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Injury of the Lumbard in Degenerative Diseases of the Lumbar Spine

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Annotation. In this study, the pathomorphological changes that develop in the yellow ligament of the spinal canal in all types of degenerative diseases of the lumbar region of the spine were studied. As a material, fragments of corpus luteum covering the back border of the spinal canal were taken. The results show that in some degenerative diseases of the lumbar region, the yellow ligament is only hypertrophied, while in others, dystrophy, calcification develop, and ossification and deformation are observed in others. Hypertrophy and thickening of the yellow ligament of the spine develops after degenerative and inflammatory diseases and begins with the increase of histitic cells around the blood vessels and in the interstitial tissue. The hypertrophy of the yellow ligament is manifested by a sharp increase in collagen fibers, the development of the fibroelastosis process, the breakdown and destruction of elastic fibers, and a decrease in their quantity.

Keywords: spine, yellow ligament, degenerative diseases, morphology, calcinosis, calcification.

The urgency of the problem. Spinal ligament lies inside the spine and forms the posterior border of the spinal canal. If the corpus luteum thickens, the spinal canal narrows. Spinal stenosis can be congenital or acquired, but in any case, spinal stenosis can compress the spinal cord and lead to significant complications, including paralysis of the legs or pelvic dysfunction (1). This pathology is more common in men than in women, geographically it is more common in the population of Japan, North Africa, Afro-Americans. The causes of this pathology are not studied, in most cases they are associated with metabolic and endocrine diseases (2, 3). Morphologically, there is ectopic ossification of the yellow ligament, infiltration with fibroblast cells, calcification together with the dura mater of the spinal cord. Clinically, chronic myelopathy of the thoracic spine, muscle weakness, shoulder pain, and paresthesia in the legs are observed in most cases (4, 5). Computed tomography shows various degrees of thickening of the yellow ligament due to calcification and ossification, hypo- and hyperintense lines appear in the yellow ligament in magnetic resonance imaging (MRT). Pathology of the yellow ligament should be differentially diagnosed with degeneration of the ligaments of the spinal cord and meningioma (6, 7). The outcome of this pathology is often bad, it can lead to the development of myelopathy in the spinal cord and the development of irreversible changes in the brain. From the above discussion, it became clear that there is almost no information in the literature about the damage of the yellow ligament and the development of pathomorphological changes in various types of degenerative-dystrophic diseases of the lumbar region of the spine.

In this study, it was aimed to determine the specific aspects of the pathomorphological changes that develop in the yellow ligament in each of the degenerative-dystrophic diseases of the lumbar region of the spine

Material and methods. As the material of this scientific research, the yellow ligament connecting the vertebrae was taken during the surgical procedures performed in various types of degenerative-dystrophic diseases of the spine, i.e. discectomy, laminectomy, during 2019-2022 in the neurosurgery department of the ASMI clinic. Tissue pieces were fixed in formalin dissolved in 10% phosphate buffer for 72 hours, then all pieces were washed in running water for 3-4 hours, dehydrated in increasing concentrations of alcohols, and embedded in paraffin wax. Histological sections with a thickness of 5-7 μm were prepared from paraffin blocks and stained with hematoxylin-eosin and van Gieson, Weigert methods. The preparations were studied under a light microscope, and pictures were taken of the necessary areas

Morphological examination results and their discussion.

The yellow ligament of the spine is normally a sufficiently resistant and elastic tissue. In almost all types of degenerative diseases of the lumbar region of the spine, various pathomorphological changes develop in the yellow ligament. The following are the risk factors leading to it: age over 40, multiple pregnancies in women, high body weight, smoking, alcohol consumption, injuries. One of the main changes is the hypertrophy of the yellow ligament, which is diffusely thickened in one place - focally or throughout its area. Often, taking into account the anatomic-physiological structure and many injuries, it occurs in the spine of the lumbar region. Microscopically, the cells in it proliferate, fibrous fibers increase, sometimes it is determined that chronic inflammation has developed. The thickening of the yellow ligament can cause the following complications: narrowing of the spinal canal, paralysis of the limbs, dystrophy of the muscles of the shoulders, arms and legs, chronic diseases related to the autonomic nervous system, pathologies of internal organs, cerebral blood circulation disorders, kidney diseases, intestines, bile. Pathology of the gallbladder and pancreas. Sooner or later, the hypertrophy of the yellow ligament begins to have a negative effect. A change in the thickness or weight of the yellow ligament automatically narrows the spinal canal. If, in addition to it, there is a protrusion, fibrous hernia, displacement of the spine, its negative effect on the spinal cord will be even more severe. Compression of the spinal cord occurs especially when a herniated disc appears on the back side of the disc. This leads to total paralysis in the body. If this pathology develops in the neck or neck-chest region of the spine, it causes sudden cardiac arrest and respiratory paralysis.

