The Children's Hospital of Philadelphia Difficult Intubation Registry

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Introduction: In a recent closed claims analysis on the management of the difficult airway, encounter of an airway emergency significantly increased the odds of death or brain damage.[1] The difficult adult airway incidence ranges from 0.01 to 13%.[2,3] There are no large-scale studies on the incidence and management of the difficult pediatric airway. Therefore, we created The Children's Hospital of Philadelphia Difficult Intubation Registry.

Methods: After IRB approval, data was collected on patients who were either an anticipated or an unanticipated difficult intubation, defined as the inability to secure endotracheal intubation by less than or equal to four attempts at conventional direct laryngoscopy. The anticipated group was determined by a known previous inability to intubate or physical examination suggestive of an inability to intubate. Data was collected on case report forms by the anesthesia provider or a research assistant at the time of the intubation attempt or within 24-48 hours after the event. Data collected included age, weight, sex, associated syndromes, airway examination, prior history of failure to intubate (FTI), premedication, anesthetic management, length of time to secure an airway by endotracheal intubation starting from induction of anesthesia, and associated 24-hour mortality and morbidity.

Results: This data was collected over a 5 month period and will be updated for the final abstract presentation. The number of patients undergoing general anesthesia with an endotracheal tube totaled 6,524 of which 16 met the registry's definition of difficult intubation for an incidence of 0.25%. Fourteen were anticipated and 2 were unanticipated for incidences of 0.21% and 0.03%, respectively. Difficulty in ventilation despite airway adjuncts occurred in only one patient; no patient was impossible to ventilate. The mean age was 5.7 years (range 0.003 - 15.42), M:F ratio 1:1, mean weight 20.4 kg (range 1.5 - 54.2) and length of time to secure an airway by endotracheal intubation was 20 minutes (range 9 - 36). Of the 14 anticipated difficult intubations, 12 patients had associated congenital abnormalities such as Goldenhar, Pierre Robin, Klippel-Feil and Treacher Collins. The other two patients had epidermolysis bullosa with a relative contraindication to direct laryngoscopy. Six patients had a previous history of FTI by direct laryngoscopy, 1 patient with Treacher Collins had a previous history of successful direct laryngoscopy and then presented with an unanticipated FTI and one patient had a physical examination not predictive of a difficult airway. The two most commonly associated physical signs of airway difficulty were inter-incisor distance and mandibular hypoplasia, seen in 93.8% and 87.5% of the patients, respectively. In descending order of frequency, other physical signs include limited neck mobility (43.8%), facial asymmetry (31.3%), short neck (18.8%), glossoptosis (18.8%), maxillary hypoplasia (18.8%) and cleft palate/lip (18.8%). Thirty-one percent of patients received no premedication while 37.5% received midazolam and 43.8% received an anticholinergic. Thirteen of 16 patients received sevoflurane by mask for induction of anesthesia. One patient underwent awake LMA placement followed by sevoflurane LMA induction, one patient underwent awake mask ventilation and another underwent intramuscular ketamine induction followed by sevoflurane mask induction. Primary management of the airway included fiberoptic bronchoscopy (FOB) in 50%, direct laryngoscopy in 44%, and an anterior commissure scope in one case. The LMA was used in 44% of cases as a bridge to securing an endotracheal airway. In all cases of FOB, intubation was successful (range 1 - 4 attempts). Vecuronium was given in 3 of these patients after establishing ventilation and in 2 of these after the first FOB attempt and prior to additional attempts to facilitate intubation. In 3 of these patients, spontaneous ventilation was maintained with sevoflurane, and intubation facilitated with topical lidocaine, propofol

infusion and/or propofol boluses. In the direct laryngoscopy group, vecuronium was given in 5 of the 7 patients. All but one of these patients required a secondary if not tertiary method in one case of securing the airway which included lightwand blind intubation (3), FOB (2) and anterior commissure scope (1). In 2 of the 5 anticipated difficult intubations within the direct laryngoscopy group, there was a prior history of inability to intubate. In one unanticipated difficult intubation was direct laryngoscopy able to secure an airway. This case involved six attempts at direct laryngoscopy with three different providers in a 31-week premature neonate at one day of life during an emergent EXIT procedure for massive saccrococcygeal teratoma. There was one failed FOB intubation as a third rescue method after an initial failure of intubation with direct laryngoscopy followed by failed lightwand intubation. The lightwand was subsequently successful after FOB failure. Hypoxemia <90% SpO_2 was the most common morbidity seen in 7 of the patients. One patient encountered laryngospasm while another patient had an unanticipated PICU admission secondary to multiple laryngeal manipulations leading to glottic edema. This patient was subsequently extubated in the PICU.

Discussion: Our incidence of failure to intubate of 0.25% approximates the narrow range as reported in the literature; however, this number likely underestimates the true incidence in our institution as our capture rate is not perfect. Our most common management of the difficult airway as a primary method was FOB (8) and direct laryngoscopy (7) with LMA used as a bridge in securing the airway in 7 patients.

References:

1. Anesthesiology 2005; 103:33-9 2. Can J Anaesth 2005; 52(6):562-7 3. Can J Anaesth 2005; 52(6):634-40