

[2007] [357] Comparative effects on LV performance, arterial hemodynamics and ventriculo-arterial coupling of two models of coronary artery occlusion in pigs

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Objective: To evaluate the hemodynamic effects of two models of coronary artery occlusion in pigs.

Methods: Experiments were performed in 12 pigs in which LV function was assessed by the slope (Ees) of ESPVR and stroke work (SW), and systemic arterial properties, including peripheral resistance (R2), compliance (C), and arterial elastance (Ea) with a windkessel model. Ventriculo-arterial (VA) coupling was defined as Ees/Ea, and mechanical efficiency as SW/pressure-volume area (PVA). After baseline, the pigs were randomised in 2 groups: in group LIG (n = 6), the LAD coronary artery was ligated, while in group FeCl3 (n =6), it was wrapped for 45 minutes with a strip saturated with FeCl3. The animals were followed for three hours.

Results: LAD coronary artery flow dropped immediately to zero in group LIG, but progressively decreased in group FeCl3 (occlusion time 23.2±1.2 min). In group LIG, mean aortic pressure (Pmean) and flow (Qmean) decreased abruptly, between baseline and T60, from 101±3 to 78±6 mmHg and from 56.4±5.4 to 34.9±3.8 ml/sec, respectively, while heart rate (HR) was unchanged; R2 and Ea increased from 1.77±0.33 to 2.33±0.22 mmHg.sec/ml, and from 3.12±0.22 to 4.24±0.28 mmHg/sec, respectively, while Ees dropped from 2.7±0.3 to 1.7±0.4 mmHg/sec. As a consequence, VA coupling fell from 0.90±0.19 to 0.41±0.12. SW and PVA decreased from 4963±596 to 2712±225 mmHg.ml and from 5371±358 to 4553±309 mmH.ml, while SW/PVA dropped from 0.85±0.12 to 0.59±0.06. Most significant hemodynamic changes were observed in the first 30 min after the LAD ligation. In group FeCl3, Pmean remained constant, while Qmean progressively decreased from 57.8±6.6 to 47.3±5.5 ml/sec, and HR increased from 107±10 to 142±13 beats/min, between baseline and T180; R2 and Ea increased from 1.72±0.22 to 1.95±0.28 mmHg.sec/ml, and from 2.99±0.33 to 3.55±0.22 mmHg/sec, respectively, while Ees decreased from 2.7±0.4 to 2.2±0.3 mmHg/sec. As a consequence, VA coupling fell from 0.90±0.16 to 0.63±0.18. SW and PVA decreased from 4903±157 to 3744±299 mmHg.ml and from 5733±366 to 5137±299 mmH.ml, while SW/PVA dropped from 0.85±0.07 to 0.72±0.07. Most hemodynamic changes observed in the FeCl3 were progressive.

Conclusion: Progressive coronary artery occlusion, as obtained by topical FeCl3 application, is responsible for a less impaired hemodynamic condition. This model, closer to the clinical condition of coronary artery thrombus formation, could be more suitable to assess pharmaceutical or mechanical cardiac support during acute myocardial ischemia.

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