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Induction and Airway Management for Pyloromyotomy

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Abstract

Study background: Infants with pyloric stenosis are considered having a full stomach; however, rapid sequence induction has not been the only method used to secure the airway. A retrospective chart review was performed to evaluate the differences in incidences of adverse outcomes (e.g., desaturation, aspiration, and failed the first attempt intubation) between various induction and airway management techniques.

Methods: A retrospective chart review over a 10-year period was conducted at a University affiliated children's hospital. Induction and airway management techniques were abstracted from medical charts, and the incidences of aspiration, desaturation, failed the first attempt intubation, and duration of hospitalization were also recorded.

Results: One hundred patients received intravenous rapid sequence induction with succinylcholine (42.6%), 78 patients received IV induction with non-depolarizing muscle relaxant (33.1%), 18 patients received IV propofol only (7.7%), 35 received inhalation induction (14.9%), and 4 received awake intubation (1.7%). There was no incidence of aspiration (0%) for all inductions, while 27 (11.4%) infants that received intravenous induction experienced desaturation during induction. We found that patients that received awake intubation had longer postoperative stays as compared to patients that received rapid sequence induction (p=0.017) and inhalation induction (p=0.016).

Conclusions: This retrospective chart review concluded that there were no differences in the incidence of aspiration, desaturation, and the rate of successful first attempt intubation between various types of induction techniques. Rapid sequence induction with succhinylcholine was the most popular induction technique to secure the airway of infants with pyloric stenosis undergoing pyloromyotomy.

Keywords: Airway management, pyloric stenosis, induction techniques, pyloromyotomy,

Introduction

Infantile hypertrophic pyloric stenosis is one of the most common gastrointestinal medical emergencies that occur during the first 2 months of life [1]. These patients typically present with non-bilious projectile vomiting; however, some infants may present with poor feeding and weight loss. Dehydration, electrolyte imbalance, and metabolic alkalosis are commonly associated symptoms in these patients; thus, a period of rehydration and correction of electrolytes are often needed prior to surgical correction [2]. Surgical correction (Ramstedt pyloromyotomy; i.e., dividing the muscle of the pylorus to open up the gastric outlet) is a definitive correction [3] usually performed under general endotracheal anesthesia.

Anesthetic induction and airway management of infants with pyloric stenosis can be challenging given that the obstruction of pyloric outlet can lead to a significant build up of gastric fluid in the stomach. This situation can predispose infants to pulmonary aspiration and limited oxygen reserve, which consequently can lead to rapid oxygen desaturation and potential cardiac arrest during induction of general anesthesia prior to the establishment of a secured airway with endotracheal tube [4]. Rapid sequence induction (RSI) and awake intubation (AI) are commonly used techniques by anesthesia practitioners to secure the airway of the infants undergoing pyrolomyotomy [5]; however, these techniques can lead to complications (e.g., failure to intubate at the first attempt, desaturation, and trauma to the airway) [6-8]. A previous study indicated that AI was not a better method of securing the airway compared to RSI or modified rapid sequence (MRSI) with respect to maintaining adequate oxygenation and heart rate or to the incidences of induction complications [6]. Inhalation anesthetic induction (II) technique was also described in the literature [8-10] to secure these infants' airway prior to pyloromyotomy; but, whether it is still a form of anesthesia induction in current pediatric anesthesia practice in securing the airway of the infants undergoing pyloromyotomy or not remains to be determined.

Thus, we were interested to know how many different types of anesthetic induction techniques were utilized and whether there were differences in induction complications between these techniques used in securing the airway of infants undergoing pyrolomyotomy in a children's hospital. A retrospective chart review over a 10-year period was performed. The primary outcomes were any adverse events (e.g., aspiration, desaturation, and failed the first attempt intubation) during induction of anesthesia.

