Research Article

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Outcomes of Initial Non-Shockable Rhythm Cardiopulmonary Arrest in Emergency Department Patients with Early vs. Late Endotracheal Intubation.

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INTRODUCTION

A serious condition that is observed in emergency rooms across the globe, cardiac arrest occurs at a rate of 330,000 in the US and 275,000 in the EU annually [1]. A vital component in the survival of patients experiencing cardiac arrest is providing high-quality cardiopulmonary resuscitation (CPR), which includes proper aided ventilation, minimal interruption of compression, and successful chest compression. About 20% of all non-cardiac causes of in-hospital cardiac arrest are hypoxic, making it the most common cause [2, 3]. During CPR, the ventilatory technique is crucial, particularly for non-shockable patients whose causes are primarily non-cardiac.
Patients experiencing cardiac arrest are frequently given bag-mask ventilation (BMV) as an initial form of assisted breathing, either with or without basic airway adjunct. When performing CPR, certain patients require advanced airway management (AAM), which may involve endotracheal intubation or the placement of a supraglottic airway device. The best way to ventilate a person during cardiac arrest is still up for debate.The American Heart Association (AHA) 2020 guidelines state that In any situation where CPR is being performed, emergency cardiovascular care, BMV, or an AAM may be taken into consideration.
A previous study that found 96.7% of tracheal intubation attempts were successful was published in [6]. According to current American Heart Association guidelines, advanced airway approach may be employed when tracheal intubation success rates are high. But as of right now, there's no proof on the best timing to AAM. Survival at discharge is improved by AAM less than 5 minutes, according to Wong et al. [7]. The advantages of delayed AAM in the prehospital context were demonstrated by Bobrow et al. [8]. This study assessed the impact of early versus late AAM in patients presenting with non-shockable initial cardiac rhythm who were at risk of cardiac arrest.

METHODS

This study was a retrospective cohort that took place from January 2013 to October 2019 at the emergency department at Ammasat University Hospital (TUH), Pathum 'ani, Thailand. Situated in the suburbs north of Bangkok, TUH is an 800-bed tertiary academic teaching hospital serving 60,000 ED visits yearly. The hospital serves about 1.1 million residents in the surrounding area.

Players

All emergency department cardiac arrest (EDCA) patients who were above the age of eighteen and who first presented with an advanced airway placement during CPR and an initially non-shockable cardiac rhythm (asystole or pulseless electrical activity) were eligible. Patients with orders to "don't attempt resuscitation" (DNAR), intubation before cardiac arrest, out-of-hospital intubation, and transfer of the patient to another hospital following resuscitation were not included in our analysis.

Changeables

Gender, age, the location of the initial cardiac arrest, the cause of the cardiac arrest, the initial cardiac rhythm, the cardiac arrest that was witnessed, bystander CPR, collapsed time to first chest compression, time to first dose of epinephrine, time to AAM, defibrillation during resuscitation, and intravenous medications during resuscitation were all recorded on a standard form. AAM made reference to tracheostomy, surgical cricothyroidotomy, and endotracheal intubation. The cerebral performance category was used to identify a favorable neurological result.

Data Measurement/Source

The survival to hospital discharge or within 30 days and the survival with favorable neurological result were the outcomes that were obtained from the Ammasat CPR Registry and the patient's medical documents.

Size of Study

According to our pilot study, the early and late AAM survival rates to hospital release at Ammasat University Hospital were 14% and 6%, respectively. The sample size was computed with STATA software. For a one-sided test with a 5% alpha level, a sample size of 198 patients per group was estimated in order to achieve 80% power to detect the difference.

Methods of Statistics

The mean and standard deviations were presented for the quantitative variables. The chi-squared test was utilized to compare categorical variables, which were reported as percentages. An analysis of multivariable logistic regression was performed to assess the independent impact of early AAM on survival results. A p-value of less than 0.05 was considered statistically significant. STATA software (version 14.0, StataCorp, College Station) was used for all analyses.

RESULTS

Players. 805 individuals with non-shockable cardiac arrest were documented between January 2013 and October 2019. A total of 416 individuals met the study's eligibility requirements; 209 (50.24%) received AAM in less than two minutes, while 207 (49.76%) received it more than that time. Due to incomplete data (168), DNAR orders (34), referrals (27), and AAM prior to cardiac arrest or out-of-hospital advanced airway therapy, 389 cases were excluded.

