睡眠窒息症

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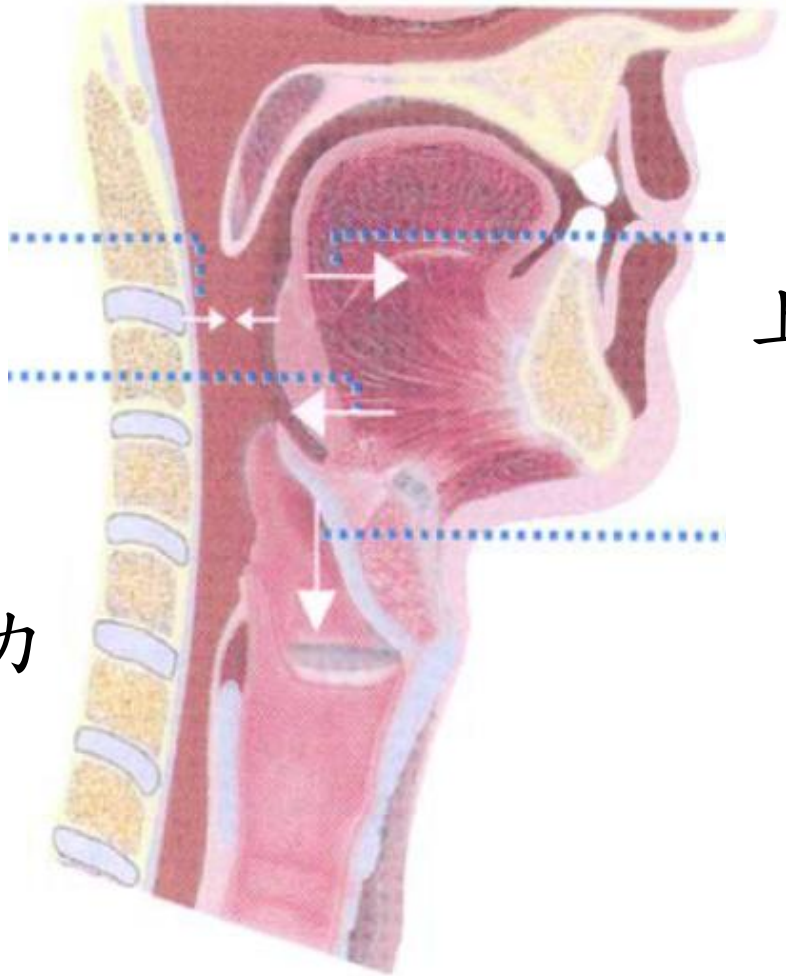
THE HONG KONG SOCIETY OF SLEEP MEDICINE

