

Perioperative risk factors for prolonged mechanical ventilation and tracheostomy in women undergoing coronary artery bypass graft with cardiopulmonary bypass

Zahra S. Faritous,
Nahid Aghdaie,
Forouzan Yazdanian,
Rasoul Azarfarin¹,
Ali Dabbagh²

Department of Cardiac Anesthesiology, Shahid Rajaei Heart Center, Tehran,
¹Department of Anesthesiology, Tabriz University of Medical Sciences, Tabriz, ²Department of Cardiac Anesthesiology, Anesthesiology Research Center, Shahid Beheshti University of Medicine, Tehran, Iran

Address for correspondence:

Dr. Ali Dabbagh,
Department of Cardiac Anesthesiology,
Anesthesiology Research Center,
Shahid Beheshti University of
Medicine, Tehran, Iran.
E-mail: alidabbagh@yahoo.com

ABSTRACT

Background: Prolonged mechanical ventilation is an important recognized complication occurring during cardiovascular surgery procedures. This study was done to assess the perioperative risk factors related to postoperative pulmonary complications and tracheostomy in women undergoing coronary artery bypass graft with cardiopulmonary bypass. **Methods:** It was a retrospective study on 5,497 patients, including 31 patients with prolonged ventilatory support and 5,466 patients without it; from the latter group, 350 patients with normal condition (extubated in 6-8 hours without any complication) were selected randomly. Possible perioperative risk factors were compared between the two groups using a binary logistic regression model. **Results:** Among the 5,497 women undergoing coronary artery bypass graft (CABG), 31 women needed prolonged mechanical ventilation (PMV), and 15 underwent tracheostomy. After logistic regression, 7 factors were determined as being independent perioperative risk factors for PMV. **Discussion:** Age ≥ 70 years old, left ventricular ejection fraction (LVEF) $\leq 30\%$, preexisting respiratory or renal disease, emergency or re-do operation and use of preoperative inotropic agents are the main risk factors determined in this study on women undergoing CABG.

Key words: Coronary artery bypass graft, prolonged ventilatory support, tracheostomy

INTRODUCTION

Prolonged mechanical ventilation is an important recognized complication occurring during cardiovascular surgery procedures, which leads to tracheostomy in a considerable number of these patients. Prolonged mechanical ventilation is associated with increased cost of treatment^[1] and decreased quality of life.^[2]

Pulmonary complications are among the main complications encountered after cardiac surgery,^[3,4]

and there are a number of risk factors attributed to prolonged mechanical ventilation; while not all of them are definite.

Risk factor identification and assessment would help us manage the patients much more precisely.^[5] This study was done to assess perioperative risk factors related to postoperative pulmonary complications and tracheostomy in women undergoing coronary artery bypass graft with cardiopulmonary bypass.

METHODS

This retrospective study was started after the approval of Institutional Review Board (IRB) for ethical considerations. Also, we obtained written informed consent from the patients to perform this study. All the female patients undergoing coronary artery bypass graft surgery with cardiopulmonary bypass from April 2002 to March 2008 were enrolled in the study.

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Prolonged intubation was considered when the duration of uninterrupted mechanical ventilation from the entry to the intensive care unit until the time of withdrawal of ventilatory support was more than 14 complete days.

The total number of patients was 5,497, which included 31 patients with prolonged mechanical ventilatory support and 5,466 patients without this type of support. From the latter group, 350 patients with normal condition (extubated in 6-8 hours without any complication) were selected randomly. Possible perioperative risk factors were compared between the two groups using a binary logistic regression model.

Data entry and analysis was performed using SPSS (version 11.5; SPSS Inc., Chicago, IL). Categorical variables were compared using chi-square or Fischer exact test as appropriate with risk stratification (odds ratio and 95% confidence interval). Analysis of continuous variables was done using independent samples *t* test; and multivariate analysis, using binary logistic regression model. Variables with *P* value $\leq .05$ in univariate analysis were included in the multivariate analysis. All the statistical tests were two tailed, and the level of significance was set at $\leq .05$.

RESULTS

Among the 5,497 (the total number of women included) women undergoing CABG, 31 women needed prolonged mechanical ventilation (PMV) and 15 underwent tracheostomy.

There was no difference between the two groups regarding preoperative weight (66.5 ± 11.4 kg in the PMV group *vs.* 70 ± 10.7 kg in the control group; *P* = .218). Also, there was no difference between the two groups regarding height (158 ± 4.5 cm in the PMV group *vs.* 152 ± 6.1 cm in the control group; *P* = .182); and the two groups did not have a statistically significant difference regarding body mass index (BMI; 30.3 ± 4.5 in the PMV group *vs.* 28.7 ± 4.2 in the control group; *P* = .13).

The women in the PMV group were 59 ± 8 years old, while those in the other group were 52 ± 14 years old (*P* = .002).

After univariate and multivariate logistic regression analysis, 7 factors were determined as being independent perioperative risk factors for PMV, and the results of the former and latter analyses are as follows, respectively:

- 1 - Age ≥ 70 years old:
Odds ratio = 2.3; CI, 0.85-6.7; *P* = .017; AND odds ratio = 3.6; *P* = .05.
- 2 - Left ventricular ejection fraction (LVEF) $\leq 30\%$:
Odds ratio = 4.4; CI, 1.6-12.1; *P* = .006; AND odds ratio = 2.2; *P* = .041.

