Approach to the patient with Shortness of Breath

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**Dyspnoea – Basic concepts**

**Definition:**
Dyspnoea is defined as abnormal or **uncomfortable breathing** in the context of what is normal for a person according to his or her level of fitness and exertional threshold for breathlessness.

**Common and important symptom- which may be due to:-**
- Pulmonary disease
- Cardiac disease OR
- Combination of both OR
- Non-cardiac and non-pulmonary – deconditioning, anemia, psychosomatic

**Cardiac Dyspnoea**
May be due to 1 or more of the following:-
Coronary disease, myocardial disease, valve disease, rhythm disorders, pericardial disease
**Important symptom – denotes severity of disease.**
Ms V - 35 year old female patient
solo mother - 5 year old daughter.

A+E – 3-month history of breathlessness, wheeze and cough.

PM/SH: nil - normal pregnancy and delivery 5 years ago   Meds: nil

SOCIAL:
Not working.
Previous heavy alcohol intake, along with other substance use (marijuana), however has stopped 5 years ago.

EXAM:
Afebrile  PR 100 bpm   BP: 100/60mmHg, no pallor, normal BMI
CVS- tachycardic, no obvious mumurs
Chest: bilateral rhonchi with an expiratory wheeze
Peripheries: no oedema
ASSESSMENT:
? Adult onset asthma and LRTI.

MANAGEMENT:

Peak flow was mildly reduced.
Given a nebulizer and observed for 30 min – had improved.

Rx – Ventolin, Flixotide and Augmentin

After the nebulizer – complained of severe palpitations

⇒ ECG was done
ECG done on the way out.
QUESTION

ECG is compatible with acute asthma

OR

Need to re-assess the diagnosis.

RE-ASSESS THE DIAGNOSIS
ECG done on the way out.
History Re-visited

3 months ago - bad episode of flu – never recovered fully – 3 lots of antibiotics

Orthopnea - Often wakes at night – coughing and sensation of suffocation

Breathless on minimal exertion – dressing or showering (NYHA FC III)

Family history of cardiomyopathy
Examination

Tachycardia, hypotension 100/60mmHg

Raised JVP

S3 gallop rhythm – ’KENTUCKY’

Crackles, wheezes,

Peripheral oedema - trace
## Bloods

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
<th>Reference Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium</td>
<td>141 mmol/L</td>
<td>135 - 145</td>
</tr>
<tr>
<td>Potassium</td>
<td>4.0 mmol/L</td>
<td>3.5 - 5.2</td>
</tr>
<tr>
<td>Creatinine</td>
<td>86 umol/L</td>
<td>45 - 90</td>
</tr>
<tr>
<td>eGFR</td>
<td>76 mL/min/1.73m2</td>
<td>&gt; 90</td>
</tr>
<tr>
<td>NT-ProBNP</td>
<td>425 pmol/L</td>
<td>&lt; 35</td>
</tr>
<tr>
<td>Ferritin</td>
<td>121 μg/L</td>
<td>20 - 190</td>
</tr>
<tr>
<td>TSH</td>
<td>0.67 mIU/L</td>
<td>0.30 - 4.00</td>
</tr>
</tbody>
</table>
Distinguishing Cardiac from Respiratory Dyspnoea

History

Examination

ECG

Bloods
# History - Characterizing Dyspnoea

<table>
<thead>
<tr>
<th>DESCRIPTOR</th>
<th>PATHOPHYSIOLOGY</th>
<th>CONDITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chest tightness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>↑ effort of breathing, unsatisfying breaths, can’t get a deep breath</td>
<td></td>
<td>Asthma, Myocardial ischaemia</td>
</tr>
<tr>
<td>Air hunger, ↑ urge to breathe</td>
<td></td>
<td>COPD, asthma</td>
</tr>
<tr>
<td>Suffocating, smothering, air hunger</td>
<td></td>
<td>Pulmonary fibrosis</td>
</tr>
<tr>
<td>Heavy breathing, breathing more</td>
<td></td>
<td>CHF, severe COPD, asthma</td>
</tr>
</tbody>
</table>

- Effort of breathing
- Unsatisfying breaths
- Can’t get a deep breath
- Air hunger, urge to breathe
- Suffocating, smothering, air hunger
- Heavy breathing, breathing more
Clinical Diagnosis of Heart Failure

**SYMPTOMS**
- Dyspnea on exertion
- Orthopnoea - most specific symptom of raised filling pressures
- Paroxysmal nocturnal dyspnoea
- Fatigue

**SIGNS**
- Elevated JVP and positive hepatojugular reflux - most reliable sign of raised filling pressures
- Third Heart Sound - prognostic for future CHF events
- Displaced apex beat
- Pulmonary crackles - insensitive for heart failure
- Peripheral oedema
- Pulsus alternans
12 lead ECG and Dyspnoea

Rate and Rhythm

Ischaemia, infarction

LV hypertrophy and atrial enlargement

Right heart pathology
ECG: Cardiac dyspnoea versus Respiratory dyspnoea.

**Dyspnoea**

**Left Heart Disease**
- *p* pulmonale
- LBBB
- LVH
- L Axis deviation

**Right Heart Disease**
- *p* pulmonale
- RBBB
- R Axis deviation
- RV strain pattern
Brain Natriuretic Peptide

Natriuretic hormone released from the ventricles ➔ volume expansion and increased wall stress. BNP inhibits the RAAS.

