

CLINICAL ARTICLE

Degenerative spondylolisthesis: part of the normal ageing process

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Abstract

Degenerative spondylolisthesis is a condition that occurs in the middle decades of a person's life and mainly affects the L4 and L5 level, especially in women. A good history, a clinical examination, well-planned special investigations and a definite diagnosis are mandatory. Various risk factors have been identified. A thorough investigation, a definite diagnosis and adequate conservative management remain the gold standard for treatment.

The majority of patients can be managed conservatively. Only about 10 to 15 per cent need surgery. Indications for surgery include severe mechanical backache with an unstable segment and radicular pain as well as progressive neurological deficit. Various forms of surgery and types of instrumentation are available, but the gold standard remains a posterior decompression, intertransverse fusion and pedicular instrumentation resulting in a solid intertransverse fusion. Other surgical modalities do exist, but they are associated with higher cost and morbidity. For some of these no long-term results are available.

Conservative treatment and decompressive surgery, where correctly indicated, and a solid fusion can increase a patient's quality of life considerably. Informed consent must be obtained and the patient must be informed that degeneration is an ongoing process. The same condition may recur at a higher level, in which case the surgery must not be regarded as a failure.

History

Degenerative spondylolisthesis is a condition that affects people after the age of 40 years and is characterised by a progressive slip of the L4 vertebra on the L5 vertebra in the majority of cases, causing symptoms such as mechanical backache, spinal stenosis and radicular pain.

The diagnosis of degenerative spondylolisthesis is quite clear but the treatment is still controversial, especially the indications for various types of surgery.

Degenerative spondylolisthesis was described in 1930 by Junghanns and later confirmed by MacNab in 1950. In 1950, Newman coined the term "degenerative spondylolisthesis" and he described the slip with an intact neural arch. He stated that the slip was secondary to degenerative changes of the lumbar-facet joints and not a defect in the pars interarticularis.¹⁻⁴

Pathological process

The pathological process of degeneration starts after the first decade of life and is characterised by a progressive loss of fluid in the disc, the so-called "black disc", on magnetic resonance imaging (MRI). As the process continues, osteophytes develop in the facets and on the disc edge and subsequently ligamentum-flavum thickening occurs⁵ (Figure 1a, b).

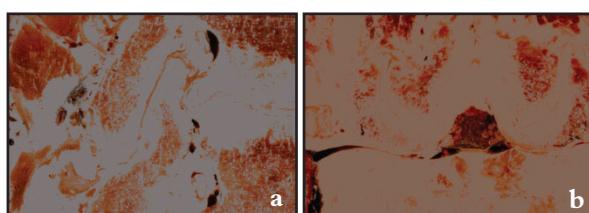


Figure 1a and b: Illustration of degeneration process

As the pathological process progresses, the disc space narrows. Spinal stenosis develops in the central canal as well as in the paravertebral and foraminal areas. Instability develops and the L4 vertebra starts slipping on the L5 vertebra.

This process is progressive, but as osteophyte formation and disc narrowing occur, the process tends to stabilise itself in the region of more or less 30 to 40 per cent of slippage.

Risk factors

Various factors contribute to this condition that occurs five to six times more often in women than in men. These include:

- ageing of individuals
- increase in body mass
- early degeneration of the L5/S1 level with subsequent stabilisation and therefore more stress on the L4/5 level
- weak abdominal muscles and lax ligaments
- the sagittal orientation of the facet joints on the L4/5 level.^{4,6}

It is very important in the evaluation of spinal stenosis as well as radicular symptoms that vascular claudication be excluded because the symptoms can be very similar and confusing

As the abdominal muscles weaken, increasing lumbar lordosis occurs. This phenomenon, in association with increased body weight, tends to lead to slippage on the L4/5 level due to anterior mechanical stresses.

The abovementioned factors occur mainly in women. In men, the only identifiable condition that increases the risk of L4/5 degenerative spondylolisthesis is age.

Degenerative-spondylolisthesis slippage is usually not more than 30 to 40 per cent. Often it is associated with other degenerative changes in the lumbar spine, such as degenerative scoliosis. Yet, in degenerative scoliosis the instability is more on the L3/4 level and it presents as a latero-listhesis (Figure 2).

Causes of pain

Degenerative spondylolisthesis may be an incidental finding and the patient can be totally free of pain. Various factors lead to symptoms that are mainly due to instability, which causes pain of a mechanical nature.

The radicular pain and symptoms of spinal stenosis are secondary to the forward slip, osteophyte formation and narrowing of the foramina, ligamentum flavum thickening and the formation of synovial cysts (Figure 3).