- 3 - Preexisting respiratory disease:
Odds ratio = 4.6; CI, 1.4-15.3; *P* = .028; AND odds ratio = 6.3; *P* = .032.
- 4 - Preexisting renal disease:
Odds ratio = 9.9; CI, 3.5-28.4; *P* = .0001; AND odds ratio = 9.2; *P* = .003.
- 5 - Emergency operation:
Odds ratio = 8.3; CI, 3.2-21.9; *P* = .0001; AND odds ratio = 4.7; *P* = .032.
- 6 - Re-do operation:
Odds ratio = 3.9; CI, 1.8-8.5; *P* = .0001; AND odds ratio = 3.8; *P* = .016.
- 7 - Use of preoperative inotropic agents:
Odds ratio = 83.5; CI, 9.7-72.3; *P* = .0001; AND odds ratio = 53.1; *P* = .0001.

Also, a cardiopulmonary bypass time more than 120 minutes was considered a significant risk factor only after univariate analysis, in which odds ratio = 2.6; CI, 1.1-5.7; *P* = .036.

DISCUSSION

Determination of the perioperative risk factors that could predict the possibility for prolonged intubation after cardiac surgery might help optimize the patients before the start of the surgical procedure^[5] and could help the clinicians in their clinical management to prevent possible occurrence of prolonged mechanical ventilation.

In one study, it was demonstrated that patients with old age, those who were obese, patients who had impaired function of the left ventricle, and patients who needed cardiopulmonary bypass were the most important ones who may have had severely decreased levels of arterial oxygenation (severe hypoxemia) after myocardial revascularization. In such cases, the clinician should be aware of using perioperative considerations to cope with possible future respiratory problems; among which, increased positive pressures at expiration and strategies to use recruitment at the level of the alveoli are to be mentioned.^[6] So, a number of risk factors mentioned in the study are in concordance with the findings of our study; though our study was performed only on women.

In another study, it was demonstrated that the weekly schedule of the operation is not a main determinant of postoperative risk status; so, the selection of the time during the day, selection of the day during the week or selection of the month throughout the year is not related with poor outcomes in elective coronary artery bypass graft surgery.^[7] Hence it may be considered that this is not a risk factor.

There is another study in which the researchers have concluded that the following patients are at increased chance for poor postoperative clinical outcome: patients over 65 years old, patients with chronic kidney disease and failure, those with chronic obstructive lung disease, patients undergoing re-do operations, patients undergoing emergency operations, those with higher classes of New York Heart Association or Canadian Cardiovascular Society classification (above class 2), those with lower levels of left ventricular ejection fraction (levels below 30%), those with transfusion of packed cells and fresh frozen plasma more than 4 units and those undergoing cardiopulmonary bypass with durations more than 77 minutes;^[8] as we see, there are a number of risk factors determined in this study that are similar to those in our study; but our study was performed only on women.

However, in another study, it was demonstrated that most factors predicting the possibility of delayed extubation in the postoperative period are not easily modified during the perioperative period. But these factors were not so much akin to our studied factors in this research.^[8,9] Also, a number of other studies have suggested findings similar to those of our study.^[10,11]

Finally, our study suggests that age ≥ 70 years, left ventricular ejection fraction (LVEF) $\leq 30\%$, preexisting respiratory disease, preexisting renal disease, emergency operation, re-do operation and use of preoperative inotropic agents are the main risk factors that may result in the need for prolonged mechanical ventilation and tracheostomy in women undergoing coronary artery bypass graft with cardiopulmonary bypass.

REFERENCES

1. Rajakaruna C, Rogers CA, Angelini GD, Ascione R. Risk

factors for and economic implications of prolonged ventilation after cardiac surgery. *J Thorac Cardiovasc Surg* 2005;130:1270-7.

2. Branca P, McGaw P, Light R. Factors associated with prolonged mechanical ventilation following coronary artery bypass surgery. *Chest* 2001;119:537-46.
3. Dabbagh A, Rajaei S, Shamsolahrar MH. The effect of intravenous magnesium sulfate on acute postoperative bleeding in elective coronary artery bypass surgery. *J Perianesth Nurs*. 2010; 25:290-5.
4. Ferasatkish R, Dabbagh A, Alavi M, Mollasadeghi G, Hydarpur E, Moghadam AA, *et al.* Effect of magnesium sulfate on extubation time and acute pain in coronary artery bypass surgery. *Acta Anaesthesiol Scand*. 2008; 52:1348-52.
5. Reddy SL, Grayson AD, Griffiths EM, Pullan DM, Rashid A. Logistic risk model for prolonged ventilation after adult cardiac surgery. *Ann Thorac Surg* 2007;84:528-36.
6. Cislighi F, Condemi AM, Corona A. Predictors of prolonged mechanical ventilation in a cohort of 5123 cardiac surgical patients. *Eur J Anaesthesiol* 2009;26:396-403.
7. Tan PJ, Xu M, Sessler DI, Bashour CA. Operation timing does not affect outcome after coronary artery bypass graft surgery. *Anesthesiology* 2009;111:785-9.
8. Szeles TF, Yoshinaga EM, Alenca W, Brudniewski M, Ferreira FS, Auler JO, *et al.* Hypoxemia after myocardial revascularization: Analysis of risk factors. *Rev Bras Anesthesiol* 2008;58:124-36.
9. Cywinski JB, Xu M, Sessler DI, Mason D, Koch CG. Predictors of prolonged postoperative endotracheal intubation in patients undergoing thoracotomy for lung resection. *J Cardiothorac Vasc Anesth* 2009;23:766-9.
10. Ben-Abraham R, Efrati O, Mishali D, Yulia F, Vardi A, Barzilay Z, *et al.* Predictors for mortality after prolonged mechanical ventilation after cardiac surgery in children. *J Crit Care* 2002;17:235-9.
11. Kollef MH, Wragge T, Pasque C. Determinants of mortality and multiorgan dysfunction in cardiac surgery patients requiring prolonged mechanical ventilation. *Chest* 1995;107:1395-401.

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