead author: Robinson P  
Publication: Bone Joint J
The authors of the study wondered if someone could have spondyloolytic spondylolisthesis and also have the features of degenerative spondylolisthesis. In reviewing a series of X-rays, they found that this combination didn’t exist – patients have strictly one or the other form of spondylolisthesis.

2014 – no specific type of spondylolisthesis mentioned

**Radiological evidence of spontaneous spinal arthrodesis in patients with lower lumbar spondylolisthesis**

Lead author: Huang K
Publication: Spine

By studying CT scans, the authors saw that about 20% of spondylolisthesis patients had vertebrae that had spontaneously fused themselves together without any medical intervention.

2013 – degenerative spondylolisthesis

**Degenerative spondylolisthesis is associated with low spinal bone density: a comparative study between spinal stenosis and degenerative spondylolisthesis**

Lead author: Andersen T
Publication: BioMed Research International

The authors speculated that low bone mineral density and the resulting bone weakening would predispose a patient to develop degenerative spondylolisthesis. They compared bone density in spondylolisthesis patients with that in patients who had spinal stenosis and found that the patients in the spondylolisthesis group did in fact have lower bone mineral density.

2013 – degenerative spondylolisthesis

**Motion characteristics of the vertebral segments with lumbar degenerative spondylolisthesis in elderly patients**

Lead author: Miao J
Publication: Eur Spine J.

This research attempted to measure the motion of the L4 vertebra in subjects with degenerative spondylolisthesis at that level as compared to the motion in normal volunteers. Subjects were tested lying down and as they stood up, bent forward and backward.
There was an altered pattern of motion detected in those with degenerative spondylolisthesis, but the altered motion fell below the threshold that would constitute instability.

2013 – congenital spondylolisthesis

**Congenital hypoplasia or aplasia of the lumbosacral pedicle as an unusual cause of spondylolisthesis in the pediatric age group**

Lead author: Patel AJ
Publication: J Neurosurg Pediatr

This article describes rare cases of congenital spondylolisthesis.

2013 – degenerative and isthmic spondylolisthesis

**Difference of sagittal spinopelvic alignments between degenerative spondylolisthesis and isthmic spondylolisthesis**

Lead author: Lim JK
Publication: J Korean Neurosurg Soc.

The purpose of this study was to compare the X-rays of people with degenerative spondylolisthesis to those of people with isthmic spondylolisthesis to see what differences there were in pelvic alignment.

One of the main differences was that people with degenerative spondylolisthesis had decreased lumbar lordosis (more flexion, less extension) compared to normal controls, whereas those with isthmic spondylolisthesis had increased lordosis.

2013 – degenerative spondylolisthesis

**Segmental spinal canal volume in patients with degenerative spondylolisthesis**

Lead author: Miao J
Publication: Spine

The researchers studied the space in the spinal canal of people with degenerative spondylolisthesis who also had stenosis symptoms. They compared the spinal canal space with that of asymptomatic controls, and also measured how it was affected by various movements and postures.

Patients with spondylolisthesis who also had symptoms of stenosis had less space in their spinal canal than the control group. Spinal flexion or lying on the back improved the...
spinal canal space. Patients with higher degrees of slippage and greater loss of disc height had less space in the spinal canal.

2013 – degenerative and isthmic spondylolisthesis

Radiologic evaluation of degeneration in isthmic and degenerative spondylolisthesis

Lead author: Jeong HY
Publication: Asian Spine J.

Researchers looked at X-rays and MRIs to compare the discs of patients with isthmic spondylolisthesis and degenerative spondylolisthesis. Those with isthmic spondylolisthesis had more advanced disc degeneration.

2013 – isthmic spondylolisthesis

L5 spondylolysis-spondylolisthesis a comprehensive review with an anatomic focus

Lead author: Foreman P
Publication: Childs Nerv Syst.

This a general review of the condition of isthmic spondylolisthesis of L5-S1 in a young, athletic population.

2013 – traumatic spondylolisthesis

Traumatic lumbar spondylolisthesis

Lead author: Tang S.
Publication: Pak J Med Sci

This article was a case report of a single patient who experienced spondylolisthesis at L5 due to a traumatic injury. Surgical treatment was provided which yielded good results.

