

Mechanical Ventilation and the Nurse

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THE UPPER respiratory tract has varied functions besides serving as a pathway for air essential to meet body's requirement such as filtering, warming and humidifying the air. When artificial ventilation is established these functions are impaired. However, effort must be made to substitute these functions if artificial means of ventilation is used.

Indications for mechanical ventilation: (1) In cases of respiratory failure to restore respiration as an emergency measure, (2) In cases of progressive falling or deteriorating respiration e.g. Poliomyelitis, (3) As a supportive measure to lessen the work of respiration e.g. after cardiac surgery, in severe shock, myocardial infarction, severe C.C.F.

Forms of mechanical ventilation

Negative Pressure ventilation : (i) iron lung, (ii) cuirass respirator.

Positive pressure ventilation : (i) Bennett's respirator, (ii) Bird respirator, (iii) Howell respirator, (iv) Normally the intra-pulmonary and intra-pleural pressures are negative during inspiration and this assists the venous return to the right side of the heart. During expiration the intrapulmonary pressure is positive and the intra-pleural pressure is still negative. When I.P.P.V. is used, these intra-thoracic pressures are reversed and there is interference to the venous return to a certain extent.

Means of giving mechanical ventilation to patient

The first method of choice in giving I.P.P.V. is by connecting the machine to an Endotracheal tube. However, the E.T. tube can be left in place only for a limited time, since damage to the cord may occur if left longer.

The ventilator may also be connected to a tracheostomy tube, preferably a portex, cuffed one. With this method long term ventilation is possible.

In cases where I.P.P.V. is to be given for short periods of time repeatedly to conscious, co-operative patients, a mask may be used. The mask has to fit tightly to provide an air tight seal for the mechanical ventilation to be effective.

Nursing intervention

When it is known that mechanical ventilation is to be given for a patient, the machine and the previously sterilized respirator tubes are assembled and connected (to sterilize, tubing may be soaked in cetavlon 1% or cidex for 12 hours) when E.T. tube or tracheostomy tubes are to be used adaptors which fit snugly

between the E.T. or tracheostomy tube as the case may be and the respirator should be used. The patient, if conscious, should be reassured and told to breathe with the machine and not against it. The presence of the nurse with repeated assurance for help would help the patient to co-operate better. The patient with respirator should never be left unattended.

The first priority need of the patient on mechanical ventilation must be maintenance of a clear airway and adequate ventilation.

A. OBSERVATION

The following observations are vital.

(1) **The colour of the patient** : Cyanosis indicates underventilation. Check air entry with the stethoscope. Watch chest for rise and fall, check E.T. tube for kinks, or collection of secretions in the airway. Check for any air leak, check tidal volume. Try straightening the E.T. tube. Extend neck.

Underventilation may also be due to the fact that the patient starts fighting the respirator and breathing rapidly on his own. Explain and reassure. Sedatives may be used occasionally.

Pallor, sweating etc. could be due to high inflatory pressure. Excessive pressures applied to patient's airway may result in damage to lung tissue. Pressures exceeding 30 cm. of water should be avoided.

The best indication of whether the ventilation is adequate or not is the result of blood gas-analysis for O_2 saturation (Normal 95-100%) PCO_2 (Normal 38-44 mm Hg), PH (Normal 7.35-7.45) and Base excess or deficit ($\pm$ °).

If for some reason the means of delivering adequate amount of air to the patient fails, there must be an alternative means of supplying air-use of ambu bag.

2. **The Attitude of the patient** : Restlessness, anxiety, non-cooperation, patient trying to communicate are significant signs because the patient on respirator has difficulty in communicating. The causes may be discomfort, pain, full bladder etc.

3. **Level of consciousness** : The level of consciousness should be observed frequently and recorded as alert, drowsy, stupor, comatose etc. These observations are especially important in patients who are unconscious—to know the progress or deterioration. Along with this, reactions of pupils' size should be observed.

4. **Vital signs.** (a) **Pulse.** Rise in pulse may be an indication of underventilation for this happens as a compensatory mechanism. A low volume pulse may mean high inflatory pressure. (b) **Blood pressure.** should be checked frequently while the patient is on mechanical ventilation for a slight rise in blood pressure may be a sign of inadequate ventilation. If this is not corrected there will be a fall in B.P. (c) **Central venous pressure** : Since I.P.P.V. impedes venous return, C.V.P. is a valuable guide to the adequacy of circulatory system. The C.V.P. during inspiration and expiration should be adequate and it should be noted that the mechanical ventilation is not producing any harmful effects on the circulatory

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