

애매모호한 증상, 과호흡증후군 바로알기

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Dysfunctional breathing (DB)

- A group of breathing disorders with chronic changes in breathing pattern
→ dyspnea often with non respiratory symptoms
- Organic respiratory disease (+/-)
- may occur as a **physiological** response to disease
- considered **pathological** if organic abnormalities absent
- **Hyperventilation syndrome(HVS)**
: most widely recognized
- No formal definition or gold standard diagnostic method
- Not a continuously symptomatic state but a syndrome of episodic symptoms with or without recognizable provocation

Margarian GJ. Medicine. 1982;61(4): 219-36.
Boulding R. Eur Respir Rev 2016;25:287-294.

Types of dysfunctional breathing(DB)

TABLE 1 Proposed classification of dysfunctional breathing patterns, with associated lung diseases and key references

Breathing pattern	Number of papers	Key references	Linked conditions
Hyperventilation syndrome	43	[1, 2, 5, 15]	Asthma Panic disorder
Periodic deep sighing	12	[8, 9, 45-47]	Asthma Panic disorder
Thoracic dominant breathing	4	[11, 47-49]	Asthma COPD Heart failure Panic disorder
Forced abdominal expiration	2	[50, 51]	COPD
Thoraco-abdominal asynchrony	6	[52-54]	Obstruction Neuromuscular disease Respiratory failure

Boulding R. Eur Respir Rev 2016;25:287-294.

Symptoms in HVS

- **Dyspnea**
- with exclusion or treatment optimization for any organic disease
- Unlikely to be caused solely by inadequate/inefficient ventilation
- Due to hyperventilation and additional factors
ex) poor subjective awareness of breathing by patient
- **Tingling sense, tetany, numbness**
- from hyperventilation and respiratory alkalosis
- **Deep sighing or the sensation of air hunger**
- Limited and largely uncontrolled evidence that dyspnea related to an abnormal breathing pattern may be improved by breathing retraining

Boulding R. Eur Respir Rev 2016;25:287-294.

Nijmegen Questionnaire

A score of over 23 out of 64 suggest a positive diagnosis of hyperventilation syndrome.

	Never	Rarely	Sometimes	Often	Very Often
	0	1	2	3	4
Chest pain					
Feeling tense					
Blurred vision					
Dizzy spells					
Feeling confused					
Faster or deeper breathing					
Short of breath					
Tight feelings in chest					
Bloated feeling in stomach					
Tingling fingers					
Unable to breathe deeply					
Stiff fingers or arms					
Tight feelings round mouth					
Cold hands or feet					
Palpitations					
Feeling of anxiety					

Van Dixhoorn J. J Psychosom Res 1985;29:199-206

Self Evaluation of Breathing Questionnaire (SEBQ)

Item	0	1	2	3
I get easily breathless out of proportion to my fitness				
I notice myself breathing shallowly				
I get short of breath reading and talking				
I sigh yawn or gasp				
I feel I cannot get a deep or satisfying breath				
I notice myself breathing irregularly				
My breathing feels stuck or restricted				
My rib cage feels tight and cant expand				
I notice myself breathing quickly				
My clothing feels tight and uncomfortable around my chest				
I get breathless when I am anxious				
I find myself holding my breath				
I feel breathless in association with other physical symptoms				
I have trouble coordinating my breathing when I am speaking				
I can't catch my breath				
I feel that the air is stuffy, as if not enough air in the room				
I get breathless even when I am resting				

Courtney RG. Int J Osteopath Med 2009;12:121-127.