2013 – isthmic spondylolisthesis

Evidence-based health consult for lumbar isthmic spondylolisthesis grading in adult: a case report

Lead author: Xi L
Publication: Chinese Journal of Evidence-Based Medicine

This was a case study of a single patient with grade II isthmic spondylolisthesis. She
was treated conservatively and after one year her symptoms had resolved, with no further progression of the spondylolisthesis.

2013 – degenerative spondylolisthesis
**Facet orientation in patients with lumbar degenerative spondylolisthesis**

Lead author: Alimasi W
Publication: Journal of Tokyo Medical University

The researchers studied the architecture of the intervertebral joints in patients with degenerative spondylolisthesis, comparing them to two other groups - those with spinal stenosis and those with low back pain. In spondylolisthesis, the angle of the posterior intervertebral joint (the facet joint) was more

2013 – isthmic spondylolisthesis
**Nonoperative treatment in lumbar spondylolysis and spondylolisthesis; a systematic review**

Lead author: Garet M
Publication: Sports Health

This is a review of articles that compared surgery to non-surgical treatment methods for physically active people with spondylolysis or spondylolisthesis. Ten articles in all were reviewed, and their findings were varied. Surgery tended to yield better results than non-surgical options, but improvement was also reported for many non-operative protocols including bracing and a variety of different exercise approaches.

2013 – degenerative spondylolisthesis
**Lumbar facet joint motion in patients with degenerative spondylolisthesis**

Lead author: Yao Q
Publication: J Spinal Disord Tech.

This research attempted to measure the movement of the lumbar vertebrae in people with degenerative spondylolisthesis as compared to normal controls and to people with degenerative disc disease.

Rotational movement of the affected vertebral joint (L4-L5) was diminished in those with degenerative spondylolisthesis as compared to controls or to people with disc degeneration. The authors' hypothesis is that the presence of degenerative
spondylolisthesis initiates a reactive process of joint stiffening to limit further deterioration.

2013 – degenerative spondylolisthesis
Correlation between lumbar vertebral instability and severe degenerative spondylolisthesis

Lead author: Golbakhsh M
Publication: Tehran Univ Med J

The researchers looked at sacral slope - the angle the top of the sacrum makes as compared to the horizontal - comparing patients with degenerative spondylolisthesis to those without. They were unable to find a correlation between sacral slope and degenerative spondylolisthesis.

2013 – isthmic spondylolisthesis
Imaging modalities for low back pain in children; a review of spondylolysis and undiagnosed mechanical back pain

Lead author: Miller R
Publication: J Pediatr Orthop.

The purpose of this study was to determine how frequently spondylolysis occurred in patients in the 10-19 year old age range, and the value of various imaging modalities in helping to diagnose them.

Of 2,846 patients with low back pain, 7.8% had spondylolysis. In most cases spondylolysis could be detected by taking 2 X-rays only - anterior-posterior and lateral, omitting the oblique views. Adding the oblique views or more advanced imaging modalities such as CAT scans or bone scans did detect additional cases of spondylolysis, but the authors’ conclusion was that since the diagnosis of spondylolysis did not change the treatment approach, there was no need to expose the patients to the additional radiation.

2012 – degenerative spondylolisthesis
Risk factors for degenerative spondylolisthesis: a systematic review

Lead author: DeVine J,
Publication: Evid Based Spine Care J.

The purpose of this study was to review the published literature to see if there have been consistently determined risk factors for the development of degenerative spondylolisthesis.
The authors found that most of the published literature on this subject was of poor quality and many of the results were inconsistent from study to study. However, they were able to determine that the risk for degenerative spondylolisthesis increased with age, that women were more likely to develop it than men, and that those with degenerative spondylolisthesis had posterior intervertebral joints (facet joints) that were more sagittally oriented - more straight front-to-back.

2012 – isthmic spondylolisthesis

A slip above a slip; retrolisthesis of the motion segment above a spondylolytic spondylolisthesis

Lead author: Mehta JS
Publication: Eur Spine J.

The authors of this study had noticed that many people with symptomatic isthmic spondylolisthesis at L5-S1 also showed backward slippage (retrolisthesis) of the segment above (L4-L5). They wanted to study this phenomenon further.

