An Observation Study of Rapid Sequence, Awake and Sedation-Only Intubations in an Emergency Department in Thai patients

Satariya Trakulsrichai MD*,
Petchara Sundarathiti MD**, Phanorn Chalermdamrichai MD*,
Isares Palasatien MD*, Sasivimol Rattanasiri PhD***,
Porntip Chatchaipun MSc***, Sant Hathirat MD*

** Emergency Department, Ramathibodi Hospital, Faculty of Medicine, Mahidol University, Bangkok, Thailand*
*** Anesthesiology Department, Ramathibodi Hospital, Faculty of Medicine, Mahidol University, Bangkok, Thailand*
**** Section for Clinical Epidemiology and Biostatistics, Research Center, Ramathibodi Hospital, Faculty of Medicine, Mahidol University, Bangkok, Thailand*

Background: *Rapid Sequence Intubation (RSI) in emergency departments (EDs) is recognized as a cornerstone of emergency airway management in developed countries. In Thailand, emergency medicine is a new specialty and RSI is a novel method for patients in EDs. The observation of RSI and two former methods in EDs were carried out to assess whether RSI was more successful and had lower immediate complication in Thai patients or not.*
Material and Method: *The authors performed a retrospective study. The emergency airway management records were reviewed and analyzed for the primary outcome. The primary outcome included the overall success rate, the success rate within 1 attempt, the success rate within 2 attempts, and the overall immediate complication rates for orotracheal intubations.*
Results: *Seventy-eight patients were included in the present study. The overall success rate, the success rate within 1 attempt and the success rate within 2 attempts of the RSI group were statistically significantly higher and the overall immediate complication rate of RSI group was statistically significantly lower than awake and sedation-only intubation groups. No incidence of severe arrhythmia, cricothyroidotomy, and cardiac arrest during the intubation were found.*
Conclusion: *RSI in EDs was more successful in selected patients compared to the two former methods in emergency airway management in Thai patients. The clinical outcome especially that resulted from the complication needs further study.*

Keywords: *Rapid Sequence Intubation (RSI), Emergency Department, The success rate*

J Med Assoc Thai 2009; 92 (8): 1022-7
Full text. e-Journal: *http://www.mat.or.th/journal*

Emergency airway management is an important life saving procedure and one of the mandatory competency skills of emergency physicians (EPs). Effective airway control, increased safety, and decreased complication of intubations are the main concern. Rapid Sequence Intubation (RSI) is recognized as a cornerstone of emergency airway management[1], especially in developed countries. In the United States, RSI is performed routinely by EPs practicing in large hospitals and in prehospital care for trauma patients in some centers[2].

EPs in the United Kingdom perform RSI in increasing number as well[3,4]. In Asia, emergency medicine is a new specialty in most countries, hence the reports of RSI use in emergency departments (EDs) are limited[5-7].

Correspondence to: Trakulsrichai S, Emergency Department, Ramathibodi Hospital, Faculty of Medicine, Mahidol University, Praram 6 Rd, Bangkok 10400, Thailand. Phone: 0-2201-1484, 0-2201-2404, E-mail: Satariya_tra@hotmail.com, rasya @mahidol.ac.th

In Thailand, physicians in EDs mostly use awake and sedation-only methods for emergency intubation. Emergency medicine residency training has been established for only 5 years and RSI is a novel practice in EDs. Therefore, there is not yet any study comparing RSI to the former methods: awake and sedation-only intubation in Thai patients.

The objective of the present study was to observe and compare the success rate, the immediate complication rate and the adverse outcome of RSI with two former methods in EDs so as to assess whether RSI might be more successful and have lower immediate complications in Thai patients or not.

Material and Method

Study design

The authors performed a retrospective study to compare RSI with awake and sedation-only intubation. Sample size analysis predicted that 48 patients would be required to demonstrate the difference with a power of 80% ($\alpha = 0.05$, d = 0.02 and intubation prevalence = 0.005). Based on the medical school and residency training setting, the first intubator is usually the last year medical student or the first year emergency medicine residents in each shift of the duty supervised by an emergency medicine attending staff. All last year medical students and emergency medicine residents who worked in ED were passed the emergency airway management training (including RSI training for residents only). The emergency medicine residents were trained how to complete the emergency airway management record form. The senior resident or the attending staff would decide and choose the method of intubations by themselves. If the first attempt failed, the senior intubator would do it. The emergency airway management records in ED were analyzed.