In Schmorl's hernia, changes in the yellow ligament were found to have the following pattern. The cause of Schmorl's hernia is that the soft tissues of the spine develop rapidly due to the rapid growth of the body during the youth, the bone tissue lags behind the growth and a gap appears in the spongy part of the bone. It is determined that strong and irreversible dystrophic and destructive changes have developed in the vertebral column of the vertebral column, fibrous dysplasia and calcinosis have appeared, and the bone columns have lost their histotopography and entered a structureless state. Instead of the normal bone marrow cells, it is determined that blood clots, carbohydrate and protein matter, connective tissue tufts and calcinosis, and in some cases, complete lipomatosis have developed in the porous bone pores. In the structure of the elastic fibrous membrane covering the scapula, it was observed that the elastic fibers were disintegrated and homogenized, rough protein was formed, the interstitial substance became vacuolated and disintegrated, and the yellow ligament was relatively little damaged, and only the ligament was deformed and hypertrophied with a focus.

If we take into account that in the hernia of the lumbar region of the spine, mainly the bulging disc, fibrous membrane, surrounding ligaments are damaged, the yellow ligament is more damaged due to its proximity to these structural units. In fact, the yellow ligament consists of densely formed connective tissue. It contains collagen and elastic fibers, collagen fibers provide durability, and elastic fibers provide contractility. In the yellow ligament, there are significantly more elastic fibers than collagen fibers. Collagen fibers consist of bundles parallel to each other, among which elastic fibers occupy a place (Fig. 1). These total structures are first firmly attached to the outer membrane of the bone, and then adhere to the bone.

When the yellow ligament of the spine becomes hypertrophied and thickened, an inflammatory process begins in the tissue of the ligament, and the proliferation of histitic cells around the blood vessels and in the interstitial tissue is determined (Fig. 2). The increased histiocytic cells proliferate in situ and spread throughout the surrounding tissue, producing an excess of collagen fibers. As a result, the collagen fibers in the yellow ligament change their order and are placed in a disorderly manner.

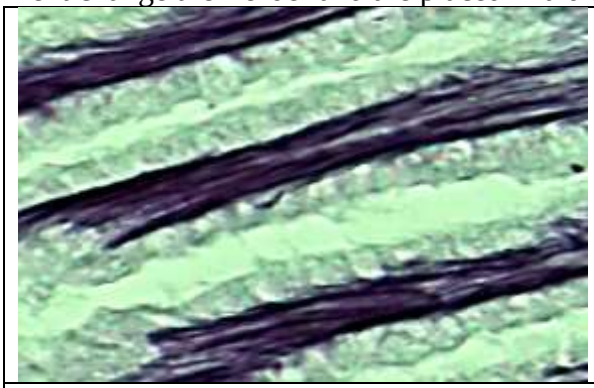

Figure 1. Spinal cord yellow. Elastic fibers are located in the form of dense tufts located separately from each other. Dye: Weigert's method. Floor: 10x100.

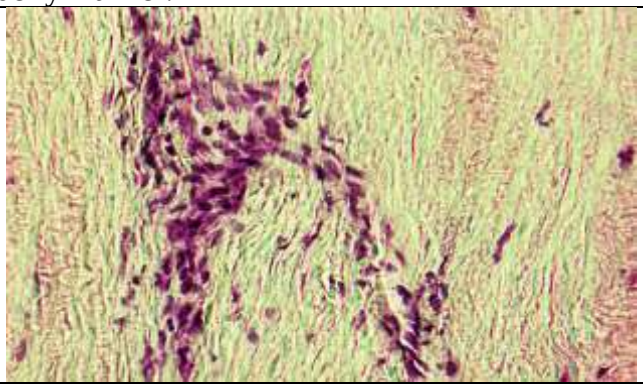

Figure 2. Hypertrophy of the yellow ligament. Focal and scattered proliferation of histiocytic cells. Paint: G-E. Floor: 10x40.

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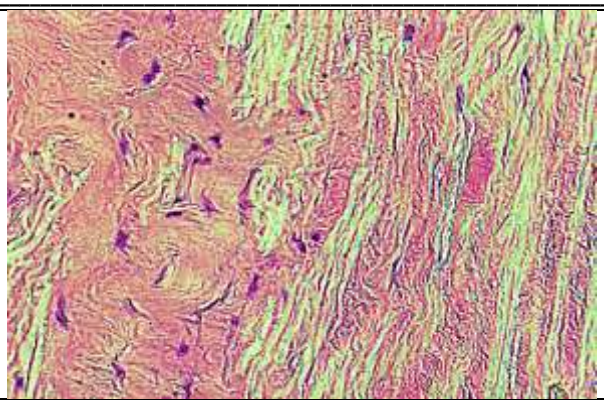

Fig. 3, Hypertrophy of the yellow ligament. Fibrocytes and fibrous structures multiply and occupy a large area. Paint: G-E. Floor: 10x40.

