Laryngotracheal/Pulmonary Problems and the Mechanically Ventilated Patient: Pediatric Lung Transplantation

G. Kurland, MD
Children’s Hospital of Pittsburgh
Geoffrey.kurland@chp.edu

11/2014
Objectives

• Discuss some causes of respiratory difficulties following lung transplantation.

• Concentration on common problems with important aspects of differential diagnosis, evaluation, and/or treatment
Case #1

• 13 year-old girl with Primary Pulmonary Hypertension undergoes double lung transplantation
• After extubation (36 hours post-transplant), she has a soft, slightly hoarse voice.
• In retrospect, she’s seemed soft-spoken during evaluation—but not hoarse.
Case #1 - 2

• Differential diagnosis based on this history?
  – Glottic trauma: vocal cord damage, subglottic stenosis
  – Neurologic damage: Recurrent laryngeal nerve and vocal cord paresis or paralysis
  – Other (?pre-existing?) vocal cord abnormality previously unrecognized, but worsened by intubation
Case #1-3

• Transplant procedure takes about 6 hours, with extubation soon thereafter. Is this too short a time for sub-glottic stenosis? How about sub-glottic edema?
• If vocal cord paresis, what is the mechanism?
Laryngeal Muscles

• Posterior cricoarytenoid mm.: Rotate the arytenoid cartilages to open the vocal cords
• Lateral cricoarytenoid mm.: Rotate the arytenoid cartilages to close the vocal cords
• Interarytenoid muscle: Closes the vocal cords
• Thyroarytenoid muscles: Close the vocal cords
• Cricothyroid mm.: Tenses the vocal cords
Neural Input to Larynx

- **Sensation:** From the Internal Laryngeal Nerve (off the Vagus in the neck).
- **Motor:** External laryngeal nerve supplies the crico-thyroid muscles.
- **Motor:** Recurrent laryngeal nerve supplies intrinsic muscles other than the cricothyroid and part of the interarytenoid.
Case #1-4
Next Step in Eval/Treatment?

1. Immediate flexible bronchoscopy or nasolaryngoscopy?
2. Keep NPO for at least 2 weeks, using TPN for nutrition?
3. Observe patient as she eats/drinks. If no obvious difficulty, continue to observe?
4. Laryngeal EMG to assess for nerve damage?
Vocal Cord Paresis Post Lung Transplantation

• Most commonly involves L cord held in abduction.
Vocal cord paresis/paralysis: Complications in lung recipients

• Aspiration, coupled with decreased cough reflex
• Infection
• Risk for chronic graft dysfunction (OB)
Treatments for VC paralysis

• Injection of affected cord to increase bulk:
  – Collagen, fat, other materials
• Structural intralaryngeal implant to re-position cord
• Vocal cord re-positioning
• Reinnervation (often with bulk injection)
• Tracheotomy
Case #1: Denouement

- We observed patient initially. No notable problem with eating/drinking
- Initial bronchoscopy (for BAL and biopsy) at about 14 days post-transplant with light sedation done with transnasal approach.
  - Vocal cords moved symmetrically...
  - No evidence of subglottic edema/stenosis
  - Left anterior cord was slightly “thin” in appearance...Possible previous injury?
- Voice improved over next 1-2 months...but still “soft”
Case #2

• A nine year old boy undergoes double lung transplantation.
• Initial post-transplant period is without major problems
• Patient extubated to BiPAP without difficulty.
• Weaning from BiPAP proved difficult, with mild shortness of breath and some dyspnea
Case #2

PA film Pre-Transplant

Portable (AP) film Post-Transplant
Case #2

PA and Lateral radiographs 10 days post-op
Case # 2: Differential Dx?

- Diaphragm paresis/paralysis?
- Atelectasis (volume loss)?
Case #2
Treatment Options?

• “Watchful waiting”?  
  – What is prognosis in post-transplant diaphragm paresis?  
  – What is functional status in patients with paresis?
• Plication?
• Pacing???
Case #2: Denouement

- After great deal of discussion amongst surgeons, CT ICU staff, Pulmonary staff, family, the decision was made to plicate.
- Post-plication, patient markedly improved in his activities and had a resolution of his pulmonary complaints...
Lessons and Caveats

• Post-transplant airway/diaphragm problems are not uncommon, with 10-15% of patients affected.

• Allowing time for improvement must be balanced against need to protect the lung, increase patient activity, and avoid unnecessary invasive procedures...
Lesson for All

• Q: How do you get good clinical judgment?
  • A: Experience

• Q: How do you get experience?
  • A: Bad judgment...

• “We’re all involved in life-long learning”