

Delivery Room Management of a Neonate with Inspiratory Stridor

Patrick Sloan, MD,* Brittany Blue, MD,* Akshaya Vachharajani, MD*

*Washington University School of Medicine and St Louis Children's Hospital, St Louis, MO

QUESTION

In this video, the neonatology team placed an oral airway to relieve the neonate's respiratory distress associated with inspiratory stridor. Which of the following intervention/s could also be helpful to relieve these symptoms? Note: More than 1 option might be correct.

- A. Insertion of a laryngeal mask airway
- B. Insertion of a nasopharyngeal airway or a nasal trumpet
- C. Nasogastric placement of a Replogle tube for continuous suction
- D. Placement of the newborn in a supine position
- E. Reattempt at endotracheal intubation with a stylet inserted into the endotracheal tube



Video. Click here to view the video. Reproduced with permission of Akshaya Vachharajani, MD, FAAP, and The Saigh Foundation Pediatric Simulation Center, St. Louis Children's Hospital, Washington University School of Medicine. Copyright 2017.

CRITIQUE

Stridor represents obstructed flow within the airway that can be heard during the inspiratory phase, expiratory phase, or both phases. The neonate in this video has *inspiratory* stridor. Stridor during inspiration suggests an *extrathoracic* or *upper airway* obstruction. The causes of upper airway obstruction in a neonate include tongue displaced posteriorly (as occurs with Pierre-Robin sequence), anomalies of the larynx (such as laryngomalacia, laryngeal hemangioma, and vocal cord edema), and vocal cord palsy. The 2 most common causes of inspiratory stridor in a neonate are laryngomalacia and vocal cord palsy. A laryngeal cyst is a rare cause of inspiratory stridor. Congenital tracheal stenosis (as a result of complete tracheal rings) and tracheomalacia in the extrathoracic portion of the trachea can also result in inspiratory stridor. Stridor associated with vocal cord pathology can be distinguished from other causes because it results in a hoarse or absent cry.

AUTHOR DISCLOSURE Drs Sloan, Blue, and Vachharajani have disclosed no financial relationships relevant to this article. This commentary does not contain a discussion of an unapproved/investigative use of a commercial product/device.

Expiratory stridor is caused by an *intrathoracic* airway obstruction involving the mediastinal structures such as the aorta (eg, abnormalities of the aortic arch, vascular rings), heart (eg, enlargement of the left atrium), and mediastinal lymph nodes (eg, node enlargement). Tracheomalacia of the intrathoracic portion of the trachea can lead to expiratory stridor.

Biphasic stridor is most often caused by subglottic stenosis (congenital or acquired) or a subglottic hemangioma.

The neonate in this video most likely has inspiratory stridor as a result of micrognathia, an excessively small mandible. (1) Micrognathia is a characteristic of the Pierre-Robin sequence, along with glossoptosis and a U-shaped cleft palate. (2) The combination of the reduced mandibular size and posterior displacement of the tongue into the hypopharynx in neonates with Pierre-Robin sequence can lead to an upper airway obstruction. (3) During the immediate postnatal period, neonates with severe upper airway obstruction may demonstrate respiratory distress, as evidenced by suprasternal, intercostal, or subcostal retractions, and inspiratory stridor as well as oxygen desaturations in the supine position. (4)

In anticipation of delivery of an infant with a possible upper airway obstruction, the neonatology team should prepare the following equipment:

- an oropharyngeal airway
- a nasopharyngeal airway
- a laryngeal mask airway
- an endotracheal tube

Following delivery, if the infant has physical examination findings that are suggestive of an upper airway obstruction, especially in the presence of micrognathia, retrognathia, or glossoptosis, the neonatology team should consider placing the neonate in the prone or side-lying position. This will use gravity to bring the tongue forward and may alleviate the obstruction. If positioning changes are unsuccessful at relieving the infant's symptoms, the neonatology team should consider placing an alternate airway, which may include an oropharyngeal, nasopharyngeal, or laryngeal mask airway. All of these airways are designed to bypass the upper airway obstruction. To place an oral airway, the clinician should measure the distance from the corner of the infant's mouth to the angle of the mandible (below the earlobe). To measure a nasopharyngeal airway, the clinician should measure from the tip of the infant's nostril to the angle of the mandible and ensure that the diameter of the airway is smaller than that of the nares.

If placement of the alternate airway is unsuccessful at relieving a newborn's upper airway obstruction, endotracheal intubation should be considered. However, the glottis may be difficult to visualize via direct laryngoscopy.

Alternative methods to visualize the airway, such as the use of a video laryngoscope, can also be considered, as well as assistance from a difficult or advanced airway team. A tracheostomy may be needed if the airway obstruction cannot be bypassed.

