Degenerative spondylolisthesis: surgical treatment

Espondilolistese degenerativa: tratamento cirúrgico

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The Guidelines Project, an initiative of the Brazilian Medical Association, aims to combine information from the medical field in order to standardize procedures to assist the reasoning and decision-making of doctors.
The information provided through this project must be assessed and criticized by the physician responsible for the conduct that will be adopted, depending on the conditions and the clinical status of each patient.

Description of the evidence collection method

To develop this guideline the following primary and secondary electronic databases were consulted: Medline (1966-2009), Cochrane, Cochrane Central Register of Controlled Trials – Central, Embase (1980-2010) and Lilacs (1982-2010). The search for evidence came from actual clinical scenarios and used keywords (MeSH terms) grouped in the following syntax: surgical procedures, operative, nonsurgical,therapy, lumbosacral region, lumbosacral, degenerative, spondylolisthesis, spondylolisthesis. The articles were selected after critical evaluation of the strength of scientific evidence by specialists from the participating Medical Associations, and publications of greatest strength were used for recommendation. The recommendations were drawn from group discussion. The entire guideline was reviewed by an independent group specializing in evidence-based clinical guidelines.

Grade of recommendation and strength of evidence

- **A.** Experimental or observational studies of higher consistency.
- **B.** Experimental or observational studies of lower consistency.
- **C.** Case reports (non-controlled studies).
- **D.** Opinions without critical evaluation, based on consensus, physiological studies, or animal models.

Objective

This guideline's target audience comprises general practitioners, rheumatologists, orthopedists, physiatrists, neurologists and neurosurgeons in order to be able to guide patients with lower back pain and/or sciatic pain resistant to non-operative treatment caused by lumbar degenerative spondylolisthesis regarding the indication for surgical treatment.

Introduction

Degenerative spondylolisthesis refers to a forward slippage of a lumbar, with an intact neural arch. Uncommon before the age of 50 years, it is more common in women and particularly in blacks, with a male: female ratio of 1:6 (**B**).[1] L4--L5 is the most commonly affected level and rarely exceeds 30% of the vertebral width. Degenerative spondylolisthesis is usually asymptomatic but may be associated with symptomatic stenosis of the lumbar spinal canal. The canal stenosis is the most common cause of back surgery in adults over 65 years when associated with neurogenic claudication. However, spinal stenosis is usually asymptomatic. Therefore, clinical radiological correlation is essential for making decisions (**A**).[2] Surgical treatment with spinal decompression and stabilization in spondylolisthesis is recommended when conservative treatment fails (**B**).[3]

How long should conservative treatment (non-operative) be maintained?

In general, favorable functional outcomes in patients unresponsive to non-operative treatment are reported in groups with diverse etiologies for degenerative lumbar stenosis as well as time of conservative treatment (**C**).[4-6] The time tested in this particular group of patients included in the clinical trial was 12 weeks. Patients treated conservatively without success and who underwent surgical treatment had better progression from a functional point of view, after 4 years of follow-up (**B**).[7]

Recommendation

After 12 weeks of unsuccessful conservative treatment, surgery is a treatment option for these patients (**B**).

Is it necessary to refer the patient to arthrodesis with use of rigid pedicle screws (non-dynamic)?

The trials below discussed the value of fusion as treatment for spinal stenosis associated on one or two levels with degenerative spondylolisthesis.

Herkowitz and Kurz[8] studied the isolated non-instrumented arthrodesis and showed that fusion produced less radicular pain (in the lower limbs) and better clinical outcome according to the surgeon's assessment (**B**).[8] Bridwell et al.[9] compared instrumented and non-instrumented fusion techniques. Patients undergoing instrumented fusion had less progression of spondylolisthesis and improved walking ability (**B**).[9] Obtaining solid fusion was associated with subjective improvement. Both studies have methodological limitations: the control group was small (**B**).[8,9]

Fishgrund et al.[10,11] in a randomized trial done in 1997, studied the effect of instrumentation on outcomes of spondylolisthesis, either arthrodesed or not. The authors found that the instrumentation increased the fusion rate but did not improve clinical outcomes (**B**).[10,11] These studies have provided conflicting evidence according to which instrumentation would produce significant clinical improvement.

Recommendation

Instrumentation is an option in the treatment of degenerative spondylolisthesis to increase the chance of obtaining solid fusion and improve clinical outcomes (**B**).

Is the use of bone substitutes such as BMP (bone morphogenetic protein) safe and effective in lumbosacral arthrodesis?