It is very important in the evaluation of spinal stenosis as well as radicular symptoms that vascular claudication be excluded because the symptoms can be very similar and confusing.⁷



Figure 2: Degenerative scoliosis

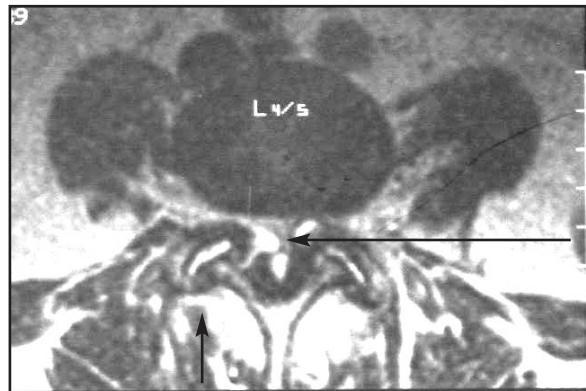


Figure 3: Synovial cyst, ligamentum flavum thickening

Diagnosis

The diagnosis of degenerative spondylolisthesis is mainly made by a combination of a good history, clinical examination and special investigations. During the clinical evaluation, it is very important to get a detailed history of the pain, which includes back pain as well as radicular pain and the distribution thereof. The patient's profile also plays an important role, especially hyperlordosis, a pendulous abdomen and forward stooping.

The clinical evaluation usually reveals a normal range of back movements. A thorough investigation of the neurological status as well as the vascular status must be done.

There are several pitfalls that one must be aware of, including vascular lesions, metastasis and hip pathology. These modalities must also be investigated and excluded.

Special investigations

Various special investigations are available and we recommend starting off with the most common investigations, such as X-rays. X-rays must include an antero-posterior and a lateral view as well as dynamic studies in order to evaluate the status of the bone and stability of the lumbar area.

Further investigations include myelography, computerised tomography as well as MRI.

Elderly patients often have other co-morbidities. Pacemakers and hearing aids exclude a MRI examination. Myelography still remains a very good investigation to determine spinal stenosis and can be done in any radiology department (*Figures 4-6*).

MRI is the investigation of choice that can reveal a wide range of pathology, including ligamentous flavum thickening, osteophyte formation, synovial cyst and even other unexpected conditions such as metastasis.

Computerised tomography is not often done unless a bony lesion is expected, but in combination with myelography it supplies very good information on spinal stenosis and especially foraminal stenosis.

It is always of value to do a full blood count and a bleeding time if antiplatelet drugs such as Disprin were taken.

Treatment

Once the patient is fully investigated and a diagnosis of degenerative spondylolisthesis and stenosis is made, a treatment programme can be started.

There is still a lot of controversy about the treatment of degenerative spondylolisthesis, especially concerning surgery for the condition. The non-operative treatment for degenerative spondylolisthesis has stayed unchanged over the years, but surgical management has varied and developed as newer ideas and products have become available.

The natural history of degenerative spondylolisthesis is very good and only 10 to 15 per cent of cases tend to come to surgery.

Surgery will be indicated by severe symptoms of mechanical backache, spinal stenosis and especially radicular pain. Progressive neurological deficit and bladder involvement are absolute indications for surgery. For the neurologically intact patient a conservative treatment programme of at least three months is advised.^{7,8}

Surgical treatment

The major aim of surgical treatment is decompression, especially where there are severe symptoms of spinal stenosis and radicular pain. Stabilisation with various methods still remains controversial. This controversy concerning surgical treatment revolves around the following approaches:

- decompression alone
- decompression with dynamic stabilisation without bony fusion
- decompression and bony fusion
- decompression, bony fusion and instrumentation
- decompression, bony fusion, instrumentation as well as an anterior implant and fusion

The more aggressive the fusion and instrumentation (such as anterior and posterior instrumentation), the higher the morbidity, complications and costs to the patient.



Figure 4: Lateral X-ray

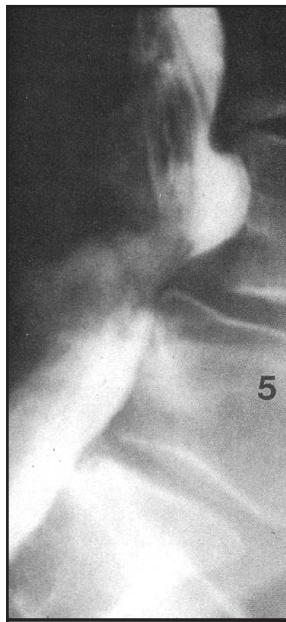


Figure 5: Myelogram

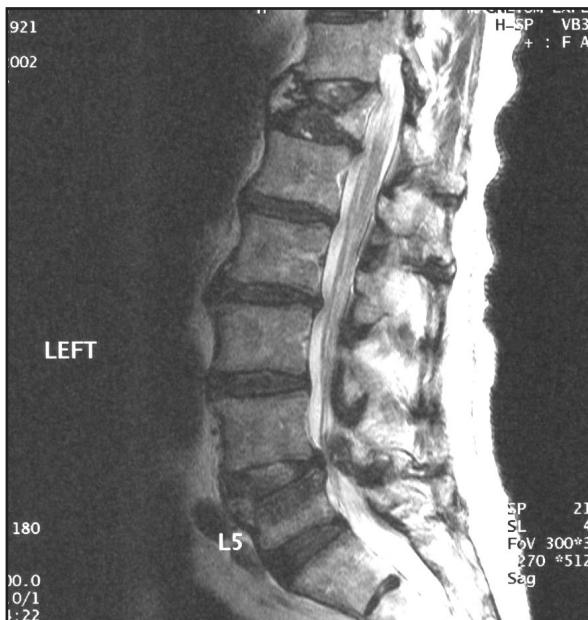


Figure 6: MRI

Different surgical options

The different surgical options include the following:

