High flow nasal cannula: an alternative to continuous positive airway pressure in cats

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Letter to the Editor

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Dear Editors,

We read with great interest the study by Di Bella et al recently published in *JFMS*, which describes the use of continuous positive airway pressure (CPAP) by a helmet in healthy cats under general anaesthesia.[1] We agree with the authors that non-invasive ventilation is useful to prevent and treat respiratory dysfunctions in animals. Di Bella et al provided encouraging results on the use of CPAP in cats. However, the equipment used to deliver CPAP with a helmet interface was complex and evaluated on cats under general anaesthesia, raising questions on the safety of its use in cats with respiratory failure.

High flow nasal cannula (HFNC) therapy is increasingly used in human medicine, especially in infants, and it is trending towards replacing nasal CPAP as primary support in mild to moderate respiratory failure.[2] HFNC is a device that allows the delivery of a humidified and heated gas with a higher flow than the inspiratory flow of the patient.[3] This technique presents several physiological benefits. It provides an oxygen reserve by making a washout of the pharyngeal cavity, and it can deliver a positive expiratory pressure (PEP) (Figure 1). In preterm infants, the level of PEP was estimated to be between 2 and 6 cmH_2O depending on the flow rate.[4] In dogs, Jagodich et al[5] showed that a CPAP level of around 5 cmH_2O was achieved by HFNC at a flow rate of 2 l/kg/min, with an improvement in oxygenation. These CPAP levels are in the same range as those used by Di Bella et al.[1] We have been using this as a primary respiratory support device for acute respiratory failure in both dogs and cats for 2 years in our intensive care unit. In a pilot study, we demonstrated that HFNC improves oxygenation parameters and is well tolerated in dyspnoeic dogs.[6] Our initial experiences in cats show that adequate placement of the nasal cannula does require sedation, but this technique is then well tolerated by the cat and does not necessitate further heavy sedation. Although these findings need to be confirmed by prospective studies, HFNC appears to be an interesting alternative to CPAP delivered by a helmet as it is usable in awake animals and does not limit access to the upper airway during respiratory support (Figure 1).

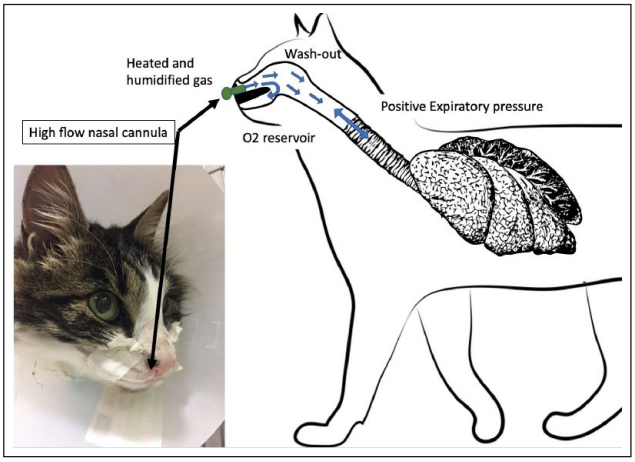

Figure 1 Physiological effect of high flow nasal cannula and an example of its use in a cat with moderate respiratory failure due to cardiogenic pulmonary oedema

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The corresponding author responds:

Thank you for your interest in and comments on our study, which aimed to document the physiological effects of CPAP applied with a helmet in cats under general anaesthesia, and to evaluate also its feasibility and safety.[1] Any extrapolation of our findings to cases of respiratory failure is purely speculative, since this case scenario has not been evaluated in our study. The helmet interface requires specific knowledge of the equipment (similarly to HFNC) but it is simple and safe to use.

HFNC therapy provides oxygen and respiratory support, and has recently been validated in dogs.[5,6] The high flow of fresh gas delivered into the upper airway of the patients provides O_2, promotes the washout of CO_2 (reduction of dead space) and creates a resistive effect on the expiratory flow of the patient, which generates a moderate 'CPAP effect' (4–6 cmH_2O).[7] The level of CPAP generated by the HFNC depends on several factors including the delivered gas flow, and the patient's breathing pattern and anatomical characteristics.[7] It is variable and not adjustable by the operator. For instance, open-mouth breathing has been proven to significantly reduce the CPAP effect in human studies, and this could be a critical aspect in dogs and cats.[8] In contrast, helmet CPAP is able to deliver a fixed level of pressure support that the operator can adjust based on the requirements of the patient, independently from the anatomical conformation and individual anatomical variability.[9] A recent study in dogs showed that 5 cmH_2O of CPAP is able to increase the volume of the laryngeal area by more than 50%.[10]

In our study, CPAP was administered with an FiO_2 of 0.21 in order to investigate the pure effects of the pressure support on gas exchange.[1] HFNC is an innovative and interesting technique that we believe can have several applications in veterinary patients. In dogs it appears to work very well, but our own experience in cats suggests that there are some limitations in terms of interface adaptation to the anatomical characteristics of the species. We are pleased to read that you report a positive experience with HFNC in cats, in terms of improvement in oxygenation, and we are looking forward to seeing your data shared with the scientific community. However, we would like to add that in order to investigate the poor effect of the pressure support (CPAP), the HFNC should be tested with air, like we did in our study with the helmet.[1]

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