They found that 29% of people with symptomatic isthmus spondylolisthesis at L5-S1 had retrolisthesis of L4-L5. They correlated the occurrence of retrolisthesis with increased degeneration of the L4-L5 disc.

2012 – degenerative spondylolisthesis

Does obesity affect outcomes of treatment for lumbar stenosis

Lead author: Rihn JA
Publication: Spine

The purpose of this study was to determine the effect of obesity on the treatment outcome of symptomatic degenerative spondylolisthesis.

Subjects with a BMI over 30 were considered obese. This group tended to have less favorable outcomes with both conservative, non-operative treatment and surgery as compared to the non-obese group, but because the results of conservative therapy in this group were so poor, they had a larger comparative benefit from surgery as compared to a non-obese group. At the same time, obese subjects were at greater likelihood of surgical complications and the later need for a second surgery.

2012 – isthmic and degenerative spondylolisthesis

Spontaneous reduction finding magnetic resonance imaging evaluation of segmental instability in spondylolisthesis
The authors studied a group of adult grade I or II spondylolisthesis patients who were surgical candidates because of symptoms of neurological impingement. The group included those with both isthmic and degenerative spondylolisthesis.

Patients had X-rays taken in the neutral position and in flexion and extension. They also had MRI's taken lying on their backs. When there was substantially less slippage on the MRI as compared to the neutral X-ray, the authors considered this to be spontaneous reduction of the spondylolisthesis. They tried to correlate the degree of spontaneous reduction with the amount of motion on the flexion and extension X-rays and the level of pain the patients experienced.

Patients who had more vertebral motion on flexion and extension had higher pain levels to begin with and were more likely to have spontaneous reduction of the anterolisthesis when lying on their backs.

2012 - isthmic and degenerative spondylolisthesis

**Grade three disc degeneration is a critical stage for anterior spondylolisthesis in lumbar spine**

This research attempted to determine what factors influenced the degree of forward slip that would occur in spondylolisthesis. By studying 447 patients, the authors determined that spondylolisthesis was relatively stable as long as the intervertebral disc was intact or exhibited a relatively mild degree of degeneration. However, once the disc degeneration reached a critical degree (Grade 3), significant anterior slippage was likely to occur. NOTE: They're not talking about Grade III spondylolisthesis, but Grade 3 disc degeneration.

2012 – isthmic spondylolisthesis

**Acute lumbar spondylolysis in intercollegiate athletes**

Most people with the sudden onset of lumbar spondylolysis are skeletally immature. The most common level for the spondylolysis to occur is L5. This article describes 8 more unusual cases - skeletally mature collegiate athletes (ages 19-21) with the sudden onset of spondylolysis at L3 or L4.
Initially, all of the athletes were treated conservatively with bracing. Two of them eventually showed radiological signs of fracture healing. Seven others were eventually treated with surgery. All eight were ultimately able to return to athletic competition.

2010 – isthmic spondylolisthesis

**Asymptomatic spondylolisthesis and pregnancy**

Lead author: Elliott J
Publication: Journal of Orthopaedic & Sports Physical Therapy

This is a case report of a pregnant woman in her 30’s who had a previously undiagnosed and asymptomatic high-grade (Grade IV) spondylolisthesis. She had a successful pregnancy but in light of her spondylolisthesis her obstetrician recommended a cesarean section.

2009 – isthmic spondylolisthesis

**Prevalence of sacral spina bifida occulta and its relationship to age, sex, race, and the sacral table angle: an anatomic, osteologic study of three thousand one hundred specimens.**

Lead author: Eubanks J
Publication: Spine

The authors studied the relationship of spina bifida occulta to the angle of forward tilt of the sacrum (the “sacral table angle”). Spina bifida occulta is a congenital abnormality of spinal architecture that has been linked to spondylolisthesis. Presumably, a more forward-tilted sacrum might predispose someone to spondylolysis, or make it more likely that someone with spondylolysis progressed to spondylolisthesis.

About 12% of the specimens exhibited spina bifida occulta, and the forward-tilt angle of the sacrum was higher on the average in those specimens.

