Original Article

Investigating the outcome of artificial ventilation in patients with ischemic stroke

Mohammad Reza Ghaffari[1*], Shamsi Ghaffari[2], Hormoz Irmlu[3]

[1]Research Center for Tuberculosis and Lung Diseases, Tabriz University of Medical Sciences, Tabriz, Iran, [2]Associate Professor, Children's Heart Research Center, Tabriz University of Medical Sciences, Tabriz, Iran, [3]Associate Professor, Neurological Research Center, Tabriz University of Medical Sciences, Tabriz, Iran.

Correspondence: Mohammad Reza Ghaffari, Research Center for Tuberculosis and Lung Diseases, Tabriz University of Medical Sciences. E-mail: Mohammadrezaghaffary@gmail.com

ABSTRACT

Background and objectives: Making decision to begin, continue, or discontinue the mechanical ventilation in patients with cerebrovascular ischemic events is still an important clinical problem due to the inherent severe prognosis. In addition, the use of respiratory supportive measures in these patients has been considered and questioned due to various risk factors, the pulmonary complications and high age of the patients. The objective of this study is to evaluate the causes of mechanical ventilation, the factors involved in the prognosis of mechanical ventilation and the outcome of ventilation in stroke patients. Methodology: This is a prospective descriptive-analytical study. The study was performed on 55 patients hospitalized in Tabriz Imam Khomeini Hospital between 2007 and 2008 due to diagnosis of ischemic stroke. From the first day of hospitalization, they underwent mechanical ventilation. The risk factors for the disease, the site of the reported lesion in CT and the causes of mechanical ventilation were determined and the relationship between the disease prognosis and gender, age, risk factors of disease, ischemic site and causes of mechanical ventilation was investigated. Results: Observations showed that out of 55 patients, 39 patients (70.9%) died, 9 patients (16.4%) survived and separated from ventilator, and 7 patients (12.7%) had a chronic dependency on mechanical ventilation. Among the factors predicted to be associated with prognosis of the disease, the presence or absence of risk factors for the disease (high age 82%, high blood pressure 65%, history of previous stroke 29%, diabetes 21%, atrial fibrillation 21%, smoking 16%, high blood lipid 10%) were the only cases, which showed significant relationship with prognosis of this disease. Gender, site of brain lesion and the reasons for patients' mechanical ventilation did not have a significant relationship with the prognosis of the disease. Conclusion: Despite high mortality (70%) and chronic dependency on ventilator (16%) in patients with acute ischemic stroke with respiratory failure, the use of mechanical ventilation still plays a major role in treating these patients. Planning to control risk factors of this disease can play an important role in the improvement of this bad prognosis. Selection of patients based on factors involved in prognosis of hospitalization in acute and intensive care units can reduce the high economic burden and number of beds occupied in intensive care units.

Keywords: Ventilation, ischemic stroke, mechanical ventilation.

Introduction

Stroke is a syndrome characterized by acute onset of neurological symptoms for at least 24 hours. Neurological symptoms are caused by the involvement of the central nervous system as a result of disruption of the cerebral blood flow. Stroke is the third cause of death in the United States and the most commonly diagnosed neurological disorder. The incidence of stroke increases with increasing the age and $\frac{2}{3}$ of strokes occurs at the age higher than 65 years. It is more common in males compared to females. It is also more common in black-skinned people compared to white-skinned people. The first study on the mechanical ventilation outcome in patients with ischemic stroke was conducted at the Mayo Clinic of Santa Mare Hospital between the years 1976 and 1994 and it was published in 1997. Then, similar studies were conducted by Berrouschot, Fanshawe, et al in different countries. The main motivation of authors in this regard was that developments in neurological and intensive nursing have led to the survival of patients who had already died at an early stage of their diseases, while many patients hospitalized in neurological intensive units, despite

Access this article online	
Website: www.japer.in	**E-ISSN:** 2249-3379

How to cite this article: Mohammad Reza Ghaffari, Shamsi Ghaffari, Hormoz Irmlu. Investigating the outcome of artificial ventilation in patients with ischemic stroke. J Adv Pharm Edu Res 2019;9(S2):115-118.
Source of Support: Nil, Conflict of Interest: None declared.

severe and irreversible brain damage, are kept alive with mechanical ventilation in the present age.

Under such conditions, many of the patient's acquaintances, in addition to asking questions on the outcome of the patient, demand for making decision on the way of continuing the mechanical ventilation. This type of patients, in addition to creating a disappointment in the medical staff, creates a set of medical, moral, economic, and legal problems for the treatment team, patient and his or her acquaintances. In all of the mentioned studies, while prognosis of patients with ischemic stroke has been described very disappointing, it has been emphasized that the general principles of clinical decision-making on the place of hospitalization, duration and method of mechanical ventilation, discontinuation of mechanical ventilation should be specified for physicians, patients, and their acquaintances (8 and 9). Given the limited and high costs of acute intensive care units in Iran and the need for the establishment of chronic intensive care units in this country, authors argue that examining the prognosis of these patients and identifying the mechanical ventilation indications and its outcomes for both physicians involved and acquaintances of patients are critical.

