

Guidelines for the use of Heliox21 via face mask

Brief description of Heliox21

Heliox21 is a medicinal gas mixture comprising 79% helium and 21% oxygen.

Rationale for helium oxygen use

The efficiency of gas flow i.e. how much flow for a given amount of pressure, is dependant upon the physical properties of a gas, specifically the density and viscosity. Reducing either or both of these physical properties increases the efficiency i.e. more flow for the same pressure. Room air is a mixture of nitrogen (79%) and oxygen (21%). Substituting helium for nitrogen reduces the density without affecting the viscosity. Hence helium oxygen mixtures are "easier" to breath / reduce the work of breathing.

Indications

Helium oxygen mixtures should be considered as a rescue therapy in the immediate management of such conditions as: Croup, Epiglottitis, Laryngitis, Tracheitis, Stridor, Foreign body aspiration, Post extubation or peri bronchoscopy stridor, Tumour (upper airway or proximal tracheobronchial tree), Tracheomalacia, Tracheal stenosis, Acute severe asthma, Acute severe (hypercapnic) exacerbation of COPD. Treatment with a helium oxygen mixture should be initiated in a patient with any of these conditions who despite first line therapy develops severe respiratory distress, specifically: reports severe dyspnoea, has a very high respiratory rate, is making excessive respiratory effort, is tiring, becomes drowsy or agitated, is becoming hypoxic and / or hypercapnic.

Expected effects

Administering helium oxygen should improve the efficiency of ventilation and thereby reduce respiratory distress. It is only a temporising intervention i.e. it extends the period of time available for definite treatment for the underlying condition to be delivered, it is not in itself therapeutic.

Presentation and cost

Helium is only available as Heliox21 (79% helium: 21% oxygen). It comes in HX cylinders. Each cylinder contains 1,780 L of Heliox21. Each cylinder has an integrated flow regulator (0-15L/min) and a connection port for a gas specific high pressure hose (to supply specially adapted ventilatory equipment). This is because you will never want to deliver a gas mixture with less than 21% oxygen. Each cylinder costs £71.22 to refill.

Patient monitoring during therapy

Routine respiratory monitoring is all that is required (airway patency, respiratory rate, clinical evaluation of the adequacy of ventilation, SpO₂ and blood gas analysis). Continuous oxygen saturation monitoring should be used in all hypoxic patients. Always assess and optimise face mask position as any air entrainment will reduce the effectiveness of this intervention.

Caution – managing hypoxia (SpO₂ < 88%)

In hypoxic patients a balance needs to be struck between improving ventilation (by minimising supplemental oxygen) and achieving adequate oxygenation (by diluting Heliox21 with supplemental oxygen). As a starting guide aim to achieve an SpO₂ 88-92%. Call for expert help early.

Stopping helium oxygen therapy

Helium oxygen therapy can be withdrawn as soon as definitive therapy has taken sufficient effect to reduce respiratory distress. It may be useful as an intermittent therapy in such conditions as acute severe asthma where periodic reductions in the work of breathing can prevent decompensation and thereby prevent the need for intubation and mechanical ventilation.

Safety

Standard safety precautions for compressed gases are all that is required. Helium is inert and insoluble in human tissues at atmospheric pressure. Helium does have a high thermal conductivity but does not cause patient cooling even in neonates.

Unwanted Effects and Contraindications

None

Interactions

None

Advice to Patients

None




Prescriber Restrictions in the Trust

None

Face Mask Administration

Heliox21 can be delivered through any tight fitting mask. Every effort should be made to minimise air entrainment. Specialist masks and mixing circuits / nebulising circuits are available. GICU (1st Floor, St James' Wing) keeps a supply of "Intersurgical Heliox21 Nebuliser Kit Adult (Ref 1420)" see *illustration below*. A paediatric kit is available from Intersurgical (Ref 1419). Supplemental oxygen can be provided either through a Y-piece mixing circuit or via nasal specs worn underneath the tight fitting mask.

Intersurgical Heliox21 Nebuliser Kit Adult (Ref 1420)

		
<p>To administer He:O₂ 79:21 connect reservoir bag to HX cylinder at a flow rate of 8-15L/min. The flow rate should be enough to maintain reservoir bag distension</p>	<p>To increase the FiO₂ add O₂ via the connector provided (on the left). Titrate the O₂ flow rate to achieve an SpO₂ of 88-92%</p>	<p>To administer nebulised therapy, attach the chamber as shown. The chamber can be driven by either Heliox21 set at 15 L/min or O₂ set at 8 L/min. Use Heliox21 if SpO₂ is ≥ 88%, otherwise use O₂. The reason for the different flow rates is that Heliox21 is less efficient at aerosol generation than O₂.</p>

Face Mask CPAP, BiPAP & Endotracheal IPPV

All of these modalities require specially adapted equipment. Please contact specialist services as required.

For further information please contact Dr Jonathan Ball on GICU, or in an emergency, any senior member of the GICU team.

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