Anesthesiology
59:366, 1983

In reply:—Drs. Ben-David and Gross observed rightly that, in our study,[1] the mean succinylcholine infusion rate required to maintain constant neuromuscular blockade was greater in each of the nine data points in the isoflurane group. Indeed, the rates were significantly different ($P < 0.05$) at 45 and 55 minutes using Student's *t* test for unpaired data. However, we considered that the use of the nonparametric "sign test" to all data points was not appropriate because this test requires the pairs of observations to be independent of each other.[2] In our study, the data at various times were collected from the same patients and cannot constitute independent pairs of observations.

Our statement that isoflurane does not affect succinylcholine requirements would have been more complete if the words "for the same level of phase II block" had been added (fig. 4). Because tachyphylaxis and phase II block develop sooner with isoflurane, succinylcholine requirements were statistically significantly higher at 45 and 55 min, but not at any other time.

Finally, we dispute that "unpaired *t* tests . . . lack the power of analysis of variance." As pointed out by Glantz,[3] "They are both different ways of doing the same thing. When comparing the means of two groups $F = t^2$, so that the *t* test is simply a special case of analysis of variance applied to two groups."

FRANCOIS DONATI, PH.D., M.D.
DAVID R. BEVAN, M.B., B.CHIR., M.R.C.P., F.F.A.R.C.S.
Department of Anaesthesia
Royal Victoria Hospital
687 Pine Avenue West
Montreal, Quebec, Canada
H3A 1A1

REFERENCES

1. Donati F, Bevan DR: Long-term succinylcholine infusion during Isoflurane anesthesia. ANESTHESIOLOGY 58:6–10, 1981
2. Dixon WS, Massey FJ: Introduction to Statistical Analysis. Third edition. New York, McGraw Hill, 1969, p 336
3. Glantz SA: Primer of Biostatistics. New York, McGraw Hill, 1981, p 82

(Accepted for publication March 8, 1983.)

Anesthesiology
59:366–367, 1983

Presurgical Stress and Plasma Endorphin Levels

To the Editor:—The relationship between stress and endorphins was first described by Guillemin.[1] Subsequent to that report plasma beta-endorphin (B-END) levels have been determined in a variety of surgical stress conditions.[2–5] However, the specific effects of exposure to a variety of anesthetic drugs on endorphin levels are still unknown.[6] Furthermore, the possible presence of pain and its effects cannot be evaluated in these reports.[2–5]

We studied 19 patients (ASA I and II) scheduled for elective surgical procedures. In all cases, there was no history of pain, and all the patients had given written consent for the study. No patient was receiving any drug therapy at the time of the study or was premedicated with narcotic analgesics or tranquilizers.

Blood samples were collected 12–14 h (control) and 10 min before the surgical procedure (stress) and immediately placed in polypropylene tubes containing EDTA. At this time samples were coded in order to prevent bias by the personnel performing the determinations. Plasma was obtained by centrifugation at 2,000 rpm for 10 min at 0° C and stored at −40° C for future assay. Plasma B-END immunoreactivity (all subsequent references are to immunoreactivity) was determined by radioimmunoassay with reagents supplied by Immuno Nuclear Corporation (sensitivity 0.3–0.6 fmol/ml, cross reactivity to beta-lipotropin 50%). The lipotropin-free plasma was obtained by addition of sepharose anti-beta-lipotropin. B-END was extracted from plasma with ODS-silica columns.

Endorphin plasma levels increased significantly ($P < 0.05$) during stress (8.4 ± 1.0 fmol/ml and 16.5 ± 2.8 fmol/ml for the control and stress groups, respectively). Although as a group, the stress values are significantly higher than the controls, an absolute increase was observed in 11 patients, with no change in 3, and a slight decrease in B-END levels in five of the patients (table 1). When B-END levels were compared in relation to sex, the male group showed control levels of 6.5 ± 1.0 fmol/ml (n = 9) and the female group, 10.1 ± 1.5 fmol/ml (n = 10). Stress induced an increase in endorphin levels of 128% and 71%, respectively. These differences, however, were not statistically significant ($P > 0.05$). Similar results were obtained after