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Title: Hypercapnic hypoventilation in tracheobroncomalacia: The success of dynamic CT scan for diagnosis and of non-invasive continuous positive pressure ventilation (CPAP) for treatment

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Body: Tracheobroncomalacia increases the respiratory load and decreases alveolar ventilation developing an hypoventilation. We describe a case of a 3 months-old child affected by Costello syndrome who was referred to our Hospital for persistent dyspnoea, stridor and hypercapnic respiratory failure without hypoxia. Bronchoscopy were normal. Nocturnal sleep study showed an isolated hypercapnia (Mean SaO2 99.6%, SaO2 <90% 0.2 % time, Desaturation Index 8.7, AHI 19 apnoea/h, Central Deasaturation Index (CDI) 2.1, Mean Tc PCO2 61 mmHg, Time spent with Tc PCO2 >50mmHg 97.3 % TST). Dynamic CT scan of the thorax showed an expiratory deformation of the main airways with significant caliber reduction of the main left bronchus, carina, and upper lobar right bronchus consistent with a diagnosis of tracheobronchomalacia. He underwent CPAP (5 cmH2O) with Helmet interface that was well tolerated. The child was discharged with home CPAP with nasal interface with a normalized hypoventilation after two weeks of treatment (Mean SaO2 99.1 %, Minimal SaO2 93 %, SaO2 <90% 0 % time, Desaturation Index 1.5, AHI 2 apnoea/h, CDI 0.8, Mean Tc PCO2 45 mmHg, Time spent with Tc PCO2>50mmHg 11 % time). This case underlines that thacheobronchomalacia can also be diagnosed by dynamic CT scan and that a diffuse condition cause an hypercapnic hypoventilation. Even in severe cases, a non invasive approach can be tried to resolve the hypoventilation and to avoid surgery. Helmet interface could allow the patient to attaint a good acceptance of the CPAP then to switch to nasal mask for starting a long term nocturnal treatment.