Materials and Methods

After receiving approval from the Human Investigation Committee at Yale School of Medicine, all anesthesia records of infants undergoing pyloromyotomy between January 1998 and May 2008 were reviewed. We were able to identify eligible charts through the billing code and all the correlated records were retrieved from the medical record office. The first

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and second authors reviewed the anesthesia records and confirmed the surgical procedure. Age, gender, birth history, types of anesthesia induction, types of muscle relaxant, duration of surgery, anesthesia time, and length of hospitalization were abstracted from the medical charts. Additionally, incidences of anesthesia complications were identified and coded (e.g., failed the first attempt intubation, desaturation [<90% O_2 saturation], and aspiration). All data were entered into in SPSS 16.0 (SPSS Inc, Chicago, IL) for subsequent analysis. Demographic data are presented with descriptive statistics using percentages or mean and standard deviations.

Results

A total of 235 charts were identified and coded. Table 1 displays the demographic data of the participants that the medical charts represented. Of the 235 charts reviewed, 187 (79.5%) patients received intravenous atropine prior to any intervention and 48 (20.5%) patients did not. All patients were presented in OR with pre-existing OGT and the majority of patients (92.7%) received suction of stomach in various positions prior to induction. Five different anesthesia induction techniques were used to secure infants' airway for pyloromyotomy: AI (n=4), anesthesia induction II (n=35), intravenous RSI with succinylcholine (n=100), intravenous induction with non-depolarizing muscle relaxant (n=78), and intravenous propofol (n=18).

No aspiration was documented among the 235 medical records. However, 27 (11.4%) patients receiving a form of IV induction experienced desaturation: 16 patients received RSI, 8 patients received MRSI and 3 patients received IVP. The differences in incidences of desaturation did not reach statistical differences between different anesthesia induction techniques. The 17 infants whose charts did not reveal any documentation of stomach suction received RSI and had no documented adverse events. There were 11 incidences of failed intubation at the first attempt: 7 incidences occurred in RSI, 2 incidences in IVP, and 2 incidences in II group. There was no difference between the levels of training with respect to the number of incidences of desturation or failed the first attempt intubation.

Age (days)	34.5 ± 14	
Weight (kg)	4.0 ± 0.7	
Gender (%)		
Female	20.5	
Male	79.5	
Prematurity (%)		
Yes	3.8	
No	86.8	
Missing	9.4	
Induction Technique (%)		
RSI	42.6	
MRSI	33.1	
IVP	7.7	
II	14.8	
AI	1.3	
Level of training (%)		
PGY 3	21.2	
PGY 4	56.5	
PGY 5	22.3	
Surgical Approach (%)		
Open	83.8	
Laparoscopic	16.2	
Surgical Time (min.)		
Open	35.0 ±11.9	
Laparoscopic	32.5 ±15.0	
Anesthesia Time (min.)		
Open	68.8 ±16.2	
Laparoscopic	77.0 ±19	
Discharge from the Hospital (Day)*		
Open	1.5 ±0.87	p=0.014
Laparoscopic	1.1 ±0.5	

*Significant differences between the groups
RSI-Rapid sequence induction
MRSI-Modified rapid sequence induction
IVP-IV propofol only
II-Inhalation induction
AI-Awake intubation

Table 1: Demographic Data.

Overall, there were no differences in the incidence of desaturation and failed the first attempt intubation in securing the airway as between RSI, MRSI, IVP, II and AI groups. The level of experience in anesthesia training did not influence the incidence of desaturation and failed the first attempt intubation. Infants undergoing pyloromyotomy with other medical problems (e.g., prematurity, congenital heart disease) had longer hospital stays as compared to those with no other pre-existing medical complications. After removing infants with co-existing medical problems, we found that the duration of hospital stay was significantly longer for infants that received an open Ramstedt procedure compared to those that received a laparoscopic procedure (p=0.014). There were no differences in the incidence of adverse events during induction between the different surgical approaches. The duration of anesthesia time (i.e. the period from anesthesia induction to extubation) and surgical time (i.e. the period from incision to the completion of dressing the wound) were not significantly difference between an open procedure and a laparoscopic Ramstedt procedure.

