Spine

SPINE Volume 41, Number 7S, p S20

SUPPLEMENT

Case Presentation of Sagittal Balance

Paul K. Kim, MD

Sagittal balance is an important concept in spinal coronal and kyphotic deformity correction. Sagittal alignment/lumbar lordosis is increasingly recognized and discussed in terms of surgical outcomes. Positive sagittal balance can lead to development of iatrogenic kyphosis, flatback syndrome, adjacent level degeneration, and junctional kyphosis. This concept is no longer associated only with deformity. Spine surgeons have learned that sagittal alignment/lumbar lordosis is very important even in 1-level or 2-level interbody fusion procedures, and that it can be attained, maintained, or lost during any procedure, resulting in complications.

Key words: lumbar lordosis, pelvic incidence, sagittal balance.
Spine 2016;41:S20

Global spinal alignment can be divided into thoracic kyphosis and lumbar lordosis. The sagittal vertical axis ignores cervical alignment and underappreciates the role of pelvic compensation. An acceptable sagittal vertical axis measures less than 5 cm (SDC Figure 1, http://links.lww.com/BRS/B102). All components of spinopelvic alignment—pelvic incidence, pelvic tilt, and sacral slope—contribute in some way to overall alignment. Clinical experience and imaging have revealed that an increase in pelvic incidence leads to a compensatory change (increase) in lumbar lordosis to maintain neutral sagittal alignment and mechanically efficient posture. The adaptability of the lumbar spine contributes to strong alignment, which must be preserved by the surgeon if possible.

To successfully maintain lumbar lordosis during spine surgery, the surgeon applies the following equation: Pelvic incidence − Lumbar lordosis = Number < 10 (as the goal). The value attained by this equation is one of the more relevant measures of lumbosacral sagittal balance. Traditionally, we have used complex deformity procedures such as osteotomy and subtraction to correct deformity and restore balance. Once attained, the challenge has been to maintain lordosis over time. For interbody fusion procedures, focus on the interbody space and implementation of new technologies to recreate disc space more safely and to restore disc height are helping to reduce failure and loss of correction.

Revision surgery is an ongoing need because too often, the patient remains in suboptimal sagittal balance. New technologies that permit implant placement with expansion to create lordosis help to minimize stresses on adjacent levels (Figure 1). We are learning to avoid past mistakes by applying these technologies while paying attention to upper level stresses of which we were previously unaware. Biomechanically, implant loading and expansion assist surgeons in maintaining correction and achieving fusion quality. Consistent correction is now a viable goal with optimal implant placement and use of expandable technologies (SDC Figure 2, http://links.lww.com/BRS/B102).

How can we take current technologies, which have worked well, and modify them as needed to improve lordosis? How can we achieve optimal implant positioning? And how can we best use new technologies to restore disc space height and attain lordosis? Pursuit of these goals of transforaminal lumbar interbody fusion technology represents the new frontier for spine surgeons and researchers.

Supplemental digital content is available for this article. Direct URL citations appearing in the printed text are provided in the HTML and PDF version of this article on the journal's Web site (www.spinejournal.com).

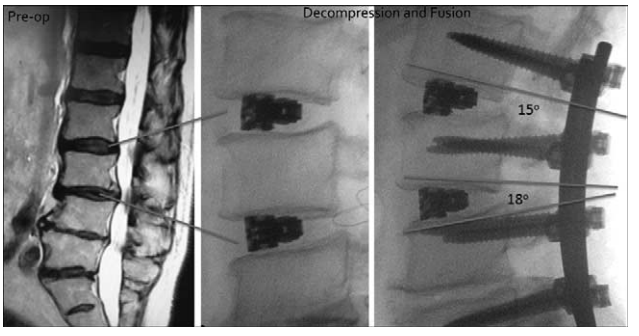

Figure 1. Postoperative view of patient fused and restored to normal sagittal alignment.

From the Carolina Neurosurgery & Spine Associates, Charlotte, NC.

Acknowledgment date: January 4, 2016. First revision date: January 5, 2016. Acceptance date: January 5, 2016.

The manuscript submitted does not contain information about medical device(s)/drug(s).

No funds were received in support of this work.

No relevant financial activities outside the submitted work.

Address correspondence and reprint requests to Paul K. Kim, MD, Carolina Neurosurgery & Spine Associates, 225 Baldwin Avenue, Charlotte, NC 28204; E-mail: paul.kim@cnsa.com

DOI: 10.1097/BRS.0000000000001429