Factors affecting difficulty in extubation after initial successful resuscitation in cardiopulmonary arrest patients

Dear Editor,

We retrospectively investigated the factors affecting the difficulty of extubation after an initial successful resuscitation. From October 2013 to July 2015, a medical chart review was retrospectively performed for all patients with cardiopulmonary arrest (CPA). The exclusion criteria included patients who experienced CPA in hospital, patients with traumatic CPA, and those who died within a week and who did not undergo tracheal intubation in the course of the resuscitation. The subjects were divided into two groups: The difficulty in extubation (DE) group, which included patients who remained tracheal intubated for 2 weeks after their collapse; and the control group, which included patients who could undergo extubation and who were free of tracheal intubation within 2 weeks after their collapse.

During the investigation period, a total of 586 patients with CPA were treated by the staff of our department. Among these patients, there were eight patients in the DE group and 12 patients in the control group. There were no statistical difference concerning frequency of cardiogenic cardiac arrest, witnessed collapse, bystander cardiopulmonary resuscitation (CPR), duration of CPR, an initial rhythm at scene, value of base excess on arrival, and frequency of induced hypothermic therapy between two groups. While the rates of a female patient (6/8 vs. 0/12), underlying pulmonary disease (3/8 vs. 0/12), flail chest (4/8 vs. 0/12), and the average age (81.6 ± 4.6 vs. 60.0 ± 3.8) in the DE group were significantly higher in comparison to the control group. In contrast, the rate of patients who returned to consciousness (5/8 vs. 12/12) and the survival rate (5/8 vs. 12/12) were significantly lower in the DE group than in the control group.
With regard to flail chest, fragility fractures tend to occur in females or elderly individuals with osteoporosis.\[1] Multiple rib fractures after chest compression were confirmed by computed tomography and such fractures tend to occur among females and elderly patients.\[2] Accordingly, elderly female patients who receive chest compression for cardiac arrest might suffer multiple rib fractures, which thereby resulting in the complication of flail chest. This hypothesis might explain why female gender, advanced age, and the complication of flail chest were risk factors for DE.

Patients with underlying pulmonary disease tend to have a poor respiratory function in comparison to healthy individuals. Chest compression for patients with CPA may lead to lung injury in addition to thoracic injury.\[3] The combination of poor underlying respiratory function and lung injury due to the direct trauma caused by chest compression, exposure to high concentrations of oxygen, barotrauma induced by mechanical ventilation or ventilator-associated pneumonia after resuscitation for CPA, may cause the further deterioration of already poor respiratory function resulting in DE and ventilator dependence.\[4,5]

This study demonstrated that among the patients with out of hospital CPA who obtained spontaneous circulation and survived for more than 1 week, female, advanced age, underlying pulmonary disease, the complication of flail chest, and persistent unconsciousness, were risk factors for difficult extubation.

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**Conflicts of interest**
There are no conflicts of interest.

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