

Intertissue Diffusion of Anesthetics

To the Editor:—Cohen, Chow, and Mathers (Autoradiographic Distribution of Volatile Anesthetics within the Brain, ANESTHESIOLOGY 37:324–331, 1972) demonstrated that halothane and other anesthetics distribute differentially in the brain as a function of solubility and local blood flow. They injected a bolus of radioactive anesthetic and measured the amounts of radioactivity present in various parts of the brain 2, 5, and 20 minutes after injection. As anticipated from its higher perfusion, grey matter at 2 minutes contained the highest anesthetic concentration. After 20 minutes the higher concentration was found in white matter. This, too, would be anticipated, since the slower perfusion and higher solubility of anesthetic in white matter should retard its removal from that tissue.

One finding was less readily explained. At 5 minutes, the highest concentration of anesthetic was found at the interface of the grey and white matter. By this time there was more radioactivity in the white than grey matter, but less than at the interface. We now believe that this represents evidence for inter-tissue (grey-to-white) diffusion of anesthetic.¹ Immediately following a bolus injection, a far

higher partial pressure of anesthetic initially exists in the grey than in the white matter. The differential represents a function of blood flow, and therefore a four- to fivefold difference might be expected. This difference would drive anesthetic into the adjacent white matter. Subsequently, the high blood flow to the grey matter would clear the grey tissue of anesthetic, leaving the highest concentration in the more poorly perfused white tissue, particularly that band of white matter which had the benefit of direct transfer of agent from nearby grey matter.

If this suggested interpretation is correct, the report by Cohen, Chow, and Mathers represents the first direct demonstration of inter-tissue diffusion of anesthetics.

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REFERENCE

1. Cohen EN: Personal communication

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