

## عنوان مقاله:

Biomechanical modeling of the lumbar spine stability in healthy and scoliosis subjects using finite element method

## محل انتشار:

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## خلاصه مقاله:

Many spinal problems which could lead to pain are associated with the instability of spine. Experiments have shown that the ligamentous spine is inherently unstable, because the isolated lumbar spine buckles under approximately 90N load. Studies show that in normal state, combination of the various mechanisms, such as muscle forces, intra-abdominal pressure cause spinal stability excluding spinal deformities. According to the biomechanical and geometrical complexity of the spine, it's crucial to use biomechanical models in order to study the stability of the spine. Granata and Wilson presented a simple two-links model of lumbar spine considering twelve muscles, and by satisfying the mechanical stability conditions, they calculated the muscular forces for different physical activities. Through experiments conducted using Electromyography (EMG), activity of the trunk muscles were recorded and compared with the predicted model results. In this paper, Granata analytical model is verified using a finite element model. Muscular forces are calculated subject to satisfying the spinal stability conditions for a standing Granata analytical model, and they are compared with the numerical results. Then the similar model is adapted to a subject with scoliosis, and spinal stability conditions are compared in these two models. Finally contribution of spinal deformities on the stability of spine and paraspinal muscle activities are studied. In the more complex physical activities such as load lifting and bending, it is inconvenient to use analytical methods, contrarily the finite element method is a more appropriate tool to study the stability of spine.

## کلمات کلیدی:

Biomechanical modeling, Spinal deformities, Muscular Forces, Granata model, Low-back pain, Idiopathic scoliosis, Stability

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