A Modification for Oxygen Delivery to Intensive Care Unit Ventilator

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Introduction

Intensive Care Unit (ICU) ventilators in the service hospitals have oxygen blenders, which mix room air with oxygen to provide desired fraction of oxygen (FiO_2) in the inspired gas to the patient. Most of the ICUs do not have piped oxygen supply and cylinders are used as a source of oxygen. These oxygen cylinders have to be changed repeatedly and the task is both labour intensive and time consuming. Moreover due to frequent changing of cylinders the regulator undergoes excessive wear and tear. During the period when empty cylinder is being replaced, the enrichment of entrained air with oxygen does not take place and room air with FiO_2 of 0.21 is delivered to the patient which may have adverse outcome. A suitable mechanical modification has been devised and successfully tested using two oxygen cylinders connected to the ventilator to overcome the situation. This modification ensures uninterrupted supply of oxygen to the critically ill patient on ventilator and the replacement of cylinders can be done without any hurry thus enabling the operator to handle the regulator retaining nut carefully and ensuring longer life of the component. The modification can be done with parts available freely in any hardware shop.

Equipment and its Assembly

Pipeline pressure supply hoses or pipes are used to connect anaesthesia machine and other apparatus to terminal units or supply connectors [1]. Two oxygen cylinders with their two-stage regulators are connected by segments of 10 mm diameter braided pressure tubing on either side of a metal "T" junction piece. The third limb of the "T" junction piece is connected to the ICU ventilator by the pressure tubing that is provided with the ventilator. A 15 mm ball valve or shutoff valve is placed in each of the pipeline segments that connects the cylinder and the "T" junction piece. Ball valves or

shutoff valves permit isolation of specific areas of pipeline system [1]. The 10 mm braided tube is connected to the 15 mm ball valve on either side by metal parts which are easily threaded onto each other as shown in Fig. 1 (a) mild steel nipple of 10mm diameter x 150mm

Fig. 1 : Ball valve and its component parts

Fig. 2 : 'T' junction piece and complete modification

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Fig 3 : A: Oxygen cylinder, B: Two stage regulator, C1: 15 mm ball valve or shutoff valve in closed position, C2: 15 mm ball valve or shutoff valve in open position, D: 'T' junction

length, (b) 15/10 mm mild steel reducing socket, (c) 15 mm extension nipple and (d) a 15 mm ball valve or shutoff valve. The complete modification is shown in Fig. 2. A line diagram (Fig.3) shows the arrangement of various components. The components used in the assembly were bought from the local hardware shop and appropriate precautions were taken to degrease and clean the various components of the pipeline assembly. Silicon tape was used to ensure leak proof connection between components.

Method of Use and Authors Experience

During use only one cylinder is connected to the

ventilator through the ball valve and when the cylinder is exhausted, it is isolated by means of 15 mm ball valve or shutoff valve. Oxygen flow to the ventilator continues uninterrupted by opening the other 15 mm ball valve or shutoff valve. In our experience this modification ensures easy change over and permits uninterrupted supply of oxygen to the ventilator.

The proposed modification was fabricated as a solution to a recurrent and common problem being faced during anaesthetic and ventilatory management of patients. Similar assembly made with components conforming to stringent standards laid down for medical gas pipeline systems will be of great use in hospitals without medical gas pipeline.

Conflicts of Interest

None identified

Reference

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