

# The Velcro Mustache: A Potential Barrier to Effective Bag-and-Mask Ventilation in Neonates on Nasal CPAP: Two Case Reports

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**Hudson prongs (Hudson RCI, Teleflex Medical, Research Triangle Park, North Carolina) (a device to deliver nasal continuous positive airway pressure) are often secured with a “Velcro mustache” in neonatal intensive care units. We report 2 premature infants who required bag-and-mask ventilation while on Hudson prongs secured with a Velcro mustache. Effective ventilation was achieved only after removing the Velcro mustache. Key words: Hudson prongs; Velcro mustache; continuous positive airway pressure; CPAP; neonate; quality improvement. [Respir Care 2011;56(7):1040–1042. © 2011 Daedalus Enterprises]**

## Introduction

Acute events that require resuscitation are not uncommon in the neonatal intensive care unit. Bag-and-mask ventilation is an effective and common procedure in infants who have poor respiratory effort and require resuscitation. We recently cared for 2 premature infants who required bag-and-mask ventilation while receiving continuous positive airway pressure (CPAP) via Hudson prongs (Hudson RCI, Teleflex Medical, Research Triangle Park, North Carolina) secured with a Velcro mustache (a strip of Velcro tape placed across the baby’s upper lip to secure the Hudson prongs in place, [Figs. 1 and 2]). Bag-and-mask ventilation was ineffective because of the Velcro mustache.

## Case Report 1

This premature infant was the second of twins delivered at 24 weeks gestation, and weighed 630 g. His hospital course was complicated by respiratory distress syndrome,

bronchopulmonary dysplasia, bowel perforation that required surgical intervention, and a patent ductus arteriosus that required ligation. At 3 months of age, he was clinically stable, tolerating gavage feedings, weighed 1,790 g, and was being managed on Hudson prongs, with bubble CPAP at 5 cm water, and 28% oxygen. In the early evening he had an episode of bradycardia while having his nasopharynx suctioned. With poor response to stimulation, he received bag-and-mask ventilation with a disposable infant resuscitation bag-and-mask (Spur II Infant Resuscitator, Ambu, Glen Burnie, Maryland) and an appropriate-size, anatomically shaped, cushioned face mask. Seconds into the resuscitation, we realized that it was not possible to achieve a good seal and generate effective ventilation. His chest did not move, despite repositioning and assuring a clear airway. We attributed the failure to achieve a good seal to the Velcro mustache, which had been placed to appropriately position the Hudson prongs. Removing the Velcro mustache allowed an effective mask/face seal.

## Case Report 2

This infant was a premature boy delivered at 27 weeks gestation, with a birth weight of 720 g. He was on Hudson prongs and bubble CPAP for respiratory distress syndrome. On the third day of life, while on CPAP, he required bag-and-mask ventilation for an episode of apnea associated with bradycardia, oxygen desaturation, and unresponsiveness to stimulation. As in the first patient, we found that effective ventilation could not be achieved with the

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Fig. 1. Velcro mustache.



Fig. 2. Hudson prong assembly.

bag-and-mask (Spur II Infant Resuscitator, Ambu, Glen Burnie, Maryland) and an appropriate-size, anatomically shaped, cushioned face mask, with the Velcro mustache in place. As with the other patient, effective ventilation with a good mask/face seal was obtained after the Velcro mustache was removed.

### Discussion

In an attempt to minimize the risk of lung injury, CPAP via nasal prongs is increasingly used as the first-line treatment for respiratory distress syndrome.<sup>1-5</sup> CPAP has been used for the treatment of lung disease in premature infants for over 30 years.<sup>6</sup> The benefits, potential complications, and required special nursing techniques for nasal CPAP are well described in the literature.<sup>1-3,7,8</sup>

In our 30-bed, level III-B neonatal intensive care unit, we had been using CPAP prongs from Fisher & Paykel Healthcare (Auckland, New Zealand). As part of our quality-improvement program we monitored the complications associated with CPAP, specifically the incidence of nasal injuries due to pressure on the nasal septum, and septal necrosis. To minimize the risk of nasal injuries, we re-

cently began using Hudson prongs, which are commonly used in many hospitals, such as Columbia Presbyterian's Babies Hospital. Figures 1 and 2 show how we apply Hudson prongs. Although not described in the product's directions for use, a common way of securing Hudson prongs is with a Velcro mustache placed on the infant's face to which the prong assembly is attached.<sup>1</sup> The mustache helps keep the prongs in good position and thus avoids applying pressure from the bridge of the prongs to the nasal septum. To protect the skin we place a layer of dressing (Duoderm, ConvaTec, Skillman, New Jersey, or Tegaderm, 3M, St Paul, Minnesota) above the upper lip before attaching the Velcro mustache.

To test our observation that the Velcro mustache prevented a good mask/face seal, we used, under various conditions, a neonatal manikin and a T-piece resuscitator (Neopuff, Fisher & Paykel Healthcare, Auckland, New Zealand) that includes a manometer, which allows easy assessment of peak inspiratory pressure (PIP), PEEP, and CPAP.

We first tested the ability to provide CPAP levels of 5, 7, 10, 12, and 16 cm H<sub>2</sub>O. Without the Velcro mustache we easily achieved the desired CPAP with a cushioned

mask on the manikin's face. With the Velcro mustache, all attempts failed to reach the desired CPAP, because of an ineffective seal.

We subsequently tested the ability to provide pre-set PIP levels of 15, 20, and 25 cm H<sub>2</sub>O and a pre-set PEEP of 5 cm H<sub>2</sub>O. Without the Velcro mustache we easily generated the desired PIP, but with the Velcro mustache all attempts failed to reach and hold a steady PIP or PEEP, despite exerting substantial pressure on the cushioned mask. The manometer never exceeded 4 cm H<sub>2</sub>O for PIP, and 2 cm H<sub>2</sub>O for PEEP.

We had been unaware that a Velcro mustache might interfere with obtaining a good mask/face seal during bag-and-mask ventilation, and we found no mention of this problem in the literature. We submit these case reports in the interest of sharing our experience with other neonatal intensive care units using or contemplating a Velcro mustache to fix nasal CPAP prongs. Removing the Velcro mustache is essential for obtaining an effective seal during bag-and-mask ventilation. We find that the easiest way to remove the Velcro mustache is by peeling off the Duo-derm or Tegaderm dressing to which it is attached.

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