Pulmonary Hypertension

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Conflict of interests

• None
Pulmonary Hypertension

• Talk outlines:
  • What is pulmonary Hypertension (PH)
  • Causes and classification of PH
  • Symptoms of PH
  • Diagnosing PH
  • Treatment of PH & PAH
  • Living with PAH
What is Pulmonary Hypertension?

- “Regular” **Hypertension**
  - High blood pressure in the artery throughout body

- **Pulmonary Hypertension**
  - High blood pressure in the lungs
Pulmonary Circulation
What causes Pulmonary Hypertension?
## Types of Pulmonary Hypertension

<table>
<thead>
<tr>
<th>Group</th>
<th>Disease state</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Pulmonary artery hypertension (PAH)</strong></td>
<td>Idiopathic, familial, associated PAH</td>
</tr>
<tr>
<td><strong>2. PH from left sided heart disease</strong></td>
<td>Systolic and diastolic heart failure, valvular heart disease</td>
</tr>
<tr>
<td><strong>3. PH from chronic hypoxic lung disease</strong></td>
<td>Severe COPD, pulmonary fibrosis, severe OSA</td>
</tr>
<tr>
<td><strong>4. PH from chronic blood clots in lung</strong></td>
<td>CTEPH</td>
</tr>
<tr>
<td><strong>5. PH from unclear multifactorial mechanisms</strong></td>
<td>Sarcoidosis, chronic metabolic and hemolytic disorder, chronic renal failure</td>
</tr>
</tbody>
</table>
Epidemiology of Pulmonary Hypertension

- PAH (WHO Group 1)
- PH due to Left Heart Disease (WHO Group 2)
- PH due to Chronic Lung Disease (WHO Group 3)
- CTEPH (WHO Group 4)
- PH due to unknown causes (WHO Group 5)
- Misc.
Pulmonary arterial hypertension (Group 1 PH)

- Specific type of pulmonary hypertension where the tiny blood vessels in the lungs become stiff, scarred and narrow.

- Group 1 PAH is a very serious disease.
- It is not the same as other groups of PH
Risk factors for Group 1 PAH

**Idiopathic PAH**
- Prevalence 6/million
- F:M -2:1,
- Age of onset 30s-40s

**Hereditary or Familial**
- 6-26% of IPAH

**CTDs: Scleroderma, SLE, RA**
- 10%-20%

**Sickle cell disease**
- 10%

**HIV**
- 0.5%

**Liver cirrhosis**
- 4%

**Anorexigen use for >3 months**
- 1:25000

**Congenital heart disease**
- 100% of unrepaired

**Schistosomiasis**
- 5% in chronic

**ACCF/AHA 2009 Expert Consensus Document on Pulmonary Hypertension**
Group 2 PH: due to left heart disease

Systolic heart failure

Diastolic heart failure
Group 3 PH: due to chronic hypoxic lung disease
Group 4 PH: due to chronic blood clot in the lungs

Chronic thromboembolic pulmonary hypertension (CTEPH)

- Scar tissue
- Narrowed blood vessels
- Right side of the heart has too much pressure
Symptoms of Pulmonary Artery Hypertension

- Shortness of breath in 98%
- Fatigue in 73%
- Chest pain in 47%
- Palpitations in 33%
- Syncope in 36%
- Leg swelling 21%
Diagnosing Pulmonary Artery Hypertension

• Very often overlooked, and patients typically experience 2-3 years of frustrating physician visits before being correctly diagnosed.

Why?

- Because most of the symptoms are common with other common lung disease like asthma, COPD

- High degree of suspicion is required (Risk factors)
Diagnosing Pulmonary Artery Hypertension

• Once PH is suspected, first test to order is ?
  • Echocardiogram

• Can overdiagnoses or miss pulmonary hypertension
Diagnosing Pulmonary Artery Hypertension

- Once PH is diagnosed on Echocardiogram, further tests are ordered to find out the causes.

- Chest X-ray and CT scan
- PFT (breathing test)
- Nuclear (V/Q) scan
- Sleep apnea test
- Blood tests
- 6 minutes walk test
- Right heart catheterization (Gold standard)
Treatment of PAH & PH

• PAH is a progressive condition with a high mortality if left untreated
  • Survival rates in IPAH at 1, 3, & 5 years were 68%, 48% and 34% before discovery of meds

• Overall survival improves with “EARLY DIAGNOSIS and start of proper therapy in time”

• Major advancements have been made in the PAH specific drugs in the past two decades

• Survival rate in IPAH at 5 years has improved to 60% from 34% with current therapy

• There is no cure for PH
Treatment of PH

• Supportive medical therapies  *(For all groups of PH)*
  • Oxygen inhalation via a nasal cannula or face mask
  • Diuretics – Get rids of excess fluid that puts pressure on the heart
  • Digoxin – Assists the pumping of the heart
  • Blood thinner pills to prevent blood clot formation
  • Physical therapy to improve DOE

• PAH specific drugs or Pulmonary vasodilators  *(For only group 1 PAH)*
• Lung Transplant if medical therapy fails
PAH specific drugs:

- Targets pulmonary arteries and decrease blood pressure by dilating them
- **Used only in group 1 PAH**
- Major advancement in last two decades
- Improves:
  - symptoms,
  - exercise capacity,
  - quality of life and survival
- & Prevents clinical worsening