Regarding the rate of fusion, two studies[12-14] A compared the use of osteoinductors (BMP) with iliac graft in patients with degenerative spondylolisthesis (single level), treated by means of neural decompression and non-instrumented intertransverse arthrodesis, with similar clinical and radiographic results (**B**). However, there are many publications and case reports on complications arising from the use of BMP, including bone resorption and osteolysis, cage/graft migration, heterotopic ossification, radiculitis, formation of specific antibodies and bruises.[15] Prospective and randomized studies are needed to elucidate the best clinical indications and safe dosages for the use of osteoinductors (BMP) in lumbosacral spine.

Recommendation

Due to the small number of studies on osteoinductors (BMP) and the high number of complications arising from their use, it was not possible to recommend its routine use for the treatment of these patients.

What is the most appropriate diagnostic study in this clinical context?

Plain radiographs in the standing position determine the diagnosis and the percentage of slippage in degenerative spondylolisthesis. Being available in most hospitals and since it is not an invasive test, this is the first additional test requested (**C**).[16,17] Plain radiographs of the spine are effective to evaluate the bone structure of the spine and should be performed in the standing position to be more accurate in identifying the intervertebral disc height, lumbar lordosis and the degree of slippage between the *vertebrae*. Plain radiographs in anteroposterior incidence also allow assessment of the morphology of the articular facets. The lateral view also allows dynamic evaluation of the stability of the spine with studies of lumbosacral spine in maximum flexion and extension (**C**).[22]

Computed tomography is more sensitive and specific in identifying the narrowing of the spinal canal than plain radiography, because it allows visualization of the spinal canal in axial view. Myelography or CT myelography is more specific than non-specific CT scans and is important for the identification of spinal stenosis in patients with degenerative spondylolisthesis and neurologic symptoms. However, this is a test rarely used because it is invasive and is associated with adverse effects – secondary to ionizing radiation and contrast injection (**C**).[18,19]

In the presence of symptomatic lumbar stenosis, the most sensitive and specific radiologic examination is MRI, as it enables the visualization of soft tissues in the spine. MRI is the most accurate study to analyze the pathological anatomy of the narrowing of the spinal canal – produced by prolapsed intervertebral disc, hypertrophy of the *ligamentum flavum*, zygapophyseal joint hypertrophy, and vertebral slippage with intact vertebral arch (**C**).[20] Dynamic myelography and CT myelography may be indicated to elucidate cases where there is a lack of association between symptoms and MR imaging for dynamic analysis or the presence of bony component contributing to the narrowing of the spinal canal. Another possibility for such an indication is MRI contraindicated in patients with pacemakers and claustrophobia. Sedation and open MRI are options for performing the test in patients with claustrophobia (**C**).[17-21]

Recommendation

The most appropriate diagnostic test in this situation is plain radiography, which is more widely available; however, MRI is indicated for patients with symptomatic lumbar stenosis.

Bone substitutes are equal or superior to autografts in this situation?

Two randomized trials [23,24] evaluated the association of bone expander beta-tricalcium phosphate to "local" bone tissue from the posterior vertebral elements, and compared their achieved results with autologous iliac graft, considered the gold standard in this clinical scenario. Both studies reported there were no clinical or radiographic differences between the groups assessed, and the use of bone expanders avoided the occurrence of pain in the iliac donor site (**A**).[23,24]

Recommendation

The association of local bone graft (from the posterior vertebral elements) and beta-tricalcium phosphate is a therapeutic option for the removal of autologous bone graft from the iliac bone (**A**).

Should the spondylolisthesis be reduced?

In the search for Keywordsand indexed terms, 388 articles were retrieved; of these, 47 abstracts, and 3 comparative clinical trials chosen for analysis. A thorough analysis showed that the three articles were case series with small samples, and two showed a 60% loss on follow-up and conflicting results (**C**).[25-27] Due to the low quality of the articles, it was not possible to make a recommendation.

Are there any differences among the various types of arthrodesis?

There are no randomized trials comparing the various methods of arthrodesis focusing on degenerative spondylolisthesis, especially with regard to intersomatic spacers. We found that lower-quality observational studies using different techniques for lumbar fusion and heterogeneous study populations showed a higher fusion rate in patients undergoing circumferential arthrodesis, but without evidence of better functional results (**B**).[28-30]

Recommendation

There are no randomized trials comparing the various methods of arthrodesis and use of intersomatic spacers in cases of degenerative spondylolisthesis; thus, it is not possible to recommend a specific technique (**B**).

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