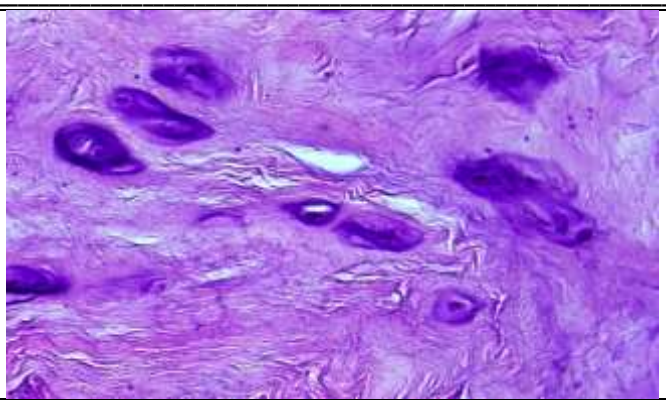

Figure 4. The yellow ligament tissue becomes inflamed and calcinosis foci appear. Dye: van Gieson method. Floor: 10x40.

Fibrocytes in bundles of yellow ligament collagen fibers undergo proliferative activation and increase in number, the amount of collagen fibers around them increases dramatically. In some places of the yellow ligament, it is observed that collagen fibers have increased sharply, fibrous tissue areas occupying a large area have appeared, and in some places they have become homogenized and turned into fibroelastosis (Fig. 3). In other areas of the yellow ligament, it is determined that the collagen fibers are thinned, homogenized in some places and distributed among the elastic fibers. In the process of hypertrophy and thickening of the yellow ligament, it is observed that elastic fibers atrophy and decrease in the ligament tissue, collagen fibers are produced in large quantities, occupying most of the structural area of the yellow ligament. When the van Gieson method is used from the histochemical methods for the determination of collagen fibers in the connective tissue, it is determined that most of the area of the yellow connective tissue is occupied by collagen fibers positively stained with red picrofuchsin. It is observed that the amount of elastic fibers between the collagen fibers has decreased and gaps have appeared in some places.

Osteophytes appearing on the front edge of the spine in spondylosis have been proven to have a morphologically concentric structure, fibrous structures and main substance are chaotically located, and consist of tissue rich in calcification (Fig. 4) and pigmentation foci. In the vibrating core, it was found that the chondroid substance was roughened, its coloring was disturbed, its fibrous structures and interstitial substance were dispersed and thickened, the number of chondrocytes increased, and they underwent processes such as dystrophy and destruction in various degrees. In chronic spondylosis, it was confirmed that the chondrocytes in the nuclear tissue of the patient were completely destroyed and necrobiized, turned into structureless substances, and calcification foci appeared. As a result of the penetration of osteophytes into the fibrous tissue of the disc, its fibrous structures are fragmented, destroyed, a coarse dispersed substance appears, and the development of calcification and chondromatous metaplasia has spread to the surrounding connective tissue, hypertrophied in the connective tissue, calcification, ossification has developed in some areas, and the spinal canal has developed. it was found that it was narrowed.

In spondyloarthrosis of the lumbar spine, all the tissue structures in and around the joint, including the articular cartilage, metatarsal bone, ligaments, fibrous membrane, yellow ligament, and surrounding muscles were damaged. In the intervertebral disk of the joint, interstitial chondroid substance was found to be affected by protein and carbohydrate dystrophy, chondrocytes were randomly arranged, their nuclei were pyknozal, and vacuolization in the cytoplasm was found. In the bone tissue under the ankle of the joint, deformation of hard bone columns, vacuolization of osteoid substance, destruction of fibrous structures in it, and the appearance of calcinosis foci in all parts of the joint were observed. In the interstitial tissue of the fibrous tissue around the facet joint, hydration develops due to the transformation of mucopolysaccharides into an acidic environment, swelling occurs, as a result, the deformation and destruction of the fibrous structures was observed. destruction of myofibrils due to dystrophic changes in muscle fibers was found

Conclusion

- In some degenerative diseases of the lumbar spine, the yellow ligament is only hypertrophied, while in others, dystrophy, calcification develop, and ossification and deformation are observed in others.
- Hypertrophy and thickening of the yellow ligament of the spine, developing after degenerative and inflammatory diseases, it begins with the increase of histitic cells around the blood vessels and in the interstitial tissue.
- Hypertrophy of the yellow ligament is manifested by a sharp increase in collagen fibers, the development of the fibroelastosis process, the breakdown and destruction of elastic fibers, and a decrease in their quantity.

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