한국어판 네이메헌 설문지

항목	증상	0 전혀 나타나지 않는다	1 아주 가끔 나타난다	2 가끔 나타난다	3 자주 나타난다	4 매우 자주 나타난다
1	가슴부위 통증					
2	긴장된 느낌					
3	사이가 호황함					
4	헛기슬어(지렁이)					
5	혼란스러워 이해나 판단이 어려운 느낌					
6	숨(호흡)이 점점 더 빨라지거나 깊어짐					
7	숨(호흡)이 빠름					
8	가슴이 조이는 느낌					
9	땀배 다부룩함(맹만함)					
10	손가락이 따끔거리는 느낌					
11	숨을 깊이 못 쉼					
12	손가락이나 팔이 뻣뻣함					
13	일 주위가 조이는(덜기는) 느낌					
14	손이나 팔이 저가움					
15	심장이 두근거림					
16	불안한 느낌					

24점 이상 : 과호흡증후군 가능성
Ok JM. J Kor Med Diagnostics. 2015; 19(3): 133-140

Epidemiology and comorbid conditions

- Prevalence
 - No accurate prevalence due to absence of gold standard diagnostic criteria
 - Prevalence by **Nijmegen questionnaire** as a method of diagnosis
 - 6~10% in the general population vs 29% in asthmatics
 - The approximate prevalence of HVS in asthmatics as 34%
- Asthma as comorbid condition
 - 80% of HVS patients have underlying asthma
 - much lower in asthmatic children : below 5%
- Asthmatics with HVS** : female, poor asthma control, frequent exacerbations comorbid anxiety states

Boulding R. Eur Respir Rev 2016;25:287-294.

Dysfunctional breathing patterns and associated conditions

- Coexistent respiratory disease
 - Asthma
 - identification of objective asthma evidence
 - optimal asthma treatment
 - before making diagnosis of dysfunctional breathing
 - COPD or ILD
- Panic disorder
- Anxiety related disorder
- Asthma with panic disorder (9.7 % of asthma)
- Asthma with anxiety disorder (2 times in poor controlled asthma)

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When it could be HVS ?

- Breathlessness, Chest tightness, Dizziness, Tremor, Paresthesia, air hunger or periodic deep sigh without organic disease**
- Documentation of hypocapnia and respiratory alkalosis during attacks of hyperventilation**
- Nijmegen Questionnaire could be applied only after organic disease has been ruled out or optimally controlled
- Often difficult to distinguish from asthma and anxiety disorder
- Exercise-induced hyperventilation during CPET : should be distinguished from exercise induce asthma (no response to bronchodilator therapy)

Bott J. Alternative Medicine 1998;160:575-8.
Boulding R. Eur Respir Rev 2016;25:287-294.

Methods of breathlessness assessment

- 1ST STEP : exclusion or adequate treatment of organic disease
- 2ND STEP: usual investigation into a cause for breathlessness
 - Chest X-ray, EKG, Spirometry with bronchodilator test
 - Bronchoprovocation test, Echocardiography
- 3RD STEP : **Cardiopulmonary exercise testing (CPET)**
- 4th STEP : confirmation of dysfunctional breathing pattern
 - Nijmegen Questionnaire**
 - developed and validated only in exercise induced HVS
 - Score > 23 : cut off for HVS (sensitivity 91%, specificity 95%)

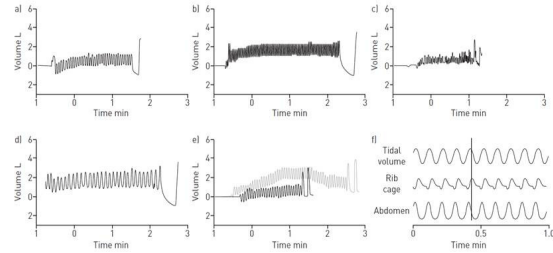
Cardiopulmonary Exercise Test (CPET)



- Assessment of cardiorespiratory reserve in unexplained dyspnea
- Minute ventilation, Respiratory rate
- Maximal oxygen consumption
- SpO₂, SpCO₂
- Heart rate, BP, EKG



Various breathing patterns in DB

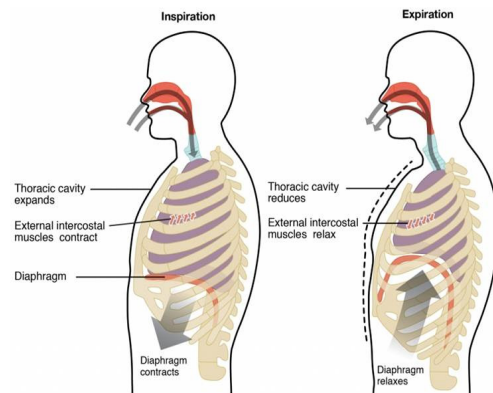


- a) healthy volunteer
- b) hyperventilation syndrome
- c) erratic breathing pattern
- d) thoracic dominant breathing
- e) forced expiratory pattern
- f) thoraco-abdominal asynchrony