上呼吸道的構造

Promotion of airway collapse

吸氣會令
上呼吸道內
形成負壓的狀
促使管壁塌陷

睡覺時，肌肉張力
減弱，造成
上呼吸道變窄



Promotion of airway patency

清醒的時候
上呼吸道管壁擴張
氣道的肌肉也會
相對地增加張力

因為語言和發聲的需求，上呼吸道演化為
由軟組織組成的管狀構造

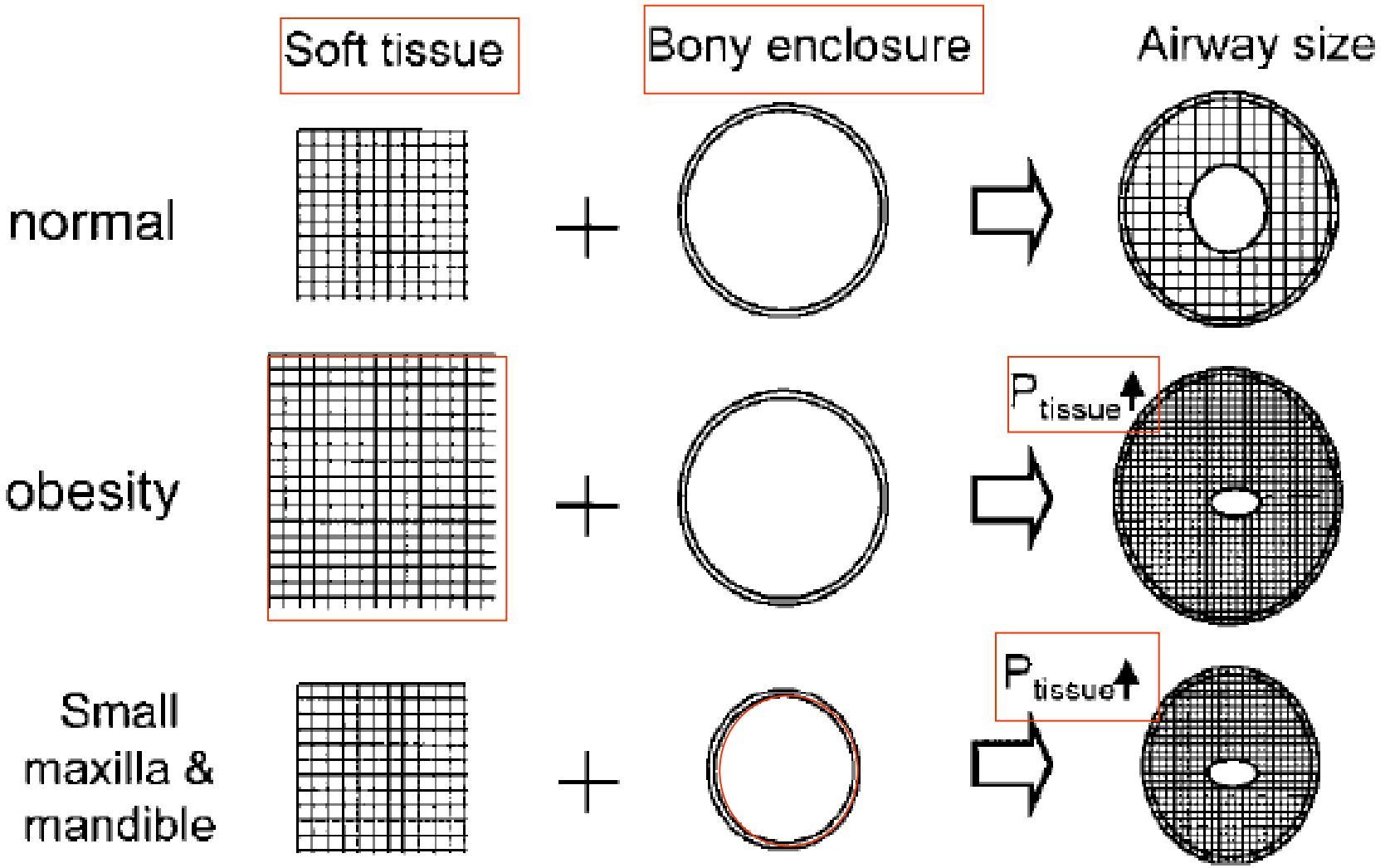
Lancet 2002

阻塞性睡眠窒息症

- 咽喉中的扁桃腺，或增殖体脹大，令呼吸道空間收窄。
- 下顎較短（即下巴後縮），以致睡覺時舌头容易後墜而阻塞氣道。
- 肥胖。过多的软组织令呼吸道空間收窄。頸圍較一般人大。

睡眠窒息症

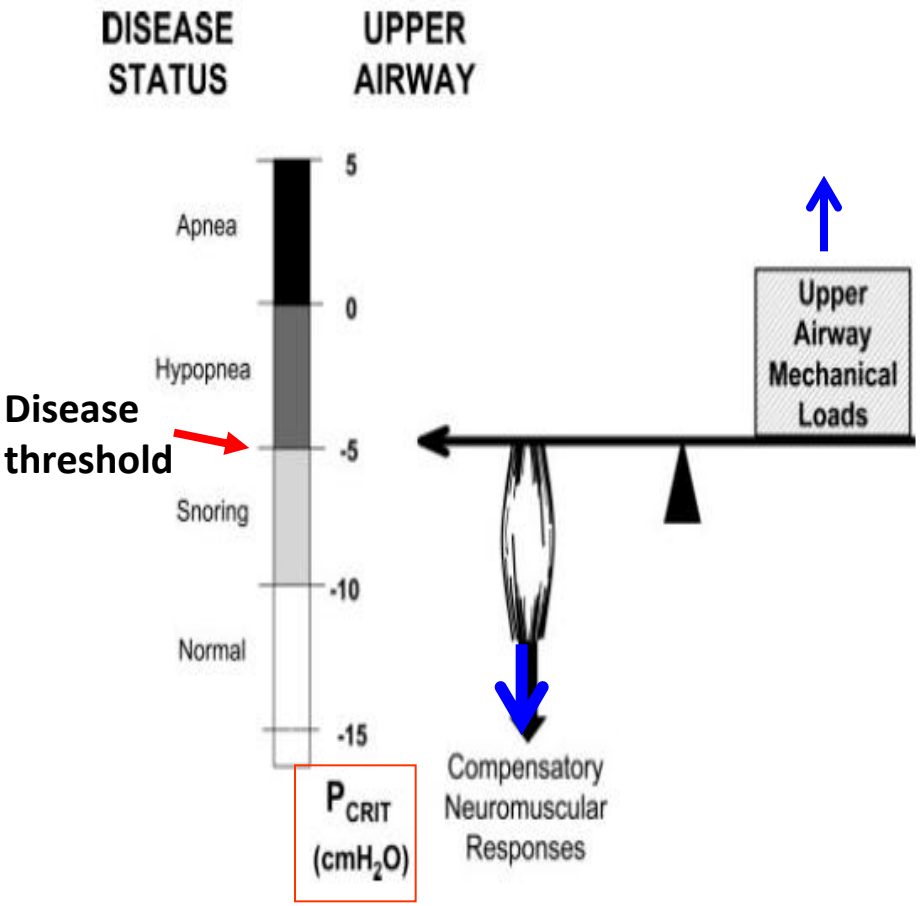
- 睡眠**窒息**患者通常有以下的問題
  - 異常的**呼吸道構造**
  - 上呼吸道擴張肌肉的**張力下降**
  - 不穩定的**呼吸控制**



