

# IMPACT OF POSTERIOR COLUMN ON VISCOELASTIC PROPERTIES OF INTERVERTEBRAL DISC IN DYNAMIC TEST

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## Introduction

A viscoelastic structure of soft tissue can be characterised by analyzing energy dissipation [Wilke, 1998]. Knowledge about viscoelastic properties of intervertebral disc (IVD) is used in various studies [Gadd, 2011, Żak, 2012].

The aim of this study was to determine impact of posterior column on the biomechanical properties of the intervertebral disc in compression test.

## Material and Methods

Thoracic spine segments (Th8-Th11) was collected from 6 pigs at the age of 8-10 months. Mechanical properties of IVD were determined between two group: APC- 5 intact segments (with anterior and posterior column) and AC- 5 segments without posterior column. Compression test was conducted for 100000 cycles at a frequency of 2Hz (increased to constant load from 150N to 650N). The changes in height of IVD and energy in the following load cycles hysteresis were analyzed in this study. To characterize viscoelastic properties of IVD was used the factor (VEF) defined as:

$$VEF = \frac{\Delta E}{E_L} = \frac{E_L - E_U}{E_L} \quad (1)$$

where:  $\Delta E$  - is energy dissipation in hysteresis and  $E_L$  - energy of load hysteresis,  $E_U$  - energy of unload hysteresis.

## Results and Discussion

This work have showed decrease height loss of IVD up to 25000 cycle and then value reached constant until the end of the test. Height loss were by about 45% higher in AC segments than in intact segments APC (Fig 1).

The viscoelastic properties of segments with only anterior column (AC) was smaller than segments with anterior/posterior column (APC). However the value of VEF of intervertebral disc was similar in the following load cycles hysteresis in both group (Fig 2). According to Koeller *et al* value of VEF is approaching to 0 classified material as a more elastic and when the value is close to 1 material has more viscous properties [Koeller, 1984]. Factor of

viscoelastic properties (VEF) was by about 20% higher in APC segments than AC segments.

These research demonstrate that intervertebral disc have much higher elastic properties regardless of the presence of posterior column.

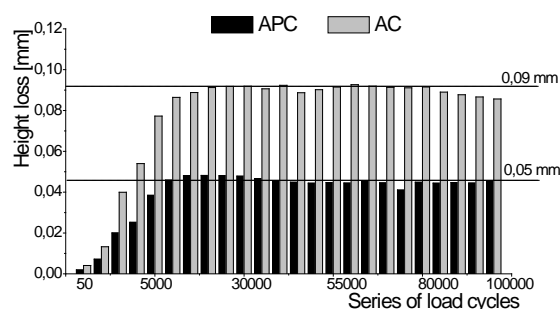


Figure 1: Height loss in the following load cycles hysteresis.

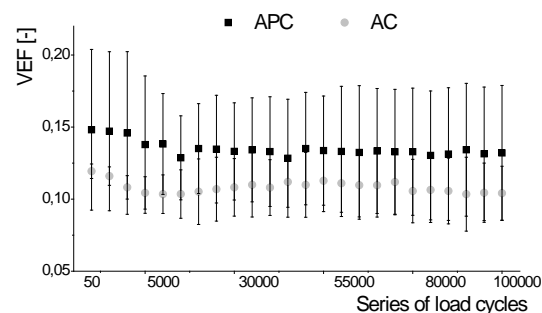


Figure 2: Factor of viscoelastic properties (VEF) in the following load cycles hysteresis.

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## References

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