

## NARROWED CORONARY ARTERIES, HALOTHANE, AND PARADOX.

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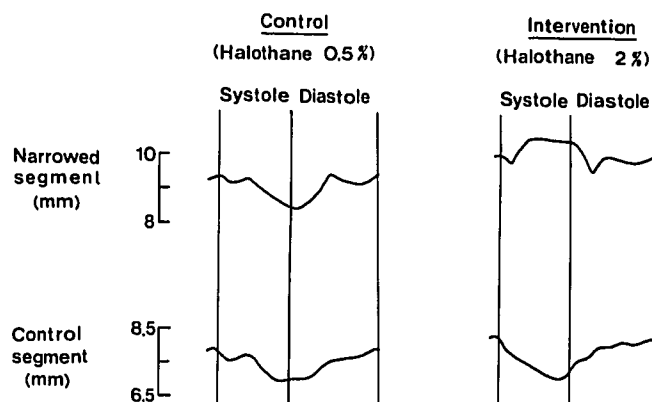
**Introduction:** These studies were performed to define the effect of increased inspired halothane concentration (H) upon left ventricular function in areas supplied by a narrowed coronary artery as compared to an area supplied by a normal coronary artery.

**Methods:** Pairs of miniature (1.5mm) ultrasonic length detectors (ULD) were implanted in subendocardial muscle supplied by LAD and circumflex coronary arteries in open chest, thiopental induced, halothane 0.5% anesthetized dogs (n=5). LAD was narrowed distal to the second diagonal branch by a micrometer controlled snare until performance in LAD segment was impaired. The snare was then released 0.025-0.050" until performance returned to the previous level. Control measurements were obtained. H was increased by 0.5% increments at 10 minute intervals from 0.5 to 2.0%, and returned to 0.5%. Abrupt elevations from 0.5% to 1.5% or 2% were also performed. Length between each pair of ULD was recorded continuously. Maximum systolic shortening and end diastolic length were obtained. Left ventricular pressure, arterial BP and heart rate were measured by standard methods.

**Results:** (a) After H was increased, paradoxical motion occurred in the segment supplied by the narrowed coronary artery (narrowed segment) in every dog. This was never observed in the segment supplied by the normal coronary artery (control segment) (Figure 1). (b) Greater depression of ventricular performance was observed in the narrowed segment than the control segment at all levels of H (Table 1). The progressive increase in end diastolic length associated with increasing H was greater in the narrowed segment than the control segment. ( $8.1 \pm 1.5\%$  vs  $9.9 \pm 1.7\%$ ;  $p < .05$ ). (c) In two of five animals, enhanced performance of the control segment occurred when the narrowed segment became depressed despite increased H.

**Discussion:** A narrowed coronary artery may more closely mimic conditions present in patients with coronary artery disease (CAD) without a recent myocardial infarction than an occluded coronary artery, as employed experimentally in the past. ULD is an accurate method for continuous length measurement of ventricular segments and regional ventricular function. The present studies indicate that a given H has a more depressive effect upon performance of myocardium supplied by a narrowed coronary artery than of myocardium supplied by a normal coronary artery. Paradoxical motion may be produced by normal clinical concentrations in ventricle supplied

by a narrowed coronary artery. The mechanism for these observations has not been defined, but it may not be related only to perfusion pressure, as they were observed even when arterial BP was maintained. The studies suggest, (a) despite normal control ventricular function, patients with CAD may sustain circulatory failure at lower H than patients without CAD and, (b) halothane administration may be associated with profound impairment of regional ventricular function in the heart with localized CAD despite absence of gross global ventricular dysfunction.



**Figure 1.** Normal systolic shortening occurs in both narrowed and control segments during control conditions. During administration of 2% halothane lengthening occurs during systole in the area supplied by the narrowed coronary artery, whereas systolic shortening is maintained in control segment.

**Table 1.**

Percent Decrease in Systolic Shortening *			
Halothane %	1.0%	1.5%	2.0%
Control Segment	5.2 (3.5)	6.5 (7.0)	11.1 (11.8)
Narrowed Segment	27.7 (4.7)	59.9 (8.6)	73.9 (9.3)
n	6	10	11
Sig.	<.01	<.001	<.005

\* Mean (S.E.M.).