SALSA

SALSA (surfactant administration through laryngeal or supraglottic airways) is a method of delivering surfactant in a minimally invasive manner through a laryngeal or supraglottic airway. With this technique, infants on non-invasive (NIV) respiratory support can benefit from surfactant administration, resulting in an increased rate of NIV success and decreased exposure to the adverse effects of intubation and mechanical ventilation.

Use of an laryngeal mask airway (LMA; this term will be used to refer to supraglottic airways in general, not referring to a specific device or manufacture) for surfactant administration was first described in 2004 in a case report of 2 infants (30 and 37 weeks gestation)[1] and in 2005 with a prospective study of 8 infants (28-35 weeks gestation)[2]. In all cases, infants had improvement in respiratory status. In 2010, an animal model comparing surfactant administration via an LMA to an ETT showed similar improvements in oxygenation[3]. To date, there are 5 published randomized controlled trials investigating the use of an LMA for surfactant administration in humans. Attridge[4] compared infants on continuous positive airway pressure (CPAP) who received surfactant via an LMA to those who did not receive surfactant and found a decrease in oxygen requirement for 12 hours after the intervention. Roberts[5] compared infants 28-36 weeks gestation on CPAP requiring FiO2 30-40% and found a 26% decrease in the need for mechanical ventilation in the group who received surfactant via an LMA compared to controls maintained on CPAP alone (38% vs 64%, OR 0.30 (95% CI: 0.13, 0.70), p=.006, NNT=4). Studies comparing LMA administration vs INSURE (Intubation Surfactant Administration Rapid Extubation) have found the LMA to be superior in improvement in oxygenation[6] and decreased failure rate (77% in the INSURE group compared with 30% in the LMA group with similar efficacy in decreasing severity of respiratory distress syndrome (RDS)[7]. A similar comparison by Barbosa found that short-term efficacy was similar between groups[8]. In addition, a recent non-randomized study investigating the use of an 8 French umbilical vein catheter passed through an LMA into the trachea for surfactant administration in 4 patients found the procedure was correctly performed on the first attempt and all patients experienced improvement in FiO2 requirement at 3 hours post administration[9].

Placement of the LMA is achieved with the thumb and index finger and does not require use of a laryngoscope or other instrumentation. Infants with a clinical diagnosis of RDS (grunting, retracting, nasal flaring) and weight ≥ 1250 grams (limited by size of currently available LMAs) are candidates for the procedure. Positive pressure ventilation (PPV) is used to distribute the surfactant, infants remain on CPAP and are spontaneously breathing throughout the procedure. An instructional video for how to perform the procedure is available at https://youtu.be/Iig9l4BgIy4.

Providers are encouraged to familiarize themselves with the procedure by viewing the instructional video, downloading the flowchart available at the end of the video, and to practice the procedure on a manikin. In the Roberts trial[5] providers had minimal or no prior experience placing an LMA. Training occurred by reviewing the procedure on a manikin. Successful placement of the LMA was achieved in < 35 seconds and on the first attempt in the majority of patients[10]. Providers stated they felt comfortable with the procedure after 2 experiences.

SALSA is a procedure that allows infants on NIV to benefit from surfactant administration without the need for intubation or mechanical ventilation. Incorporating the procedure into clinical practice is feasible and relatively easy to learn. Because this technique requires minimal instrumentation and equipment, the SALSA technique may have application beyond the moderate to high- resource NICU setting as well. Infants born at community

hospitals capable of providing NIV may be able to avoid transport to a higher level of care facility if the infant improves with surfactant administration. In addition, this technique has potential to significantly impact neonatal morbidity and mortality in areas of the world where resources beyond NIV, such as intubation and mechanical ventilation, are not available.

---

[1]Brimacombe J, Gandini D, Keller C. The laryngeal mask airway for administration of surfactant in two neonates with respiratory distress syndrome. Paediatric Anaesthesia 2004; 14(2): 188-90. [2]Trevisanuto D, Grazzina N, Ferrarese P, Micaglio M, Verghese C, Zanardo V. Laryngeal mask airway as a delivery channel for administration of surfactant in preterm infants with RDS. Biology of the Neonate 2005; 87(4): 217-20. [3]Roberts KD, Lampland AL, Meyers PA, Worwa CT, Plumm BJ, Mammel MC. Laryngeal Mask Airway for Surfactant Administration in a Newborn Animal Model. *Pediatric Research*. 2010; 68(5): 414-418. [4]Attridge JT, Stewart C, Stukenborg GJ, Kattwinkel J. Administration of rescue surfactant by laryngeal mask airway: lessons from a pilot trial. *Am J Perinatol* 2013;30:201-206. [5]Roberts KD, Brown R, Lampland AL, Leone TA, Rudser KD, Finer NN, Rich WD, Merritt TA, Czynski AJ, Kessel JM, Tipnis SM, Stepka EC, Mammel MC. Laryngeal mask airway for surfactant administration in neonates: A randomized, controlled trial. *J Pediatr*. 2018;193: 40-46. DOI 10.1038/pr.2017.237. [6]Sadeghnia A, Tanhaei M, Mohammadizadeh M, Nemati M. A comparison of surfactant administration through i-gel and ET-tube in the treatment of respiratory distress syndrome in newborns weighing more than 2000 grams. *Adv Biomed Res* 2014;3:160. [7]Pinheiro JMB, Santana- Rivas Q, Pezzano C. Randomized trial of laryngeal mask airway versus endotracheal intubation for surfactant delivery. *J Perinatol* 2016;36: 196-201. [8]Barbosa RF, Simoes e Silva AC, Silva YP. A randomized controlled trial of the laryngeal mask airway for surfactant administration in neonates. *J Pediatr* 2017;93:343-350. [9]Vannozzi I, Ciantelli M,MoscuzzaF, et al. Catheter and laryngeal mask endotracheal surfactant therapy: the CALMEST approach as a novel MIST technique. J Matern Fetal Neonatal Med 2017; 30(19):2375-2377. [10]Wanous AA, Wey A, Rudser KD, Roberts KD. Feasibility of Laryngeal Mask Airway Device Placement in Neonates. Neonatology 2016; 111:222-227.