Interaction between soft tissue and the upper airway bony enclosure and their combined effect on airway size

Watanabe T *Am J Respir Crit Care Med* 2002

Maintenance of upper airway patency



- **Mechanical loads** on the upper airway
- Below the disease threshold (Pcrit -5 cmH_2O)
  - OSA is not present
- Above the disease threshold,
  - Important to recruit compensatory **neuromuscular responses**

Patil S, *J Appl Physiol* 2007

- 當空氣不能進入肺部時，會降低应吸入的氧氣及提高应呼出的二氧化碳
- 身體本能：呼吸力會增加而刺激到腦部令人立即醒來，再次恢復呼吸
- 睡眠受擾亂會令人不能安睡，使患者精神未能恢復而整天感到疲倦

- 缺氧會對心血管及神經系統造成嚴重的健康問題
- 會增加患高血壓，心臟病突發，心律不齊，腦中風，及其他健康問題的風險

阻塞性睡眠窒息症

- 最常見的睡眠呼吸疾病
- 在本港三十至六十歲的人口中， 4.1% 的男性及2.1% 的女性患有阻塞性睡眠窒息症

M Ip, *Chest* 2004

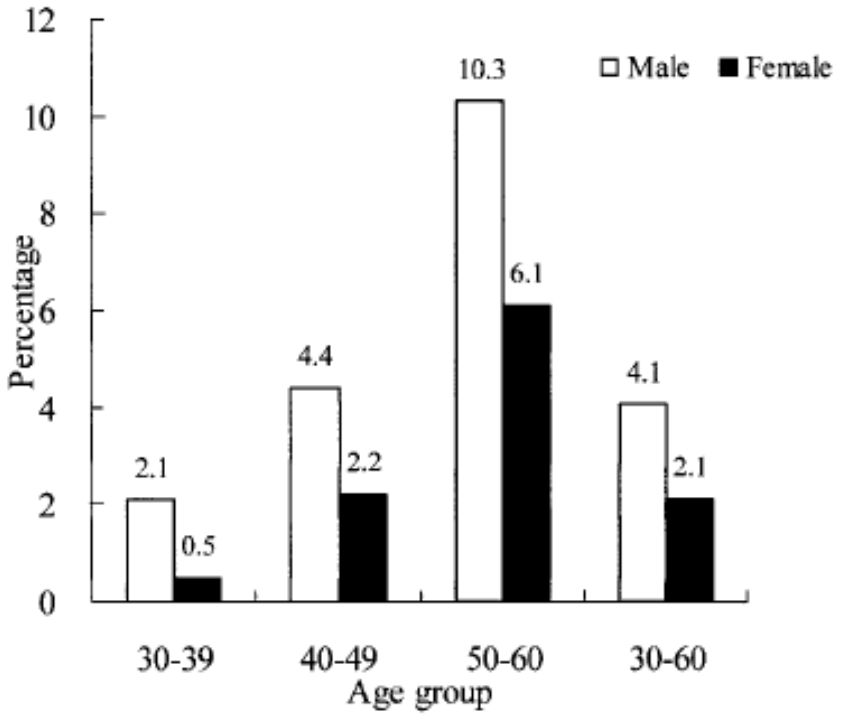


FIGURE 3. Age-specific prevalence rates of OSAS (AHI ≥ 5 and EDS) in middle-aged Chinese men and women.

睡眠窒息症的徵狀

- 大鼻鼾聲
  - 睡醒後亦覺疲累
  - 早晨感到頭痛
  - 無論在任何環境下，如工作或駕車亦會打瞌睡
  - 反應緩慢
  - 思想不能集中
  - 記憶力衰退

精神及心理性問題

- 工作能力走下坡
- 脾氣暴躁
- 憂鬱病

- 睡眠窒息症患者發生交通意外的比率比正常人高出二至七倍

Findley 1988, Wu 1996, Young 1997, Barbe 1998

困倦駕駛
Drivers' sleepiness & fatigue

- 在美國，每年超過十萬次交通意外是疲勞駕駛造成的，導致一千五百人死亡，另七萬一千人受傷。

  National Highway Traffic Safety Administration (NHTSA)
- Over 100,000 accidents in U.S. are caused by driver fatigue
  - 1,500 people are killed and a further 71,000 injured every year

- 香港中文大學一項對中年職業司機的調查研究發現百分之四十的司機承認日間渴睡，百分之十三点四的司機駕駛時有瞌睡。
- In a study of middle-aged commercial drivers,
  - 40% admitted to having daytime sleepiness
  - 13.4% had fallen asleep during driving respectively. CUHK Press Release 16 January 2002

為何困倦司機累人累己?