The primary outcome included the overall success rate, the success rate within 1 attempt, the success rate within 2 attempts, and the overall immediate complication rates for orotracheal intubations, for example: emesis, oropharyngeal trauma/ bleeding, new arrhythmia, delayed or prolonged intubation, and probably morbid change of vital signs.

The present study was approved by the Institutional Ethic Committee Board of Ramathibodi Hospital, Faculty of Medicine, Mahidol University.

Study setting and population

The setting of the present study was in a tertiary teaching hospital emergency department with an annual ED patient volume about 70,000 patients a year.

The inclusion criteria were patients older than 15 years old and needed orotracheal intubation in ED.

The exclusion criteria were patients who were completely unresponsive or near dead patients or patients who had the anatomic structures that were difficult to mask ventilate and intubate (*e.g.*, distorted maxillofacial anatomy).

Study protocol

All patients who needed intubation were put on blood pressure, heart rate, respiratory rate, and oxygen saturation monitoring and followed the emergency airway management standard protocols set for every intubation method. RSI protocol combined administration of a pretreatment agent, an induction agent, and a neuromuscular blocking agent after preoxygenation. Awake protocol did not use any drugs to facilitate tracheal intubation. Sedation-only protocol used only a sedative drug to facilitate tracheal intubation. The emergency airway management record form contained the data about the patient' s name, hospital number, evaluation prior to intubation (such as difficult anatomy), choice and indication of airway management, diag-nosis, presentation, medication, intubation and postintubation management (which included number and detail of attempts, technique, intubator's detail, supervisor's detail, tube placement confirmation method and time when confirmed tube and cuff inflated), alternative airway management, unanticipated event or complication and comment.

The senior resident or the attending staff supervised the recording of the data according to their decision in each item of records. A single intubation attempt was defined as one act to try to view the vocal cord using the direct laryngoscope and failed if the endotracheal tube did not pass through the vocal cord.

The authors reviewed the complete records from May 2007 to January 2008 and analyzed for the primary outcome.

Data analysis

All complete emergency airway management records were analyzed by using Pearson Chi-square (χ^2) or Fisher's exact test for categorical data and one-way ANOVA for continuous data.

Mean and SD were used to describe continuous data, and frequency and percentage were used for categorical data.

Results

Seventy-eight patients were included in the present study (Table 1). The baseline characteristics for patients in each group were not statistically different (Table 2).

The most common diagnosis and indication for intubations were acute cerebrovascular disease and respiratory failure. The pretreatment drug, the induction drug and the neuromuscular blocking agent mostly used were Fentanyl (25/37) with the dose of 0.5-1mcg/kg and Etomidate (17/37) with the dose of 0.2-0.3 mg/kg and Succinylcholine (35/37) with the dose of 1-1.5 mg/kg, respectively. The overall success rate, the success rate within 1 attempt and the success rate within 2 attempts of the RSI group were statistically significantly higher than awake and sedation-only intubation groups (Table 3).

The overall immediate complication rate of all groups in the present study was 35.9% (27/78) and each patient could have more than one complication. The overall immediate complication rate of RSI group was statistically significantly lower than awake and sedation-only intubation groups (Table 4). When the authors performed the subgroup analysis for each complication recorded in the emergency airway management records, it was found that emesis, prolonged intubation, dental, or oropharyngeal trauma and esophageal intubations in RSI group were statistically significantly lower than those in the other two groups. The authors found two immediate hypotension (defined by systolic blood pressure < 90 mmHg or decreasing > 20%) and one new arrhythmia complication (Bigeminy Premature Ventricular Cardiac Activity) recorded only in the RSI group, however these complications had no statistically significance. In the present study, no incidence of severe arrhythmia, cricothyroidotomy and cardiac arrest during the intubation were found.

