Denis three-column model

- Vertebral Fracture
- Stability of the Subaxial Spine after Penetrating Trauma: Do Classification Systems Apply?
- Biomechanical effects of vertebroplasty on thoracolumbar burst fracture with transpedicular fixation: a finite element model analysis
- Spinal instability: the orthopedic approach
- The history of spinal biomechanics

The TLICS, SLIC, and three-column classification systems cannot be applied to civilian gunshot wounds (CGSWS) to quantify injury severity, predict outcomes, or guide treatment decision-making. Despite significant neurologic injuries and disruption of multiple spinal columns, CSGSW do not appear to result in unstable injuries requiring operative intervention. Further research is needed to identify the rare spinal gunshot injury that would benefit from immediate surgical intervention [1].

Denis' 3-column model of the spine attempts to identify CT criteria of the instability of thoracolumbar spine fractures [2].

From a retrospective study of 412 thoracolumbar injury, Francis Denis introduced the concept of middle column or middle osteoligamentous complex between the traditionally recognized posterior ligamentous complex and the anterior longitudinal ligament. This middle column is formed by the posterior wall of the vertebral body, the posterior longitudinal ligament, and posterior annulus fibrosus. The third column appears crucial, as the mode of its failure correlates both with the type of spinal fracture and with its neurological deficit. Spine injury is subdivided into minor and major. Minor injuries are represented by fractures of transverse processes, facets, pars interarticularis, and spinous process. Major spinal injuries are classified into four different categories: compression fractures, burst fractures, seat-belt-type injuries, and fracture dislocations. These four well-recognized injuries have been studied carefully in clinical terms as well as on roentgenograms and computerized axial tomograms. They were then subdivided into subtypes demonstrating the very wide spectrums of these four entities [3].

Anterior column

Anterior annulus fibrosus plus anterior longitudinal ligament.

Middle column

Posterior annulus fibrosus plus posterior longitudinal ligament.

Posterior column

Supraspinous ligament and interspinous ligament, facet joints and joint capsule, and ligamentum flavum.

Injury to this column alone does not cause instability.

Denis classification

see Denis classification.

1)
Staggers JR, Niemeier TE, Neway WE 3rd, Theiss SM. Stability of the Subaxial Spine after Penetrating Trauma: Do Classification Systems Apply? Adv Orthop. 2018 Oct 9;2018:6085962. doi: 10.1155/2018/6085962. PMID: 30402292; PMCID: PMC6198542.
2)
Denis F. The three-column spine and its significance in the classification of acute thoracolumbar spinal injuries. Spine (Phila Pa 1976). 1983 Nov-Dec;8(8):817-31. PubMed PMID: 6670016.
3)
Denis F. The three column spine and its significance in the classification of acute thoracolumbar spinal injuries. Spine (Phila Pa 1976). 1983 Nov-Dec;8(8):817-31. PubMed PMID: 6670016.