

Spondylolysis/isthesis in athletes:

Prevention better than cure

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What is spondylolisthesis?

Spondylolisthesis (spon + dee + lo + lis + thee + sis) is a condition of the spine whereby one of the vertebra slips forward or backward compared to the next vertebra. Forward slippage of one vertebra on another is referred to as anterolisthesis, while backward slippage is referred to as retrolisthesis. Spondylolisthesis can lead to a deformity of the spine as well as a narrowing of the spinal canal (central spinal stenosis) or compression of the exiting nerve roots (foraminal stenosis).

What causes spondylolisthesis?

There are five major types of lumbar spondylolisthesis.

1. Dysplastic spondylolisthesis:

Dysplastic spondylolisthesis is caused by a defect in the formation of part of the vertebra called the facet that allows it to slip forward. This is a condition that a patient is born with (congenital).

2. Isthmic spondylolisthesis:

In Isthmic spondylolisthesis, there is a defect in a portion of the vertebra called the pars interarticularis. If there is a defect without a slip, the patient has spondylolysis. Isthmic spondylolisthesis can be caused by repetitive trauma and is more common in athletes exposed to

hyperextension motions including gymnasts, and football linemen.

3. Degenerative spondylolisthesis:

Degenerative spondylolisthesis occurs due to arthritic changes in the joints of the vertebrae due to cartilage degeneration. Degenerative spondylolisthesis is more common in older patients.

4. Traumatic spondylolisthesis:

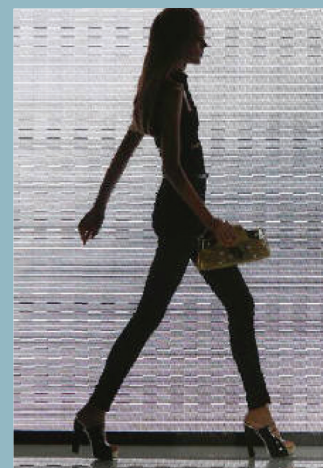
Traumatic spondylolisthesis is due to direct trauma or injury to the vertebrae. This can be caused by a fracture of the pedicle, lamina or facet joints that allows the front portion of the vertebra to slip forward with respect to the back portion of the vertebra.

5. Pathologic spondylolisthesis:

Pathologic spondylolisthesis is caused by a defect in the bone caused by abnormal bone, such as from a tumor. In children, spondylolisthesis usually occurs between the fifth bone in the lower back (lumbar vertebra) and the first bone in the sacrum (pelvis) area. It is often due to a birth defect in that area of the spine or sudden injury (acute trauma).

Bad postural habits can lead to spondylolisthesis.

Bad postural habits:



Symptoms

Spondylolisthesis may vary from mild to severe. A person with spondylolisthesis may have no symptoms. The condition can produce increased lordosis (also called swayback), but in later stages may result in kyphosis (roundback) as the upper spine falls off the lower spine.

Symptoms may include:

- Lower back pain
- Muscle tightness (tight hamstring muscle)
- Pain, numbness, or tingling in the thighs and buttocks
- Stiffness
- Tenderness in the area of the slipped disc
- Weakness in the legs

How is spondylolisthesis diagnosed?

In most cases it is not possible to see visible signs of spondylolisthesis by examining a patient. Patients typically have complaints of pain in the back with intermittent pain to the legs. Spondylolisthesis can often cause muscle spasms, or tightness in the hamstrings.

Spondylolisthesis is easily identified using plain radiographs. A lateral X-ray (from the side) will show if one of the vertebra has slipped forward compared to the adjacent vertebrae. Spondylolisthesis is graded according to the percentage of slip of the vertebra compared to the neighboring vertebra.

1. Grade I is a slip of up to 25%,
2. grade II is between 26%-50%,
3. grade III is between 51%-75%,
4. grade IV is between 76% and 100%, and
5. Grade V, or spondyloptosis occurs when the vertebra has completely fallen off the next vertebra.

If the patient has complaints of pain, numbness, tingling or weakness in the legs, additional studies may be ordered. These symptoms could be caused by stenosis or narrowing of the space for the nerve roots to the legs. A CT scan or MRI scan can help

identify compression of the nerves associated with spondylolisthesis. Occasionally, a PET scan can help determine if the bone at the site of the defect is active. This can play a role in treatment options for spondylolisthesis as described below.

Your doctor or nurse will examine you and feel your spine. You will be asked to raise your leg straight out in front of you. This may be uncomfortable or painful. X-ray of the spine can show if a bone in the spine is out of place or broken.



What is the treatment

Aims:

- Relief pain
- Work into flexion
- Spinal articulation
- Gluts activation
- Stretching
- Strengthening
- Psoas rehabilitation

The initial treatment for spondylolisthesis is conservative and based on the symptoms.

- A short period of rest or avoiding activities such as lifting and bending and athletics may help reduce symptoms.
- Physical therapy can help to increase range of motion of the lumbar spine and hamstrings as well as strengthen the core abdominal muscles.
- Anti-inflammatory medications can help reduce pain by decreasing the inflammation of the muscles and nerves.

- Patients with pain, numbness and tingling in the legs may benefit from an epidural steroid (cortisone) injection.

- Patients with isthmic spondylolisthesis may benefit from a hyperextension brace. This extends the lumbar spine bringing the two portions of the bone at the defect closer together and may allow for healing to occur.