Table 1. Demographic data of 78 patients

Characteristics	Total number	Number (%)
Sex	78	
Male		43 (55.13)
Female		35 (44.87)
Age (year); mean (SD)	78	63.41 (17.83)
Preexisting conditions	78	
Yes		63 (80.77)
No		15 (19.23)
Signs and symptoms at presentation	78	
Non trauma		74 (94.87)
Trauma		4 (5.13)

Discussion

According to previous studies describing RSI use in EDs, higher success rates with lower compli-cation/failure rates were reported by the RSI than by other methods[8-18].

In Asia, RSI use was reported in EDs in Singapore[5] and Hong Kong[6,7]. However, there is no

Table 2. Demographic and clinical data of the patients in each group

Characteristic	RSI group, n (%)	Awake group, n (%)	Sedation-only group, n (%)	p-value
Total	37 (47.44)	20 (25.64)	21 (26.92)	
Sex				0.459
Male	19 (51.35)	10 (50)	14 (66.67)	
Female	18 (48.65)	10 (50)	7 (33.33)	
Age (year); mean (SD)	61.56 (17.97)	65.45 (19.27)	64.71 (16.66)	0.688
Preexisting condition				0.566
Yes	29 (78.38)	18 (90)	16 (76.19)	
No	8 (21.62)	2 (10)	5 (23.81)	
Signs and symptoms at presentation				0.181
Trauma	4 (10.81)	0 (0)	0 (0)	
Non trauma	33 (89.19)	20 (100)	21 (100)	
The intubator				0.195
Last year medical student	1 (2.7)	3 (15)	1 (4.76)	
Resident	36 (97.3)	17 (85)	20 (95.24)	

Table 3. The success rate of intubation: the overall success rate, the success rate within 2 attempts and the success rate within 1 attempt

Number of attempts (time)	RSI group, n (%)	Awake group, n (%)	Sedation-only group, n (%)	p-value
1	35 (94.59)	7 (35)	13 (61.9)	<0.01*
2	2 (5.41)	8 (40)	5 (23.8)	0.002**
3	0 (0)	4 (20)	1 (4.8)	
4	0 (0)	1 (5)	2 (9.5)	
Total	37 (100)	20 (100)	21 (100)	<0.01***

* The success rate within 1 attempt
** The success rate within 2 attempts
*** The overall success rate

Table 4. The overall complication rate of intubation and the subgroup analysis

The complication	RSI group, n (%)	Awake group, n (%)	Sedation-only group, n (%)	p-value
The overall complication				<0.01
Yes	4 (10.81)	13 (65)	11 (52.38)	
No	33 (89.19)	7 (35)	10 (47.62)	
Emesis				0.001
Yes	0 (0)	5 (25)	5 (23.81)	
No	37 (100)	15 (25)	16 (76.19)	
Prolonged Intubation				0.012
Yes	0 (0)	4 (20)	2 (9.52)	
No	37 (100)	16 (80)	19 (90.48)	
Oropharyngeal/ Dental trauma				<0.01
Yes	0 (0)	6 (30)	5 (23.81)	
No	37 (100)	14 (70)	16 (76.19)	
Esophageal Intubation				0.002
Yes	1 (2.7)	7 (35)	3 (14.29)	
No	36 (97.3)	13 (65)	18 (85.71)	
Other complications				0.437
Yes	3 (8.1)	0 (0)	0 (0)	
No	34 (91.9)	20 (100)	20 (100)	

report about comparison between RSI and other former methods (awake and sedation-only intubations) which can help confirming the benefit of RSI in Asian emergency patients. The result of the present study showed that RSI had the statistically significantly higher overall success rate, success rate within 1 attempt and success rate within 2 attempts than awake and sedation-only groups. RSI also had the statistically significantly lower immediate complication rate including both overall complication and each subgroup complication than the other groups. These results were similar to other published studies from the developed countries in which RSI was shown to be superior to other methods for higher success rate and lower complication rate.

