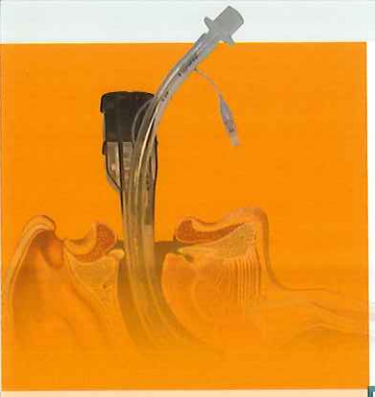

Rapid Sequence Airway

Chapter 7

What is RSA?

RSA is a new approach to emergency airway management being introduced in some EMS and air medical services. RSA involves all the same preparatory steps and pharmacology as RSI but the express goal is insertion of an extraglottic airway device rather than intubation. The fundamental concepts behind RSA are:

1. The greater than realized aspiration protection afforded by some EADs.

2. The potential for significant hypoxemia, transport delays and airway trauma during out-of-hospital RSI.

History and Development

Over a five year period beginning in 2000, we instituted the aggressive use of back-up airways, specifically the Combitube and LMA-Unique, to limit the number of airway attempts, shorten scene times, minimize the use of surgical airways, prevent critical hypoxemia and improve patient outcomes. Our crews and the receiving hospitals became very comfortable with these devices and their use increased. Initially they were recommended only for use after all reasonable attempts at intubation had failed and before a surgical airway was performed. Then we began limiting attempts to three, the "three strikes and you're out" rule. Eventually we began using back-up devices after only one or two attempts at intubation had failed. There were even a few cases where the crews planned to do RSI, but the oxygen saturation dropped precipitously and they appropriately elected to go straight to a back-up airway. That coincided with a renewed focus on prehospital scene times.

It occurred to us that these devices were working so well that we could theoretically give the induction agent and paralytic and immediately place a back-up airway, rather than waiting for a missed airway situation. We elected to call this Rapid Sequence Airway.

We currently use this approach in very selected cases, usually scene responses with short flight times to the trauma center or airways managed in the aircraft while enroute. The majority of our advanced airways are still traditional RSI though we continue to move to back-up devices very early. In the last three years, approximately 10% of advanced airways managed by our flight teams utilized RSA and the remainder were RSI. However, in an additional 10% or so of these cases where the team planned RSI, they ended up appropriately placing a back-up airway without any prior attempt at laryngoscopy, due to falling oxygen saturations that could not be rescued with BVMV. We do not call such cases RSA because the original intent was to intubate the patient.

While it is clear that an endotracheal tube provides the optimal degree of airway protection, EADs provide much more aspiration protection than most people realize. Ideally an EAD that provides maximal airway protection would be used. Currently available products that appear to offer superior airway protection include the Combitube, EasyTube, LMA-Supreme, LMA-ProSeal and King LTS-D.

Case Report

At 1809 two of our helicopters were dispatched to the remote scene of a motor vehicle collision involving a tractor-trailer and an SUV. The first crew, composed of two flight nurses, was asked to care for a 42 year old male who was an unrestrained passenger in the back of the SUV and was being extricated. The patient was noted to be alert and oriented complaining of head and abdominal pain. After a prolonged extrication, a rapid secondary survey was performed and an IV established prior to loading the immobilized patient into our Eurocopter AS350 B3 aircraft for a 23 minute flight to the nearest trauma center.

Care enroute included maintaining spinal precautions, oxygen administration at 15 liters/minute by non-rebreather mask and infusion of normal saline. During flight the patient was noted to become increasingly somnolent. With 18 minutes remaining in the flight, the crew determined that the patient required an airway intervention, as he was no longer able to protect his airway and would soon be unable to adequately ventilate.

