

the benefit of allowing continuous monitoring of the size and direction of the pressure gradient. In these patients the benefits are, at least theoretically, greater and so we have a different risk-benefit ratio. Whether these increased benefits outweigh the potential risks demonstrated in our case report remains arguable.

Certainly monitors should not be used in a way that withdraws attention from the patient. We believe Dr. Robinson is attempting to focus our attention on the patient, and we agree. But precise monitoring is also necessary when the information derived may alter therapy. Our paper tried to describe risks and benefits in specific patient groups to help clinicians decide when or if PA pressure monitoring was appropriate in Eisenmenger's syndrome. We hope that our paper and Dr. Robinson's response has brought into focus attention on a high risk anesthetic problem which requires detailed analysis in order to determine optimum monitoring and patient care.

Anesthesiology
58:590-591, 1983

Anesthesia and Neuroradiology: Considerations Regarding Metrizamide

To the Editor:—Metrizamide (Amipaque™) is a contrast medium used in neuroradiology. We would like to call attention to this agent because patients undergoing neuroradiologic procedures often require anesthetics, and metrizamide may lead to complications not reported in the anesthesia literature.¹⁻⁴

Unlike other presently available contrast media, metrizamide is water-soluble. It is injected into the subarachnoid space to delineate central nervous system lesions during myelography and during computed tomography of the posterior fossa and spinal canal. Once in the subarachnoid space, water-soluble agents are absorbed and need not be removed. Water-soluble agents often result in radiographic images that are superior to those produced by the traditional oil-base substances. In addition, metrizamide combined with computed tomography provides visualization of anatomic areas that are difficult to evaluate with traditional techniques. Numerous water-soluble contrast media have been used for neuroradiology in foreign countries but were found to cause neurologic sequelae. Metrizamide has a low incidence of these sequelae and, therefore, has gained popularity in the United States since its release by the Federal Food and Drug Administration in 1978.

The most common adverse side effects of metrizamide

are headache, nausea, and vomiting.² Headache may occur after lumbar puncture without metrizamide, but its incidence is even higher after myelography with metrizamide. Meningeal irritation, manifested by stiffness of the neck and Kernig and Brudzinski signs, is another side effect of this substance.² Mild, acute psycho-organic reactions also have been reported; these manifest as change of consciousness, anxiety, or panic.² Rarely, idiosyncratic, anaphylactic reactions have been reported.² Localized spinal irritation may occur with spasms and stiffness in the lower extremities.²

Of great interest to the anesthesiologist is the occurrence of electroencephalographic changes in patients within 24 to 48 h after instillation of metrizamide into the subarachnoid space.³ Such changes have occurred in patients with no history of epilepsy or abnormal electroencephalograms.⁵ Grand mal seizures also have occurred after procedures with metrizamide.^{1,2,5}

Clinical reports suggest that phenothiazines and related compounds predispose the patient to metrizamide-induced seizures by lowering the seizure threshold.⁴ We therefore avoid administering phenothiazines to patients undergoing neuroradiologic procedures with metrizamide. We also avoid anesthetics such as enflurane,⁶ methohexital,⁷ and ketamine,⁸ which have been asso-

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(Accepted for publication November 23, 1982.)

ciated with seizure activity. Instead, agents that are not associated with seizures are selected. Benzodiazepines are acceptable premedicants; phenobarbital is thought to be the premedicant of choice.⁴ If general anesthesia is indicated, halothane, isoflurane, or narcotic/relaxant techniques are used.

Strict attention to radiologic and anesthetic techniques may reduce the likelihood of metrizamide-induced seizures. As new contrast media are developed for neuroradiology, the anesthesiologist should become acquainted with their side effects and possible drug interactions.

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Anesthesiology
58:591-592, 1983

Neutralizing Capacity of Particulate Antacids

To the Editor:—We read with interest the clinical report. "Effectiveness of Sodium Citrate as an Antacid," by Gibbs *et al.*¹ who demonstrated that 0.3 M sodium citrate is an effective pre-induction antacid in pregnant women. They also reported that 0.3 M sodium citrate has a higher acid-neutralizing capacity *in vitro* than does Mylanta®. However, their data (in Table 2) show a neutralizing capacity for Mylanta less than that previously published.²

To reproduce Dr. Gibbs' experiment, we added HCl of pH 1.5 in 100-ml increments to 30 ml of Mylanta (pH 8.0) stirring for 5 min after each addition. Immediately following the third and subsequent increments (to a total of 1,000 ml HCl), pH fell to the 2.2–2.6 range but rose steadily to 4.0 or above during the next five minutes. In a separate experiment we added 10 ml Mylanta to 330 ml HCl (pH 1.5). With continuous stirring the pH rose steadily reaching 2.5 at 4 min 40 s, and 4.0 at 20 min. Thus, one volume of Mylanta can neutralize (to pH 2.5) over 33 volumes of pH 1.5 HCl, as opposed to 10 volumes in Dr. Gibbs' report.

These data indicate that Mylanta has a greater neutralizing capacity than shown in Dr. Gibbs' report for 0.3 M sodium citrate, provided that adequate time and

mixing are allowed. This error does not detract from the significance of their data concerning sodium citrate. The lesser requirement for mixing and quicker onset of action of sodium citrate compared to Mylanta would, in fact, be advantageous in the antepartum setting.

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(Accepted for publication November 30, 1982.)

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(Accepted for publication November 23, 1982.)