

Effects of *Salvia Miltiorrhiza* on Zero-Stress State of Rat's Abdominal Aorta

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Summary

The root of *Salvia miltiorrhiza* bunge, Danshen, is a traditional Chinese herb known to prevent hypertension. However, the mechanism of how Danshen affects the mechanical properties of blood vessel is not clear. In this project, we studied the effects of Danshen on zero-stress state of rat's abdominal aorta, which is the basic configuration of blood vessel affected solely by intrinsic parameters.

Sprague Dawley rats, male, around 350g, were used. The zero-stress state of a blood vessel can be very different from the *in vivo* state and the no-load state of the vessel. At the *in vivo* state, the rat's abdominal aorta was subjected to blood pressure and longitudinal stress. After dissecting from the abdominal aorta above the bifurcation of left and right ileal arteries, the aortic specimens were cut into small rings with 1mm height; and the rings were placed on the small wells filled with Krebs solution bubbled with a gas of 95% O₂-5% CO₂ at 37°C. The arterial small rings were at no-load state, in which the internal pressure, external pressure, and longitudinal stress in a short ring-shaped segment were all zero; however, there were residual stress and strain in the wall of the segment. By cutting radially to release the residual stress in the wall, the vessel ring opened up into a sector quickly; at 20 min after cutting, the sector's configuration would not change and was defined as the zero-stress state of a blood vessel, which was characterized by its residual strain and opening angle, the angle subtended between two radii, with origin located at the midpoint, and tips at the outer edges of the endothelium. Then Danshen extract prepared with methanol was added in the Krebs solution, and the changes of the aorta's zero-stress state were monitored by taking photos routinely for analysis to determine the opening angle, residual strain, and residual stress. Additionally, other sets of samples were tested in a solution of norepinephrine-Krebs solution as positive control or a methanol-Krebs solution as negative control, respectively.

It was demonstrated that the zero-stress state of rat's abdominal aorta was affected by the Danshen extract and norepinephrine in two different patterns, while the methanol-Krebs solution did not have similar effects. These results may help us better understanding the anti-hypertension effect of Danshen.