Characteristic Information

Table 1 summarizes clinical characteristics and demographic information. The early AAM group's mean AAM time was 1.16 minutes (SD 0.83), while the late AAM group's mean AAM duration was 5.87 minutes (SD 5.35). The early AAM group was administered epinephrine 1.39 minutes prior to the late AAM group (2.28 minutes, $p < 0.001$). There was no proof that there was a statistical gender difference.

Principal Findings

In the early AAM group, ROSC was observed in 106 patients (50.72%), but in the late AAM group, it was observed in 98 patients (47.34%) ($p = 0.094$). 23 patients (11%) in the early AAM group and 14 patients (6.80%) in the late AAM group survived to be discharged from the hospital ($p = 0.168$). Thirteen patients (6.25%) and six patients (2.91%) in the early AAM and late AAM groups, respectively, were discharged with a satisfactory neurological outcome ($p < 0.157$).

The following variables were controlled using multivariable logistic regression analysis: age, gender, etiology of cardiac arrest, sodium bicarbonate use, time to first dose administration of adrenaline, and collapsed time to initial chest compression.Compared to the late AAM group, the early AAM group had a greater survival rate to hospital release; nevertheless, there was no statistically significant difference (adjusted odds ratio (aOR): 1.28, 95% confidence interval (CI); 0.59–2.76, $p < 0.524$). A good neuronal outcome was also more common in the early AAM group, however there was no statistically significant difference (aOR: 1.68, 95%CI; 0.52–5.45, $p < 0.387$).

DISCUSSION

In non-shockable cardiac arrest, early epinephrine delivery is crucial, according to Advanced Cardiovascular Life Support [12]. Early AAM was linked to early epinephrine administration, according to our research. Izawa et al.'s [9] evidence showed that patients in their early AAM group were also given early injections of adrenaline. However, in an out-of-hospital cardiac arrest, Lumpton et al. [13] did not discover a correlation between AAM and the duration until the first dose of epinephrine was administered. This result could be explained by the CPR team's excellent performance; with more efficient resuscitation, epinephrine can be given right away, and the advanced airway can be put earlier.

In the early AAM group, we showed greater odds ratios of surviving to neurological endpoint, ROSC, and hospital release; however, none of these differences were statistically significant. Early advanced airway management (AAM) may help during the circulatory phase of CPR [14], but there is still debate over the possible advantages of advanced airway management for the neurological outcome. AAM before 5 minutes was linked to a higher survival rate at hospital discharge (16.16 versus 11%), as shown by Wong et al. [7]. Better neurological results were found by Kajino et al. [15] with early prehospital AAM done by EMS personnel (aOR for one minute delay, 0.91, 95% CI; 1.24–2.02) and Izawa et al. [9] (early AAM 2.2% against late AAM 1.4%, aOR: 1.58 (95% CI; 1.24–2.02) Wang et al. [10] observed a poor neurological prognosis in hospitalized patients with a delayed AAM.

Rhythm that is not shockable (OR: 0.86, 95% CI: 0.80–0.93, $p < 0.001$). AAM was associated with a higher risk of a poor neurological outcome than traditional BMV, as demonstrated by Hasegawa et al. [16] (1.1% versus 2.9%, unadjusted OR: 0.38, 95% CI; 0.36 to 0.39). Tracheal intubation performed within the first 15 minutes was associated with a reduced incidence of hospital release, according to Andersen et al. [17]. There is no proof that AAM is superior to BMV, according to the 2020 AHA guidelines for cardiopulmonary resuscitation

and emergency cardiovascular care [4].

Hospitalized patients with a delayed AAM had a poor neurological prognosis, according to Wang et al. [10]. non-shockable rhythm (OR: 0.86, 95% CI: 0.80–0.93, p < 0.001). Hasegawa et al.'s research [16] showed that AAM was linked to a worse neurological outcome than regular BMV. (1.1% versus 2.9%; 95% CI: 0.36 to 0.39 for the unadjusted OR). Andersen et al. [17] found that tracheal intubation done within the first 15 minutes was linked to a lower likelihood of hospital release. The 2020 American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care [4] state that there is no evidence to support the superiority of AAM over BMV.

CONCLUSION

The patients with initial non-shockable cardiac arrest who got early AAM within two minutes did not significantly improve in terms of survival to hospital release or survival with acceptable neurological outcome, according to our retrospective analysis. To increase survival, more study is required on the timing of AAM and airway management techniques.

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