

Anesthetic Techniques and Perioperative Complications of Cleft Lip and Cleft Palate Surgery at Srinagarind Hospital

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Background: Cleft lip (CL) and cleft palate (CP) are common craniofacial abnormalities with an incidence of around 1: 800. Surgical corrections are often performed during the first year of life. These patients have risks for difficult intubation and various perioperative complications due to their young age and craniofacial abnormalities.

Objective: The purpose of the retrospective descriptive study is to report the data of anesthetic techniques and complications of repairing CLCP in Srinagarind Hospital. These results could improve the caring and services for these groups of patients.

Material and Method: Data was retrieved from anesthetic records of patients undergoing correction of CLCP from the period January 2005 to January 2009. Demographic data, clinical diagnosis, type operation, anesthetic technique, total opioid were analyzed using direct laryngoscopic view, grading intubation, method of intubation, and as well perioperative complications were also analyzed.

Results: A total of 469 anesthetic records were obtained. The most common type of CLCP was unilateral side (45.48%). The highest incidence of difficult intubation was found in the CP and unilateral CLCP subgroup (4.48% and 4.48%, respectively). All patients were successfully intubated with a stylet except one patient, in whom retrograde intubation was used. Perioperative complications included desaturation, reintubation, postoperative bleeding, and post-operative nausea and vomiting (PONV). And the highest incidence of PONV was found in the CP (8.95%). Correlation between fentanyl using and postoperative desaturation was statistically significant when multivariate analysis was used ($OR = 1.2$; $p = 0.01$).

Conclusion: Patients with unilateral CLCP or CP had a higher risk for difficult intubation. Fortunately, all of the patients were successfully intubated with advanced anesthetists' skill. Long operative periods and a large dose of opioid could contribute to the postoperative desaturation and PONV.

Keywords: Cleft lip, Cleft palate, Craniofacial deformity, Anesthesia, Airway management, Tawanchai center

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Orofacial clefts are the most common craniofacial birth defects. The overall incidence of cleft lip and palate (CLCP) is 1: 800 of live births⁽¹⁾. Also, 68-86% of these patients are born with CLCP. The incidence varies depending on some factors, which include gender, race, and type of clefts. Most of the CLCP patients are males; whereas, females are more associated with isolated cleft lip⁽²⁾.

Generally, the cleft lip and tip of the nose are

repaired at the age of 3 months. Afterward, cleft palate would be repaired at the age of 9 to 12 months to avoid problems of speech and language development⁽²⁾. Intubation in the early age of life increases the risk of difficult airway management; therefore, anesthetic techniques and equipments have been developed for dealing with this problem.

Airway management in patients with CLCP has been studied more than 70 years. Regarding intubation, many techniques have been developing with many types of equipment including intubation with external laryngeal technique intubation, using gum elastic bougie and fiberoptic intubation. However, during surgery or postoperation, some complications

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may occur including bleeding, pain, oxygen desaturation and tachycardia.

Tawanchai cleft center is a center for CLCP and craniofacial deformities at Srinagarind Hospital, Khon Kaen, Thailand. Tawanchai cleft center was established in 2009 to help orofacial cleft patients in the North East of Thailand. The operation rate of correction of anomalies increases every year, but there is a lack of data collection of anesthetic techniques and complications. The purpose of this retrospective descriptive study was to report the data of anesthetic techniques and complications of repairing CLCP in Srinagarind Hospital. This will form a database for Tawanchai cleft center and improve the caring and services for these groups of patients.

Material and Method

A retrospective study was conducted in Srinagarind Hospital, Faculty of Medicine, Khon Kaen University, Thailand from the period between January 2005 to January 2009. The demographic data, ASA classification, underlying disease of patients were retrieved from preanesthetic evaluation and preparation record. Furthermore, we analyzed the data of intraoperative anesthesia including technique of anesthesia, type of intubation, type of ET tube, anesthetic circuit, pain management and special equipments. Regarding complications, we analyzed two periods including immediate postoperative care within 2 hours and postoperative in 24 hours.