The objective of this study was:

- Identifying the indicators of mechanical ventilation in stroke patients
- Prognosis of mechanical ventilation in these patients
- The factors affecting this prognosis

Materials and Methods

The study was a descriptive-analytical and prospective study. The study population was selected among the patients admitted to Neurology Unit and ICU of Imam Khomeini Hospital in Tabriz in 2007-2008. In this study, 55 patients admitted due to stroke ischemic and hospitalized since the first day or intubated later or mechanically ventilated were selected and examined. There was no limitation in patient selection in terms of age. Authors did not interfere in the treatment of patients. All patients completed the normal course of treatment.

The outcome of the patients is as follows:

1-dead, 2-living isolated from ventilator 3- chronic dependency on ventilator.

Patients with mechanical ventilation for more than 4 weeks were assigned to chronic dependency on ventilator chronic group. Only the duration of the ventilation of the patient was considered. For each patient, according to history and clinical examination, comorbidities and common risk factors for ischemic stroke disease were identified. The considered risk factors included: High blood pressure, diabetes, high blood lipids, history of heart disease in the form of AF rhythm, history of smoking and injecting drugs, previous history of CVA and age over 60 years. All patients had CT scans during the first 24 hours of hospitalization in hospital, which, according to their CT scan report, we assigned them into 4 classes in terms of ischemic site.

Classification of patients based on CT scan report for ischemic place:

1-Ischemic people who were in cerebral anterior artery range 2- Those who had an ischemia in the middle artery 3- Patients who had posterior cerebral lesion 4- People with normal CT scan. Some ischemic patients had the range of two or three arteries.

In addition, we had another investigation to specify the ischemic range in terms of involved hemisphere:

1- People with right hemisphere ischemic. 2. People with left hemisphere ischemia. 3. People with both involved hemispheres. 4. People whose CT scans were reported without a lesion.

For each of the above-mentioned cases, the prognosis is presented separately and compared. After determining the above information (gender, age, risk factors for CVA, anesthesia site in the CT scan, indicating of patient's mechanical ventilation), the relationship between each of them and the prognosis and outcome of the patients was examined.

Statistical method

Data obtained in this study were analyzed using SPSS 15 software and Pearson correlation test. The significance level (P-value) is less than 0.05.

Results

In this study, 55 patients were examined, which 55% of them (n=30) were female and 45% of them (n=25) were male. In the study, there was no significant relationship between gender and prognosis (P≤0.335). There was no significant relationship between age and outcome of ischemic stroke (P≤0.098).

CT scan results are plotted in Figure 1:

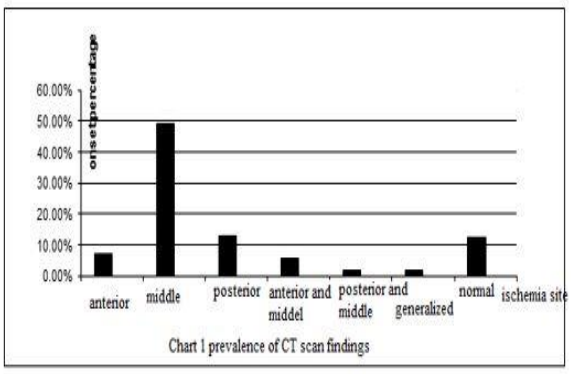

Figure 1:

Statistical analysis showed that there was no significant relationship between the ischemic site of the brain in the CT scan and the outcome of the patients (P = 0.363).

In another investigation on the site of ischemia in the CT scan, patients were classified into 4 classes (Table 1)

Table 1: hemisphere involvement and outcome of patients

Ischemic hemisphere	Number of patients	died	Dependent on ventilator	Separated from ventilator
Right	18	4	10	4

hemisphere	32.7%	22.2%	55.5%	22.2%
Left hemisphere	23 41.8%	18 78.2%	1 4.3%	4 17.3%
Both hemispheres	7 12.7%	6 85.7%	1 14.3%	0
Normal scan	7 12.7%	5 7.4%	0	2 28.6%

Observations showed that there was no significant relationship (p ≤0.492) between the causes of patient connection to the ventilator and the ventilation outcome. The frequency of risk factors for high age, high blood pressure, history of previous stroke, atrial fibrillation, diabetes, smoking, and high blood fat were 81%, 65%, 29%, 21%, 21%, 16% and 9%, respectively. It should be noted that patients in most cases had several risk factors simultaneously. For example, out of 36 people who had high blood pressure, 33 people had other risk factors, such as diabetes. Among 55 cases, no patient had risk factor. The presence or absence of risk factor was the only case, which had a significant relationship with the ventilation outcome (P <0.033). The final goal of this study was to determine the mechanical ventilation prognosis in patients with ischemic stroke. In this case, out of the 55 patients studied, 39 patients (70.9%) died, 9 patients (16.3%) survived, and 7 patients (12.7%) had chronic dependency on ventilator.