For patients whose symptoms fail to improve with conservative treatment surgery may be an option. The type of surgery is based on the type of spondylolisthesis. Patients with isthmic spondylolisthesis may benefit from a repair of the defective portion of the vertebra, or a pars repair. If an MRI scan or PET scan shows that the bone is active at the site of the defect it is more likely to heal with a pars repair. This involves removing any scar tissue from the defect and placing some bone graft in the area followed by placement of screws across the defect.

If there are symptoms in the legs the surgery may include a decompression to create more room for the exiting nerve roots. This is often combined with a fusion that may be performed either with or without screws to hold the bone together. In some cases the vertebrae are moved back to the normal position prior to performing the fusion, and in others the vertebrae are fused where they are after the slip. There is some increased risk of injury to the nerve with moving the vertebra back to the normal position.

What is the outlook

The outlook for patients with spondylolisthesis is good. In most cases patients respond well to a conservative treatment plan. For those with continued severe symptoms, surgery can help alleviate the leg symptoms by creating more space for the nerve roots. The back pain can be helped through a lumbar fusion.

Expectations (prognosis)

Exercises and changes in activity are helpful for most people with mild spondylolisthesis.

Complications

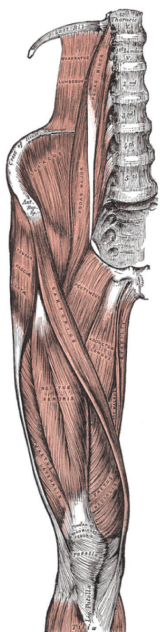
If too much slippage occurs, the bones may begin to press on nerves. Surgery may be necessary to correct the condition.

Other complications may include:

- Chronic back pain
- Infection
- Temporary or permanent damage of spinal nerve roots, which may cause sensation changes, weakness, or paralysis of the legs

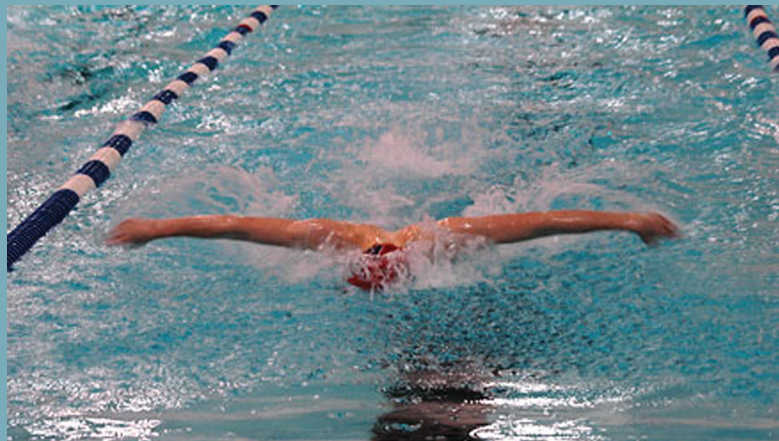
Why is it so important to strengthen the psoas muscle?

Psoas minor originates from the vertical fascicles inserted on the last thoracic and first lumbar vertebrae. From there, it passes down onto the medial border of the psoas major, and is inserted to the innominate line and the iliopectineal eminence. Additionally, it attaches to and stretches the deep surface of the iliac fascia and, occasionally, its lowermost fibers reach the inguinal ligament. Variations occur, however, and the insertion on the iliopubic eminence sometimes radiates into the iliopectineal arch.



The psoas major is divided into a superficial and deep part. The deep part originates from the transverse processes of lumbar vertebrae I-V. The superficial part originates from the lateral surfaces of the last thoracic vertebra, lumbar vertebrae I-IV, and from neighboring intervertebral discs. The lumbar plexus lies between the two layers. Tightness of the psoas can result in lower back pain by compressing the lumbar discs.

**Case studies:
17 year old fly swimmer**



- Bilateral pars interarticular stress fractures L5/S1
- Non union of stress fracture after 12 months follow up MRI
- Bilateral pins and needles legs
- Clicking sound when patient flexes
- Too young for fusion

16 year old high jumper



Symptoms

- Pain with jumping after 3 jumps
- Pain took 3 days to subside
- Tight feeling in the hamstrings
- Pain worse on push off leg
- Pain in buttocks
- Stiffness in lowerback
- Lumbar spine fixated in extension

Clinical findings

- R pars interarticular stress fracture L5
- Abnormal gluteal activation problem
- Overactive lower lumbar extensors
- Weak core stabilizers
- Decrease range of motion hamstrings
- No intersegmental movement lumbar spine
- Tight latissimusdorsi muscle

21 year old sprinter

Clinical findings

- MRI :There is evidence of an acute stress fracture of the left pars interarticularis at the L5 level with bone oedema present.
- Increased lumbar lordosis
- Gluteus maximus sequencing wrong
- No core stability



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General sports physiotherapy practice which also offer:

Biomechanical Analysis

- Functional movement analysis to identify :
muscle length- and strength imbalances
movement impairments
areas at risk for injury
- Correction of the above and injury prevention
- Stretching programmes
- Strengthening programmes
- Identification of incorrect muscle recruitment patterns with correction

Massage

Includes sports, pre-event, recovery & pregnancy
Massage therapist also available

Individual and group Pilates classes

Rehabilitation which improves:

- Posture
- Strengthens stabilisers
- Flexibility
- Circulation
- Skill-based conditioning

Spinal alignment, postural correction and Lyno Method