For the overall immediate complication of all groups, the result of the present study was higher than that of other studies[8,10,11]. The difference from other studies could partly be explained by the inclusion criteria of one study included the patients represented end-stage pre or fully arrested[8], thus they might be easily intubated and have less complication. Moreover, some studies were conducted in patients mostly intubated by the RSI method[10,11] who could have fewer complications.

Limitations

The present study may be limited by the small number of total patients and trauma patients. The present study did not study about the hemodynamic change during the intubation among these three methods and the clinical outcome of the patients. The present study did not study the delayed complication from intubations such as pulmonary aspiration and the patients who were predicted to need the difficult airway management either. Thus, further studies in trauma patients, about the hemodynamic change during the intubation and about the clinical outcome are needed.

Conclusion

RSI method in EDs had the statistically significantly higher success rate, lower immediate complication rate than awake and sedation-only methods in Thai patients. Thus, RSI in EDs can be acceptably used as alternative emergency airway management method in Thai and perhaps in Asian patients.

References

1. Walls RM. Airway. In: *Marx JA*, Hockberger RS, *Walls* RM, editors. Rosen's emergency medicine concepts and clinical practice. 6th ed. Philadelphia: Mosby; 2006: 2-26.
2. Fakhry SM, Scanlon JM, Robinson L, Askari R, Watenpaugh RL, Fata P, et al. Prehospital rapid sequence intubation for head trauma: conditions for a successful program. J Trauma 2006; 60: 997-1001.
3. Simpson J, Munro PT, Graham CA. Rapid sequence intubation in the emergency department: 5 year trends. Emerg Med J 2006; 23: 54-6.
4. Butler JM, Clancy M, Robinson N, Driscoll P. An observational survey of emergency department rapid sequence intubation. Emerg Med J 2001; 18: 343-8.
5. Wong E, Fong YT, Ho KK. Emergency airway management-experience of a tertiary hospital in South-East Asia. Resuscitation 2004; 61: 349-55.
6. Tam AY, Lau FL. A prospective study of tracheal intubation in an emergency department in Hong Kong. Eur J Emerg Med 2001; 8: 305-10.
7. Choi TF, Wong TW, Lau CC, Siu AY, Lo CB, Yuen MC, et al (2003). A study of orotracheal intubation in emergency departments of five district hospitals in Hong Kong. Hong Kong J Emerg Med 2003; 10: 138-45.
8. Walls RM, Gurr DE, Kulkarni RG, Sakles J, Pollack C. 6,294 emergency department intubations: second report of the ongoing National Emergency Airway Registry (NEAR) II Study. Ann Emerg Med 2000; 36: S51.
9. Li J, Murphy-Lavoie H, Bugas C, Martinez J, Preston C. Complications of emergency intubation with and without paralysis. Am J Emerg Med 1999; 17: 141-3.
10. Sakles JC, Laurin EG, Rantapaa AA, Panacek EA. Airway management in the emergency department: a one-year study of 610 tracheal intubations. Ann Emerg Med 1998; 31: 325-32.
11. Tayal VS, Riggs RW, Marx JA, Tomaszewski CA, Schneider RE. Rapid-sequence intubation at an emergency medicine residency: success rate and adverse events during a two-year period. Acad Emerg Med 1999; 6: 31-7.
12. Dronen SC, Merigian KS, Hedges JR, Hoekstra JW, Borron SW. A comparison of blind nasotracheal and succinylcholine-assisted intubation in the poisoned patient. Ann Emerg Med 1987; 16: 650-2.
13. Dufour DG, Larose DL, Clement SC. Rapid sequence intubation in the emergency department. J Emerg Med 1995; 13: 705-10.
14. Vijayakumar E, Bosscher H, Renzi FP, Baker S, Heard SO. The use of neuromuscular blocking agents in the emergency department to facilitate tracheal intubation in the trauma patient: help or hindrance? J Crit Care 1998; 13: 1-6.
15. Rotondo MF, McGonigal MD, Schwab CW, Kauder DR, Hanson CW. Urgent paralysis and intubation of trauma patients: is it safe? J Trauma 1993; 34: 242-6.
16. Talucci RC, Shaikh KA, Schwab CW. Rapid sequence induction with oral endotracheal intubation in the multiply injured patient. Am Surg 1988; 54: 185-7.
17. Walls RM, Vissers RJ, Sagarin MJ. 2392 emergency department intubations: first report of the ongoing national airway registry (NEAR 97) study [abstract]. Acad Emerg Med 1998; 5: 393.
18. Fortney JP, Bodner M, Lewis LM, Hall JB. Comparison of rapid-sequence intubation with conscious sedation or awake intubation [abstract]. Acad Emerg Med 1996; 3: 458.