- 未能應付交通及道路環境的轉變
- Failure to respond to changes in traffic and road conditions

- 不能夠緊急剎制
- Impaired ability to perform emergency braking

- 後果等於醉酒駕駛
- Comparable consequences to drink driving

駕駛時短暫睡眠的危害
Consequence of “microsleep” at the wheels

- 在時速100公里行駛時，如果眼睛關閉超過一秒鐘，相等於無人駕駛28米。

- At the speed of 100 km/h, closure of eyelids for one second or more would be equivalent to a “driverless” car having travelled almost 28 m

評估日間瞌睡(眼瞤)的程度，請作答下列問卷。

艾和夫瞌睡評估表：				
請根據日常生活情況，評估閣下有否在以下情況下瞌睡（瞤著覺）：				
情況	瞌睡的發生次數 從未 (0)	少有 (1)	間中 (2)	經常 (3)
(1) 坐下閱讀時	☐	☐	☐	☐
(2) 看電視時	☐	☐	☐	☐
(3) 在公眾地方悠閒地靜坐時，例如電影院或會議中	☐	☐	☐	☐
(4) 在乘搭不停行駛的車輛，超過一句鐘時	☐	☐	☐	☐
(5) 在環境許可下，中午臥下休息時	☐	☐	☐	☐
(6) 坐下與別人閒談時	☐	☐	☐	☐
(7) 在沒有喝過酒的午膳，靜坐時	☐	☐	☐	☐
(8) 坐在車上，當交通阻塞數分鐘時，例如塞車或停在紅燈前	☐	☐	☐	☐
計分方法：將上列 8 項每項分數(0, 1, 2, 3)逐一加上	總分：			

總分	結果顯示
<10	你很可能有足夠睡眠。
10 - 14	你可能有過度的日間瞌睡，你或需要找醫生評估你的睡眠。
15 或以上	你有過度的日間瞌睡，你需要找醫生評估你的睡眠。

日間嗜睡的原因
Causes of Excessive Daytime Sleepiness

- 缺乏睡眠時間 Sleep deprivation
- 無規律的睡眠時間 Irregular sleep-wake schedule
- 缺乏良好睡眠質素 Poor sleep quality

- 患有睡眠障礙 Sleep disorders
  - 阻塞性睡眠窒息症 Obstructive sleep apnoea
  - 渴睡症 Narcolepsy
  - 失眠 Insomnia