2006 – isthmic and degenerative spondylolisthesis

**Spondylolysis, spondylolisthesis, and lumbo-sacral morphology in a medieval English skeletal population.**

Lead author: Mays S.
Publication: Am J Phys Anthropol,

The authors studied skeletons from an English medieval gravesite to see if the incidence of spondylolysis and spondylolisthesis was similar to modern populations. There was a higher prevalence of spondylolysis, but a lower incidence of spondylolisthesis. The
authors speculated that the discrepancy was caused by different lifestyle factors in the medieval population as compared to people today.

2003 – isthmic spondylolisthesis

The natural history of spondylolysis and spondylolisthesis: 45-year follow-up evaluation

Lead author: Beutler W
Publication: Spine

This article studied 500 first-grade school children beginning in 1955 and followed them for 45 years.

Of the 500 children originally studied, 30 were found to have a defect in the pars interarticularis. Over the course of 45 years, no one with a unilateral defect had slippage. When those with a bilateral defect did have slippage, the rate of slippage tended to slow down over the decades. None of the subjects had slipping of more than 40% (Grade II). The overall incidence of back pain of those individuals with a pars defect was no different from the incidence in the general population.

2000 – degenerative spondylolisthesis

Nonsurgically managed patients with degenerative spondylolisthesis: a 10- to 18-year follow-up study

Lead author: Matsunaga S
Publication: J Neurosurg

The authors followed 145 cases of degenerative spondylolisthesis who chose not to have surgery. Many had slippage progression, but there was no correlation of spondylolisthesis progression and worsening symptoms. Those whose symptoms improved tended to have a diminishment of intervertebral disc space, which the authors interpreted as meaning that the spine became more stable.

There was a big difference in outcome between patients who initially had a neurological deficit versus those who did not. Most of the patients who began with no neurological deficit stayed that way; many patients who had nerve problems to begin with got worse.

Surgical care compared to non-surgical care

2013 – isthmic spondylolisthesis

Living Well With Spondylolisthesis
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Quality of life of patients with high-grade spondylolisthesis: minimum 2-year follow-up after surgical and nonsurgical treatments

Lead author: Bourassa-Moreau E
Publication: Spine J.

Researchers studied 28 pediatric patients with high-grade spondylolisthesis for a minimum of two years. Twenty-three of the patients had surgery; five had conservative care only.

Patients who had surgery improved, and the worse their symptoms were to begin with, the more they improved. The patients who were treated conservatively were not as bad to begin with; their initial symptom level was comparable to the symptoms that the surgical patients had after surgery. They did not show a tendency to improve over the two-year period, but neither did any of them experience further slippage or the onset of neurological symptoms.

2012 - isthmic spondylolisthesis

Surgically treated cases of lumbar spondylolysis and isthmic spondylolisthesis: a multicenter study

Lead author: Hirano K
Publication: J Spinal Disord Tech.

This study looked at the characteristics of all people with spondylolysis or isthmic spondylolisthesis compared with the subgroup who ultimately required surgery. Although L5 was by far the most common level for spondylolysis to occur, one major finding was that a higher percentage of people with spondylolysis at L4 eventually required surgery. The authors concluded that spondylolysis at L4 might be less stable than the more common spondylolysis at L5.

Males were more likely than females to have spondylolysis, but equal percentages of males and females ended up needing surgery.

2009 – degenerative spondylolisthesis

Surgical compared with nonoperative treatment for lumbar degenerative spondylolisthesis. Four-year results in the Spine Patient Outcomes Research Trial (SPORT) randomized and observational cohorts

Lead author: Weinstein JN
Publication: J Bone Joint Surg Am.
This article was an extension of a 2007 article (see below), continuing the follow-up period to four years. It documented that the advantages of the surgical group persisted over the four years.

2008 – degenerative spondylolisthesis
**Fusion and nonsurgical treatment for symptomatic lumbar degenerative disease: a systematic review of Oswestry Disability Index and MOS Short Form-36 outcomes**

Lead author: Carreon LY
Publication: Spine J.

