Remifentanil in Children with and without Obstructive Sleep Apnea

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Introduction & Methods
Adenotonsillectomy (AT) is the most common pediatric surgery performed in the United States. It is a first line treatment for pediatric obstructive sleep apnea (OSA) and chronic tonsillitis (CT). There is some evidence that children with OSA have an increased sensitivity to the respiratory depressant effects of opioids, which may predispose them to tragic post-operative complications. The goal of this study is to test the hypothesis that patients undergoing AT with OSA as compared to patients without OSA 1) have an increased pharmacodynamic rather than pharmacokinetic sensitivity to opioids and 2) that their individual misuse responses to remifentanil using dark-adapted pupillometry will reflect their respiratory depressant response.

The study is ongoing at the time of presentation of this poster. It is a prospective, study of 40 patients, ages 6-14 years, presenting for AT with either a diagnosis of OSA (20 patients) or CT (20 patients). The study is conducted in the pre-operative holding area prior to surgery. Following informed consent patients have a standard NIH monitor placed for monitoring vital signs, including capnography. Patients wear a pair of light-sensitive pupillometry goggles throughout the study. A remifentanil infusion of either 0.05, 0.1, 0.15 mcg/kg/min is started and continued for 15 minutes. Primary outcomes are remifentanil effect on respiratory rate, ETCO2, and pupil diameter vs. concentration. Blood draws are also taken at seven time points: 0, 1, 2, 4, 6, 10, and 15 minutes, for pharmacometric studies. Secondary outcomes include the amount of post-operative analgesics required and post-operative pain scores compared between OSA and CT patients.

Patient Recruitment (9/1/15 to 1/31/16)

Opioid Use

Primary Outcomes

Pupillometry

Pupil Size in Children with OSA During a Remifentanil Infusion

ETCO2 in Children with OSA During a Remifentanil Infusion

Remifentanil Plasma Concentrations

Remifentanil Plasma Concentration vs. Remifentanil Plasma Concentration

Respiratory Rate in Children with OSA During a Remifentanil Infusion

ETCO2 vs. ETCO2

Respiratory Rate vs. ETCO2

Pain Metrics

Pain Scores

Pain Expectations

Results & Discussion

The concentration effect relationship of remifentanil on melatonin demonstrates a larger and faster reduction of pupil size in patients receiving higher doses of remifentanil. Data collected at present are insufficient for comparison between OSA and CT patients, however patient recruitment is ongoing.

It is expected that patients with OSA will have miosis and ventilatory pharmacodynamic curves that are left-shifted (increased sensitivity) as compared to CT patients, while pharmacokinetics will be non-different. It is expected that increased sensitivity to miosis will also reflect increased sensitivity to respiratory depression. These findings will help to objectively quantify the magnitude of increased opioid sensitivity in patients with OSA as compared to those without. It will also assess whether increased sensitivity to opioid-induced miosis reflects increased sensitivity to opioid-induced respiratory depression.

References