HYPERVENTILATION – A BREATH TOO FAR.

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CONTENT

• DEFINITIONS, CAUSES, SIGNS AND SYMPTOMS

• DIAGNOSIS

• ASSESSMENT

• EVIDENCE and TREATMENT OPTIONS
HISTORY AND DEFINITIONS

In the past, variously described - irritable heart, DaCosta’s syndrome, the soldiers heart.

1937 Kerr, Dalton and Gliebe first used the term “hyperventilation”.

Respiratory disorder. Psychologically or physiologically based, involving breathing too deeply and/or too rapidly (hyperventilation). (Brashear 1983)
DEFINITIONS

Hyperventilation is defined as a state of alveolar ventilation in excess of metabolic demands leading to a decreased PaCO2 and respiratory alkalosis (Malmberg 2000)

Not all patients present with hypocapnia.

"Inappropriate breathing which is persistent enough to cause symptoms with no appropriate cause" (Rowley)
CAUSES

Many, varied, complex – interaction between organic, psychogenic and physiological factors

Organic disorders 5-11% – Asthma, ILD, heart failure, PE and pain. Physiologic (↑ progesterone)
Associated diagnoses.

Psychological factors 35-83%
Triggers – bereavement, emotional event, personality
Heightened emotional states – fear, anger, depression
Mental health issues – panic attacks, anxiety states, agoraphobia
SYMPTOMS

Multiple, variable and multi-system. Some common themes.

RESPIRATORY – breathlessness, sighing, yawning, dry cough, air hunger, unsatisfying deep breaths

CARDIAC – palpitations, chest pain, tachycardia, pseudo angina

NEUROLOGICAL – dizziness, paraesthesia (facial and distal), confusion, poor concentration, tetany (rare)
MORE SYMPTOMS……

GI – dysphagia, bloating, heart burn, reflux

MUSCULO SKELETAL – cramps, aches and pains, twitching, jaw clamping, postural abnormalities, adaptive shortening

PSYCHOLOGICAL – anxiety, panic attacks, phobias, depression

VICIOUS CYCLE.........
PHYSIOLOGY OF HYPERVENTILATION

“We live in a narrow zone of homeostasis bordered on both sides by physiological disaster” Christopher Gilbert

Low/ fluctuating levels of Pa CO2 $\rightarrow \downarrow$ CBF and $\uparrow$ lactic acid production
PHYSIOLOGY OF HYPERVENTILATION

Cerebral vasoconstriction, coronary vasoconstriction and subsequent tissue hypoxia

Bohr effect – reduced unloading of O2 to tissues

THE IMPORTANCE OF NOSE BREATHING

“The nose is for breathing, the mouth is for eating”
Proverb

Filters/ warms/humidifies/protects

Regulates lung volume (controls CO2 regulation)

Adds resistance

Sends afferent stimuli to Respiratory Centre – regular breathing pattern
No conclusive diagnostic tests

### Nijmegen Questionnaire

*Rare = less than monthly.  Sometimes = more than monthly, less than weekly.
Often = at least weekly, but not daily.  Very often = at least daily.*

<table>
<thead>
<tr>
<th>Nijmegen Questionnaire</th>
<th>Never</th>
<th>Rare</th>
<th>Sometimes</th>
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<tbody>
<tr>
<td>Chest pain</td>
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<td>Feeling tense</td>
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<td>Blurred vision</td>
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<td>Dizzy spells</td>
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<td>Feeling confused</td>
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<td>Faster or deeper breathing</td>
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<td>Short of breath</td>
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<td>Tight feelings in chest</td>
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<td>Bloated feeling in stomach</td>
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<td>Tingling fingers</td>
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<td>Unable to breathe deeply</td>
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<td>Stiff fingers or arms</td>
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<td>Tight feelings around mouth</td>
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<td>Cold hands or feet</td>
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<td>Palpitations</td>
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<td>Feelings of anxiety</td>
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Total: /64

*Patients mark how often they suffer from the symptoms listed. A score above 23/64 is diagnostic of hyperventilation syndrome.*
The Nijmegin Questionnaire

Developed at the University of Nijmegen
Questions relate to symptoms - rated on a 5 point scale
Three dimensions
Max score of 64
Score of $> 23$ suggests chronic HVS
Used as an objective marker
High sensitivity and specificity (Van Dixhoorn & Duivenvoorden, 1985)
OTHER DIAGNOSTIC TESTS

• Breath hold tests – semi-objective, useful outcome measure for treatment

• ABG, ETCO2

• Hyperventilation Provocation Test (HVPT) – measures Pa CO2 after 3 mins voluntary hyperventilation and recovery rate.
PHYSIOTHERAPY ASSESSMENT

Subjective assessment – open ended Qs, full history of symptoms. Proforma

Trigger/trace

How often/for how long

Lifestyle – diet, exercise, occupation, sleep, personality, psycho social history
What does hyperventilation look like?

OBSERVATIONS

BREATHING PATTERN – speed, depth, coordination, diaphragmatic vs accessory muscle use, chest wall movement, I:E ratio, breath holding, breath stacking

Sighing, yawning, coughing, throat clearing, sniffing, dry cough

Co-ordination of talking and breathing – pre-sentence gasps.

Posture and gait
MSK ASSESSMENT

Tight Upper Trapezius & Levator Scapula
Inhibited Neck Flexors
Inhibited Rhomboids & Serratus Anterior
Tight Pectorals
BREATHING RETRAINING - a glance at the evidence

What is the evidence that it works..... Some RCTS

Thomas et al (2009)

- Randomised controlled trial comparing breathing retraining vs nurse led asthma education.

- At one month – similar AQLQ score improvements between both groups but significant improvement in BT group at 6/12 (symptoms, activs, emotions domains)

- Study suggests that BT may have a role to play in mild-moderate sub-optimally controlled asthmatics but must occur alongside pt education and pharmacotherapy.

- Double blind RCT
- Studied the effects of breathing retraining vs upper limb exercises in the treatment of asthma.
- Instruction by video and 2xdaily practice
- Improvements noticed in BOTH groups with decreased use of reliever medication
COCHRANE REVIEW 2013 – breathing exercises for asthma

• 13 studies, 906 adults with mild-mod asthma. Overall improvements in QOL, symptoms and numbers of exacerbations reported
• No adverse effects reported
• Overall quality of evidence was poor
• Therefore, no conclusive evidence to support or refute their use

Also…Cochrane review of Breathing exercises for db/HVS in adults 2013
TREATMENT

Education and explanation
Breathing retraining
Postural re-education
Chest wall, shoulder girdle and spinal mobility
Rescue strategies – acute episodes, persistent cough
Relaxation (Stress management, hypnotherapy)
Behavioural therapy CBT/NLP/Mindfulness
Lifestyle management – dietary advice, increased activity levels, exercise
Yoga / Buteyko??!!
BREATHING RETRAINING – HOW I DO IT

Relaxed position – head and neck support
4 important components
1) Nose breathing
2) ↓ accessory muscle activity
3) Activate diaphragm
4) Lengthen expiratory phase

Progress by increasing frequency, reducing support (sitting, standing, walking, treadmill)
References


Singh J, 2001 “Management of Hyperventilation How to cope with heavy breathers” Journal of the Association of Chartered Physiotherapists in Respiratory Care 34 50-55

