ELASTIC STABILIZATION WITH POSTERIOR SHOCK ABSORBER

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INTRODUCTION

Lumbar disc degeneration is the most common cause of back and leg pain. It is a multifaceted syndrome and it could be part of a more complex syndrome in which all three columns are involved with consequent instability.

One of the biggest problems in spinal surgery is the diagnosis and treatment of vertebral instability.

Disc arthrosis, segmental instability and spondylolisthesis are the principal indications for spinal fusion. However, there is a lack of precision concerning the definition of certain pathologies and the relation between degenerative lesions, actual low back pain and the need for fusion is, at best, open to debate.

Many different surgical techniques are employed to treat lumbar instability: postero-lateral fusion (PLF), intersomatic fusion (ALIF or PLIF) and posterior instrumented fusion alone (screws fixation) or combined with intersomatic fusion (circumferential fusion). All these procedures may achieve the goal of fusion, with good radiological results, but at the same time they should create a pathology concerning the adjacent level to fused area.

During the last years the interest in the “so-called” non-fusion technology grew up and new stabilization systems have been introduced in spinal surgery, identifying a new kind of treatment philosophy. This new kind of surgical treatment is based on the principle of the preservation of the functional spinal unit (FSU), leaving the arthrodesis technique to a very few selected cases.

There are a lot of ligamentoplasty systems on the market, like the posterior dynamic stabilization systems that include the Graf ligamentoplasty and the Dynesys implant, and like the interspinous systems as the Wallis implant and the Diam shock absorber.

We began our experience in 1991 with the Bronsard’s ligament and, one year later, with the Graf stabilization system. Our clinical results in few cases using the Graf system were bad, with worsening of the back pain and in one case there was arising of sciatica pain. We thought that the problem was in the overloading of the facet joints and in the decreasing of the neuroforamen size caused by the system.

SHOCK ABSORBERS

With the term shock absorbers we identify all the interspinous systems which purpose is to re-establish the stability of the posterior spinal ligament complex.

Interspinous devices were designed in order to restore the posterior stability normally done by the ligamentous complex and to restrict abnormal flexion-extension movement of the spine.

Senegas in 1988 introduced the concept of the interspinous device for the treatment of vertebral instability. The system principles are: reduction of the instability, fixation of the mean IAR (instantaneous axes of rotation), discharging facet joints and opening the neuroforamen.

Since 1988 a lot of interspinous systems were designed and different material were combined in order to improve the shock absorber function. One of the last systems designed is the Loop system.

They confer substantial mechanical advantages and when the spinal column is submitted to loading, the interspinous blocker displaces the mechanical constraints dorsally and reduces the load upon the disc and the facet joints.

Since 1991 we began to use the interspinous shock absorbers, using first the Bronsard’s ligament and later the DIAM system.

The surgical technique is very simple and through a small skin incision is possible to perform the procedure.

The main indications to elastic stabilization are:

1) initial disc degeneration with very low grade instability in young people affected by chronic low back pain;
2) discectomy for voluminous herniated disc leading to substantial loss of disc material;
3) recurrent disc herniation with or without scar tissue formation;
4) degenerative disc disease at a level adjacent to a previous fusion;
5) neuroforamen stenosis.
OUR EXPERIENCE

We started using the system in 1991 but our results are reported from January 1994 to December 2001. We performed 82 surgical procedures, 57 elastic stabilization alone and 25 associated with instrumentation and fusion (combined stabilization). The mean age was 43 years old and the admission diagnosis was degenerative disc disease in half of the cases, disc herniation in 25.6%, recurrent disc herniation in 11% and other diagnosis in 13.4% of the cases.

Two patients were affected by L5 spondylolisthesis. We performed reduction and a combined stabilization in both cases. Fusion was done from L4 to S1 and it was associated with an elastic stabilization in L3-L4 because of initial degeneration of the disc.

Four patients suffered from a lumbar stenosis. We performed a one or two levels laminectomy associated with elastic stabilization.

Fifty-seven patients (57/82) underwent elastic stabilization alone. In 61.4% of these cases we performed a one level L4-L5 elastic stabilization. Six patients underwent a two level procedure, four of them had an L3-L4 and L4-L5 stabilization. In one case we did an L5-S1 stabilization using Dynasys System with an L4-L5 interspinous device with Diam.

In picture 1 we present the case of a female 35 years old affected by L4-L5 degenerative disc disease. MRI demonstrate the presence of a bulging disc. She suffered from a persistent back pain and we decided to perform an L4-L5 elastic stabilization.

The dynamic x-rays taken at one year of follow-up (picture 2) demonstrate the good position of the device and increased stability of the segment. The patient is pain free.
In twenty-five patients (25/82) we performed a combined stabilization. L4-S1 rigid stabilization with fusion associated with an L3-L4 elastic stabilization was done in 44% of these cases. Three patients underwent spinal fusion associated with two levels elastic stabilization; in one of them we performed a one level fusion with interspinous devices on the level above and below.

We reviewed sixty-one patients (61/82) with a mean follow up of twenty months (minimum 12 months; maximum 6 years). Clinical results are very satisfactory especially in the group of patients affected by recurrent disc herniation in whom the elastic device was used alone.

No complications related to the material were detected.

Our mean follow-up is too short to arrive a conclusion about it.

The best indication is a single level elastic stabilization positioned at L4-L5. No differences in results were observed if two devices were placed one above the other. L5-S1 level should be avoided for the poor quality of the S1 spinous process.

Flexible stabilization system were based on the concept that they permitted only restricted movement within the range of normal movement. They work because they restrict movement to a zone or a range where normal loading may occur, or they prevent the spine adopting a position where abnormal loading may occur.

Nevertheless elastic stabilization could be a good alternative to fusion in cases in which arthrodesis is an excessive procedure. Furthermore it should be used in addition to lumbar stabilization-fusion in cases in which the disc adjacent to the fused area is initially degenerated.

In our experience we believe that the elastic stabilization with interspinous shock absorber is a safe procedure with good clinical results especially in patients affected by recurrent disc herniation.

It should also be used with good results in patients affected by degenerative disc disease, lumbar stenosis and in very low grade instability.

When used in association with lumbar stabilization-arthrodesis we think that the elastic stabilization reduces the mechanical stresses applied on the disc above. In such a way the bordering area should be protected by accelerated degenerative process.