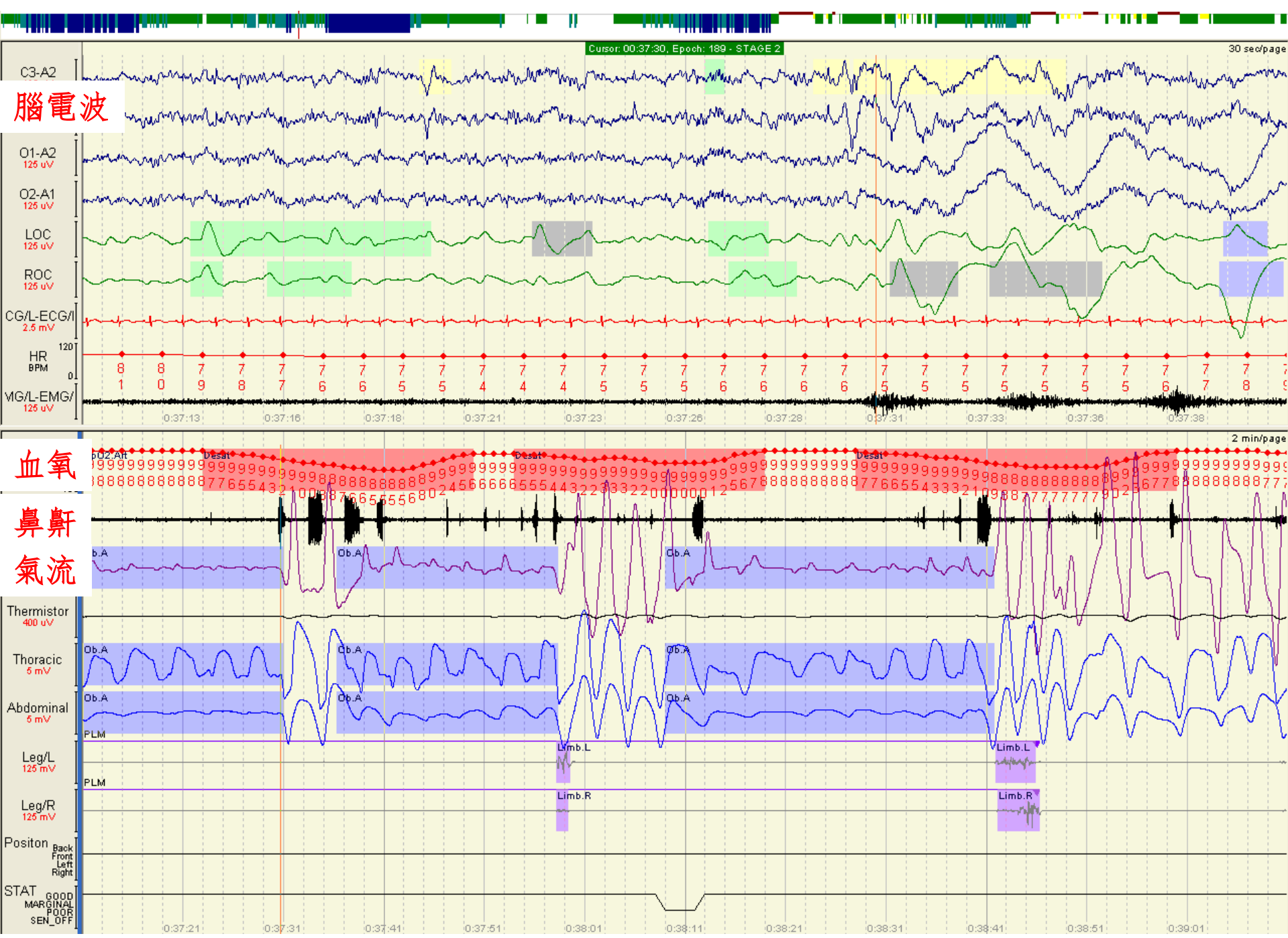
生理性問題

- 血壓高
- 心臟病(如冠心病，心臟衰竭)
- 中風
- 心律不正（心房顫動）
- 糖尿病
- 脂肪肝

如何評估睡眠呼吸問題？

睡眠多重描繪紀錄（PSG）可紀錄患者於睡眠時**多項身體功能**的反應，包括：

腦電波（腦部電流活動）EEG
眼睛移動情況 EOG
肌肉活動 Chin EMG
心跳率 ECG
呼吸力度 Thoraco-abdominal effort
氣流 Airflow
血氧水平 SaO_2
（**氣壓滴定治療**pressure titration）


Cursor: 00:37:30, Epoch: 189 - STAGE 2
30 sec/page
C3-A2
O1-A2
125 uV
O2-A1
125 uV
LOC
125 uV
ROC
125 uV
CG/L-ECG/I
2.5 mV
HR
BPM
120
0
MG/L-EMG/
125 uV
0:37:13
0:37:16
0:37:18
0:37:21
0:37:23
0:37:26
0:37:28
0:37:31
0:37:33
0:37:36
0:37:38
2 min/page
pO2 Aft
Desat
Ob.A
Thermistor
400 uV
Thoracic
5 mV
Abdominal
5 mV
PLM
Leg/L
125 mV
Limb.L
Leg/R
125 mV
Limb.R
Positon
Back
Front
Left
Right
STAT
GOOD
MARGINAL
POOR
SEN_OFF
0:37:21
0:37:31
0:37:41
0:37:51
0:38:01
0:38:11
0:38:21
0:38:31
0:38:41
0:38:51
0:39:01

