Self Inflating Bag: Manual Resuscitator

The self inflating bag, as its name implies, inflates automatically without a compressed gas source. Since it is not dependent on a compressed source for inflation, it is inflated always, is ready to use and is portable. There are four parts of the self-inflating bag:

- Air inlet
- Oxygen inlet
- Patient outlet
- Valve assembly

Air Inlet

As the bag re-expands following compression, air is drawn into the bag through a one-way valve that may be located at either end of the bag. This is the air inlet.

Oxygen inlet

The oxygen inlet, which is located next to the air inlet, is a small nipple or projection to which oxygen tubing can be attached. In the self-inflating bag, an oxygen tube is not necessary for the bag to function. It has to be attached only if the infant is to be resuscitated with an oxygen-enriched air mixture rather than with room air.

Patient outlet

The patient outlet is where air exits from the bag to the infant through a mask or an endotracheal tube.

Valve assembly

Self-inflating bags have a valve assembly positioned between the bag and the patient outlet. When the bag is squeezed during ventilation, the valve opens, releasing oxygen/air to the lungs of patient. When the bag re-inflates (during the exhalation phase of the cycle), the valve is closed. This prevents the patient's exhaled air from entering the bag and being rebreathed.

Optional parts

Pressure gauge

Some self-inflating bags have a small hole or projection for attaching a pressure manometer/gauge located close to the patient outlet. A pressure gauge is an extra piece of equipment which measures pressure generated by the bag in centimeters of water. This gauge allows us to control the pressure of the air or oxygen being delivered to the patient.

PEEP valve

An adjustable PEEP (positive end expiratory pressure) valve can be connected to valve assembly. It is useful if one is resuscitating extremely low birth-weight babies (< 1 kg) or while manually ventilating a baby disconnected from the ventilator.

Using bag with oxygen

The NRP recommends that room air resuscitation can be initiated in term babies with back up facility for supplemental oxygen if baby does not improve despite 90 seconds of effective ventilation with room air. Since oxygen is considered to be a drug, its use in neonates must be carefully controlled. When the self inflating bag is used without a reservoir, every time the bag reinflates, room air is drawn into the bag by way of the air inlet along with hundred percent oxygen through the O_2 inlet. As a result, the concentration of oxygen actually received by the patient is about 40 – 70 percent.

Oxygen reservoir

High concentrations of oxygen can be achieved with a self-inflating bag through the use of an oxygen reservoir. An oxygen reservoir is an appliance that can be attached over the bag's air inlet. It provides a chamber filled with a high concentration of oxygen. During re-inflation, instead of room air being drawn in, the bag draws the highly oxygen-enriched air in the reservoir. This permits administration of as high as 90-100 % oxygen with a self-inflating bag.

Therefore, all self-inflating bags used in a delivery room must have oxygen reservoirs.

Safety features

Two safety features are built into resuscitation bags to prevent high pressures being delivered inadvertently to lungs.

Any resuscitation bag used for neonates should have at least one of the two features.

The first is *pressure release valve*, also known as a pop-off or safety valve. These pressure release valves are set to release at 30-40 cm of water. Therefore, if pressures in excess of this limit are generated, the valve opens, preventing the excess pressure from being transmitted to the infant.

The pop-off valve may be temporarily occluded to allow pressure in excess of 40 cm of water to be administered. This may be necessary to ventilate a neonate's stiff, non-aerated lungs, especially with the first few breaths. Any self-inflating bag in which one can bypass the pop-off valve should have a pressure gauge attached to it.

The second safety feature is the pressure gauge or manometer which measures the peak inspiratory pressure delivered.

Use

1. To provide intermittent positive pressure ventilation
2. To provide peak end expiratory pressure in preterm babies
3. To judge pressure required before connecting baby to ventilator.

Misuse

1. Never use the bag for providing free flow of oxygen
2. Excessive pressures may result in pneumo-thorax
3. Prolonged ventilation with 100% oxygen may lead to oxygen toxicity
4. The use of bag is to be avoided in meconium stained liquor prior to oropharyngeal suctioning and in diaphragmatic hernia

Resuscitation masks

Masks come in a variety of shapes, sizes and materials. The selection of a specific mask for a particular infant will depend on how well it fits the infant's face. Resuscitation masks have rims that are either cushioned or non-cushioned. Non cushioned masks do not have a padded soft rim and thus have a firm, abrupt edge, whereas cushioned masks have a rim made of either a soft, flexible material, such as foam rubber, or an air-inflated ring.

A cushioned-rim mask has several advantages over a mask without a cushioned rim:

- The rim conforms to the shape of the infant's face, making it easier to form a seal.
- It requires less pressure on the infant's face to obtain a seal.
- There is less chance of damaging the infant's eyes if the mask is incorrectly positioned.

Shape

Masks may be either round or anatomically shaped.

Round: A round mask can be effective in obtaining a seal for ventilation. If the mask is too small, it may not fit over the mouth and nose correctly. If the mask is too large, pressure may be exerted on the eyes.

Anatomically shaped: Some masks are shaped to fit the contours of the face. These masks are referred to as anatomically shaped masks. They are made to be placed on the face with the most pointed part of the mask fitting over the nose. It is easier to obtain a seal with an anatomical mask.

Size

Masks come in several sizes. The rim of the appropriate sized mask must cover the tip of the chin, the mouth, and the nose, but not the eyes.

- Too large a mask will lead to ineffective seal and possible eye damage.
- Too small a mask will not cover the mouth and nose and may occlude the nose.

Decontamination

Washing and rinsing: Thorough decontamination of the resuscitator is necessary, ideally after each use. Disassemble all parts. Wash thoroughly in warm water using a detergent that is compatible with the resuscitator materials. Rinse all the parts thoroughly in clean water. Dry them before reassembling.

Disinfection/sterilization: Disinfection is the process by which all the live organisms get killed while in sterilization even the spores are killed. Chemical disinfection can be done by soaking in 2% glutaraldehyde active solution for 20 minutes. Sterilization procedure takes at least 6 hours. One can use ethylene oxide for gas sterilization while boiling and autoclaving can be used for all disassembled parts of resuscitator except the reservoir. All parts should be dried before reassembling.