

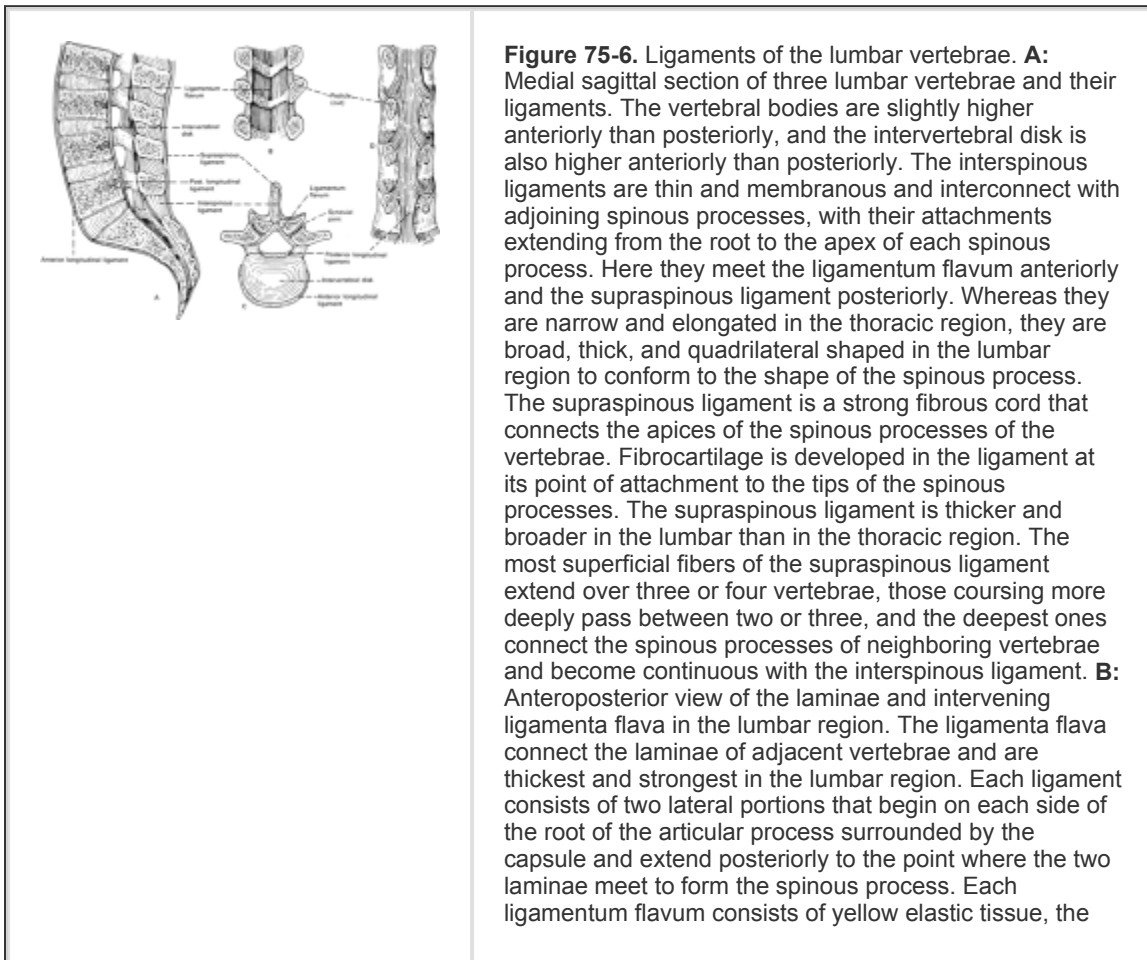
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CHAPTER 75

LIGAMENTS

Part of "CHAPTER 75 - General Considerations of Pain in the Low Back, Hips, and Lower Extremities"