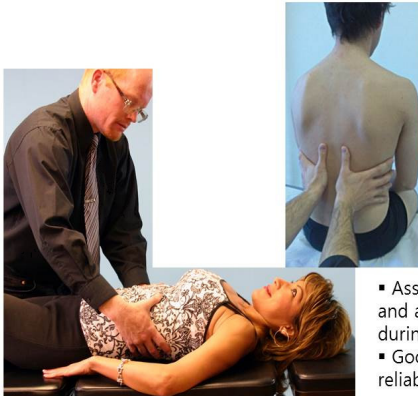
Evaluation of respiratory pattern

- Manual assessment of respiratory motion(MARM)
- Respiratory inductance plethysmography (RIP)

Respiratory Movement

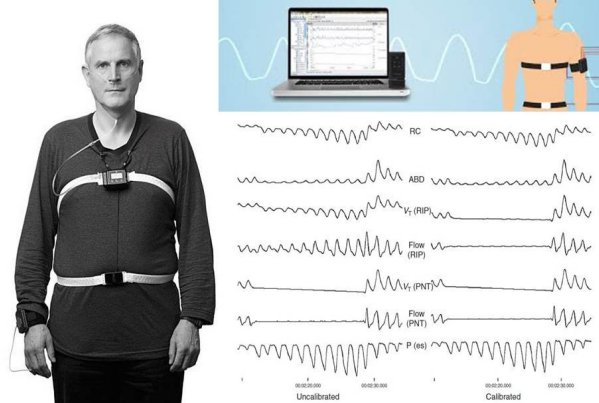


Manual Assessment of Respiratory Motion(MARM)



- Assessment of rib cage and abdominal motion during breathing
- Good inter-examiner reliability

Respiratory inductance plethysmography (RIP)



Confirmation of dysfunctional breathing

- **Nijmegen Questionnaire**
- Hyperventilation provocation test
- Self Evaluation of Breathing Questionnaire (SEBQ)
- End-tidal carbon dioxide measurement
- Breath holding time
- Manual assessment of respiratory motion (MARM)
- Respiratory induction plethysmography (RIP)

Treatments in HVS

- **An accurate diagnosis**, itself can provide significant reassurance and relief of anxiety
- 0.5% CO₂ rebreathing is no longer recommended
- **Reassurance and time** : usually sufficient to get over attack
- **Physiotherapy directed breathing technique**
- Breathing techniques
 - 1) Papworth method : diaphragmatic breathing with slow nasal breathing
 - 2) Buteyko technique : use of nasal breathing with increasing controlled pause
- Pulmonary rehabilitation : no definite evidence except in COPD

Other treatments in HVS

- Medication in anxiety/panic disorder
- Inhaled corticosteroid/bronchodilator in accompanying asthma
- Cognitive/behavioral psychotherapy which include breathing retraining

Deep breathing exercise : examples

- Deep breathing exercise
 - 1) **Papworth method**
: diaphragmatic breathing with slow nasal breathing
 - 2) **Buteyko technique**
: use of nasal breathing with increasing controlled pause
 - 3) Diaphragmatic breathing exercise
 - 4) Yoga breathing ; include mental concentration



Conclusion

- Dysfunctional breathing/Hyperventilation syndrome(DB/HVS) is a respiratory disorder, its prevalence uncertain due to absence of gold standard diagnostic criteria.
- The treatment of DB/HVS include accurate diagnosis, reassurance, medication for anxiety/panic disorder if indicated and breathing exercise.
- Clinical trials in the DB/HVS is lacking, therefore, well designed further clinical research is needed even in the field of diagnosis, prevalence and adequate treatment strategy.