**INTRODUCTION:**

The hypertrophy or ossification of the ligamentum flavum (LF) sometimes causes neurological symptoms due to compression of the spinal cord or nerve root. The hypertrophy of LF is one of the important factors for lumbar spinal canal stenosis. The clinical significance of LF is well recognized, but its histology is not well understood.

In this study, we undertook histology of samples from patients to identify the type of layers along its thickness. The effect of different types of layers on the biomechanics of LF was investigated using the finite element technique.

**METHODS:**

*Histological evaluation of the ligamentum flavum*

Ten ligamentum flavum were collected during surgeries for degenerative lumbar spinal canal stenosis after written informed consent was obtained. The mean age of the patients was 57.1 years, and ranged between 34 to 75 years. The ligament was sagittally cut for the purpose of comparison between deep dural and superficial dorsal layers. The cut samples were fixed in 10% formalin for 48 hours, and embedded into a paraffin block. Thin-sliced sections (4 micro-m) were prepared and stained using two staining techniques; i.e. Trichrome (T) stain to evaluate the collagenous fibers, and Verhoeff-Van Gieson elastic stain (VVG) to evaluate the condition of elastic fibers.

*Biomechanical study:*

To understand the biomechanical role of the thin collagenous layer, we used finite element (FE) method. We modified an experimentally validated three dimensional intact L3-S1 motion segment FE model (FEM). This model has been previously used to access a variety of clinical issues (1,2,3,4). In the altered model, the 35 mm thick LF was represented as seven layers. Each layer consisted of seven cables; therefore, a total of 49 cables were used for the ligamentum flavum in the modified model.

**RESULTS and DISCUSSION:**

*Histological study:*

Since LF consists mainly of elastic fibers rather than collagen fibers, most of the area was stained in black color in VVG stain. Also, in T stain there was a small blue color stained area indicating collaginous tissue (fibrosis).

**CONCLUSION:**

In conclusion, a distinctive collagenous layer was clarified to exist in the ligamentum flavum at the dural most aspect, and this relatively stiff layer would prevent the deeper site of the LF against mechanical loading/ stretching, which can cause stress-related injury, during lumbar motion. This could keep the deeper site, where neural tissue is close, intact.

**REFERENCES:**


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