

Effect of Continuous, Repeated and Intermittent Pressure on the Biomechanical and Histological Characteristics of Guinea Pig Skin

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Abstract

In this study 22 male Guinea Pigs, 4-6 months old, weighting 400-450 g were used. A computer controlled indenter system was used to apply a controlled pressure. The applied pressure was 291 mmHg for 3 hours over the trochanter region of animal hind limb. The animals were divided in three groups; in group 1, pressure was applied 3 hours continuously, in group 2, pressure was applied 90 minutes at two days and in group 3, Pressure was applied in two cycles of 90 minutes with 15 minutes rest between them. To study the biomechanical and histological changes, tissue was removed 7 days after pressure application. Uniaxial tensile test was performed at a deformation rate of 20 mm/min. In this test, the contralateral site on the experimental animal served as intra-animal control. Tissue biopsy was taken and stained with H&E and Trichorome for histological examination. Continuous pressure induced muscle necrosis. Also ultimate stress, stiffness, ultimate strain and area under the load-deformation curve decreased significantly. These results suggest that application of continuous pressure is the major cause of ischemia and necrosis of soft tissue.

Keywords: External pressure; Ischemia; Skin; Biomechanical characteristics; Tensile strength

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¹ Necrosis
⁵ Langer's line
⁹ Stiffness
¹³ Repeated

² Ischemia
⁶ Daniel
¹⁰ Doillon
¹⁴ Cyclic

³ Viscoelastic
⁷ Edsberg
¹¹ Stress-Strain Test
¹⁵ Turnover

⁴ Non-Isotropic
⁸ Uniaxial Tensile Test
¹² Static

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¹⁶ Computer controlled indenter system

¹⁷ Driver

¹⁸ Pulse Width Modulation

¹⁹ Analog to Digital

²⁰ Direct Current

²¹ Strain Gauge

²² Look Up Table

²³ Xylazin

²⁴ Ketamin

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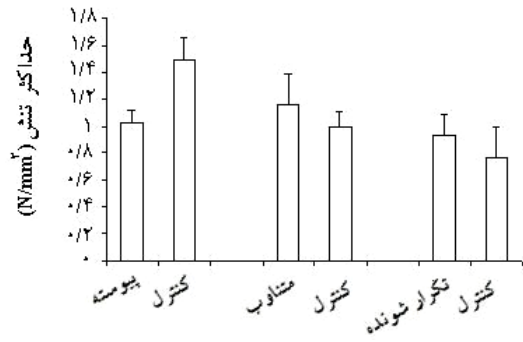
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²⁵ Chloroform
²⁹ Hematoxilin-Eosin
& Co, ulm- Einsingen, Germany
³⁶ Kolmogorov-Smirnov

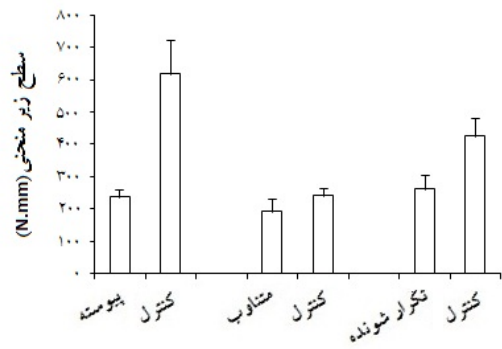
²⁶ Intra-animal Control
³⁰ Masson's Trichrome
³³ Elastic Modulus
³⁷ Nonparametric

²⁷ Normal Saline Solution
³¹ Tensiometer
³⁴ Maximum Force

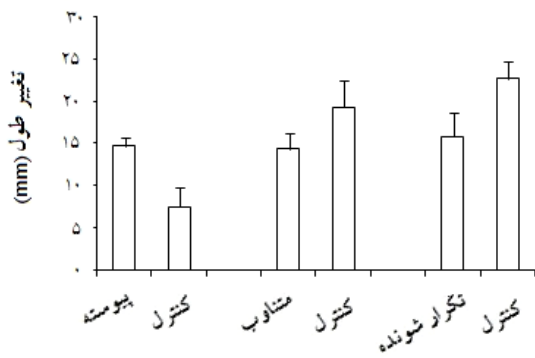
²⁸ Formal Saline Solution
³² model Z 2.5, Zwick GmbH
³⁵ SPSS



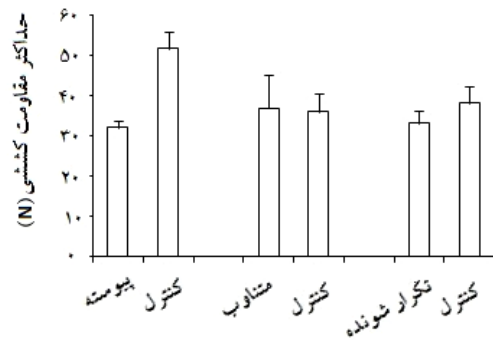
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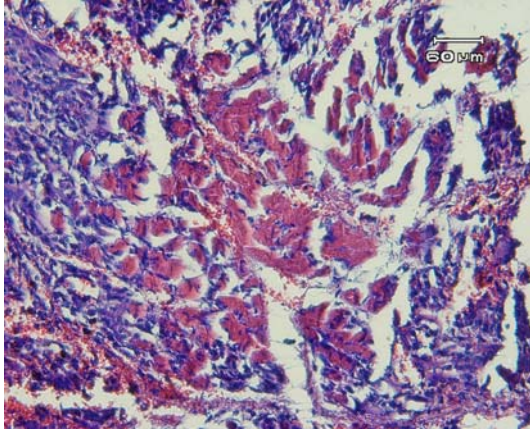
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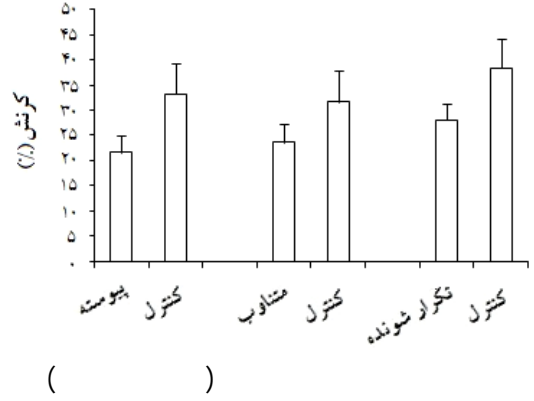
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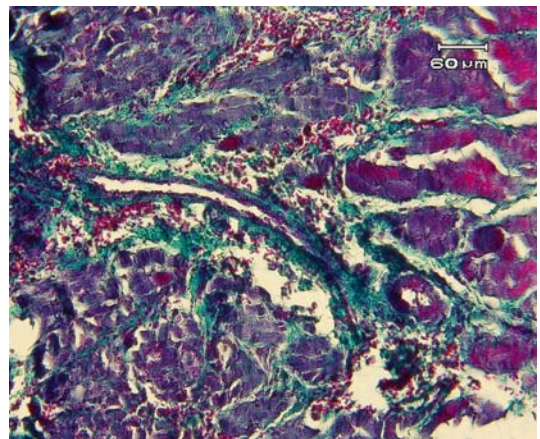
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⁴⁹ Kosiak
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⁵² Pletismography

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