The authors reviewed previously published research about the outcome of fusion surgery for degenerative conditions of the low back. Patients included those both with and without spondylolisthesis. Three different comparisons were made:

- Patients who had surgery were compared to those who had a conservative treatment program,
- Three different surgical method were compared, and
- Three different lumbar conditions were compared: degenerative disc disease, spondylolisthesis, and the general category of chronic low back pain.

Those patients who had surgery started off worse than the group that didn't, and based on some measures (though not others), the surgical group improved more than the nonsurgical group. There was little difference in outcome among patients receiving different types of fusion surgery.

Patients with spondylolisthesis and degenerative disc disease had better surgical results than those with the less specific category of chronic low back pain.

2007 – degenerative spondylolisthesis
**Surgical versus nonsurgical treatment for lumbar degenerative spondylolisthesis**

Lead author: Weinstein
Publication: NEJM

This article tried to determine the best treatment for patients with Grade I or Grade II spondylolisthesis and stenosis, comparing surgery to conservative care without surgery. Three hundred four patients were enrolled in the study. After surgery and at follow-up two years later, those who received surgery fared better.

2005 – isthmic spondylolisthesis
The long-term effect of posterolateral fusion in adult isthmic spondylolisthesis: a randomized controlled study

Lead author: Ekman P
Publication: Spine J.

This study was designed to learn more about how patients with lumbar isthmic spondylolisthesis fared over the long run (9 years). It also was designed to compare those who had surgery with those who had one year of exercise therapy without surgery.

Within the surgery option, it compared two different fusion procedures - one using screws and the other without.

What they learned:

• The two surgical groups fared equally well no matter how the improvement was measured.
• The benefits of surgery diminished somewhat over time, but they never wore off altogether.
• All groups fared about equally well in all measures except for one: self-rating of their overall improvement. Surgical patients gave their own improvement a higher score.

Descriptions of surgical techniques and comparisons of types of surgery

2016 – degenerative spondylolisthesis
Laminectomy plus fusion versus laminectomy alone for lumbar spondylolisthesis

Lead author: Ghogawala Z
Publication: N Engl J Med

This study compared two surgical procedures for people with degenerative spondylolisthesis and stenosis: spinal decompression to remove the nerve impingement, and spinal decompression along with spinal fusion, which additionally stabilizes the motion of the area.

By some measures, those patients who underwent fusion had improved function over the long run, though by other measures there was little difference between groups. Those receiving fusion were less likely to require a second surgery down the road.
Compare these results to those of a similar study that is cited next.

2016 - degenerative spondylolisthesis
A randomized, controlled trial of fusion surgery for lumbar spinal stenosis

Lead author: Försth, P
Publication: N Engl J Med

This article addresses a similar question to the article cited above – do patients with degenerative spondylolisthesis and stenosis benefit from spinal fusion performed along with decompression or does the extra procedure just lead to longer hospital stays, more blood loss and more complicated surgery?

This article came to the opposite conclusion as the article cited above. It showed that the two groups of patients who received these two different options fared equally well, thus indicating that fusion surgery constituted an unnecessary added complication when decompression surgery was performed.

2014 - no specific type of spondylolisthesis mentioned
Evidence-based surgical management of spondylolisthesis: reduction or arthrodesis in situ

Lead author: Longo UG
Publication: J Bone Joint Surg Am

The researchers wanted to study if it was better for surgeons to reposition the spondylolisthetic vertebra before fusing it with its neighbor or simply stabilize it by fusing it in place without repositioning it first. They performed a literature search to explore this question.

There didn’t seem to be negative consequences from repositioning the bone prior to fusion, and both procedures had good success rates. But the authors assumed that choosing to reposition the bone prior to fusion would leave the spine in better biomechanical shape.

2014 – no specific type of spondylolisthesis mentioned
Rationale in the management of 4-level lumbar spondylolyses with or without instability and/or spondylolisthesis

Author: Vidyadhara S.
Publication: Spine
This was a report of a case of an individual who had spondylolysis at 4 different spinal levels, with different degrees of degeneration and spondylolisthesis at each level. Surgery addressed the specific issues at each level individually.

2014 – degenerative spondylolisthesis

Cost-effectiveness of surgical treatment for degenerative spondylolisthesis and spinal stenosis

Lead author: Harro J
Publication: Spine

The authors wanted to see if any published articles explored the cost-effectiveness of various approaches to the treatment of spondylolisthesis. Very little information was available.

