TITLE: DEPRESSED REFLEX CORONARY VASOCONSTRICTION IN CONSCIOUS DOGS WITH RIGHT VENTRICULAR HYPERTROPHY

AUTHORS: P.A. Murray, Ph.D. and S.F. Vatner, M.D.

AFFILIATION: Department of Anesthesiology and Critical Care Medicine, The Johns Hopkins Med- 
Institutions, Baltimore, MD 21205 and the Department of Medicine, Harvard 
Medical School and Brigham and Women's Hospital, Boston, MA 02115

Introduction: The development of chronic, pressure-overload right ventricular hypertro- 
phy (RVH) alone or in combination with right heart failure is characterized by a markedly 
 depressed a-adrenergic mediated reflex in- 
crease in right coronary vascular resistance in response to carotid sinus hypoten- 
sion. The exact locus of dysfunction responsible 
for this abnormal reflex response, and the 
extent to which this abnormality reflects a 
generalized depression in overall reflex car- 
diovascular control with RVH is unknown. The 
goal of the present study was to assess the 
effects of severe RVH on reflex chronotropic, 
coronary and peripheral vascular responses to 
carotid chemoreflex activation (CCRA), a po- 
tent reflex stimulus that activates both the 
parasympathetic and sympathetic nervous sys- 
tems. In this study, CCRA is utilized as a 
powerful experimental tool to identify mech- 
anisms responsible for abnormal reflex con- 
trol of the circulation, which may be im- 
portant during the anesthetic induction of 
patients with RVH.

Methods: Seventeen conditioned, mongrel 
dogs were chronically instrumented with right 
main coronary (Doppler) and iliac artery 
(electromagnetic) flow transducers, a solid 
state transducer in the right ventricle, ca- 
theters in the aorta and carotid artery, ven- 
tricular pacing electrodes, and a hydraulic 
occulder around the main pulmonary artery. 
Heart rate was induced by gradually inflating 
the pulmonary artery occluder over a 9-12 month 
period. CCRA was achieved by injecting min- 
ute quantities of nicotine (0.4 ug/kg) into 
the carotid artery. All experiments utilized 
conscious dogs with controlled respiration 
during succinylcholine chloride infusion (0.1 
mg/Kg/min; iv). Student's t-test for paired 
comparisons was utilized to assess the ef- 
effets of CCRA on the measured variables. 
Student's t-test for grouped comparisons was 
employed to assess differences in the re- 
sponses of the measured variables to CCRA 
between 9 dogs subjected to chronic pulmonary 
artery stenosis and 8 normal dogs. Values 
presented are mean ± 1 SEM.

Results: Chronic pulmonary artery steno- 
sis increased (p<0.01) RV weight to body 
weight ratio from 1.36 ± 0.05 g/kg to 2.74 ± 
0.18 g/kg. As summarized in Table 1, RVH was 
characterized by a marked attenuation in the 
magnitude of the right coronary vasoconstric- 	or response to CCRA (heart rate constant). 
The attenuated CCRA-induced increase in right 
coronary resistance was not enhanced following 
a-adrenergic blockade (27 ± 5%), but was abol- 
ished (p<0.01) following a-adrenergic block- 
ade (5 ± 4%). In contrast to this abnormal 
coronary response, CCRA-induced constriction 
of the iliac artery bed was normal, and the 
CCRA-induced increase in cardiac cycle length 
was slightly enhanced in dogs with RVH.

Discussion: These are the first data to 
describe the effects of severe RVH on reflex 
cardiovascular responses to CCRA. The most 
striking finding of this study was that the 
magnitude of the CCRA-induced coronary vaso- 
constriction was markedly attenuated follow- 
ing the development of RVH. It appears un- 
likely that this attenuated right coronary vasoconstriction reflects a generalized abnor- 
mality in reflex responsiveness to CCRA, be- 
cause the parasympathetic CCRA-induced in- 
crease in cardiac cycle length was slightly enhanced 
in dogs with RVH. Moreover, the 
attenuated right coronary constriction is 
apparently not the result of an overall de- 
pression in reflex sympathetic a-adrenergic 
vascular responsiveness to CCRA, because a- 
adrenergic constriction of the iliac artery 
vascular bed was entirely normal. Thus, 
these results imply a somewhat selective 
abnormality in sympathetic a-adrenergic con- 
trol of the coronary circulation supplying 
the hypertrophied right ventricle.

Table 1. Late Response to Selective Carotid 
Chemoreflex Activation

<table>
<thead>
<tr>
<th>Control</th>
<th>Response (A%)</th>
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<tbody>
<tr>
<td>Mean Arterial</td>
<td>Normal 119 ± 3 19 ± 4*</td>
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<tr>
<td>Pressure (mmHg)</td>
<td>RVH 126 ± 2 14 ± 3*</td>
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<tr>
<td>Right Coronary</td>
<td>Normal 20 ± 2 -24 ± 4*</td>
</tr>
<tr>
<td>Flow (ml/min)</td>
<td>RVH 36 ± 3 -13 ± 3*</td>
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<tr>
<td>Right Coronary</td>
<td>Normal 6.2 ± 0.6 62 ± 13*</td>
</tr>
<tr>
<td>Resistance (mmHg/ml/min)</td>
<td>RVH 3.6 ± 0.5 33 ± 7*</td>
</tr>
<tr>
<td>Iliac Artery</td>
<td>Normal 143 ± 9 -68 ± 4*</td>
</tr>
<tr>
<td>Flow (ml/min)</td>
<td>RVH 117 ± 8 -72 ± 7*</td>
</tr>
</tbody>
</table>

Cardiac Cycle

| Normal 629 ± 25 348 ± 27* |
| Length (msec) | RVH 602 ± 51 452 ± 47* | NS |

*Significant (p<0.01) effect of CCRA on mea- 
sured variables. p values represent compari- 
sions between normal dogs and dogs with RVH. 
NS is not significant.

References:
I. Murray PA, Vatner SF: Carotid sinus baro- 
receptor control of right coronary circula- 
tion in normal, hypertrophied and failing 
right ventricles of conscious dogs. Circ Res 