Relax and Take a Deep Breath: What’s New in the Treatment of Pulmonary Hypertension

Nancy D. Bair, RN, MSN, CNS-BC
Pulmonary Hypertension Mid-level Provider
History of PAH

• First recognized on clinical & pathological grounds in 1891
• Named & chronicled in 1950’s through cardiac catheterization
• 1973 Geneva WHO PH classification-2 groups
• 1998 Evian World Health PH Symposium-5 groups
• 2013 Nice 5th World Symposium
2013 Revised Nomenclature & Classification of PAH

• Pulmonary Arterial Hypertension- WHO Group I

  IPAH
  Heritable PAH
  Drugs and toxin induced

  APAH
  Collagen vascular disease
  Congenital systemic to pulmonary shunts
  Portal Hypertension
  HIV infection
  Shistosomiasis

  1′ Pulmonary veno-occlusive disease (PVOD) &/or pulmonary capillary hemangiomatosis (PCH)
  1″ Persistent pulmonary hypertension of the newborn
2013 Revised Nomenclature & Classification of PAH

Pulmonary Venous Hypertension - WHO Group II

Left heart systolic dysfunction
Left heart diastolic dysfunction
Valvular disease
Congenital/acquired left heart inflow/outflow tract obstruction & congenital cardiomyopathy
2013 Revised Nomenclature & Classification of PAH

- Pulmonary hypertension due to lung diseases &/or hypoxia- WHO Group III
  
  COPD

  Interstitial lung disease

  Mixed obstructive and restrictive pattern

  Sleep-disordered breathing

  Alveolar hypoventilation disorders

  Chronic exposure to high altitude

  Developmental lung diseases
2013 Revised Nomenclature & Classification of PAH

- Chronic Thromboembolic PH (CTEPH) - WHO Group IV
2013 Revised Nomenclature & Classification of PAH

- Pulmonary hypertension with unclear multifactorial mechanisms - WHO Group V

Hematologic Disorders: chronic hemolytic anemia, myeloproliferative disorders, splenectomy

Systemic disorders: sarcoidosis, pulmonary hystiocytosis, lymphangioleiomyomatosis

Metabolic disorders: glycogen storage disease, Gaucher disease, thyroid disorders

Other: tumoral obstruction, fibrosing mediastinitis, chronic renal failure, segmental PH
PAH Definition

- Mean Pulmonary Artery Pressure $\geq 25\text{mm Hg}$ at rest
- PCWP $\leq 15\text{mm Hg}$
- PVR $> 3$ Wood units
Pathophysiology of PAH: Pathways of Disease
Imbalance of Vasoactive Mediators

- Prostacyclin - potent vasodilator & anti-proliferative activity
- Nitric Oxide - potent vasodilator & anti-proliferative activity
- Endothelin & Thromboxane - potent vasoconstrictor & proliferative activity
Treatment of PAH

• No Cure at This Time
• Transplant and Calcium Channel Blockers only treatment 20 years ago
• Flolan®, Tracleer®, Veletri®, Remodulin™, Ventavis®, Revatio™, Letairis™, Tyvaso™, Adcirca™, Adempas®, Opsumit®, Orenitram
• Other drugs in clinical trials in U.S. and abroad
Pathophysiology of PAH: Pathways of Disease
Flolan® , Veletri® (epoprostenol)
Remodulin® (treprostinil)

• Potent vasodilator of pulmonary and systemic arterial beds
• Action: Vasodilator, Inhibits platelet aggregation and smooth muscle proliferation
IV therapy

- Flolan, Veletri, & Remodulin
- Side effects: Headache, jaw pain, flushing, nausea, diarrhea
- Long term indwelling catheter
- Need for ice to maintain solution - Flolan only
- Education about care of catheter
- Education about mixing and infusing the drug
Canè Crono Five
CADD MS-3
Inhaled Therapy

Iloprost (Ventavis)

- Specialized nebulizer
- Frequent dosing (6-9 x/day)
- Similar side effect profile to other prostanoids
Tyvaso™
Inhaled prostacyclin
9 inhalations  4 times/day
Handheld, battery-powered nebulizer
Orenitram (treprostinil)

- Oral doses are titrated starting @ 0.25 mg bid
- Side Effects: headache, nausea, diarrhea
Pathophysiology of PAH: Pathways of Disease
Endothelin Receptor Antagonists (ETRA)

- ETRAs potential for teratogenicity and male infertility (Counseling, barrier contraception, monthly HCG)
- Liver dysfunction (LFTs q month-Tracleer)
- Anemia (CBC q 3 month-Tracleer)
Pathophysiology of PAH: Pathways of Disease
Sildenafil and Tadalafil

PDE-5 Inhibitors

Side effects:
headache, muscle aches, flushing
Adempas® (riociguat)

- Soluble guanylate cyclase stimulator
- Vasodilator, anti-platelet, anti-fibrotic
- CTEPH (non-op) and PAH
- Cannot use w/ revatio or adcirca
Calcium Channel Blockers

• Vasodilation of smooth muscle in pulmonary arteries
• 10-20% responders
• Increases cardiac output
• Decreases mPAP
• Requires a vasoreactive challenge
• Potential for severe adverse reactions
  – systemic hypotension
  – pulmonary edema
  – right ventricular failure
  – death
Updated Guidelines: Inadequate Clinical Response to Initial PAH Therapy

- Inadequate Clinical Response
- Sequential Combination Therapy
  - ERAs
  - Prostacyclin
  - PDE-5i or sGCS
- Consider eligibility for lung transplantation
- Inadequate response on maximal therapy
- Referral for lung transplantation
- Balloon atrial septostomy

Marvel at the beauty of winter!