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Expression of Endothelial Tight Junction Protein Occludin under Mechanical Factors after Stent Implantation

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Abstract: Tight junctions are the most apical intercellular junctions of the lateral membrane in endothelial cells, regulating the paracellular material and energy exchange and maintain plasma membrane polarity. Occludin protein is one of the important proteins involved in endothelial tight junctions, and also closely related to the occurrence of atherosclerosis. Therefore, the study of occludin is valuable [1]. With the implantation of coronary stents, the integrity of the vascular endothelium is damaged and the local mechanical environment at the stent segment was changed [2]. The present study tried to explore the impact of mechanical stimulation after stent implantation on the expression of occludin by cell and animal experiment. *In vivo* experiments were developed in two animal modes, carotid ligation of $ApoE^{-/-}$ mice for 48 h and abdominal aorta poly (L-lactic acid) stents implantation of male SD rats for indicated time (1 week, 1 month, 3 month and 1 year). HUVECs were exposed to 40 kpa static pressure, 5 dyn/cm^2 (low shear stress, LSS) and 12 dyn/cm^2 (high shear stress, HSS) fluid shear stress for 6 hours and 12 hours respectively. After loading, cell lysate were collected to gene analysis and Western blotting. In addition, the loaded cell were immunofluorescence stained. In animal model, $ApoE^{-/-}$ mice were given carotid ligation for 48 hours and analyzed expression level of occludin by qPCR. Male SD rats were applied PLLA stents implantation. Sample sections were taken at one week, one month, three months and one year, respectively. The sample sections were stained with immunofluorescence. Compared to control, the expression of occludin in endothelial cells extremely significantly increased after loading for 6 hours at static pressure, LSS and HSS. After loading at 40 Kpa static pressure for 12 hours, occludin protein contents in endothelial cells significantly increased. At the same time, we observed that occludin fluorescence intensity increased significantly. In animal model, the expression of occludin extremely significantly increased, compared to control. Three months after stent implantation, the fluorescence intensity of the sample was the strongest. At last, we tried to explore the impact of mechanical stimulation after stent implantation on the expression of occludin. We observed that the expression of occludin and the intercellular junction increased in endothelial cells after loading 40 Kpa static pressure, LSS and HSS for 6 and 12 hours. Moreover, the expression of occludin was significantly higher in LSS than HSS. So LSS has greater effect on the intercellular junction in endothelial cells, compared with HSS. In animal models, the results were consistent with those of cell experiments. Therefore, we speculate that the permeability of endothelial cells will change accordingly under these conditions.

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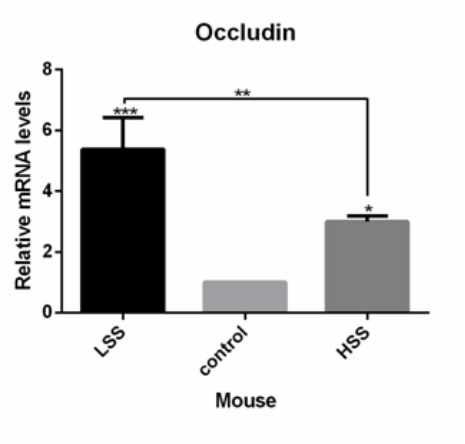

Figure 1. Quantitative analysis of *occludin* in ApoE-/- mice was given carotid ligation for 48 hours.

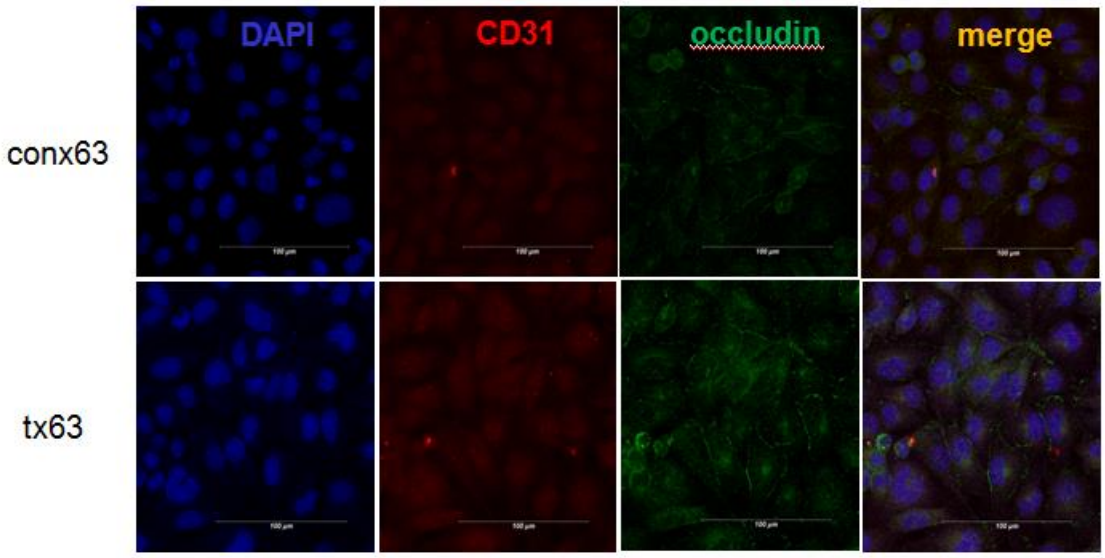

Figure 2. Immunofluorescence staining of HUVECs after loading 40 Kpa for 12 hours.

Keywords: Occludin; stent implantation; mechanical stimulation; tight junction.

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