

iment above for an entire cardiac cycle; note that the portion used for analysis of T is between maximum negative dP/dt and mitral valve opening (estimated as LVEDP of the preceding beat). The plot was generated using high fidelity pressure transducers, an analog-to-digital convertor, and special computer software to produce dP/dt from the digitized pressures and time. Since Swanson and Muir did not use an A/D convertor to capture their data, the differentiated pressures might be difficult for them to obtain.

We cannot predict whether the method of analysis herein proposed would change the conclusions of Swanson and Muir. Thompson *et al.*⁵ have shown that techniques using equation 1 underestimate T . In fact, however, T may be either overestimated or underestimated, since the P axis intercept (P_{asym}) from equation 4 may be positive or negative (cf figure 3 from reference 6). The error becomes greater as P_{asym} becomes increasingly different from zero. When values of T are compared between interventions that may change P_{asym} (such as halothane or ischemia), both the absolute values and the conclusions may suffer. Most investigators have abandoned the equation 1 model.⁴⁻⁶

Finally, it is well to note that the pressure-time asymptote (or the pressure axis intercept in the dP/dt versus P plot) is not necessarily identical to the actual physiologic pressure to which the system decays. The issue is really the "apparent" value of P_{asym} that applies over the range of $P(t)$ that is analyzed for T . Over another pressure range, different values of both P_{asym} and T may be obtained. An outstanding feature of the dP/dt versus P display is that simple inspection will reveal the extent to which any portion of the relationship does or does not follow the presumed monoexponential fall-off.

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In Reply:—Drs Beattie *et al.* point out a fundamental analytical error in our data describing left ventricular relaxation. We agree with their assessment, and appreciate their critical reading of our manuscript.

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Use Caution when Extrapolating from a Small Sample Size to the General Population

To the Editor:—Sears *et al.* recently reported "that the administration of a second dose of succinylcholine to healthy adult patients after induction with ketamine is safe with respect to cardiac rate and rhythm."¹ They based this conclusion on the results of a study performed on eight patients. We believe their conclusion is too strong. Because they encountered no dysrhythmias and did not have a statistically significant

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REFERENCES

1. Swanson CR, Muir WW: Simultaneous evaluation of left ventricular end-systolic pressure-volume ratio and time constant of isovolumic pressure decline in dogs exposed to equivalent MAC halothane and isoflurane. *ANESTHESIOLOGY* 68:764-770, 1988
2. Simon AC, Safar ME, Lenenson JA, London GM, Levy BI, Chau HP: An evaluation of large arteries compliance in man. *Am J Physiol* 235:H550-H554, 1979
3. Liu Z, Brin KP, Yin FC: Estimation of total arterial compliance: An improved method and evaluation of current methods. *Am J Physiol* 251 (Heart Circ Physiol 20):H588-H600, 1986
4. Weisfeldt ML, Weiss JL, Frederiksen JT, Yin FCP: Quantification of incomplete left ventricular relaxation: Relationship to the time constant for isovolumic pressure fall. *Eur Heart J (Suppl A)*:119-129, 1980
5. Thompson DS, Waldron CB, Coltart DJ, Jenkins BS, Webb-Peploe MM: Estimation of time constant of left ventricular relaxation. *Br Heart J* 49:250-258, 1983
6. Humphrey LS, Topol EJ, Rosenfeld GI, Borkon AM, Baumgartner WA, Gardner TJ, Maruschak G, Weiss JL: Immediate enhancement of left ventricular relaxation by coronary artery bypass grafting: intraoperative assessment. *Circulation* 77:886-896, 1988

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decrease in heart rate does not imply the true incidence of these undesirable side effects is insignificant.

Whenever the numerator is zero in the incidence of an effect, the true incidence in the population at large represented by the group is:

$$\sqrt{p}$$