

**TITLE:** EFFECTS OF CARDIOPULMONARY BYPASS ON ALFENTANIL PHARMACOKINETICS AND PROTEIN BINDING IN INFANTS AND CHILDREN  
**AUTHORS:** P.J. Davis, M.D., R.L. Stiller, Ph.D., D.R. Cook, M.D.  
**AFFILIATION:** Dept. of Anesthesiology, Children's Hospital of Pittsburgh, and the University of Pittsburgh, Pittsburgh, PA 15213

**Introduction:** Congenital heart disease and the use of cardiopulmonary bypass (CPB) in the surgical correction of congenital heart defects can modify the pharmacokinetics of anesthetic agents. Alfentanil, an opioid with a small volume of distribution (Vd) and a short elimination half-life (t<sub>1/2</sub>), has kinetic properties useful in studying the effects of CPB on drug pharmacokinetics.

**Methods:** Twelve infants and children aged 3 months to 17 years scheduled for elective repair of a complex congenital heart defect were studied. The study was approved by the hospital's Human Rights Committee. Informed consent was obtained from a parent and, when appropriate, from the patient as well.

In 6 patients (group I) pharmacokinetic variables were measured pre- and post-CPB, while in 6 patients (group II) protein binding was determined pre- and post-CPB. In all patients anesthesia was induced with nitrous oxide, oxygen, and halothane. In group I, alfentanil (50-100 µg/kg) was administered intravenously and 30-sec arterial samples were obtained at 0, 1, 2, 3, 5, 7.5, 10, 12, 15, 20, 30, 45, 60, 90, and 120 min or until the initiation of CPB. After completion of CPB a second dose of alfentanil identical to the first was administered, and arterial blood samples were obtained prior to the injection and at the same time intervals as prior to CPB in each patient.

Patients in group II (N=6) had an inhalational anesthetic. Blood

samples were obtained pre- and post-CPB, and no opioids were administered until after the post-CPB sample was taken. Protein binding of alfentanil was analyzed in vitro.<sup>1</sup> Pharmacokinetic data were analyzed by model-independent methods. The paired Student t-test was used to analyze both kinetic and protein binding data. Significance was assumed for p<0.05.

**Results:** Data for the 12 patients are summarized below. In the 6 patients in whom kinetics were determined, the T<sub>0</sub> plasma concentration in the post-bypass period was less than 5 ng/ml and represented less than 2% of the 1 min plasma concentration following the second injection. Following CPB, significant increases in Vd and clearance (Cl) were noted. Although T<sub>1/2</sub> increased, this change was not significant. Protein binding (PB) significantly decreased following CPB.

	Vd (L/kg)	T <sub>1/2</sub> (min)	Cl (ml/kg/min)	PB (%)
<b>Group I</b>				
pre-CPB	0.24 ± 0.06	25.1 ± 9.0	7.7 ± 2.1	-
post-CPB	0.70 ± 0.42*	37.0 ± 15.0	12.0 ± 3.0*	-
<b>Group II</b>				
pre-CPB	-	-	-	81.2 ± 4.0
post-CPB	-	-	-	61.2 ± 9.0*

\* p < 0.05.

**Discussion:** Drug pharmacokinetics and free drug fractions can be markedly altered by CPB. Following CPB, more free alfentanil is available and consequently, less drug may be needed to achieve a desired pharmacodynamic effect in the post-bypass period.

#### References:

1. Arch Int Pharmacodyn 257:4-19, 1982.

## A1121

**TITLE:** EVALUATION OF ADOLESCENTS' PREFERENCE AND PERCEPTION OF ANESTHESIA INDUCTION  
**AUTHORS:** I.T. Cohen, M.D., D. Atkins, M.D., R. Hannallah, M.D.  
**AFFILIATION:** Children's National Medical Center, and George Washington University, Washington, DC 20010

**Introduction:** This study determined the age at which adolescents prefer separation from their parents for induction of anesthesia and examines factors that create anxiety for this age group. This information should be helpful in designing preoperative teaching programs for adolescents.

**Methods:** Following institutional approval and consent, 92 ASA I-II patients ages 11-17 years (mean = 13.6) who underwent minor ambulatory surgery completed pre- and post-operative questionnaires. These questionnaires examined previous knowledge of anesthesia, desire for parental support during induction, and subjectively rated anxiety-causing factors on a 0-4 scale. These factors were pain, vomiting, dizziness, being undressed, embarrassment, and loss of control. Degree of anxiety was also assessed by the Manifest Upset Scale<sup>1</sup> and changes in heart rate and blood pressure. Comparison of the responses in three stages of adolescence<sup>2</sup> (Pre: 11-12 years old, Early: 13-14 years old, Mid: 15-17 years old) were made using Pearson Chi-square analysis. Patient preference and anxiety scoring were related to sex, sexual development (Tanner stage), previous experience, socio-economic background, and postoperative pain and vomiting.

**Results:** Seventy-five percent of all patients stated that they had received no preoperative counselling. The number of patients (%) who preferred parental presence was 84% among pre-adolescents, 44% for early adolescents, and 33% among mid-adolescents. These differences are statistically significant (p=.0001).

Specific concerns that triggered an anxiety score ≥ 2 in the perioperative period are shown in the following table:

Category	Preoperatively	Postoperatively	Δ
Pain	44.4%	28.3%	-16.1
Vomiting	33.7%	19.6%	-14.1
Dizziness	39.1%	45.5%	+6.4
Being Undressed	34.1%	17.4%	-16.7
Embarrassment	27.3%	9.8%	-17.5
Loss of Control	48.4%	27.2%	-21.2

Compared with boys, girls expressed significantly more anxiety concerning pain, being undressed, embarrassment, and the operating room setting (p<0.1).

In the pre-induction period, the pre-adolescents scored comparatively higher on the Manifest Upset Scale (p=.012). All groups displayed marked increases in blood pressure.<sup>3</sup>

**Discussion:** Many factors must be considered in planning a preoperative teaching program for adolescent patients. Loss of control is this age group's major concern. Fear of pain is also an important factor. The operating room environment, except for cold temperatures, was not perceived as stressful by most patients.

The differences between the different age groups, sex, and other factors need to be explored further. Preoperative teaching and induction planning for adolescents should allow for the flexibility and individualization this age group requires.

#### References:

1. Pediatrics 64:646-655, 1975.
2. Adolesc Psychiatry 2:13-34, 1979.
3. Anaesthesia 44:651-655, 1989.