NT-proBNP has a longer plasma half-life and rises more in CHF than does BNP.
Elevated plasma BNP levels
Not specific for CHF-lends weight to the diagnosis of HF
↑ LV filling pressures, reduced LVEF, LV hypertrophy,
↑ Acute MI and ischemia
Pulmonary embolism, COPD and cor pulmonale

Natriuretic peptides are sensitive to biological factors
age, sex, weight, and renal function
elevated in women and in people over 60 years of age who do not have HF.
Lower in obese patients
NT-proBNP

- NT-proBNP levels below 35pmol/l - CHF unlikely negative predictive value of 98 percent.

- **GOOD RULE OUT TEST**

<table>
<thead>
<tr>
<th>AGE</th>
<th>NT-proBNP (pmol/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;50 yrs</td>
<td>50</td>
</tr>
<tr>
<td>50-75 yrs</td>
<td>100</td>
</tr>
<tr>
<td>&gt;75 yrs</td>
<td>210</td>
</tr>
</tbody>
</table>

Sens 90%, spec 84%
Case 2

68 year old patient

**CABG 12 years** ago (3 grafts- LIMA to LAD, radial to OM, SVG to distal RCA)
Normal LV function.

Ex smoker (40 pack years) – **COPD FEV1 1.4L** – 55% of predicted

Hypertension, Impaired glucose tolerance (HbA1C-46), treated hyperlipidemia

**Worsening dyspnoea on exertion** – 2 chest infections requiring antibiotic Rx
2 recent courses of Prednisone
Hasn’t got back to his baseline fitness
No chest pain
Medication:

Ventolin
Flixotide
Seretide
Aspirin – 100mg/d
Liptor -40mg/d
Inhibace – 5mg/d

EXAM:

PR 80bpm BP 150/90mmHg  JVP-1

CVS- distant heart sounds, no mumurs, no gallop

Chest_ hyperinflated, no crackles or wheezes

Abd: central obesity

Peripheries- no oedema, mild PVD
Investigations

CXR- normal CTR, ? Hyperinflation, no failure, no infection

Bloods- unremarkable – no anaemia, normal S creat, trop I neg, NT-proBNP 83pmol/l

ETT – equivocal, inadequate HR, quite SOB

Coronary angiography:

Severe native vessel disease
Grafts were patent
No targets for revascularisation

LV – EF 50%, LVEDP 18mmHg
Dyspnoea and Coronary Disease

DYSPNOEIC patients with known CAD or SUSPECTED CAD
-generally high risk – recommend specialist assessment

Dyspnea and fatigue – often herald important CAD in elderly patients.

Breathlessness alone can be the presenting symptom even for acute coronary syndrome and was found to be present in 25% of patients in the EuroHeart data set.

In a large series of patients referred for evaluation of dyspnea, 42% with this symptom alone had ischemia on exercise echocardiography
CASE

83 year old - usually well. Complains of exertional breathlessness.

Severe Calcific Aortic Stenosis
Case

• Mrs DR- 53 years of age.
• **Intermittent episodes of breathlessness on exertion x 3months (with vacuuming)**
• **No chest discomfort or palpitations**
• Some days are normal.

**PM/SH:**
Late onset asthma in her 20’s  
No hypertension

CV risk factors- low CV risk

**Examination:**
Mildly raised body mass index. Her pulse rate was 74 bpm. Blood pressure was well controlled at 100/60mmHg. 
Heart sounds were normal with no murmurs.
Case

50 year old, English journalist with his own advertising business.

Regular gym attendant- 4 month hx of unexplained breathlessness and lethargy. No chest discomfort

Known bicuspid aortic valve – normal valve fx
Known hypertensive on Rx - Hyzaar

Non-smoker, no diabetes, no family hx of CAD.
Case cont.

EXAM:
BP 180/110mmHg       PR 63bpm       JVP- no raised       raised BMI - 28

CVS- ejection click, no murmurs
Chest – normal
Abdomen – normal
CNS-normal
Peripheries- normal
ECG and ETT
Relationship between age and maximal heart rate in >5000 asymptomatic women, with 95% confidence limits.

Peter H. Brubaker, and Dalane W. Kitzman Circulation. 2011;123:1010-1020
Contrast CMR
Coronary angio
Discussion

During maximal aerobic exercise in healthy humans, cardiac output increases approximately 4-fold. \[ \text{CO} = \text{HR} \times \text{SV} \]

2.2-fold increase in heart rate (HR)
0.3-fold increase in stroke volume

**Chronotropic incompetence** – relatively common in patients with sick sinus syndrome (elderly), atrioventricular block, coronary artery disease, and HF.
Conclusion

Need a good history and examination
Orthopnoea, smothering, suffocating
JVP, S3 gallop (‘KENTUCKY’)

12 lead ECG:
rhythm, ischaemia, ventricular hypertrophy
L sided – p mitrale, LVH LBBB, L axis – cardiac cause for SOB
R sided – p pulmonale, RBBB, R axis – pulmonary cause for SOB

CXR:
Cardiomegaly, upper lobe venous blood diversion, interstitial oedema

NT-proBNP
Low level <35pmol/l – GOOD RULE OUT TEST for heart failure

Suspected IHD - Unexplained breathlessness in patients with known or suspected IHD – high risk and require specialist assessment

Exertional arrhythmias - often present with intermittent episodes of breathlessness (PAF – most commonly)
THANK YOU

Colin Edwards