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Formation of reactive oxygen species in the aquatic humor of the anterior chamber of rabbits after standard, accelerated and pulsed-light accelerated UV-A cross-linking

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Aim: Accelerated (A-CXL) and Pulsed-light accelerated (p-A-CXL) UV-A cross-linking – are modified techniques of standard UV-A corneal cross-linking. It is important to compare Standard, Accelerated and Pulsed-light accelerated UV-A corneal cross-linking to assess production of reactive oxygen species (ROS) in the aqueous humour of the anterior chamber.

Methods: The experiments were carried out on 27 Chinchilla rabbits. In all experimental groups Epi-Off, UV-A light 370 nm, 0.1% Riboflavin + 20% Dextran was used. 1st group (6 rabbits) – intact (control); 2nd group (16 rabbits) – Standard UV-A corneal cross-linking (S-CXL)– 3 mW/cm² - 30 min; 3rd group (16 rabbits) – Accelerated UV-A corneal cross-linking (A-CXL) – 18 mW/cm² - 5 min; 4th group (16 rabbits) – Pulsed-light accelerated UV-A corneal cross-linking (p-A-CXL) – 18 mW/cm² - 10 min (1 sec on/1 sec off).

Results: In all of the studied groups UV-A cross-linking contributed to an increase in the parameters of spontaneous luminosity and the light sum of the luminescence of LD CL. The increase in LD CL values indicates an increase in the production of ROS in the model system. The growth rate of spontaneous CL (at the 1st day) in comparison with the control was: S-CXL – 167±14.2%; A-CXL – 142±16.0%; p-A-CXL – 137±12.5%. The growth rate of the the light sum CL (at the 1st day) in comparison with the control was: S-CXL – 182±16.3%; A-CXL – 165±13.9%; p-A-CXL – 178±15.4%. The maximum level of the light sum luminescence CL was recorded after 1 day, and not 1 hour after CXL. This is due to the preservation of traces of riboflavin in the aqueous humour of the anterior chamber after 1 hour after CXL.

Conclusions: The increase in production of ROS in the aqueous humour of the anterior chamber is revealed, which is manifested by an increase in the values of the light sum of luminol-dependent chemiluminescence (165-182%, $p<0.05$-$p<0.01$) 1 day after CXL with a further decrease in the indicator on the 4th day. Significant differences with S-CXL, A-CXL and p-A-CXL are not established.

Notes: