Desperate times call for desperate measures: An innovative apparatus designed for domiciliary oxygen delivery

Sir,

The second wave of coronavirus disease-19 pandemic was unmatched in terms of its ferocity and the challenges that it presented. The existing infrastructure was overwhelmed with thousands of patients desperately needing hospital care and oxygen supplementation. The deluge of hypoxic patients created an oxygen shortage, which was needed to be supplemented with nasal cannulae, face masks, non-invasive ventilation, mechanical ventilation and hyperbaric oxygen therapy[1,2] As hospital beds became scarce, people resorted to arranging oxygen cylinders at home for their sick relatives, by buying or renting medical grade oxygen cylinders. Usually, domiciliary oxygen cylinders are provided with compatible attachments having the suitable pin index, humidifying chambers and flowmeters to regulate oxygen flow; nevertheless, the unprecedented demand for such devices in this period overshot their availability. Many of the cylinders that were arranged could not be used as the suitable connectors and delivery devices were unavailable to provide the required flows. This compromised oxygen delivery to the patients in the unmonitored domiciliary environment.

"E" type oxygen cylinders are commonly used in anaesthesia machines.[3,4] In such a desperate situation, we devised a novel apparatus that could be safely attached to "E" type cylinders and used for delivering the required oxygen flows to patients. We wish to describe this assembly and report regarding the same.

For the construction of this apparatus, we used the hanger yoke assembly of an old Boyle's anaesthesia machine [Figure 1a] which is nowadays not much in use as it has been replaced with new advanced work stations. The hanger yoke assembly can be easily detached from the Boyle's anaesthesia machine by unscrewing it from the machine [Figure 1b]. The pin index system provided on the oxygen yoke assembly allowed the safe alignment and attachment of the oxygen cylinder (E type) sealing with the yoke washer without tampering with this essential safety system.[2]

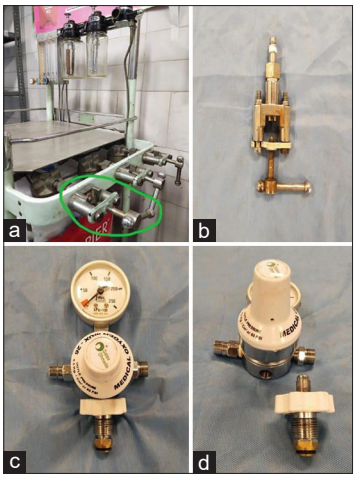

Figure 1: (a and b) Old Boyle's machine with yoke assembly (c) Oxygen regulator with pressure gauge (d) Bull nose with removed thread connector

A spare oxygen regulator with pressure gauge, which was compatible with bullnose type of cylinder, was taken [Figure 1c] and the thread connector of the bullnose was removed [Figure 1d]. Having the same threading characteristics, this now allowed the easy air-tight and threaded attachment of the yoke outlet with the pressure regulator. At the other end of the pressure regulator, using the threaded attachment, a flow-meter with a built-in plastic humidifier bottle (commonly used in wards/intensive care units) was secured in a leak-proof manner [Figure 2a]. The final assembly was then attached to an "E" type cylinder and a plastic extension tubing with face mask was attached to its outlet port, which could be used to provide regulated flow (15L/minute maximum) and also lower flows (1-2L/min) through nasal prongs [Figure 2b].

Advantages of this assembly were its compactness and its components sourced from easily available and unused equipment. Being easy to transport, it could be sent to distant places/homes where "E" type cylinders were arranged but suitable delivery systems could not be procured. The perfect pin index system and air-tight compatible attachments ensured maintenance of safety standards. This could at times obviate the need of oxygen concentrators. However, the drawback was the limited number of spare parts which restricted its mass production. These spare parts being sourced from different machines may not be readily available in many places. As the isolated usage of the yoke assembly is not authenticated and certified by regulatory authorities, its safety may be questioned. In addition, apart from delivering oxygen up to a maximum permissible flow (15L/min),

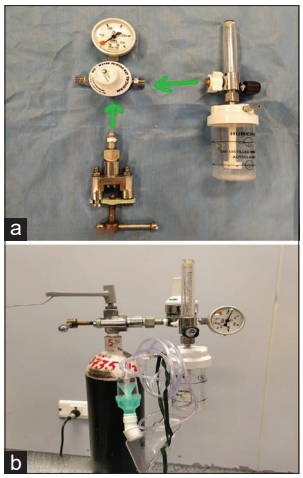

Figure 2: (a) Assembly with plastic humidifier bottle (b) Final assembly for usage

higher flows (like with high flow nasal cannula) or pressurised (like in noninvasive ventilators) could not be delivered, thereby restricting its versatility.

Despite its limitations, this innovation proved of immense benefit during the second wave of the pandemic. Further modifications in this apparatus under stringent manufacturing supervision to provide versatility in its operation is an area open to exploration.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

Dhiraj Singh, Rudrashish Haldar, Ashish K. Kannaujia, Anil Agarwal

Department of Anaesthesiology, Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow, Uttar Pradesh, India

Address for correspondence:
Dr. Rudrashish Haldar,
Department of Anaesthesiology, Sanjay Gandhi Post Graduate Institute of Medical Sciences, Rae Bareilly Road, Lucknow - 226 014, Uttar Pradesh, India.
E-mail: rudrashish@yahoo.com

Submitted: 09-Jul-2021
Revised: 16-Aug-2021
Accepted: 22-Aug-2021
Published: 28-Oct-2021

REFERENCES

1. Samantaray A, Johnson E, Kumar N, Mehdiratta L. COVID-19: A game of drugs, vaccines, hope and… death! Indian J Anaesth 2021;65:434-8.
2. Senniappan K, Jeyabalan S, Rangappa P, Kanchi M. Hyperbaric oxygen therapy: Can it be a novel supportive therapy in COVID-19? Indian J Anaesth 2020;64:835-41.
3. Srivastava U. Anaesthesia gas supply: Gas cylinders. Indian J Anaesth 2013;57:500-6.
4. Das S, Chattopadhyay S, Bose P. The anaesthesia gas supply system. Indian J Anaesth 2013;57:489-99.

Access this article online	
Quick response code	Website: www.ijaweb.org
	DOI: 10.4103/ija.ija_627_21

How to cite this article: Singh D, Haldar R, Kannaujia AK, Agarwal A. Desperate times call for desperate measures: An innovative apparatus designed for domiciliary oxygen delivery. Indian J Anaesth 2021;65:179-80.