腦電波

血氧

鼻鼾

氣流

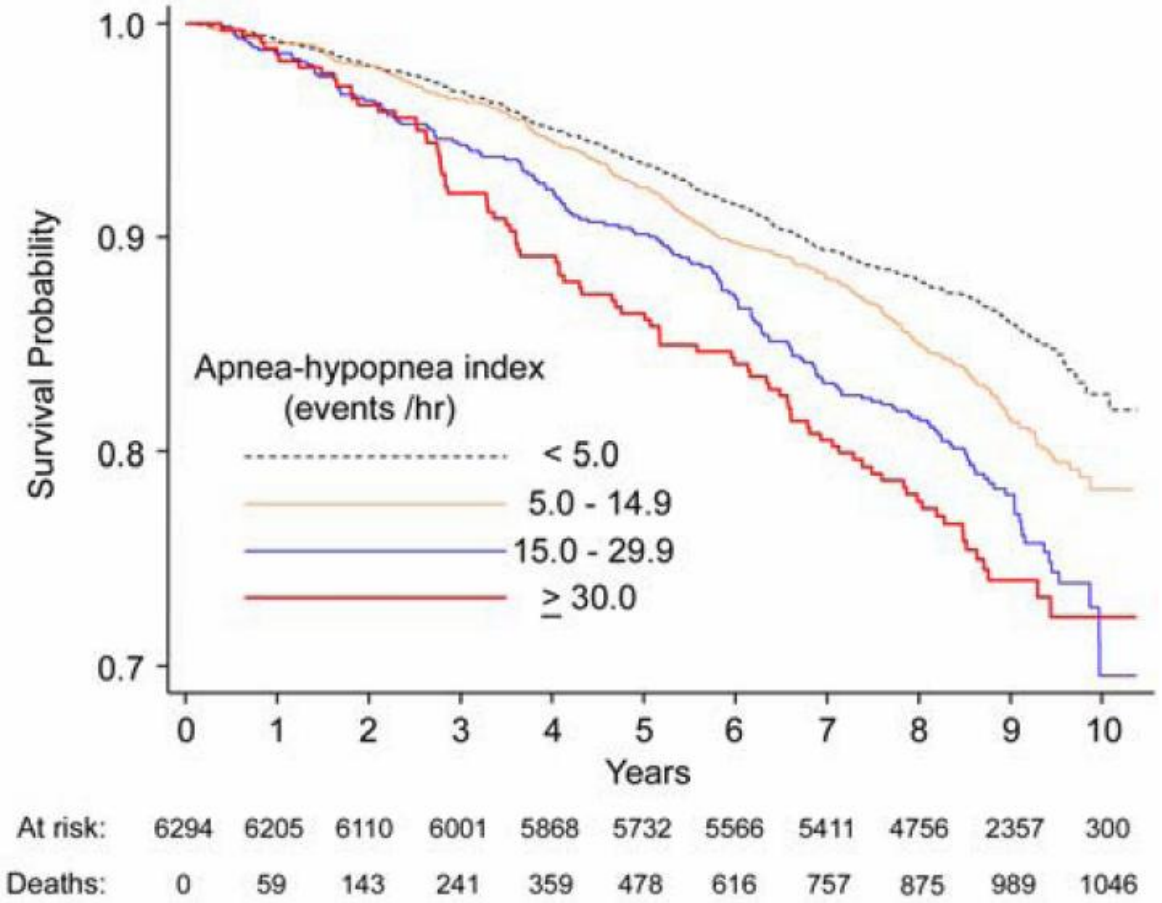
Sleep Summary Information			
Recording Start Time:	23:08:55	Recording End Time:	08:35:43
Analysis Start Time:	23:12:55	Analysis End Time:	07:40:54
Total Recording Time (min) :	9:26.8	Epoch Size (sec):	30
Number of Awakenings:	54	Total Sleep Time:	6:34.0
Wake Time After Sleep Onset (min):	114.0	Sleep Efficiency (%):	69.5

Respiratory Events Summary					
Parameter	**Obstructive**	**Mixed**	**Central**	**Total Apnea**	**Hypopnea**
Number	565	105	13	683	5
No. of event /Hour	86.0	16.0	2.0	104.0	0.8
Average Duration (Second)	24.0	31.7	15.1	25.0	18.2
Longest Duration (Second)				66.0	25.4
Number in NREM	556	98	12	666	5
Number in REM	9	7	1	17	0
			RDI	**104.8**	

Staging Table			
Sleep Stage	**Duration (min)**	**% Sleep Time**	**Normal Sleep Stage Distribution**
Wake	114.0		
Stage REM	23.0	5.8	25%
Stage 1 Sleep	186.5	47.3	5%
Stage 2 Sleep	71.0	18.0	50%
Stage 3 Sleep	110.0	27.9	20%
Stage 4 Sleep	3.5	0.9	

AROUSAL STATISTICS	
Sleep latency	4.0 min
REM latency	201.0 min
Sleep period from 23:12:55 to 07:40:54	508.0 min
Total time awake during sleep period	114.0 min
Movement time	0.0 min
Unsure time	0.0 min

Kaplan-Meier survival curves across categories of apnea–hypopnea index (AHI)