Discussion

Similar to previous studies examining anesthesia induction techniques to secure the airway of infants undergoing pyloromyotomy, rapid sequence induction with succinylcholine was the most common induction technique. Furthermore, inhalation anesthetic induction and awake intubation were still used by pediatric anesthesiologists.

Although 17 infants did not receive suction of the stomach prior to induction, this technique and airway manipulation remains to be common practices among the majority of the pediatric anesthesiologists for infants with pyloric stenosis, as recommended by previous studies [4,5].

Five different anesthetic inductions were noted in our anesthesia practice, but no differences in the number of adverse events (i.e. aspiration, desaturation, and failed the first attempt intubated) were noted among the anesthesia induction techniques used to secure the airway of infant undergoing pyolormyotomy. However, given that some of the techniques were utilized at low rates, there was an inadequate sample size to adequately detect any potential differences. The most likely cause of desaturation during induction is the prolonged duration of airway instrumentation; however, there was no documentation in the medical record to test this association. Another potential reason could be aspiration of gastric contents; but, there was no documentation of aspiration among the charts reviewed.

Lastly, the change of surgical techniques to a minimally invasive approach (i.e., laparoscopic approach) has shortened the recovery time. This was demonstrated by the significantly shorter duration of hospital stay for infants that received a laparoscopic approach as compared to those that received an open Ramstedt procedure [11]. In conclusion, even though majority of textbooks still state that RSI and AI are the primary anesthesia induction techniques to secure the airway in infants with pyloric stenosis undergoing pyloromyotomy, under the conditions of our study, other induction techniques have also been used successfully.

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References

1. Bissonnette B, Sullivan PJ. Pyloric stenosis (1991) Can J Anaesthh 38: 668-76.
2. Touloukian RJ, Higgins E (1983) The spectrum of serum electrolytes in hypertrophic pyloric stenosis. J Paediatr Surg 18:394-7.
3. Caty MG, Azizhkan RG (1994) Acute surgical condition s of the abdomen. Pediatr Ann 23: 192-201.
4. Cook-Sather SD, Tulloch HV, Lisacouras CA, Schrenier MS (1997) Gastric fluid volume in infants for pyloromyotomy. Can J Anaesth 44: 278-283.
5. Roberts JD, Romanelli TM, Todres ID (2008) Neonatal emergencies, in Coté, Lerman, Todres (eds): A Practice of Anesthesia for Infants and Children. (4th edn) Elsevier Health Science, Philadelphia pp.761-762.
6. Cook-sather SD, Tulloch HV, Cnaan A, Nicolson SC, Cubina ML, et al. (1998) A comparison of awake versus paralyzed tracheal intubation for infants with pyloric stenosis Anesth Analg 86: 945-51.
7. Gary DW, Gear MW Stevens DW (1984) The results of Ramstedt's operation: Room for complacency? Am R Coll Surg Eng 66: 280-2.
8. MacDonald NJ, Fitzpatrick GJ, Moore KP, Wren WS, Keenan M (1987) Anaesthesia for congential hypertrophic pyloric stenosis Br. J Anaesth 59: 672-677.
9. Stoddart PA, Brennan L, Hatch DJ, Bingham (1994) Postal survey of paediatric practice and training among consultant anaesthetists in the UK. Bri J Anaesth 73: 559-63.
10. Daly AM, Conn AW (1969) Anaesthesia for pyloromyotomy: A review (The hospital for Sick Children, Torento) Can Anaesth Soc J 16: 316-20.
11. Fujimoto E, Lane GJ,Segawa O, Esaki S, Miyano T (1998) Laparoscpic Extamucosal pyloromyotomy versus open pyloromyotomy for infantile hypertrophic pyloric stenosis: Which is better? J Pediatr Surg 34: 370-372.

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