The crew prepared for a difficult airway due to spinal precautions, darkness, turbulence and tight working conditions. The patient was pre-oxygenated then given etomidate followed immediately by rocuronium. The front of the cervical collar was removed and the second crewmember applied cricoid pressure with one hand and maintained cervical stabilization with the other hand. Utilizing options allowed in our treatment guidelines, the crew elected to place an LMA without any prior attempt at intubation. A #4 LMA-Unique was placed rapidly without complication and confirmed with end-tidal CO2 detection and good chest rise. The cervical collar was replaced and the patient was given 50 micrograms of fentanyl for analgesia; sedation with midazolam was withheld as blood pressure could not be determined.

They arrived at the hospital and the patient was taken to the trauma room where he was noted to have an oxygen saturation of 98% and was being ventilated without difficulty; there was no evidence of aspiration. The trauma team elected to leave the LMA in place for emergency CT scanning.

Indications and Contraindications

Indication – Same as RSI

1. Impending or actual respiratory failure
2. Impending or actual inability to protect airway (typically GCS < 9)
3. Inability to maintain saturation > 90% with supplemental 02/BVM/CPAP
4. Combative secondary to head injury

Contraindications

ABSOLUTE

1. Patient already unconscious and flaccid – i.e. cardiac arrest
2. Upper airway pathology – known or suspected
   a. Blunt or penetrating anterior neck trauma
   b. Inhalation injury
   c. Angiodema
   d. Anaphylaxis
   e. Tumor
   f. Infection – croup, epiglottitis, parapharyngeal abscess
   g. Caustic ingestion

Note that an EAD may still be considered as a rescue airway in these clinical situations in the event of a missed RSI – though a surgical airway may be better - but should not be used by original intent, because there is the possibility that the process will progress to the point that the airway is occluded and the patient cannot be ventilated from above.

RELATIVE

1. Patient may be managed by BNTI or oral intubation without medications
2. Anticipated difficult placement of EAD
3. Anticipated inability to BVMV in the event of failed EAD insertion
4. Anticipated need for very high airway pressures
5. Very high aspiration risk
6. Short ETA to hospital or arrival of flight team

Sample RSA Protocol from Espanola Valley EMS

Procedure

1. *Preoxygenate* with 100% oxygen
   a. Manual ventilation only if patient unable to maintain saturations
      - Use optimal "Rule-of-twos" technique
   b. Consider CPAP

2. *Place continuous saturation monitors*

3. *Protect c-spine if* indicated

4. *Pressure to cricoid*
   a. During any positive pressure ventilation
   b. From time first RSA meds administered until LMA confirmation

5. *Ponder* situation and options
   a. If crash airway (code or near code) proceed directly to LMA placement or intubation without medications
   b. Consider ETA to hospital or arrival of flight crew
   c. Consider contraindications

6. *Prepare*
   a. LMA-Supreme w/ gastric tube, suction, $ETCO_2$, BVM
   b. Back-up equipment: King, intubation and cricothyrotomy supplies
   c. All medications including post-airway sedation and analgesia
   d. Assistant(s) to maintain cricoid pressure and in-line immobilization

7. *Position patient optimally*

8. *Paralyze and induce*
    a. Etomidate 0.4 mg/kg IVP
    b. Rocuronium 1 mg/kg IVP

9. *Pass airway*
    a. Wait 60 seconds after rocuronium administration
    b. In the event of failed LMA-Supreme insertion/ ventilation
        - Oxygenate with BVM if saturations < 90% or falling
        - Place larger/smaller LMA-Supreme if patient on border of sizing
        - Place King if LMA-Supreme failure
        - If able to maintain oxygenation with any of above TRANSPORT
        - If unable to maintain oxygenation with any of above:
            - Single attempt at oral intubation (ETI)
                - Assumes LMA, King and BVM failure
            - Surgical cricothyrotomy
                - Assumes LMA, King, BVM and ETI failure

10. *Post-airway management*
    a. Confirm placement including end-tidal CO_2
        a. Place patient on continuous $ETCO_2$
    b. Continue cervical precautions if indicated
    c. Place gastric tube through port and decompress stomach
    d. Place patient on transport ventilator
    e. Secure airway device
    f. Provide on-going sedation, on-going analgesia and paralysis if indicated
        a. Rocuronium 0.5 mg/kg every 30 minutes as needed
        b. Midazolam 1 – 5 mg every 10 minutes as needed if SBP >100
        c. Fentanyl 25 – 100 micrograms IV q 10 minutes as needed

Note: This is a representative protocol only. The King LTS-D or other EAD with good seal and a port for a gastric tube could substitute for the LMA-Supreme. Likewise drug choices and dosages could vary.

