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Intubation in emergency department of a tertiary care hospital in a low-income country

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Abstract

Objective: To study the indications, method, success rate and complications of intubation at the Emergency Department of a private, tertiary care hospital in Karachi, Pakistan.

Methods: The case series involved 278 patients above 14 years of age who underwent emergency intubation at the Emergency Department of Aga Khan University Hospital, Karachi between 1998 and 2003. Descriptive statistics were used to compare rapid sequence intubation with crash intubation. The level of significance was $p < 0.05$.

Results: Of the total 278 intubations performed, 37 (13.3%) had to be left out for incomplete information. The study population remaining for inferential analysis comprised of 241 patients. Of the total 278 patients, 174 (63%) were males. Rapid sequence intubation was the commonest type ($n=185$, 67%) of intubation and was performed mostly by anaesthetists ($n=236$, 85%). Cardiogenic pulmonary oedema and head injury were commonly seen in these patients. The success on first attempt of intubation was 98% ($n=181$) in rapid sequence intubation, and 85% ($n=48$) in crash intubation. Overall, 15 (5.3%) complications were seen in these intubations.

Conclusion: Study showed a satisfactory success rate in both rapid sequence and crash intubations.

Keywords: Emergency department, Intubation, Complications, Pakistan. (JPMA 63: 306; 2013)

Introduction

Airway control and adequate ventilation are paramount to the management of acutely ill patients and bear significant impact on the course of their disease. This task, mostly accomplished with endotracheal intubation (ETI), enables delivery of specific inspired oxygen concentration and institution of positive pressure ventilation.¹ However, this highly skilled life-saving procedure involves risks especially when performed in an emergency situation compared to performing it in elective conditions of an operating room.^{2,3} These differences are due to setting, patient characteristics, method used for intubation and timely availability of experienced personnel. The risk of complications with intubations has been reported to be 14-28% and it increases with the number of attempts as well as depends on the method of intubation.⁴

Rapid sequence intubation (RSI) and crash intubations are two different approaches for ETI in an emergency situation. Between the two, RSI is more common and safer for patients presenting to an emergency department (ED).⁵ Significance of ETI mandates that all physicians with acute care responsibilities, especially emergency physicians (EPs), should be competent in its institution and have the expertise to handle full spectrum of airway problems.⁶ Previously ETI was the domain of an

anaesthesiologist and even now in many parts of the world they are called to other units of the hospitals, including ED, to manage airway problems.

With the development of emergency medicine (EM) as a recognised medical specialty, airway management has become an essential skill for EPs.⁷ Its teaching is a mandatory component of training curriculum, and in Canada and the United States, EPs have already taken over this responsibility and deal with the major chunk of patients requiring emergency intubation.⁷⁻⁹ The situation is significantly different in England and Wales where anaesthetists perform the majority of RSI, and EPs perform it in only a few teaching hospitals.¹⁰

The data for successful intubation and its complication is sparse in developing countries. A study from Thailand reported overall success of 99.6% for orotracheal intubation (both RSI and crash intubation) and successful intubation on first attempt in 79.5% of patients.¹¹ Anaesthetists performed most of these intubations.

A similar situation exists in Pakistan where few teaching hospitals have qualified EPs and even fewer have EM residency programmes. In fact, EM is still evolving as a speciality in the country and there is a need to have regional baseline data regarding ETI, especially in ED setting, for future evaluation of training skills of EM residents and quality assurance practices. The aims of this study were to gather data on the indications, method,

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success rate and complications of intubation in the ED of a private, tertiary care teaching hospital and referral centre in Karachi, Pakistan.

Patients and methods

The case series spanned a period of five years from June 1998 to June 2003 and included patients who presented to the ED of the Aga Khan University Hospital (AKUH). The EPs included senior medical officers and trained EM faculty. During the study period, a 24-hour on-call in-house anaesthesia resident was available for any crash call for intubation. Both EPs and anaesthetists shared the responsibility of emergency airway management at the hospital.