2014 – isthmic spondylolisthesis

Posterolateral fusion versus posterior interbody fusion in adult lumbar isthmic spondylolisthesis

Author: Habib HA
Publication: Menoufia Med J

This article compared two different surgical techniques for fusing the vertebrae in spondylolisthesis surgery.

2014 – degenerative spondylolisthesis

National trends in the use of fusion techniques to treat degenerative spondylolisthesis

Lead author: Kepler C
Publication: Spine

The authors studied the numbers of the different types of procedures performed for degenerative spondylolisthesis patients since 1999 and found that the overall use of surgery was rising, and that a procedure involving fusion of the vertebral bodies was also becoming more popular, as an alternative procedure fusing together the vertebral arches was becoming less popular.

2014 – no specific type of spondylolisthesis mentioned

Adjacent lumbar disc herniation after lumbar short spinal fusion

Living Well With Spondylolisthesis
Ronald Lavine, DC.....Page 51
This reports on the case of a man who had had surgery for spondylolisthesis and three years later had a significant disc herniation at a level above the original spondylolisthesis.

2014 - degenerative spondylolisthesis
**Degenerative spondylolisthesis does not affect the outcome of unilateral laminotomy with bilateral decompression in patients with lumbar stenosis**

Lead author: Chang HS
Publication: Spine

Many people have degenerative spondylolisthesis along with lumbar spinal stenosis. The authors found that patients having surgery for stenosis did not have a poorer outcome if they also had degenerative spondylolisthesis.

2014 – degenerative spondylolisthesis
**Radiographic restoration of sagittal spinopelvic alignment after posterior lumbar interbody fusion in degenerative spondylolisthesis**

Lead author: Kong LD
Publication: J Spinal Disord Tech.

The authors reviewed 53 cases of degenerative spondylolisthesis to conclude that correction of spinal alignment did occur and it was positively correlated with the amount of clinical improvement.

2013 – degenerative spondylolisthesis
**Transforaminal lumbar interbody fusion and posterior lumbar interbody fusion utilizing BMP-2 in treatment of degenerative spondylolisthesis: neither safe nor cost effective**

Lead author: Moatz B
Publication: Surg Neurol Int.

This article compared two different surgical techniques to see if one was more clinically effective or cost-effective than another.
2013 – no specific type of spondylolisthesis mentioned

**Hybrid technique for posterior lumbar interbody fusion: a combination of open decompression and percutaneous pedicle screw fixation**

Lead author: Mobbs RJ
Publication: Orthop Surg.

This article describes a surgical technique for spondylolisthesis that is less invasive and requires a shorter hospital stay and lower post-operative use of pain relievers.

2013 – isthmic spondylolisthesis

**A novel minimally invasive technique for the treatment of high-grade isthmic spondylolisthesis using a posterior transsacral rod**

Lead author: Shedid D
Publication: J Spinal Disord Tech.

This article favorably describes a new surgical method for patients with high-grade (Grade II or Grade IV) spondylolisthesis at L5-S1.

2013 – no specific type of spondylolisthesis mentioned

**Management of high-grade spondylolisthesis**

Lead author: Kasliwal MK
Publication: Neurosurg Clin N Am.

This is a review article that summarizes our state of knowledge regarding the best surgical practices for patients with high-grade spondylolisthesis.

2013 – isthmic spondylolisthesis

**Influence of the posterior lumbar interbody fusion on the sagittal spinopelvic parameters in isthmic L5-S1 spondylolisthesis**

Lead author: Feng Y
Publication: J Spinal Disord Tech.

This article discusses measurable differences in pelvic alignment between patients with isthmic spondylolisthesis and normal controls, and also how those differences are affected by surgery.

Spondylolisthesis patients had increased lumbar lordosis and pelvic tilt as compared to controls, among other differences. These differences diminished after surgery.
2013 – isthmic spondylolisthesis

Outcomes of anterior lumbar interbody fusion in low-grade isthmic spondylolisthesis in adults: a continuous series of 65 cases with an average follow-up of 6.6 years

Lead author: Riouallon G
Publication: Orthop Traumatol Surg Res.

