Correspondence

Ketamine for Delivery

To the Editor:—As practicing obstetric anesthesiologists, we would like to take exception to Dr. Galloon's statement that "ketamine is less than an ideal anesthetic for delivery of a full-term pregnancy."[1] He bases his objections to the drug on his findings of ketamine-induced increases in uterine tone of second-trimester uteri, as well as on reports of depressed Apgar scores following the use of ketamine in anesthetic doses during delivery.

Extrapolation of data on uterine tone from the second-trimester to the parturient is probably invalid, and further extrapolation to the suitability of ketamine as an anesthetic agent for delivery unjustified. There is a significant difference between second-trimester and term uteri in both resting and active pressure, as well as oxytocin response. Resting pressure doubles in the prelabor period.[2] The evolution of active pressure is gradual until the thirty-sixth week of pregnancy, with an increase from less than 5 torr at 14 weeks to an average of 15 torr at 36 weeks. Thereafter, pressure increases rapidly to more than 30 torr at term and 100 torr in labor.[3]

Low-dosage ketamine produces excellent analgesia as well as amnesia in the mother without abolishing muscle tone or protective reflexes. Neonatal arterial pressures in the immediate postnatal period have been shown to be less depressed after ketamine than after thiopental induction.[4] Our comparisons of results of Scanlon's neonatal neurobehavioral tests of normal babies delivered both vaginally (after < .8 mg/kg) and by elective cesarean section (< .1 mg/kg) with results following thiopental (< .3 mg/kg) gave statistically significantly more high scores after ketamine (Hodgkinson R, unpublished data). The quoted Apgar scores of Chodoff and Stella,[5] obtained following 0.15 mg/lb for vaginal delivery, and those reported by Peltz and Sinclair[6] for 1 mg/kg used for cesarean section, appear excellent. However, the minimum information needed to assess the effect on the Apgar score is a comparison of the effects of ketamine at various dosages with an alternative medication (*e.g.*, thiopental) at the same hospital, using similar patients, by the same observer. Such a study should preferably be randomized and double-blind.

Finally, we feel strongly that theoretical hypotheses based on the effects of drugs on uterine tone should give way to the clinical assessment of the neonate in terms of survival rates, Apgar scores, neurobehavioral assessments, blood pressure, and other clinical modalities.

ROBERT HODGKINSON, M.D.
GERTIE F. MARX, M.D.
Department of Anesthesiology
Albert Einstein College of Medicine
Bronx, New York 10461

REFERENCES

1. Galloon S: Ketamine for obstetric delivery. ANESTHESIOLOGY 44:522–524, 1976
2. Caldeyro-Barcia R, Poseiro JJ: Physiology of the uterine contraction. Clin Obstet Gynecol 3:386–408, 1960
3. Csapo A: The diagnostic significance of the intrauterine pressure. Obstet Gynecol Survey 25:403–435, 1970
4. Marx GF, Cabe CM, Kim YI, et al: Neonatal blood pressures. Anaesthetist 25:318–322, 1976
5. Chodoff R, Stella JG: Use of CI-581, a phencyclidine derivative, for obstetric anesthesia. Anesth Analg (Cleve) 45:527–530, 1966
6. Peltz B, Sinclair DM: Induction agents for caesarean section. A comparison of thiopentone and ketamine. Anaesthesia 28: 37–42, 1973

(*Accepted for publication July 26, 1976.*)

To the Editor:—I thank Drs. Hodgkinson and Marx for their comments, and I am particularly pleased that they support, in their third paragraph, what I regard as the message of my article, *i.e.*, low doses of ketamine may be good for delivery, high doses are certainly not. However, I must disagree with their

second paragraph: there is evidence in the literature[1] that one *can* extrapolate oxytocic effects on the pregnant uterus from the second trimester to the uterus in labor. In fact, the full-term uterus is more sensitive to those effects, and therefore doses of ketamine that are used to produce anesthesia in other circumstances may be dangerous to the fetus if used before delivery. Finally, in answer to their first sentence, the word "ideal," as an adjective, is defined as "conforming to an ultimate form of perfection or excellence"[2] or again "considered the best of its kind."[2] My statement only said that "ketamine is less than an ideal anesthetic"; surely Drs. Hodgkinson and Marx are not suggesting that ketamine is the ultimate, perfect anesthetic for delivery?

S. Galloon, M.B., Ch.B.
Department of Anaesthesia
University of Toronto
Toronto, M5G 1L7
Canada

References

1. Caldeyro-Bracia R, Poseiro JJ: Oxytocin and contractibility of the pregnant human uterus. Ann NY Acad Sci 75:813–830, 1958–59
2. American Heritage Dictionary of the English Language. Edited by Morris W. New York, American Heritage Publishing Co., 1969, p 653

(Accepted for publication July 26, 1976.)

Mutagenicity of Fluroxene

To the Editor:—We wish to alert anesthetists to the finding that fluroxene is mutagenic in the Ames *Salmonella*/microsome assay system. This test is both sensitive and specific in the detection of carcinogens as mutagens, with approximately 90 per cent of carcinogens tested being mutagenic and almost all mutagens tested being carcinogenic.[1] Halothane was not mutagenic in this system.[2] We have also tested enflurane, isoflurane, and methoxyflurane, and they are not mutagenic (unpublished data).

Although fluroxene is no longer in production, some institutions may have accumulated stores of this agent, so that it may still be in clinical use. It is unlikely that fluroxene will be further tested for carcinogenic potential. Our findings suggest that fluroxene poses a possible health hazard both as a mutagen and as a suspect carcinogen. Although the experimental data have not yet been published, we feel that anesthetists should be aware of these facts if they are considering using fluroxene in the clinical setting.

Jeffrey M. Baden, M.D.
Merijean Kelley, Ph.D.
Robert S. Wharton, M.D.
Ben A. Hitt, Ph.D.
Richard I. Mazze, M.D.
Departments of Anesthesia
Stanford University School of Medicine
Stanford, California
and
Veterans Administration Hospital
Palo Alto, California

Vincent F. Simmon, Ph.D.
Stanford Research Institute
Menlo Park, California

References

1. Ames BN, McCann J, Yamasaki E: Method for detecting carcinogens and mutagens with the *Salmonella*/mammalian-microsome mutagenicity test. Mutation Res 31:347–364, 1975
2. Baden JM, Brinkenhoff M, Wharton RS, et al: Mutagenicity of volatile anesthetics: Halothane. Anesthesiology 45:311–318, 1976