Punjabi NM, 2009

治療方法

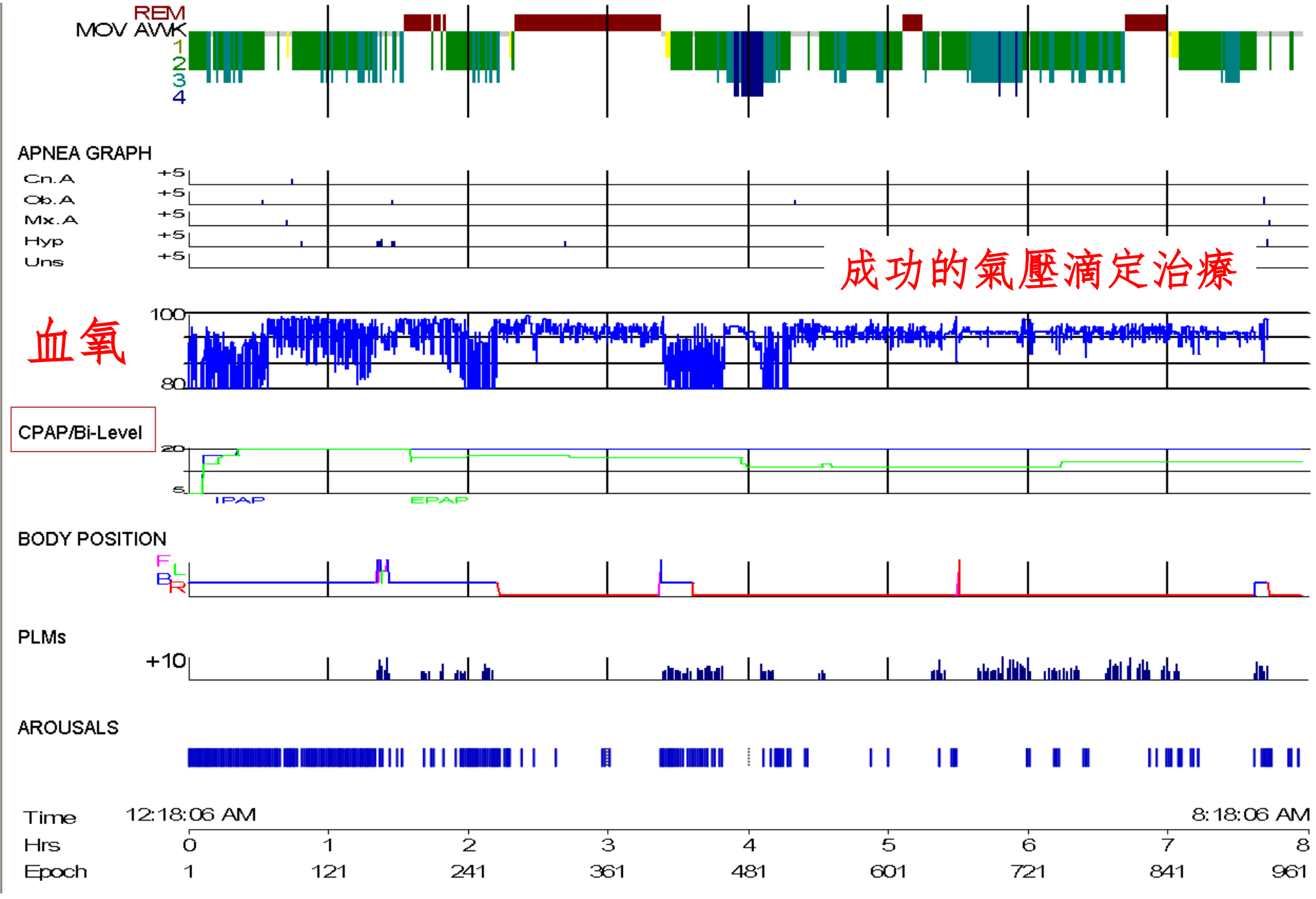
- 改善生活方式(睡眠充足，保持适量運動，戒烟)
- 減肥
- 好的睡眠習慣
- 側睡
- 避免飲酒和服食安眠藥，特別是睡前四小時內更不可飲酒，因為酒精可能令呼吸肌肉更加鬆弛，增加舌頭阻塞咽喉引致窒息的機會

治療方法

- 牙膠矯正器(牙托)：
  可重新矯正下顎與舌頭的位置，對於患有輕微睡眠窒息症而顎骨向後的患者特別有效。
- 正氣壓機
- 外科手術
- 氣管切開術（tracheostomy）

無創正氣壓治療 (CPAP)

- 病人睡眠時，透過附戴在鼻或面部面罩的連接管輸送空氣
- 呼吸機把正氣壓輸至鼻道，藉此「打通」呼吸道，以空氣吹開阻塞氣道的組織
- 使用空氣力度的大小是依照個人的病況而定
- 氣壓被調校至可阻止呼吸道塌下的強度，而且穩定和持續。


REM
MOV AWK
1
2
3
4
APNEA GRAPH
Cn.A
Ob.A
Mx.A
Hyp
Uns
+5
+5
+5
+5
+5
成功的氣壓滴定治療
血氧
100
80
CPAP/Bi-Level
20
5
IPAP
EPAP
BODY POSITION
F
L
B
R
PLMs
+10
AROUSALS
Time
12:18:06 AM
8:18:06 AM
Hrs
0
1
2
3
4
5
6
7
8
Epoch
1
121
241
361
481
601
721
841
961