Researchers reported on a surgical technique that involved fusing the affected vertebra in spondylolisthesis without trying to reduce forward slippage. They concluded that the results were just as good as surgical techniques that included reducing the forward slip.

2013 – degenerative spondylolisthesis

Radiographic predictors of delayed instability following decompression without fusion for degenerative grade I lumbar spondylolisthesis

Lead author: Blumenthal C
Publication: J Neurosurg Spine.

This was a study of patients with grade I spondylolisthesis and symptoms of stenosis. The surgeons used a decompression technique to alleviate the symptoms of stenosis without fusing the neighboring vertebrae. The researchers wanted to know how many of these patients would experience instability after the surgery that necessitated a second surgery, and if any specific risk factors could be found that would predict the likely need for a second surgery.

About one-third of the patients ultimately required a repeat surgery due to the development of pain from instability. Patients were at greater risk of instability if

- They originally exhibited significant vertebral glide on flexion and extension, or
- Their intervertebral discs had greater height (greater disc height is due to less disc degeneration, but less degeneration allows for more movement)

The authors propose that the presence of these factors in a spondylolisthesis patient might warrant the use of a surgical technique that includes fusion.

2013 – degenerative spondylololisthesis

Minimally invasive versus open transforaminal lumbar interbody fusion (TLIF) for degenerative spondylolisthesis: comparative effectiveness and cost-utility analysis
Since minimally invasive surgery for spondylolisthesis has been proven to be equally effective as open surgery, this article went one step further to measure the superior cost-effectiveness of minimally invasive surgery based not only on the medical costs but time lost from work and other factors.

2013 – degenerative spondylolisthesis

**Variation in outcomes across centers after surgery for lumbar stenosis and degenerative spondylolisthesis in the Spine Patient Outcomes Research Trial**

Lead author: Desai A
Publication: Spine

This review looked at different surgical centers to see if the outcomes of spondylolisthesis surgery differed from center to center.

The patient characteristics at each surgical center varied, but after mathematically adjusting for these differences it was still found that certain centers had better patient outcomes than others.

2013 – isthmic spondylolisthesis

**Minimal access bilateral transforaminal lumbar interbody fusion for high-grade isthmic spondylolisthesis**

Lead author: Quraishi NA
Publication: Eur Spine J.

This article studied the use of a minimally-invasive surgical technique for a single patient with high-grade spondylolisthesis. The results for this individual were positive, establishing the potential feasibility of the method.

2013 – no specific type of spondylolisthesis mentioned

**Long-term follow-up of minimal access and open posterior interbody fusion for spondylolisthesis**

Lead author: Cheung N
Publication: Neurosurgery

This research covered the long-term benefits of two common surgeries for
spondylolisthesis: open posterior lumbar interbody fusion (PLIF) and minimally invasive posterior lumbar interbody fusion.

Most patients experienced positive results, particularly in the relief of nerve problems and leg pain. Low back pain was less consistently relieved. The positive results were stable over the follow-up period of 3 or more years. Both methods yielded comparable results.

2013 – no specific type of spondylolisthesis mentioned

**Minimally invasive transforaminal lumbar interbody fusion for spondylolisthesis in patients with significant obesity**

Lead author: Lau D
Publication: Journal of Clinical Neuroscience

Comparing spondylolisthesis surgery in obese patients with those of normal weight, the authors found no difference between the two groups in surgery time, blood loss at surgery, rate of complications, or the degree of improvement that surgery afforded.

2013 – degenerative spondylolisthesis

**Transforaminal lumbar interbody fusion with rhbmp-2 in spinal deformity, spondylolisthesis and degenerative disease**

Lead author: Crandall DG
Publication: Spine

In this article, the authors sought to study the use of a particular surgical technique - transforaminal lumbar interbody fusion - combined with the use of a bone-enhancing substance BMP - bone morphogenetic protein-2. Previous research had been industry-supported; this research was independent of industry funding.

Though the patients in this study were not compared to any control group, the surgical results were considered to be beneficial, thus supporting the use of this procedure.