Case Scenario

In-flight airway management/RSA

A flight team is transporting an otherwise healthy 40-year old male who rolled an ATV without a helmet from the scene to a trauma center, 20 minutes away. He was confused for first responders but had improved when the flight team arrived, complaining only of nausea and neck pain. He is in c-spine precautions, has two large-bore IVs running normal saline and is on a non-rebreather at 10 liters/min. Half way to the receiving hospital he has a generalized seizure and his pupils are now unequal. His GCS following the seizure is 5, he has snoring respirations and his saturation is still 100%. Blood pressure and heart rate are mildly elevated. What is your assessment and plan?

LEMONS: It appears that the major potential difficulty is cervical precautions.

PREOXYGENATE: Already on a non-rebreather at 10 liters/min. He should have already achieved maximal "nitrogen washout".

PROTECT C-SPINE: Indicated.

PRESSURE TO CRICOID: Only once medications administered.

PONDER: This patient meets criteria for airway intervention to "protect his airway" but his saturations are fine, flight time is only 10 minutes and intubation is complicated by the confined space of the aircraft and c-spine precautions. Most likely the patient has a head injury with elevated intracranial pressure. It will be critical to avoid hypoxemia, hypotension, abnormal CO2s and any additional elevation of his ICP. Options include positioning the patient on his side to allow secretions to drain, nasal intubation, RSI and RSA.

Given the concerns for elevated ICP, nasal intubation is relatively contraindicated. Given that RSI is never as rapid as the name suggests, I would discourage in-flight RSI with such a short transport time. If any difficulties are encountered it would be hard to justify, especially when done only for theoretical protection of the airway. You would not want to be messing with the airway on the helipad when there is a full trauma team waiting inside for the patient. Either watchful waiting with BVM assist as needed or RSA are appropriate. Let's assume RSA is selected.

PREPARE EQUIPMENT AND PEOPLE: Prepare the appropriate size EAD, hopefully one that permits passage of a gastric tube, which should be lubricated and ready. Cricoid pressure is still indicated though ELM is not necessary with RSA. It is still prudent to remove the front of the collar and have someone maintain in-line immobilization. A jaw thrust is not necessary with RSA.

PREMEDICATE: I would forego any premedications due to the limited time available and because the EADs are generally less noxious than intubation and therefore less likely to elevate ICP.

POSITION THE PATIENT OPTIMALLY: Limited by cervical precautions.

PARALYZE AND INDUCE: Etomidate 0.4 mg/kg is a likely choice for induction. Because this is a head trauma patient who also has the potential for multisystem trauma, I would avoid propofol and induction doses of midazolam if possible. Rocuronium or succinylcholine are both appropriate for paralysis. Given the need to monitor for additional seizures and mental status changes and the short time before evaluation by the trauma team a case could be made that succinylcholine is a marginally better choice than rocuronium.

PASS THE TUBE: Maintaining in-line immobilization. Jaw thrust and ELM are not necessary with RSA.

POST-INTUBATION MANAGEMENT: The patient will be placed on the ventilator with continuous capnography. The stomach will be decompressed with a gastric tube passed through the EAD if using a King LTS-D or LMA-Supreme. The device may be secured in place if time permits or it may be closely monitored and repositioned as necessary. Fentanyl and midazolam would be administered for sedation and analgesia at doses dependent on patient size and blood pressure. The patient should be ready for off-loading upon arrival to the trauma center in 10 minutes.