Severe upper airway obstruction identified prenatally should prompt a team approach with an advanced airway team present at the delivery, as well as consideration of an ex utero intrapartum treatment procedure. (5)

The video reveals opportunities to improve the communication among the team members. These include the following:

- A. The team leader responsible for the airway intervention addressed one of the team members by name, which is an excellent approach to communicating in an emergent situation. However, the team leader could have indicated the sizes of the laryngeal blade and endotracheal tube that he desired.
- B. The team member who provided the laryngoscope closed the communication loop by verbalizing the size of the endotracheal tube but could have also stated the size of the laryngoscope blade that he provided.
- C. The team leader responsible for the airway intervention could have specifically addressed the third team member with the request to increase the supplemental oxygen.
- D. The third team member increased the supplemental oxygen but could have announced her action and closed the communication loop.

The video demonstrates how knowledge sharing can still occur in an emergent scenario; this occurred when the third team member questioned why different-sized oral airways may be needed and the most experienced person on the team provided a response.

Correct Responses

A and B. Inspiratory stridor in a neonate might be decreased by placing the infant in a *prone* position, insertion of a laryngeal mask airway, or placement of a nasopharyngeal airway or a nasal trumpet. A stylet inserted within the endotracheal tube is likely to increase the risk of injury to the vocal cords without improving the chance of successful intubation.

American Board of Pediatrics Neonatal-Perinatal Content Specifications

- Know the proper approach to airway management in the delivery room.
- Know the various causes of stridor in the newborn and how to assess severity.

ACKNOWLEDGMENT

We wish to thank Sarah Weyhrich, RN (Clinical Education Specialist, Saigh Pediatric Simulation Center) and Bryan Camp (Media Services at St Louis Children's Hospital, St Louis, MO) for the production and editing of the video. We wish to thank Ms Jessica Hutchens and Mr Keith Patten for participating in the video.

References

1. Martin RJ, Fanaroff AA, Walsh MC, eds. *Fanaroff and Martin's Neonatal-Perinatal Medicine: Diseases of the Fetus and Infant*. Philadelphia, PA: Elsevier/Saunders; 2015
2. Breugem CC, Evans KN, Poets CF, et al. Best practices for the diagnosis and evaluation of infants with Robin sequence: a clinical consensus report. *JAMA Pediatr*. 2016;170(9):894-902
3. Cielo CM, Montalva FM, Taylor JA. Craniofacial disorders associated with airway obstruction in the neonate. *Semin Fetal Neonatal Med*. 2016;21(4):254-262
4. Thimmappa B, Hopkins E, Schendel SA. Management of micrognathia. *NeoReviews*. 2009;10(10):e488-e493
5. Ryan G, Somme S, Crombleholme TM. Airway compromise in the fetus and neonate: prenatal assessment and perinatal management. *Semin Fetal Neonatal Med*. 2016;21(4):230-239

ANSWER KEY FOR JUNE 2017 NEOREVIEWS

Congenital Diseases of the Kidneys: Prognosis and Treatments: 1. C; 2. B; 3. E; 4. D; 5. A.
Neonatal Hypertension: 1. B; 2. B; 3. E; 4. C; 5. B.

Delivery Room Management of a Neonate with Inspiratory Stridor

Patrick Sloan, Brittany Blue and Akshaya Vachharajani

NeoReviews 2017;18:e395

DOI: 10.1542/neo.18-6-e395

Updated Information & Services

including high resolution figures, can be found at:
<http://neoreviews.aappublications.org/content/18/6/e395>

References

This article cites 4 articles, 1 of which you can access for free at:
<http://neoreviews.aappublications.org/content/18/6/e395.full#ref-list-1>

Subspecialty Collections

This article, along with others on similar topics, appears in the following collection(s):
Pediatric Drug Labeling Update
http://classic.neoreviews.aappublications.org/cgi/collection/pediatric_drug_labeling_update

Permissions & Licensing

Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at:
<https://shop.aap.org/licensing-permissions/>

Reprints

Information about ordering reprints can be found online:
<http://classic.neoreviews.aappublications.org/content/reprints>



Delivery Room Management of a Neonate with Inspiratory Stridor

Patrick Sloan, Brittany Blue and Akshaya Vachharajani

NeoReviews 2017;18:e395

DOI: 10.1542/neo.18-6-e395

The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://neoreviews.aappublications.org/content/18/6/e395>

Neoreviews is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 2000. Neoreviews is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 2017 by the American Academy of Pediatrics. All rights reserved. Online ISSN: 1526-9906.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN[®]