Patients over the age of 14 years, admitted through ED and requiring intubation were included. The exclusion criteria was patients below the age of 14 years, patients intubated before arriving in the ED, patients intubated in other units of the hospital, patients who were intubated in ED but had to be shifted out to some other hospital due to non-availability of ventilator, and patients who expired in the ED. Cases were selected through a computerised search based on the inclusion criteria of the hospital information management system. RSI was defined as orotracheal intubation in which both neuromuscular blocking agents (NMBA) and sedatives were used to facilitate the process. Crash intubation was defined as orotracheal intubation in which no medications were used.

A medical graduate used a data-collection tool to obtain the following information: patients' demographics, underlying conditions for intubation, precipitating factors (both medical and surgical conditions), specific diagnosis, method of intubation (RSI versus crash), number of attempts required to intubate successfully, team deciding and intubating the patient, medications used, time delays after intubation decision, and immediate complications. Given that the mode of data-collection was through retrospective chart review, information bias was possible. To nullify its effect, the final comparison of the RSI and crash intubations were done by removing those cases with incomplete information. Thus, only 241 cases were used for inferential statistical calculations, with respect to comparison between the two modes of intubations. All other analyses were done on the basis of the total study population (n=278).

Data was entered and analysed using SPSS 19. Descriptive statistics were used to describe patients' demographics, intubation details and occurrence of complications. Mean and standard deviation values were computed for continuous variables. Pearson's chi-square test was conducted to compare categorical variables related to the

two types of intubations. To compare the age of the unpaired groups, Student's t-test was used. The level of significance was set at $p < 0.05$. The AKUH Ethics Review Committee placed the study in the ethics exempted category.

Results

A total of 278 intubations meeting the inclusion criteria were performed during the study period. The mean age of the study sample was 52 ± 19 years. There were 174 males (63%) in the study. The most common reason for intubation was an underlying medical condition in 221 (80%) patients, followed by trauma in 42 (15%) patients. The most common diagnoses of patients requiring ETI was cardiogenic pulmonary oedema 76 (27%) and head injury 25 (9%). The most common indication for airway intervention was hypoxia in 186 (67%) cases when analysed using multiple response analysis (n=193, 69%) (Figure).

EPs made the decision to intubate in 193 (69%) cases. However, the actual procedure was performed by the anaesthesiology team in 236 (85%) cases while the EM team performed it in 36 (13%) cases. The overall success on the first intubation attempt was 230 (94%).

Of all the intubations, 185 (67%) were RSI and 56 (20%) were

Table: Characteristics of rapid sequence intubation and crash intubation.

Variables	Method of intubation		p-value
	RSI (n = 185)	Crash intubation (n = 56)	
Mean age (years)	51 ± 19	53 ± 19	0.47
Gender†			
Male	121 (65%)	29 (52%)	0.06
Female	64 (35%)	27 (48%)	
Underlying condition requiring intubation†			
Medical	146 (79%)	50 (89%)	0.20
Surgical	10 (5%)	2 (4%)	
Trauma	29 (16%)	4 (7%)	
Speciality of doctor who made the decision to intubate			
Anaesthesiology	11 (6%)	-	0.01
Emergency Medicine	120 (65%)	49 (87%)	
Medicine	49 (27%)	6 (11%)	
Surgery	5 (3%)	1 (2%)	
Speciality of doctor who performed the intubation			
Anaesthesiology	170 (92%)	31 (55%)	0.0001
Emergency Medicine	12 (6.5%)	24 (43%)	
Medicine	3 (2%)	1 (2%)	
Number of attempts			
First	181 (98%)	48 (85%)	0.001
Second	4 (2%)	6 (11%)	
Third	0	2 (4%)	

+: Student's t-test.

†: Pearson chi-square test.

RSI: Rapid sequence intubation.