The data was analyzed with the use of STATA software. Numerical data was expressed as mean(s) while categorical data was expressed number(s) and percentage(s). Univariate logistic regression and

multivariable logistic regression were conducted to evaluate the determinants and to identify independent predictor of endotracheal intubation complication. Results were presented as odd ratio (OR) and 95% confidence interval (95% CI). A *p*-value <0.025 was considered as statistically significant for univariable analysis and <0.005 for multivariable analysis.

The study was approved by the Khon Kaen University Ethics Committee for Human Research (HE531141).

Results

The data of 469 patients were classified into 5 subgroups. The most common abnormality was unilateral CLCP. Reparation of bilateral cleft lip and palate had the longest operating time (Table 1).

The highest difficult intubation was found in CP and unilateral CLCP subgroup with 4.48% and 1.85%; respectively. All patients in difficult intubation group were intubated by using stylet; except one CL patient who intubated with retrograde intubation technique (Table 2).

Desaturation, reintubation, bleeding and nausea vomiting were common complications in this study (Table 3).

Using multivariate analysis, we found a correlation between dose of fentanyl and postoperative desaturation (OR = 1.2, *p* = 0.01) (Table 4).

Discussion

Tawanchai center was established in 2005 with aims to provide high quality holistic and multi-disciplinary care team. It plays a vital role in the increasing number of patients who constantly require

Table 1. Demographic data

Type	n (%)	Mean age (month)	Gender (%)	Mean weight (kg)	Mean duration of surgery (min)
Unilateral CL	132 (28.14)	63	Male = 70 (53) Female = 62 (47)	18.40	85.38
Bilateral CL	3 (0.64)	4.67	Male = 3 (100) Female = 0 (0)	7.4	105.00
CP	67 (14.28)	31.28	Male = 31 (46.3) Female = 36 (53.7)	11.35	94.13
Unilateral CLCP	215 (45.84)	27.73	Male = 113 (52.6) Female = 102 (47.4)	11.45	98.07
Bilateral CLCP	52 (11.09)	15.17	Male = 29 (55.8) Female = 23 (44.2)	8.4	122.63

CL = Cleft lip; CP = Cleft palate; CLCP = Cleft lip Cleft palate; kg = kilogram; min = minute

Table 2. Airway management and anesthetic technique in subtype of CLCP

Airway management	Unilateral CL	Bilateral CL	CP	Unilateral CLCP	Bilateral CLCP
DL view grade (%)					
I	95.42	10	86.57	91.2	92.31
II	3.82	0	10.45	7.41	5.77
III	0	0	1.49	0.93	1.92
IV	0	0	1.49	0	0
Tracheal intubation grade (%)					
I	93.30	10	86.57	89.81	94.23
II	6.11	0	8.96	7.87	5.77
III	0	0	2.99	1.39	0
IV	0	0	1.49	0.46	0
Conventional laryngoscopy (%)	96.18	100	94.02	95.37	96.15
Elastic Gum-bougie (%)	0	0	0	0	0
Stylet (%)	3.81	0	4.48	4.62	3.84
Fiberoptic laryngoscopy (%)	0	0	0	0	0
Retrograde intubation (%)	0	0	1.49	0	0
Intubator success (%)					
Staff	11.45	0	11.94	12.55	11.54
Resident	43.51	66.67	53.73	3.71	53.85
Nurse	26.72	0	20.90	6.67	23.08
Nurse trainee	17.56	33.33	13.43	16.67	11.54
Induction agent (%)					
Volatile	31.36	0	43.28	31.48	32.69
IV	8.71	100	56.72	68.52	67.31
Circuit (%)					
Pediatric circle circuit	45.03	66.66	73.44	60.19	65.38
JR	19.08	0	20.89	22.69	13.46
Baby EAR	14.50	33.33	7.46	15.28	23.08
Coaxial	21.37	0	7.46	9.35	1.92
Mean duration of surgery (min),	85.38	105	94.13	98.07	122.63
Opioid usage (mean)					
Morphine (mg/kg)	0.03	0	0.02	0.028	0.019
Fentanyl (mcg/kg)	61.76	91.24	22.522	2.09	2.65
Pethidine (mg/kg)	0	0	0	0	0