Decompression without fusion

Decompression without fusion has good results in about 50 to 60 per cent of cases, especially where there is no pre-existing instability and the decompression is done with preservation of the facet joints and minimal disruption of the posterior elements.

The problem is, however, that progressive slippage, mechanical backache and subsequent radicular pain and a recurrence of symptoms do occur. This is, therefore, not a good option and must only be considered where fusions are contra-indicated or no instability is present.^{7,9,10}

Postero-lateral fusion without instrumentation

After a thorough decompression and with pre-existing instability, a fusion is done without instrumentation. In many cases, the patient is severely osteoporotic and instrumentation tends to fail. Good results are being reported with a success rate of $\pm 90\%$ of cases. Pseudo-arthrosis can, however, develop due to the instability, quality of bone and the co-morbidities.

It is quite evident that the arthrodesis or fusion group does better than cases where a decompression alone was done. Not all patients with a pseudo-arthrosis are symptomatic, but if they have recurrent symptoms the pseudo-arthrosis is most probably the cause and must then be addressed accordingly.¹³

Postero-lateral fusion with instrumentation

Pedicular instrumentation is added to the decompression and bony fusion. These patients do significantly better in the short term with a better fusion rate, but long-term results are equivocal compared to fusion without instrumentation. Problems that do occur are bone-screw loosening and instrument failure. Both of these can result in discomfort and recurring pain.¹⁴

Anterior and posterior fusion

As spinal surgery develops and more devices become available, there is a tendency to address the spine from the front in order to keep the alignment and to stabilise the spine circumferentially.¹⁴ These procedures lead to a higher morbidity and complication rate and are not superior to posterior fusion and instrumentation alone.

This approach is, however, recommended for the earlier stages of degenerative spondylolisthesis because in the later phases stabilisation of the anterior structures has already occurred. One must bear in mind that the pathological conditions, such as stenosis, are posterior and therefore posterior surgery is still the treatment of choice for this age group.

Dynamic stabilisation

Various forms of dynamic stabilisation are available, including pedicular screws with dynamic fixation and interspinous devices. The overall view is that the results are not superior to decompression alone and various problems were identified, such as progressive slippage, progressive degeneration and bone-screw loosening as well as dislodging of the devices. The long-term results of this procedure are still uncertain.^{7,11} (Figure 7).



Figure 7: Dynamic fixation

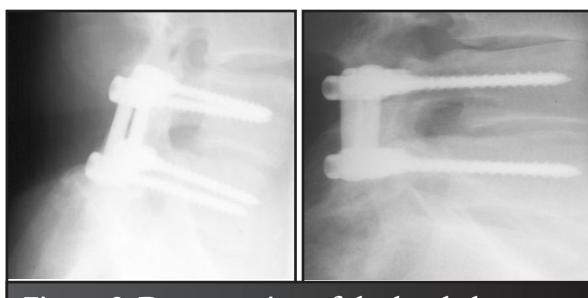


Figure 8: Degeneration of the level above

Instrumentation

Instrumentation in degenerative spondylolisthesis has various advantages as well as disadvantages. The main advantages are that it creates a stable segment, it controls the alignment and the patient is much more comfortable in the immediate postoperative period. It also leads to a better fusion rate, but the clinical outcome is not significantly superior to non-instrumentation.

Disadvantages include increased local trauma, longer operating time, higher blood loss, instrument failure as well as a higher infection rate.

Apart from the above, cost becomes a major factor and must be considered.

Degeneration on the level above the surgical procedure

Degeneration of the level above is a major problem. Patients with degenerative spondylolisthesis are usually in their fifth and sixth decade and therefore already suffer from degeneration of their whole lumbar spine.

Various causes of degeneration have been identified including increased mechanical stress on the level above the fusion, pre-existing and ongoing degeneration, as well as the effect of the normal ageing process.

Patients must be warned that degeneration on the level above the procedure is not due to a failure of the surgical process but is something that can be expected. The patient must therefore be informed about this condition and must take care to protect the back at all times (Figure 8).

Acknowledgement

I thank the typist, Mrs A Mitchell and secretary, Mrs H Oldewage, for helping prepare this document.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article. This article is free of plagiarism.

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