The lumbar spine can be viewed as a series of stacked bony elements. From a functional perspective the bony elements must be held together in a manner that allows sufficient stability to allow the arms and upper body to be maintained in a stable upright posture but at the same time allow a high level of mobility. The stability of the spine is the result of the anatomic structure of the intervertebral disks, the shape and orientation of the facet joints, and the orientation and mechanical characteristics of the ligaments. The ligaments can be classified into two major groups: those that are long and straplike and extend over the length of the spine, such as the anterior and posterior longitudinal ligaments, and those that are shorter and span only one or two segments (Fig. 75-6).



fibers of which are almost perpendicular to and are attached to the anterior and inferior surfaces of the lamina above and to the superior and posterior surfaces of the lamina below. **C:** Superior view of a lumbar vertebra showing the positions of the various ligaments in the lumbar region. The anterior longitudinal ligament almost covers the anterior surface of the body of the vertebra, whereas the posterior longitudinal ligament covers only a portion of the posterior surface of the vertebra. Note also the cut supraspinous and interspinous ligaments, ligamenta flava, and articular joints. **D:** Posterior aspect of the vertebral body. The laminae and spinous process have been removed to show the posterior longitudinal ligament in the lumbar region. The ligament broadens and becomes intimately adherent as it passes over each of the intervertebral disks and over contiguous margins of the vertebrae. It is narrow and thick over the center of the body, however, from which it is separated by the basivertebral veins. This ligament is broad in the cervical region but at the L-1 vertebral level it begins to narrow progressively, so that on reaching the last lumbar and first sacral interspace it is only half of its original width. See text for a discussion of the implications.

The anterior longitudinal ligament is a broad band that lies on the anterior surface of the vertebral bodies and extends from the anterior tubercle of the atlas to the upper part of the pelvic surface of the sacrum. It consists of several laminae of fibers, the deepest spanning one intervertebral segment, while the most superficial extend over several segments. The anterior longitudinal ligament is thickest centrally, and it becomes progressively broader as it passes in a caudal direction. It is firmly united to the periosteum of the vertebral bodies but is free over the intervertebral disks. The anterior longitudinal ligament functions to limit extension of the vertebral column. In anterior crush injuries of the vertebral bodies, the anterior longitudinal ligament is ordinarily not injured, so that when the injured region is placed in hyperextension, this ligament can act as a splint to hold and fix the bony fragments.

The posterior longitudinal ligament lies on the posterior surface of the vertebral bodies and is therefore within the central vertebral canal. It extends from the posterior aspect of the body of the axis superiorly to the sacral canal below. It is attached firmly to the superior and inferior margins of the vertebrae and to the intervening disks, but over the centers of the vertebral bodies, there is a space through which blood vessels course to and from the posterior aspect of the vertebral body. The posterior longitudinal ligament functions in part to limit flexion of the vertebral column.

The vertebral arches are united by the ligamenta flava, intertransverse ligaments, interspinous ligaments, and supraspinous ligaments. The ligamenta flava are elastic in content and distinctly yellow. They join the contiguous borders of adjacent laminae and are attached to the front of the upper lamina and to the back of the lower lamina. They are stretched by flexion of the spine. Their elastic nature prevents redundancy and buckling when the ligament is slack. Thickening (hypertrophy) of

the ligament flava can contribute to compression of a nerve root at the intervertebral foramen.

Three collagenous, segmental ligaments further unite and stabilize the vertebral arch. The supraspinous and interspinous ligaments join adjacent spinous processes; the supraspinous fibers are superficial and join just the tips. They are extremely strong and limit flexion of the lumbar spine. The intertransverse ligaments run from transverse process to transverse process. They are thin and membranous in the lumbar spine. It is thought that they stabilize and limit intervertebral movement during lateral flexion.

The ligaments of the spine are richly innervated by both somatic and sympathetic fibers. A branch of the dorsal primary ramus, the sinuvertebral nerve, innervates all of the posterior ligaments and facet joints (1). A branch of the ventral primary ramus innervates the anterior longitudinal ligament. In spite of their extensive innervation, it is controversial whether or not pathologic processes affecting ligaments are a significant source of nociception for patients suffering from low back pain.