CL = Cleft lip; CP = Cleft palate; CLCP = Cleft lip Cleft palate; DL = Direct laryngoscopy

Table 3. Perioperative complication

Perioperative complication	Unilateral CL (n = 131)	Bilateral CL (n = 3)	CP (n = 67)	Unilateral CLCP (n = 216)	Bilateral CLCP (n = 52)
Aspiration	0	0	0	0	0
Desaturation	2 (1.52%)	0	0	1 (0.46%)	0
Laryngospasm	0	0	0	0	0
Re-intubation	0	0	0	3 (1.39%)	0
Bleeding	0	0	0	1 (0.46%)	2 (3.85%)
Nausea Vomiting	1 (0.76%)	0	6 (8.95%)	0	1 (1.92%)

CL: Cleft lip; CP: Cleft palate; CLCP: Cleft lip Cleft palate

Table 4. Factors related to of desaturation complication (multivariate analysis)

Factor	Incidence desaturation n/N (%)	Crude OR	Adjust OR (95% CI)	<i>p</i> -value
CL/CP/CLN				
CL	1/4 (25.0)	Ref	Ref	-
CLCP	1/4 (25.0)	0.3	0.1	0.183
CLN	1/4 (25.0)	1.5	2.2	0.584
CP	1/4 (25.0)	1.2	0.6	0.724
Fentanyl/kg	4.3 (2.0)	1.9	1.2	0.010*

(* *p*<0.05; statistical significant)

CL = Cleft lip; CP = Cleft palate; CLCP = Cleft lip Cleft palate; CLN = Cleft nose

anesthesiology surgical operation for cleft lip and cleft palate. A high risk of anesthesia complications occur, including difficult airway management from cleft alveolus, protruding maxilla and high vaulted arch due to difficult placement of the laryngoscope blade, tube-related problems, laryngeal and bronchospasm, desaturation and aspiration⁽³⁾ and, also, complications related to pediatric anesthesia.

In this retrospective study, patients were classified into subgroups. The most common type of anomalies was unilateral CLCP (45.84%) and the second most common was isolated unilateral CL (28.14%). The duration of anesthesia was highest in bilateral CLCP (122.63 minutes), this correlated with the degree of anomaly.

General anesthesia with endotracheal intubation with or without muscle relaxant was applied in all children. Intravenous induction was the most commonly used approach in our study; whereas, prior studies showed inhalation anesthesia was the most commonly used technique⁽³⁾. Induction techniques are controversial techniques that attract issues whether intravenous or inhalation is better; however, there were no complications related to intravenous induction in our study. In case of difficulty achieving venous cannulation prior to undergoing operation due to poor co-operative patients, the inhalation technique may be used in order to access this benefit.

Alternative techniques could be used for airway management in CLCP. A variety of techniques for intubation include firm pressure over larynx, bougie as a guide and other more sophisticated methods, such as fiberoptic techniques, laryngeal mask airway, specially designed light wands and laryngoscopy⁽⁴⁾. In addition, retrograde techniques were considered useful. In the study, one CP patient encountered difficult airway management. Numerous intubations were

attempted but no success was achieved. Thus, intubation with retrograde technique was used. It proved successful and no complications were recorded. From this, it can be deduced that it is a great alternative technique for a difficult airway patient due to maxillofacial anomalies such as CP.

In the present study, the most common method for intubation was conventional laryngoscopy without stylet (96.34%). Most of the patients were successfully intubated in at first attempt by anesthesiology resident and nurse anesthetist trainee.

