

TABLE 1. Perinatal Mortality by Type of Anesthesia in Premature and Mature Births* in a Study Conducted by Ten University Teaching Hospitals, Ontario (Single Births—1960–1961)

Type of Anesthesia	Total Births		Fetal Deaths		Early Neonatal Deaths		Perinatal Deaths	
	Number	Per Cent	Number	Rate†	Number	Rate‡	Number	Rate‡
None	738	21.7	164	222.2	161	238.9	325	440.4
General	1,707	50.2	232	135.9	191	129.5	423	247.8
Conduction	764	22.4	30	39.3	77	104.9	107	140.0
Combined	193	5.7	8	41.4	26	140.5	34	176.2
Total	3,402	100.0	434	127.6	455	153.3	889	261.3

* Birth weight under 2,500 grams.

‡ Per 1,000 live births.

† Per 1,000 total births.

thetia was preferable in obstetric patients in the presence of premature fetus.

A study was conducted by the Ontario Department of Health* which was published in 1967, pertaining to this very question. The data, though quite old, showed the enormous difference in mortality in premature neonates when different techniques of anesthesia were compared (table 1). Although we are not entirely familiar with the methods used to collect these data, we assume that it was retrospective and therefore should be subjected to much closer scrutiny. However, the results were so positively in favor of conduction anesthesia that they are difficult to ignore.

In a recent review, Shnider and Levinson² stressed that the fetus was very susceptible to depressant drugs administered maternally. General anesthesia usually involves the administration of several drugs, including depressants. It would seem logical that techniques involving the administration of only one drug, such as spinal anesthesia, would be preferable. One can speculate that only minute quantities of local anesthetic may reach the fetus during a spinal anesthetic. During epidural anesthesia, larger quantities of local anesthetic are required, therefore one should select agents which are either rapidly metabolized in the maternal circulation, such as 2-chloroprocaine or bupivacaine, which is highly protein bound. Scanlon *et al.*³ has shown that lidocaine and mepivacaine are

more likely to cause neurobehavioral abnormalities in newborn infants than other local anesthetics and therefore should be avoided in these premature infants. To even complicate matters further, Teramo *et al.*⁴ have shown in animal studies, that premature fetuses may be more resistant to the toxic effects of local anesthetics than full-term fetuses.

In this institution, we feel strongly that properly conducted regional anesthesia, including proper selection of local anesthetic agents, offers more advantages to the well being of the fetus than general anesthesia, which by necessity requires the administration of several drugs including depressants.

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2. Shnider SM, Levinson G: Anesthesia for Obstetrics. Baltimore, Williams and Wilkins, 1979, p 155
3. Scanlon JW, Ostheimer GW, Lurie, AO, et al: Neurobehavioral responses and drug concentrations in newborns after maternal epidural anesthesia with bupivacaine. *ANESTHESIOLOGY* 45:400–405, 1976
4. Teramo K, Benowitz N, Heymann MA, et al: Gestational differences in lidocaine toxicity in the fetal lamb. *ANESTHESIOLOGY* 44:133, 1976

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* Supplement to the Second Report of the Perinatal Mortality Study in Ten University Teaching Hospitals, Ontario, Canada, The Ontario Department of Health 1967, p. 214 (Table III).

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Failure of a New System to Prevent Delivery of Hypoxic Gas Mixture

To the Editor:—The recently introduced Ohio Modulux[®] anesthesia gas machines are provided with a Proportion Limiting Control System. This system is to insure, that with an oxygen-nitrous oxide mixture, at

least 25 per cent of the mixture will be oxygen. A warning on the machines states: "Hypoxic mixtures may be delivered if gases other than oxygen, nitrous oxide and/or air are used".

Our department recently took delivery of 12 of these machines. So far, the Proportion Limiting Control System has failed on two machines. This resulted in the potential to deliver a mixture of approximately 13 l of nitrous oxide and 200 ml of oxygen.

Inspection of the machines revealed two problems: 1) The chain connecting the oxygen and nitrous oxide control had fallen off its sprockets. 2) Sprocket assembly in the oxygen control had become loose due to a loose set screw.

To prevent a potentially dangerous situation developing, I suggest that: 1) Ohio warns users of the

Modulus® anesthesia machine of the potential failure of the Proportion Limiting Control System. 2) Proportion Limiting Control Systems be redesigned to prevent future failure.

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In reply:—The Ohio Link 25® is a system which mechanically links the oxygen-flow control valve to the nitrous oxide-flow control valve in such a manner as to allow independent adjustment of either valve, yet, automatically intercedes to maintain the prescribed minimum nominal 25 per cent oxygen concentration of the oxygen-nitrous oxide gas mixture. This capability is accomplished in the following manner:

A sprocket is secured to the nitrous oxide needle valve stem by the use of two 8-32, stainless steel, knurled cup point set screws. A second sprocket is allowed to rotate about the oxygen-needle valve stem within a predetermined limit before engaging with a collar secured to the oxygen-needle valve stem by the use of two set screws as described above. A cable chain having a 100-lb operating tensile strength interconnects the two sprockets. A chain tensioning device is incorporated to maintain the sprocket's rotational relationship by reducing chain back lash. In operation, the oxygen sprocket becomes engaged with the collar at the prescribed minimum oxygen concen-

tration. This action links the two flow control valves together in such a manner as the rotation of one causes a proportionate rotation of the other, thereby maintaining the minimum oxygen concentration.

The day following Dr. Malone's report to us regarding the problems he encountered, Ohio Service Personnel inspected the machines involved. Both problems were traced to inadequately tightened screws within the chain link mechanism. Final assembly and inspection procedures have been reviewed and modified where necessary, in an effort to reduce the possibility of a reoccurrence in current and future production units. In addition, field inspection of existing machines is currently underway to verify integrity of the system.

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