Discussion

The mechanical ventilation and intensive care units are one of the essential components of patient care, including ischemic stroke patients. Although, the number of patients undergoing mechanical ventilation has increased in recent years, the results of using mechanical ventilation on the patient's survival and the economic impact of using the mechanical ventilation have not been fully studied. Over the past 10 years, various studies have been carried out on the effect of mechanical ventilation in patients hospitalized in intensive care units on survival, duration of hospitalization, economic burden of in ICU for families, and attitudes of patients' acquaintances to cares provided in intensive care units. Studies conducted between 1990 and 2005 on intensive care units and use of mechanical ventilation in these units suggest that the use of mechanical ventilation and patients' hospitalization duration in intensive care units have increased over the past decade and this increase was associated with improvement in the survival level of the patients (5 and 6). In our study, 55 patients were examined, which 30 of them were female and 25 of them were male and the mean age of patients was 70 years. In the study of Mayo Clinic, 24 patients were studied, 13 of them were males and 11 were females and the mean age of patients was 68 years. In the study conducted by Berrouschot in Germany, 52 patients with a mean age of 62 years participated. In the study conducted by Fanshawe et al at the University Hospital in Australia between 1994 and 1999, 23 patients with a mean age of 53 years participated. In the study conducted by Wijdicks, 49 patients and in the study conducted by Brochard, 124 patients were investigated (7, 8, 9, 10, and 6). In our study, as other studies, no significant relationship was found between gender and mortality (p≤0.355). In our study, there was no limitation in terms of age in the selection of samples, but in the study conducted by Berrouschot et al, people in the age range of 18 to 85 years were selected. We also considered age over 60 as a risk factor for ischemic stroke disease. The rate of mortality in our patients was 70.9%, while it was 71% In Mayo Clinic study, 88% in Wijdicks study, and 52% in Brochard study (7, 8 and 10). Results of our study are almost similar to those of other studies on the rate of mortality and it is even lower than that of some developed countries. Determination of mortality in our study is based on the death in hospital and the study on mortality after discharge was not performed, while in the study conducted by Fanshawe et al., patients were followed up to three months after discharge. The mortality rate of ICU, inside the unit, and 3 months after discharge was 36%, 47%, and 52%, respectively. In the study conducted by Berrouschot et al in Australia, mortality was followed 3 months after discharge and it was found that 42 patients out of 52 patients (81%) died (8 and 9). In our study and similar studies, no significant relationship was found between the mortality and the ischemic site in the CT scan (p≤0.363). In this study, acute respiratory distress syndrome was the most common indication of mechanical ventilation (43.6%), and aspiration pneumonia, apnea, Cheyne-Stokes respiration, and neurogenic hyper-ventilation were the main indications of mechanical ventilation. Lung edema, cerebral edema, and tonic-clonic seizures were the most common mechanical ventilation indications in the Mayo Clinic study. In this study, the prognosis of patients with seizure indication was better than that of other patients, so that out of 7 patients successfully separated from the ventilator, 4 patients were intubated merely due to seizures (Survival of 67%). 7 In our study, no patient underwent mechanical ventilation due to seizure, indicating extensive prophylactic treatment of seizure in patients of this center. The indications considered by Berrouschot et al were similar to those of our study. In 47 patients out of 52 patients (90%), disturbance of consciousness was the main cause of mechanical ventilation (8). In Australian university hospital, disturbance of consciousness and the inability to maintain airway and aspiration pneumonia were the main cause of ventilation in patients [9]. In our study and most of the studies, no significant relationship was found between mortality rate and mechanical ventilation indications. In our study, risk factors for ischemic stroke in patients were examined and we considered high blood pressure, diabetes, high blood fat, smoking, age over 60 years, cardiovascular problems, and the use of injectable drugs as risk factors. In the study conducted by Mayo Clinic, as our study, a significant relationship was found between risk factors and mortality. In the study conducted by Fanshawe et al, the considered risk factors were similar to those of our study (7 and 9). In the study conducted by Berrouschot, the most common cause of death was the herniation of middle brain due to complete obstruction of the middle cerebral artery. Patients who survived had a good

to relatively good survival (8). Lack of performing thrombolytic therapy, hemi-craniotomy for treating cerebral edema, cerebral CT scan at onset of respiratory failure and its serial control, and lack of determining the mortality after discharge and quality of life of patients are considered as limitations of this study.

Conclusion

Mortality of patients with cerebral ischemia who required mechanical ventilation is very high. The presence of risk factors for cerebrovascular disease such as diabetes, hypertension, hyperlipidemia, high age, smoking, AF rhythm were the cases, which showed significant relationship with outcome of ischemic patients underwent mechanical ventilation. While mechanical ventilation alone does not improve the outcome of this disease, it is still considered as essential component in treatment of this disease. The use of modern treatments, such as hemi-craniotomy, and thrombolytic drugs should be considered in the treatment of these patients in order to be used routinely, if they improve the survival.

References

1. .