Xue FS, et al⁽⁵⁾ reported that the incidence of difficult applying laryngoscopy correlated with the severity of CLCP deformities to be 4.77%. The highest incidence of difficulty applying laryngoscopy was reported in patients with both CL and CP. This result is similar to that of Gunawardana RH⁽⁴⁾ who demonstrated the correlation between degree of difficulty applying laryngoscopy and level of anatomical deformities. He reported the incidence of difficulty applying laryngoscopy to be 7.38%; whereas, in the authors' study only 1.17% was found. It was lower than in previous studies^(4,6) due to different population, including age, race, sites and degrees of deformities, advanced anesthesia technique, equipments, and experience of anesthesiologists.

All of patients with CP had a higher grade of direct laryngoscopic view than the patients with isolated CL who had no incidence of difficulty applying laryngoscopy (defined as Cormack and Lehane view grade III and IV). Isolated CP and unilateral CLCP had the highest incidence of difficult intubation (4.48% and 1.85%, respectively), which defined as tracheal intubation grade III-IV. However, there was no failed endotracheal intubation with conventional laryngoscopy using stylet in the authors' study.

Regarding postoperative complications,

Biazon J et al⁽⁶⁾ reported that 58.05% of common complications included inadequate pain control, hypoxemia, and tachycardia, respectively. Excessive bleeding and respiratory problems were also reported as serious complications⁽⁷⁻⁹⁾. In addition, Fillies et al⁽⁸⁾ reported other serious complication including arrhythmia, hyperthermia, and hypothermia. Incidence of complications in the authors' study was 3.6%. Complications were classified into 4 categories including desaturation, bleeding, nausea and vomiting and reintubation. The incidence was lower than in the aforementioned studies⁽⁷⁻⁹⁾, this could be as a result of the influence of various factors, including difference race, improvement in surgical techniques, and the advance techniques in pediatric anesthesia. However, serious complications were associated with respiratory system and bleeding as is the case with previous study⁽⁷⁻⁹⁾.

To determine the predictive factors associated with anesthetic complications, the authors found that fentanyl usage was associated with postoperative desaturation (OR 1.2, $p = 0.01$). These results support existing theories that fentanyl usage can suppress the respiratory system, especially in pediatric patients. However, how doses of fentanyl contributed to desaturation could not be identified. Further study is recommended to investigate this controversial issue.

Furthermore, postoperative desaturation could be the consequence resulting from the influence of a variety of factors, including residual effect of anesthesia, inadequate reversal, respiratory depression, airway obstruction and laryngospasm⁽¹⁰⁾. The main limitation of the present study is its retrospective nature, which might have yielded incomplete data or inaccurate data recording.

Conclusion

Anesthesia during CLCP surgery carries high risks of complications such as difficult airway management, especially in patients who had combined CLCP. The most prominent anesthetic complication is a respiratory problem which could lead to life-threatening conditions. Therefore, anesthesia providers should have good plans, complete equipment preparation, and discuss anesthesia techniques with other multidisciplinary care team in order to achieve excellent outcomes and decrease complications.

What is already known on this topic ?

From previous studies, it was deduced that applying laryngoscopy in CLCP patients is very difficult

depending on the severity of CP; however, the failure rate of intubation is low due to advanced anesthesia techniques and equipments. In addition, serious postoperative complications included respiratory problems and excessive bleeding which can lead to life threatening conditions.

What this study adds ?

The authors found that fentanyl usage is associated with postoperative desaturation (OR = 1.2, $p = 0.01$). These results support existing theories that fentanyl usage can suppress the respiratory system, especially in pediatric patients.

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Abbreviations

CL = Cleft lip, CP = Cleft palate, CLCP = Cleft lip Cleft palate, PONV = Post-operative nausea and vomiting, ASA = American Society of Anesthesiologists, ET = Endotracheal tube

Potential conflicts of interest

None.