2013 – degenerative spondylolisthesis

**Single- versus multilevel fusion for single-level degenerative spondylolisthesis and multilevel lumbar stenosis**

Lead author: Smorgick Y
Publication: Spine

This research compared two surgical techniques in patients who had degenerative
spondylolisthesis at a single vertebral level but spinal stenosis at more than one level. All the patients received decompression surgery at the multiple levels at which stenosis was occurring; one sub-group had fusion only at the level of the spondylolisthesis; the other sub-group had fusion at multiple levels.

Both groups had equally positive surgical results.

2013 – degenerative spondylolisthesis
**Dynamic stabilization for degenerative spondylolisthesis: evaluation of radiographic and clinical outcomes**

Lead author: Fay LY
Publication: Clinical Neurology and Neurosurgery

The authors studied the effectiveness of a particular device (Dynesys) used in surgery to stabilize the lumbar spine after laminectomy. All patients had symptoms of stenosis; the authors compared the results of those with spondylolisthesis to those without. Comparably favorable results were obtained in both groups.

2012 – degenerative spondylolisthesis
**Surgical results of degenerative spondylolisthesis**

Lead author: Atabey C
Publication: Turk Neurosurg.

The aim of this study was to evaluate the results of surgery for degenerative spondylolisthesis in 34 patients over 70 years old. At the end of a two-year follow-up period, pain and disability scores had gone down significantly. Patients were asked if they had known the outcome, would they have opted for the surgery, and 26 of the 34 said they would have.

2012 – no specific type of spondylolisthesis mentioned
**Grade 2 spondylolisthesis at L4-5 treated by XLIF: safety and midterm results in the "worst case scenario"**

Lead author: Rodgers WB
Publication: ScientificWorldJournal

This article described the use of a specific type of spinal fusion surgery - extreme lateral interbody fusion (XLIF) - to test if it was effective and safe. The results of a one-year follow-up of 63 patients showed that it was.
2012 – degenerative spondylolisthesis
Long-term outcome after monosegmental L4-5 stabilization for degenerative spondylolisthesis with the dynesys device

Lead author: Hoppe S
Publication: J Spinal Disord Tech.

This was a study of the long-term results of using a specific stabilizing device in surgery for L4-L5 degenerative spondylolisthesis.

The results were favorable.

2012 – isthmic spondylolisthesis
Direct repair of the pars interarticularis defect in spondylolysis

Lead author: Kim YT
Publication: J Spinal Disord Tech.

This is an analysis of a particular method of surgical repair of isthmic spondylolisthesis - Buck's method. The technique was used in a group of 25 patients all under the age of 30 who had severe symptoms and who hadn't responded to conservative means. The results were favorable.

2012 – degenerative spondylolisthesis
A prospective randomized controlled study comparing transforaminal lumbar interbody fusion techniques for degenerative spondylolisthesis

Lead author: Aoki Y
Publication: J Neurosurg Spine.

This article compared two surgical techniques for patients with degenerative spondylolisthesis. One method used a single screw on one side of the vertebra to achieve fusion. The other method involved using screws on both sides. The unilateral method was less invasive but led to poorer surgical outcomes than the bilateral method.

2010 – no specific type of spondylolisthesis mentioned
Adjacent segment degeneration after lumbosacral fusion in spondylolisthesis: a retrospective radiological and clinical analysis

Lead author: Zencica P
This study explored what happens after you have fusion surgery to correct spondylolisthesis: is there greater likelihood that you'll have problems at the vertebral segments above the level of the fusion, since they're now subject to greater mechanical stress?

The authors reviewed the X-rays of 91 patients who had had fusion surgery for spondylolisthesis. Ten of them subsequently developed problems at spinal segments above or below the level of surgery. Because of the limitations of study design, the authors were unable to learn much about how to predict that this problem might occur, how to prevent, or how to deal with it if it does happen.

**DISCLAIMER** - Nothing in this guide is a substitute for the advice of your personal health care practitioner. Dr. Lavine has never seen you or discussed your specific condition, so he can't possibly diagnose your condition or give you specific healthcare advice. Although we hope that the information provided will be helpful, never blindly follow the advice of any single book, article, website, or other source without input from your own health care provider and without paying attention to feedback from your own body.