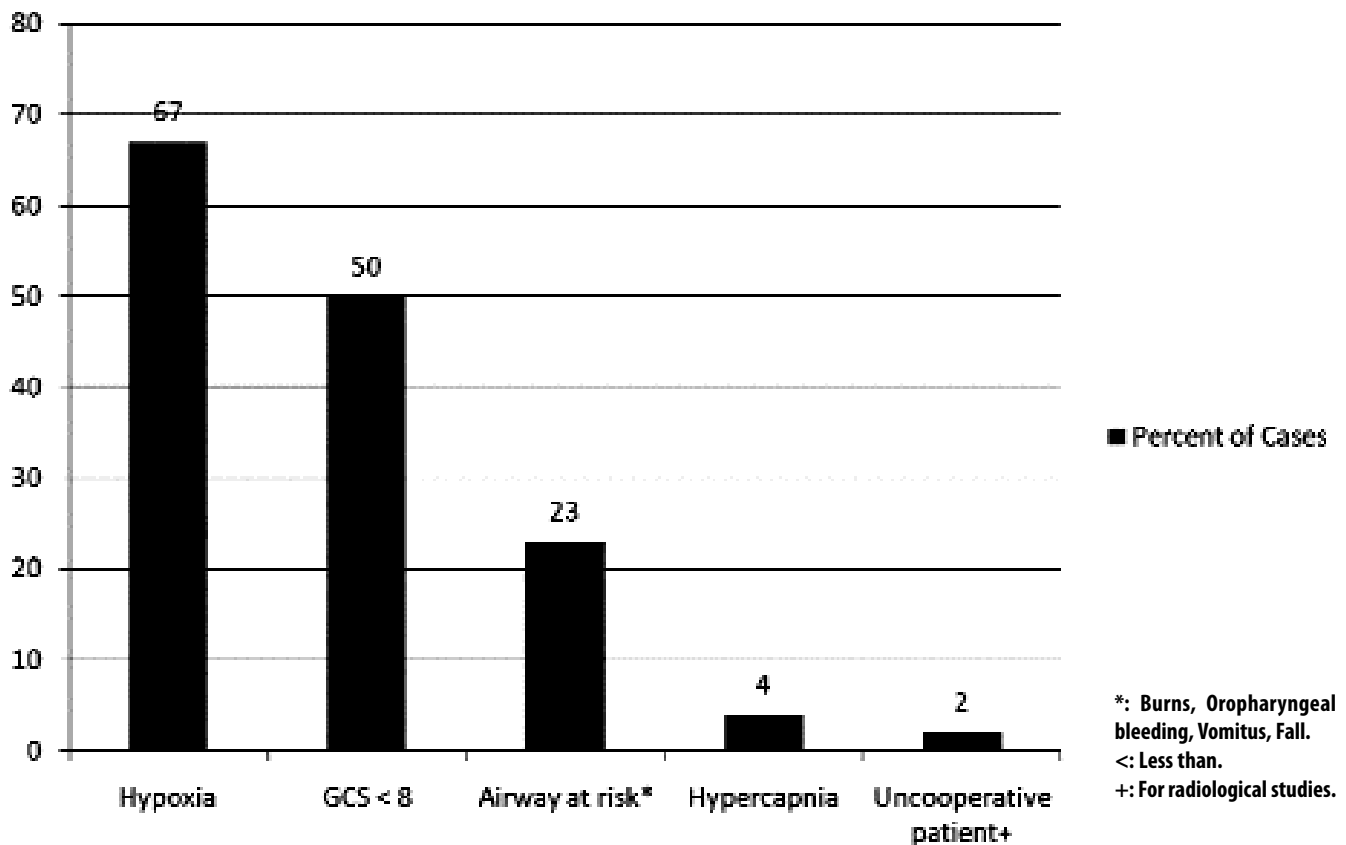


Figure: Indications for airway intervention.

crash intubations. Sedating agents alone were used in 19(7%) and paralyzing agents were used in 18(6%) cases. Complete RSI and crash intubation cases were compared (Table). The mean time from the arrival of patient in the ED to an intubation decision was 73 ± 103 minutes in RSI, and 8 ± 204 minutes in crash intubation. On the other hand, the mean time interval from decision to intubation was 27 ± 95 minutes in RSI, and 12 ± 20 minutes in crash intubation.

