The relationship between isthmic and degenerative spondylolisthesis and the configuration of the lamina and facet joints

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Summary. Advanced degenerative change in the facet joints leads to displacement of the vertebral body, and the configuration of facet joints and lamina is closely related to the development of degenerative spondylolisthesis. For this study 103 patients and 25 controls were examined with respect to the configuration of the lamina, anteroposterior diameter of the vertebral canal, interarticular distance, interlaminar distance, disc degeneration, and degree of arthritic changes of facet joint, all as shown on plain radiography, and facet angle, interfacet distance, and contour of the canal side of the inferior articular process and lamina, as shown on computed axial tomography. The results of this study showed that those patients with a narrow facet angle were more likely to have developed degenerative spondylolisthesis. If the sum of both facet angles was less than 77.9°, the risk of development of degenerative spondylolisthesis was 2.5 times higher than if the sum was greater than 77.9°. Those with type N lamina, detected on plain radiographs, were especially likely to have developed degenerative spondylolisthesis. This suggested that degenerative spondylolisthesis may be due to the less effective check mechanism preventing a vertebra from slipping forward on the vertebra below. We recommend fusion of the degenerated spinal segments when operation is considered in cases of acute facet angle with symptoms.

Key words: Lumbar spine – Spondylolisthesis – Configuration of lamina and facet joints – Plain radiograph and CT scanning

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The purpose of this study includes radiological classification of laminas based on their configuration, inquiry into the etiologic factors of degenerative spondylolisthesis by comparing patients with the degenerative and the isthmic types with a control group, and the establishment of a possible relationship between the type, degree of displacement, and symptoms of spondylolisthesis and the contour of the lamina and facet angle.

Materials and methods

Subjects

The study included 103 in-patients with spondylolisthesis treated at the Orthopaedic Department of the Severance Hospital, Seoul, from January 1985 to December 1990. The admission records and the radiological studies, including plain radiographs and computed tomographs, were analyzed. The control group comprised 25 volunteers of similar age and sex to the patients with no previous history of spondylolisthesis or chronic back pain.

Review of patients’ records

In the review of the patients’ records, general characteristics (age, sex, etc.), symptoms and signs were analyzed. For the sake of convenience, subjective symptoms were evaluated in three different categories: back pain, radiating pain of the lower extremities, and claudication. The signs were evaluated in two categories: motor weakness and sensory change.

Type of spondylolisthesis and degree of displacement

Spondylolisthesis was classified into two types, isthmic and degenerative, and the degree of anterior displacement was measured by Meyerding’s method [7] of quadrisectional expression and Taillard’s method [6, 13] of percentile expression.

Plain radiograph measurements

Plain radiographs were taken with the patient in supine position, flexing the hip and knee joints to eliminate lumbar lordosis. The X-ray beam was focused on the L4-5 intervertebral space to obtain a true anteroposterior view, minimizing any error caused by tilting of the L4 or L5 vertebra. In comparing the 103 patients with the 25 controls, the contour of the L4 lamina was divided into three types using the method introduced by Sato et al. [12]. The classification into types W1, W2, and N was done according to facet joint space and the interarticular distance on anteroposterior view: cases where the interarticular distance was longer than the width of the lamina were classified W, and cases of equal or shorter interarticular distance were classified N. Type W was divided into W2, where the facet joint space was visible, and W1, where it was not visible. We found that type N had two different contours of the inferior articular process, but both were grouped under type N (Fig. 1).