การศึกษาสังเกตการใส่ท่อหลอดลมคอแบบรวดเร็ว การใส่ท่อหลอดลมคอโดยไม่ใช้ยา และการใส่ท่อหลอดลมคอแบบใช้ยานอนหลับอย่างเดียวที่ห้องฉุกเฉินในผู้ป่วยไทย

สาทริยา ตระกูลศรีชัย, เพชรา สุนทรฐิติ, พรรณอร เฉลิมดำริชัย, อิศเรศ พละเสถียร, ศศิวิมล รัตนศิริ, พรทิพย์ ฉัตรชัยพันธ์, สันต์ หัตถีรัตน์

ภูมิหลัง: *การใส่ท่อหลอดลมคอแบบรวดเร็วที่ห้องฉุกเฉินถือเป็นวิธีหลักในการจัดการดูแลการช่วยหายใจในประเทศที่พัฒนาหลายประเทศ ในประเทศไทยเวชศาสตร์ฉุกเฉินเป็นสาขาใหม่และวิธีนี้ยังเป็นวิธีใหม่สำหรับผู้ป่วยห้องฉุกเฉิน การศึกษานี้จึงได้สังเกตการใส่ท่อหลอดลมคอแบบรวดเร็วที่ห้องฉุกเฉินว่าจะมีผลสำเร็จสูงกว่าและมีภาวะแทรกซ้อนทันทีน้อยกว่าหรือไม่เมื่อเทียบกับ 2 วิธีเดิมในผู้ป่วยไทย*

วัสดุและวิธีการ: *เป็นการศึกษาย้อนหลัง โดยศึกษาจากแบบบันทึกการจัดการดูแลการช่วยหายใจในผู้ป่วยห้องฉุกเฉิน โดยศึกษาผลการศึกษาหลัก คือ อัตราความสำเร็จในการใส่ท่อหลอดลมคอโดยรวม อัตราความสำเร็จในการใส่ท่อหลอดลมคอครั้งแรก อัตราความสำเร็จในการใส่ท่อหลอดลมคอภายใน 2 ครั้งแรก และอัตราการเกิดภาวะแทรกซ้อนทันทีโดยรวม*

ผลการศึกษา: *มีผู้ป่วยทั้งหมด 78 คน พบว่าอัตราความสำเร็จในการใส่ท่อหลอดลมคอโดยรวม อัตราความสำเร็จในการใส่ท่อหลอดลมคอครั้งแรก อัตราความสำเร็จในการใส่ท่อหลอดลมคอภายใน 2 ครั้งแรกในกลุ่มการใส่ท่อหลอดลมคอแบบรวดเร็วสูงกว่าในกลุ่มไม่ใช้ยาและแบบใช้ยานอนหลับอย่างเดียวอย่างมีนัยสำคัญ และอัตราการเกิดภาวะแทรกซ้อนทันทีโดยรวมต่ำกว่าในกลุ่มไม่ใช้ยาและแบบใช้ยานอนหลับอย่างเดียวอย่างมีนัยสำคัญ การศึกษานี้ไม่พบอุบัติการณ์ของหัวใจเต้นผิดจังหวะรุนแรง การเจาะคอ และหัวใจหยุดเต้น*

สรุป: *ในผู้ป่วยไทยที่มีลักษณะเหมาะสม การใส่ท่อหลอดลมคอแบบรวดเร็วที่ห้องฉุกเฉินมีอัตราความสำเร็จสูงกว่า 2 วิธีเดิม และผลทางคลินิกจากภาวะแทรกซ้อนที่สำคัญควรได้รับการศึกษาต่อไป*