Total short-term complications noted in the data were 15(5%): 8 in RSI and 7 in crash intubations. Rate of complication for patients in whom the airway was secured in the first attempt was 3%; 22% in the second attempt; and 50% in the third attempt. The common complications observed were desaturation ($n=3,2\%$), cardiac arrest ($n=2,1\%$) and hypotension ($n=2,1\%$) in RSI, while oral trauma ($n=3,5\%$), cardiac arrest ($n=2,4\%$) and regurgitation ($n=2,4\%$) were noted in crash intubation. Out of 278 cases, 29(10.43%) had difficult airway, and in 14(5%) patients, more than one anaesthetist was required for the procedure.

Discussion

Our study highlighted that RSI was a common type of

intubation in our ED. It also had a better success rate on first attempt of intubation compared to the crash intubation. Cardiogenic pulmonary oedema and head injury were the common diagnoses requiring intubation. Overall, complications were seen in 5% patients with these intubations. Almost equal numbers of complications were noted in both types of intubations.

RSI is a safe and accepted method of intubation in ED patients. It provides a secure airway in acute conditions, facilitating patient stability even in need of transportation. However, like all procedures it holds some level of risk.¹² One study involving 1068 cases of ED intubation over a five-year period reported 51% of the intubations to be orotracheal with no medication, followed by 28% RSI.¹³ On the contrary, 67% of the intubations in this study data were RSI, while 20% were crash intubations. The variability in data may be due to different patient conditions and skills of the physician in RSI. In our data, RSI was the most common approach because in the ED we had anaesthesia rush-call cover 24 hours a day and the team is prompt in attending to and intubating patients. Others have reported under-usage of

RSI in the region.¹¹ In England, a study reported 0.12% incidence of ED RSI of which only 20% were performed by EPs. Senior anaesthetic trainees of specialist trainee year 3 and above from anaesthesia undertook 80% of ED RSIs.¹⁴ Our study also found similar findings.

Another study showed that there were no differences in failure rates between ED staff and anaesthetists (2.73% vs 0%, $p < 0.55$).¹² In our study, most decisions to intubate were taken by EPs, but were performed by anaesthetists. This can be explained because the protocol followed in the department was to call for an anaesthetist earlier instead of attempting to intubate directly. Others have also reported little or no difference in the success rates between the two groups.¹⁰

In developed countries, trauma and low Glasgow Coma Scale (GCS) score have been identified as the most common indications for intubations. In England, 25% of RSI were in trauma patients.¹⁴ In our data, medical conditions were responsible for 79% of RSI intubations, while trauma accounted for 16%. In a regional study, stroke and pneumonia were common indications, but non-traumatic ED patients were studied.¹¹ One study explained that diagnoses requiring intubation were mostly cardiopulmonary arrest, congestive heart failure and head injury (38%, 21% and 8% respectively).¹³ Our data also reports 79% of RSI and 89% of crash intubations due to medical-related conditions. Trauma was involved in 16% of RSI and 7% of crash cases. The reason for this difference is that our hospital is not a direct reference centre for trauma. Most of the cases initially go to public-sector hospitals.

Regional studies explain hypotension, multiple attempts and oesophageal intubation as common peri-intubation complications.¹³ Desaturation, cardiac arrest, hypotension and regurgitation were the common complications in our data. We had 15 complications reported, of which hypotension was reported in 2 cases while 11 cases required multiple intubation attempts. Rate of complication altered according to the number of attempts. It may be inferred that difficult intubation is likely to have more complications. It has been reported that soft tissue injury followed by hypotension and oesophageal intubation were major complications in a non-traumatic ED in Bangkok.¹¹ RSI was reported to be underused in that study. Using RSI might lead to less soft-tissue injury as the muscles are relaxed and intubation is smooth.

Major limitations of this study included the retrospective approach and data collection from a single-centre, which hampers generalisation for mass population. Besides this those who died in the ED had to be excluded as the medical record system of the hospital did not code them as in-patient admissions. Similarly, we had to exclude patients shifted to other hospitals due to non-availability of beds, financial reasons and patient/family wishes.

Conclusion

RSI was the most common method used which is in line with relevant recommendations. Hypoxia was the most frequent indication for intubation. Pulmonary oedema was the most common underlying diagnosis requiring the procedure. The study had a satisfactory success rate in both RSI and crash despite the fact there were a few complications.

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