- Available in pills, Inhalational, subcutaneous and Intravenous forms
PAH specific drugs:

- Epoprostenol (Flolan®) - IV
- Treprostinil (Remodulin, Tyvaso, Orenitram)
- Iloprost (Ventavis®)
- Selexipag (IP receptor agonist)
- Bosentan (Tracleer®)
- Ambrisentan (Letairis®)
- Macitentan (Opsumit)
- Tadalafil (Adcirca®)
- Sildenafil (Revatio®)
- Riociguat (Uptravi)

**Prostaglandins**

- Epoprostenol (Flolan®) - IV
- Treprostinil (Remodulin, Tyvaso, Orenitram)
- Iloprost (Ventavis®)
- Selexipag (IP receptor agonist)

**Endothelin receptor antagonists**

- Bosentan (Tracleer®)
- Ambrisentan (Letairis®)
- Macitentan (Opsumit)

**Phosphodiesterase 5 inhibitors**

- Tadalafil (Adcirca®)
- Sildenafil (Revatio®)

**Soluble Guanylate cyclase activators**

- Riociguat (Uptravi)
## Comparison of PAH specific therapy

<table>
<thead>
<tr>
<th>Drugs</th>
<th>Cost $ (annual)</th>
<th>Route</th>
<th>Frequency</th>
<th>Ease of Use</th>
<th>Side effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epoprostenol</td>
<td>~100,000</td>
<td>IV</td>
<td>Continuous</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>Treprostinil</td>
<td>&gt;175,000</td>
<td>Oral, SQ, IV, Inhaled</td>
<td>Continuous</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>Iloprost</td>
<td>~175,000</td>
<td>Inhaled</td>
<td>6-9x per day</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Sildenafil</td>
<td>~15,000</td>
<td>Oral</td>
<td>TID</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td>Tadalafil</td>
<td>~12,000</td>
<td>Oral</td>
<td>Daily</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td>Bosentan</td>
<td>~75,000</td>
<td>Oral</td>
<td>BID</td>
<td>++++</td>
<td>+</td>
</tr>
<tr>
<td>Ambrisentan</td>
<td>~75,000</td>
<td>Oral</td>
<td>Once a day</td>
<td>++++</td>
<td>+</td>
</tr>
<tr>
<td>Macitentan</td>
<td>~75,000</td>
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<td>Once a day</td>
<td>++++</td>
<td>+</td>
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IV Epoprostenol (Flolan®) & Treprostinil (Remodulin)

- Requires continuous infusion via chronic indwelling catheter.
  - Risks of drug interruption
  - Risk of iv catheter infection, blood clot

- Half-life short

- **Abrupt withdrawal** can result in **rebound PH (can be fatal)**
Subcutaneous Treprostinil (Remodulin®)

- SQ administration
- Longer half-life than epoprostenol
- Pre-mixed
- Stable at room temperature
Inhaled Prostanoids

Tyvaso

Ventavis
Treatment of other group of PH

• Group 4 due to chronic blood clots in the lungs
  • Surgical removal of blood clots
  • Riociguat (PAH specific drug) in patients not a candidate for surgery
  • Blood thinner and other supportive treatment

• Group 2, 3 & 5:
  • Treatment of underlying heart and lung disease plus supportive treatment
  • PAH specific drugs are not used
Living with PAH

• What to expect regarding treatment

  • There is no cure for PAH.

  • The goals for treatment is to slow the course of the disease.

  • Response to medicine is somewhat unpredictable and depends on how advanced the disease is at diagnosis as well as the underlying cause.
Living with PAH

• What else to expect?

  • Change in life styles
    • Medications (continuous IV, SQ, Inhalation 4-6 times/day)
    • Appointments q3-4 months
    • Testing (Echo, 6 minutes walk tests, blood tests)

• Financial stress

• Psychological stress

"Take with meals? After I pay for these, how can I afford food?"
Living with PAH

• **To best manage your PAH you should:**
  • Take your medication exactly as directed.
  • Do not stop a medication without consulting with your doctor.
  • Take care to never run out of medication.
  • Avoid things that can put a strain on the lungs and heart.
    • Smoking, illicit drugs, OTC decongestants
  • Adhere to a low salt diet and limit fluid intake.
  • Monitor your weight to recognize fluid retention.
  • Develop strategies to help cope with fatigue and shortness of breath.
  • Develop a careful exercise program with your healthcare providers.
  • Get immunized against flu and pneumonia.
  • Talk to your doctor about anxiety and depression
  • Talk to your provider about support group
Living with PAH: Finding Support

Join PHA’s free social network exclusively for the pulmonary hypertension community.

Financial support:
What could my family and I be entitled to?

A PHA UK guide to navigating potential support, whatever your situation.
Sharon Clayton
Pulmonary Hypertension program at SUNY Upstate

• **Treating Physicians**
  • Birendra Sah, MD
  • James Sexton, MD
  • Anish Desai, MD

• **Clinical Nurse co-ordinator**
  • Naquia Worrell, RN
  • Direct phone line: 315 464 3132
Take home points

• Pulmonary hypertension is high blood pressure in the lungs
• Classified in 5 groups based on etiology (can be difficult)
• Classification is important for treatment
• Group 1 PH is also called PAH
• PAH progressive and fatal if left untreated
• PH specific drugs (pulmonary vasodilators) are used only to treat group 1 PAH
• Living with PAH can be challenging