Questions Raised and Lessons Learned from the Anesthetics Administered to Conjoined Twins

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INTRODUCTION

Anesthetic management of conjoined twins can be complicated by cross-circulation, an unknown volume of distribution, and shared metabolism of pharmacologic agents. An injected or inhaled drug may be inappropriately dosed, delivered, or metabolized before reaching its target receptors. We present the management of conjoined twins (Twin A and B) for three separate anesthetics to bring several pharmacokinetic issues to the forefront.

HISTORY

Twins A and B are dicephalic, tetrabrachic, thoracopagus, and presented for MRI under general anesthesia. MRI revealed two hearts, two pairs of lungs, fused livers with all hepatic veins emptying into Twin A’s heart, a shared GI tract distal to the stomachs, four arms and two legs. Subsequently, Twin A presented for tonsillectomy/adenoidectomy and ear exams and then for surgical control of a post-tonsillectomy hemorrhage.

Anesthetic management for all cases consisted of inhalation induction with bilateral, outer, upper-extremity IV access, intubation, and combined IV and inhaled maintenance of anesthesia with the exception of a rapid sequence induction and intubation for the post-tonsillectomy hemorrhage.

CASES

Case 1: MRI with general anesthesia
Clinical observations: Twin A required larger doses of propofol than twin B to maintain general anesthesia, presumably due to cross-circulation, hepatic blood flow, and metabolism.

Case 2: Tonsillectomy and adenoidecstomy of Twin A, exams under anesthesia of both twins’ ears.
Clinical observations: Simultaneous inhalation induction times were similar. IV propofol-induced apnea was specific to the twin in which it was injected. End-tidal nitrous oxide and carbon dioxide show cross-circulation between the twins without equilibration (see images). During laryngospasm, hypoxemia was slow to develop in the apneic twin when the other one was adequately ventilating.

Case 3: Emergent control of post-tonsillectomy hemorrhage
IV propofol and succinylcholine in Twin A made Twin B apneic.

Discussion

The degree of cross circulation in conjoined twins has been assessed using IV atropine and propofol. However, cross circulation of volatile anesthetics may provide useful information regarding the degree of mixing of each twin’s blood as it travels from one pair of lungs to the other. Using expired concentrations and evaluating the crossover of insoluble and soluble gasses such as nitrous oxide and carbon dioxide may allow one to gauge the degree of circulatory sharing from one twin’s arterial blood to the other twin’s pulmonary blood. This is an easy, inexpensive test. The noteworthy corollary of shared circulation is that end-tidal concentrations of gas may no longer fully correlate with brain concentrations as equilibrium may not be achieved due to cross circulation.

References: