

Artificial Respiration

Muralinath.E¹, Manjari. P¹, Kalyan Chakravarthi. C¹, Sravani Pragna. K¹, Guruprasad. M² Sridevi. V³ and Gnana Prasunnamba¹

¹College of Veterinary Science, Proddatur
²Vaishnavi Microbial Pvt. Ltd, Telangana
³Mohan Babu University, Tirupathi, Andhra Pradesh

Introduction: Artificial respiration (resuscitation) or assisted respiration is administered in patients suffering asphyxia without cardiac failure. Cessation or depressed breathing occurs in the following conditions:

1. Trauma
2. Drowning
3. Gas poisoning
4. Electrocution
5. Anaesthesia

Cessation of oxygen supply for 5 minutes causes irreversible brain injury, especially to cerebral cortex. Artificial respiration (resuscitation) henceforth has to be commenced immediately without any delay to avoid cardiac arrest. The primary indication for artificial respiration is to ventilate the alveoli and to stimulate the neural respiratory centres

Artificial respiration can be administered in two ways.

1. Manual ventilation
2. Mechanical ventilation

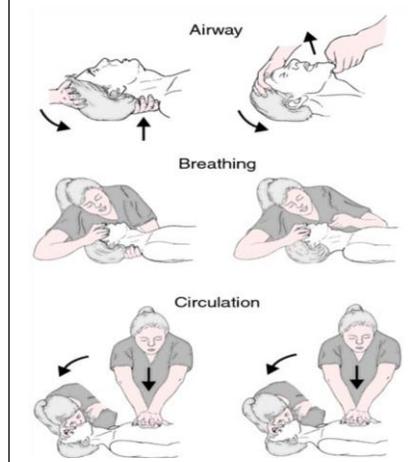
Manual Ventilation: Manual ventilation can be applied quickly without any advanced mechanical aids. Affected person must be provided with clean air. Clothes around upper body regions (neck and chest) must be loosened. Mouth, face and throat should be cleared of any mucus, saliva and foreign particles. Tongue must be drawn forward to clear airways, of any obstruction.

Manual method of ventilation can be administered in two ways (**Fig. 1**):

- a. Mouth-to-mouth method
- b. Holger Nielsen method
- c. Mouth-to-mask method
- d. Bag-valve-mask method

a. Mouth-to-Mouth Method: The subject is postured in supine position and the resuscitator (person who will do resuscitation) kneels by the side of the subject. By applying the thumb on subjects' mouth, the lower jaw is pulled downwards. Simultaneously, the nostrils of the subject are closed with thumb and index finger of the other

Figure 1. Mouth to Mouth method.



hand. After maximal inspiration, the resuscitator takes a deep breath and exhales into the subject's mouth forcefully. Ideally, volume of exhaled air must be twice the normal tidal volume. This expands the subject's lungs. Then, the resuscitator removes his mouth from that of the subject. Now, the elastic recoil of the lungs results in a passive expiration in the subject. Approximately, this procedure has to be repeated for 12 to 14 times a minute, till the subject resumes normal respiration. Because carbon dioxide in expired air of the resuscitator can significantly stimulate the respiratory centres and facilitate the onset of respiration, mouth to mouth method of resuscitation is considered quite effective. However, a major disadvantage is that of a close contact between the mouths of resuscitator and that of the subject's, which may not be acceptable for various reasons (Fig. 1).

b. Holger-Nielsen Method or Back Pressure or Arm Lift Method: Subject is pronated with

head turned to one side (Fig. 2). Then the hands of the subject are placed under the cheeks with flexion at the elbow joint and abduction of arms at the shoulders. Then, the resuscitator kneels by the head side of the subject. By placing the palm of the hands over the back of the subject, the resuscitator bends forward with straight hands (without flexion at elbow) and applies pressure on the back of the subject. Weight of the resuscitator and pressure on back of the subject compresses the subject's chest and expels air from the lungs. The resuscitator then leans back and draws the subject's arm forward by holding above the elbow. This manoeuvring cause the expansion of subject's thoracic cage and air flows into the lungs. This process is repeated for 12 times per minute until normal respiration is restored in the subject.

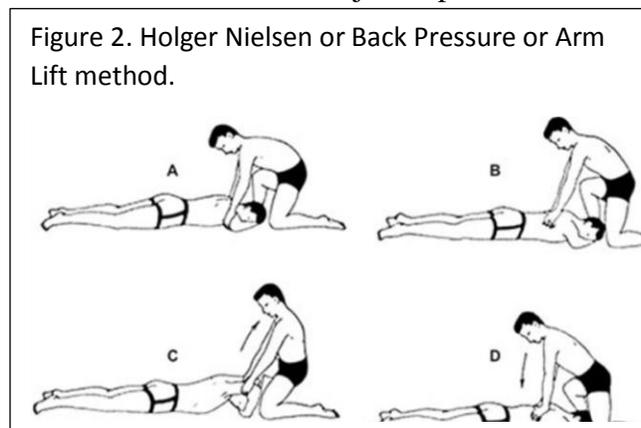


Figure 2. Holger Nielsen or Back Pressure or Arm Lift method.

3. Mouth-to-mask method: Mouth to mask is a very effective method for cardiopulmonary resuscitation. This simple, but very effective method can deliver up to 3 litres of tidal volume. Besides, this method is more hygienic and an ward off any apprehension of contracting infectious diseases which we hear in case mouth-to-mouth contact method

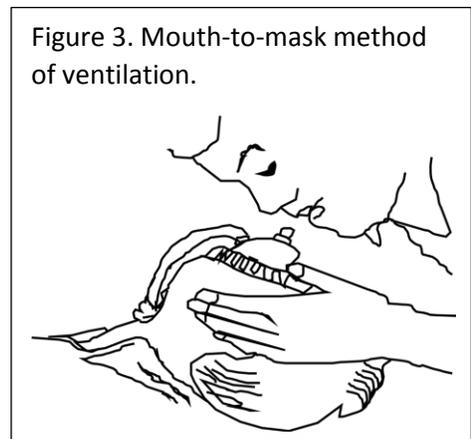


Figure 3. Mouth-to-mask method of ventilation.

4. Bag-valve-mask method: The Bag-valve-mask method require a self-inflating air bag, patient connection port, unidirectional or nonbreathing patient valve (inspiratory) and an expiratory port (Fig. 4). This system is attached to the patient mask, and a certain amount of air can be delivered to the patient each time by squeezing the self-inflating air bag. However, this method has been shown to

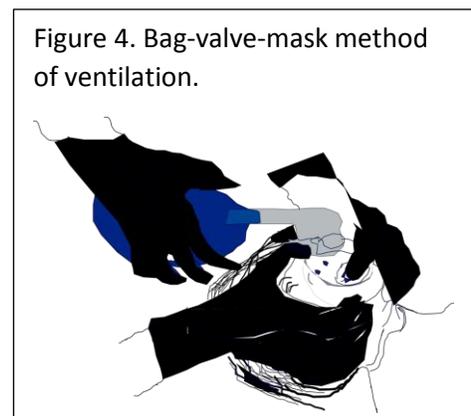


Figure 4. Bag-valve-mask method of ventilation.

hyperventilate the patients, generate high pressures in airways and thorax, and cause gastric insufflation. Hence, this procedure has to be performed only by trained personnel.

MECHANICAL METHODS

Mechanical methods of artificial respiration become very necessary in subjects who are acutely ill and admitted to intensive care units. Most commonly, patients who are suffering with hypoxic or hypercapnea associated respiratory distress require mechanical ventilation, because these patients need enhanced ventilation for longer periods without compromising airways' safety. Additionally, mechanical ventilation may also be needed during surgical procedures and as a supportive therapy in patients suffering from neuromuscular disorders. Furthermore, patients suffering with conditions such as hemoptysis, angioedema, heart failure and shock requires mechanically ventilated during treatment. Mechanical ventilation is very essential to treatment of respiratory failure due to paralysis of respiratory muscles.

Mechanical methods are of two types:

1. Drinker method
2. Ventilation method

1. Drinker Method: The machine used in this method is called iron lung chamber or tank respirator. The equipment has an airtight chamber made of iron or steel. Subject is placed inside this chamber with the head outside the chamber. Then the pressure inside the chamber is made positive and negative, alternately. During the negative pressure in the chamber, the subject's thoracic cage expands and inspiration occurs and during positive pressure the expiration occurs. By using tank respirator, the patient can survive for a longer time, even up to the period of one year till the natural respiratory functions are restored.

2. Ventilation Method: Apparatus used for ventilation is called a ventilator. The patient will be intra-tracheal intubated by passing a rubber tube into the trachea through the mouth. By using a pump, air or oxygen is pumped into the lungs with a certain pressure, intermittently. When air is pumped, inflation of lungs takes place and inspiration occur. When the pump is stopped, expiration occurs and the cycle is repeated. There are two types of ventilators based on different control variables, although operated in the same mode.

1. Volume ventilator
2. Pressure ventilator

1. Volume ventilator: A constant volume of air is pumped into the lungs of the patients, albeit intermittently, with application of minimum pressure.

2. Pressure ventilator: In here, air is pumped into the lungs of the subject at a constantly high pressure.

References

1. N. A. Bergman. Effect of different pressure breathing patterns on alveolar-arterial gradients in dogs. *J. Appl. Physiol.*, 1963, 18, 1049.
2. P. Drinker and C. F. McKhann. The use of a new apparatus for the prolonged administration of artificial respiration. *J. Amer. med. Assoc.*, 1929,92,1658.

