

## **Spondylolisthesis**

This is a descriptive term to describe subluxation between vertebrae. Unlike other orthopedic descriptions, it is the proximal part that is described with respect to the distal. Thus antero- and retro-listhesis describe forward and backward subluxation of the upper vertebrae with respect to the lower respectively. Moreover, lateral subluxation may also occur. However, the most common use of 'Spondylolisthesis' describes a forward slip of the upper vertebra on the lower. The most common level involved is L5/S1.

Spondylolisthesis can be described according to what levels are involved, the direction of displacement and the degree (i.e., **grade 1**, **grade 2**, **grade 3** and **grade 4**) and also the etiology of the listhesis.

There are two classifications commonly used: Wiltse, Newman and McNab (1976) described five types of spondylolisthesis based on the pathology and anatomical location. Unfortunately, this gives no guidance to natural history or treatment needed. Marchetti and Bartolozzi (1982, 1994) described a system based on the etiology and supplemented with guidance to natural history.

The pars interarticularis plays an important part in intervertebral stability. It forms part of the 'hook' that enables the upper vertebra to remain in position. As can be seen by the classification schemes, pathology leading to **pars disruption** (spondylolysis, **Slide 1** and **Slide 2**) is one of the common causes of spondylolisthesis.

## **Degenerative Spondylolisthesis**

Degenerative spondylolisthesis usually occurs at the L4/L5 level and is primarily due to wear and tear at the discs and facet joints. The pars remains in continuity. Presentation is that of back pain as well as lumbar stenosis.

## **Imaging**

### *Plain X-Ray (Static)*

When spondylolysis or spondylolisthesis is clinically suspected, standing PA and lateral radiographs of the lumbar spine with a cone-down lateral view of L3 to the sacrum are indicated. In most cases, the pars interarticularis defect can be seen on spot lateral views as a radiolucent band just beneath the pedicles. If the defect is not visualized by lateral film and the condition is suspected, the **oblique view** may be helpful. On this view, one can see what has been described as a Scotty dog (**Slide 1** and **Slide 2**) with a broken neck or wearing a collar.

### *Plain X-Ray (Dynamic)*

Because a spinal motion segment is considered mechanically unstable when it exhibits increased or abnormal motion, the radiographic analysis of lumbar spine dynamics is fundamental. In order to maximize the degree of slip for static radiographs, they should be obtained in the static position. However, in patients with unstable spondylolisthesis, to maximize the chances of detecting maximum abnormal translatory motion, flexion and extension radiographs should be taken in the lateral decubitus position.

### *Computed Tomography*

CT, when performed with a reverse gantry angle and thin sections, is the investigation of choice for identifying radiographically occult lyses. CT is very sensitive in diagnosis of the pars defect, especially in thin sclerotic lesions.

### *Magnetic Resonance Imaging*

Recently, appearances of normal pars interarticularis and of pars defects on MRI have been reported. Although pars defects can clearly be identified, the normal pars can either be missed or appear hypointense if the scan plane passes predominantly through the medial or lateral cortex of the pars. This may make exclusion of a pars defect difficult on MRI. Conversely, if the scan plane passes directly through the pars, a defect can be excluded if continuous medullary bone can be followed from the pedicle through the pars into the lamina. According to the MRI findings the pars interarticularis are graded as:

Type 1 = normal pars

Type 2 = sclerotic pars, where the pars appear hypo-intense if the scan plane was predominantly through the cortex of the pars.

Type 3 = when the pars could not be assessed at all.

Type 4 = when the pars are clearly demonstrated and a defect is felt to be present.

For a defect to be diagnosed, a double hypo-intense line had to be present crossing the pars.