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เทคนิคการระงับความรู้สึกและภาวะแทรกซ้อนของผู้ป่วยที่ได้รับการผ่าตัดปากแหว่งเพดานโหว่ ในโรงพยาบาลศรีนครินทร์

ปิยะพร บุญแสงเจริญ, ศัทธยา ทองรอง, บัณฑิต ปั้นเหนงเพชร, ศุภกร สมสะอาด, นนทิตา โรจนพิทยากร, ลำไผ่ พลเสนา, ดวงเนตร ลีตุ, วิมลรัตน์ ศรีราช, พรเทพ เกษมศิริ

ภูมิหลัง: ภาวะปากแหว่งเพดานโหว่มีพบมากที่สุดในความผิดปกติของโครงสร้างกระดูกและใบหน้า และอุบัติการณ์ประมาณ 1:800 การผ่าตัดแก้ไขมักจะเริ่มตั้งแต่อายุน้อยกว่า 1 ปี ผู้ป่วยมักมีความเสี่ยงที่จะเกิดภาวะแทรกซ้อนจากการระงับความรู้สึกและการใส่ท่อช่วยหายใจลำบากเนื่องจากอายุที่น้อยมากและความผิดปกติที่พบ

วัตถุประสงค์: เป็นการศึกษาพรรณยาอนหลัง โดยศึกษาเทคนิคที่ระงับความรู้สึกและภาวะแทรกซ้อนจากการผ่าตัดแก้ไขภาวะปากแหว่งเพดานโหว่ในโรงพยาบาลศรีนครินทร์ เพื่อนำมาพัฒนาการให้บริการใหม่ประสิทธิภาพยิ่งขึ้นต่อไป

วัสดุและวิธีการ: เป็นการศึกษาทบทวนเวชระเบียนและแบบบันทึกการระงับความรู้สึกในผู้ป่วยที่ได้รับการผ่าตัด แก้ไขภาวะปากแหว่งเพดานโหว่ ระหว่างปี พ.ศ. 2548-2552 ข้อมูลที่ศึกษาประกอบด้วยข้อมูลทั่วไปของผู้ป่วย ผลการวินิจฉัย ชนิดของการผ่าตัด วิธีการให้การระงับความรู้สึก ปริมาณยาแก้ปวดที่ได้รับจัดการทางเดินหายใจ ระดับความยากง่ายของการใส่ท่อช่วยหายใจ วิธีใส่ท่อช่วยหายใจรวมถึงภาวะแทรกซ้อนต่างๆ

ผลการศึกษา: มีเวชระเบียนที่นำมาเก็บข้อมูลทั้งหมด 469 คน ชนิดของภาวะปากแหว่งเพดานโหว่ที่พบมากที่สุดคือ unilateral CLCP (45.48%) อุบัติการณ์เกิดการใส่ท่อช่วยหายใจลำบากพบมากที่สุดในประเภท Cleft palate (4.48%) และ Unilateral CLCP (4.48%) ซึ่งผู้ป่วยทั้งหมดสามารถใส่ท่อช่วยหายใจได้โดยใช้ stylet มีเพียงหนึ่งคนที่ต้องใช้เทคนิค retrograde intubation ภาวะแทรกซ้อนที่พบประกอบด้วย desaturation, reintubation, postoperative bleeding, และภาวะคลื่นไส้อาเจียนและพบว่าผู้ป่วยในกลุ่ม CP พบอุบัติการณ์ของภาวะคลื่นไส้อาเจียนได้มากกว่ากลุ่มอื่น (8.95%) และเมื่อทำการวิเคราะห์ด้วย multivariate analysis พบว่าการใช้ fentanyl มีความสัมพันธ์กับการเกิดภาวะ desaturation (OR = 1.2, p = 0.010)

สรุป: ผู้ป่วยที่มีภาวะ unilateral CLCP หรือ CP พบอุบัติการณ์การใส่ท่อช่วยหายใจลำบากได้มากกว่ากลุ่มอื่นๆ แต่อย่างไรก็ตามผู้ป่วยทุกรายสามารถใส่ท่อช่วยหายใจได้โดยวิธีสัญญาณแพทย์ที่มีทักษะและระยะเวลาการผ่าตัดที่นาน รวมถึงการใส่ยาแก้ปวดในขนาดสูงอาจเพิ่มโอกาสในการเกิดภาวะแทรกซ้อนเช่น desaturation และภาวะคลื่นไส้อาเจียนได้