SCIENTIFIC INVESTIGATIONS

JCSM
Journal of Clinical Sleep Medicine

pii: jc-00288-14
http://dx.doi.org/10.5664/jcsm.4844

All APAPs Are Not Equivalent for the Treatment of Sleep Disordered Breathing: A Bench Evaluation of Eleven Commercially Available Devices

Kaixian Zhu, MS[1,2,3]; Gabriel Roisman, MD, PhD[2]; Sami Aouf, MD[1]; Pierre Escourrou, MD, PhD[2,3]

[1]Air Liquide Healthcare, Gentilly, France; [2]Sleep Disorders Center, AP-HP Antoine-Béclère Hospital, Clamart, France; [3]EA3544, Faculty of Pharmacy, Paris-Sud University, Châtenay-Malabry, France

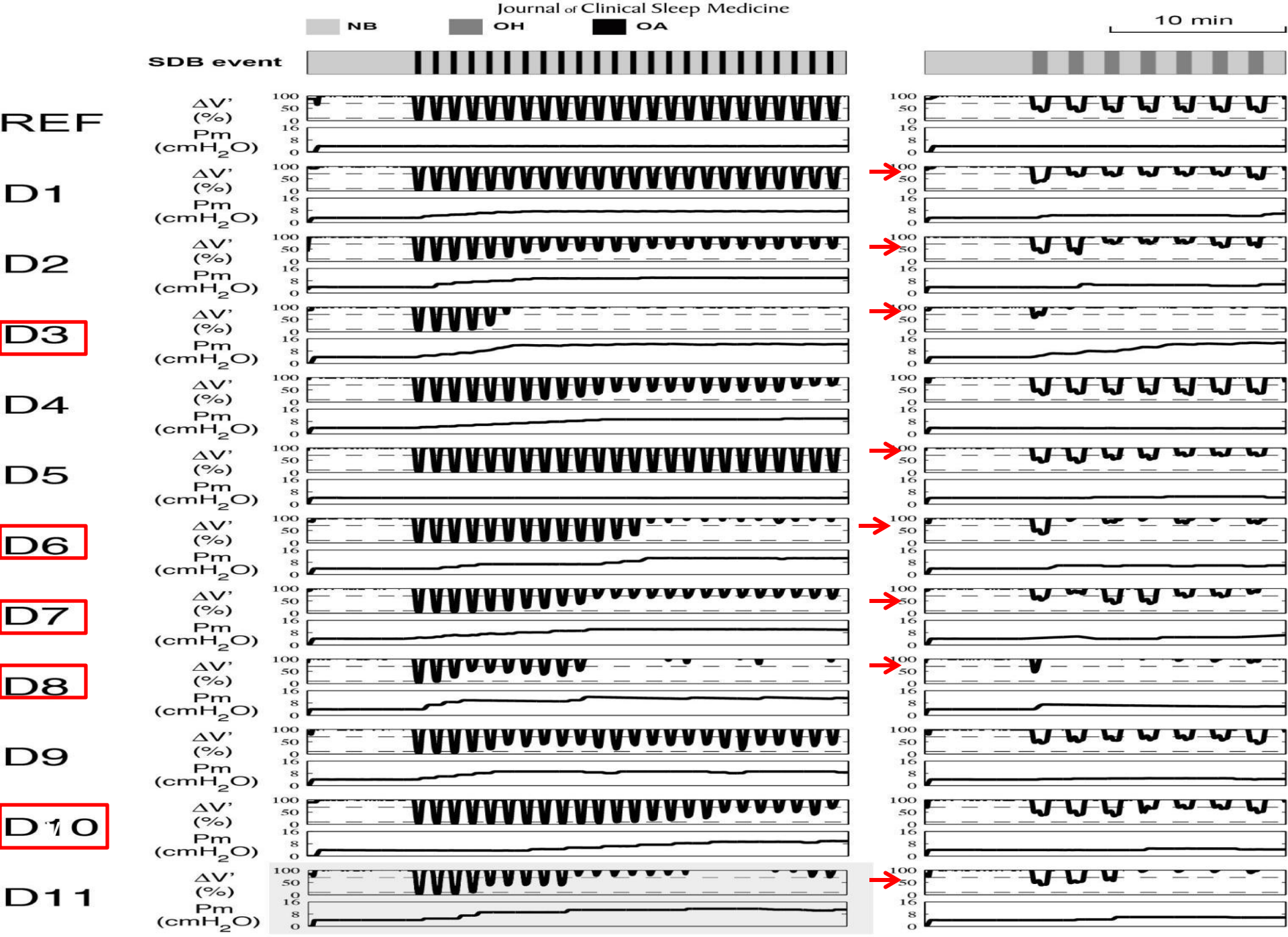

NB
OH
OA
10 min
SDB event
REF
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
ΔV' (%)
Pm (cmH2O)

Table 3—Scoring and classification of APAP devices.

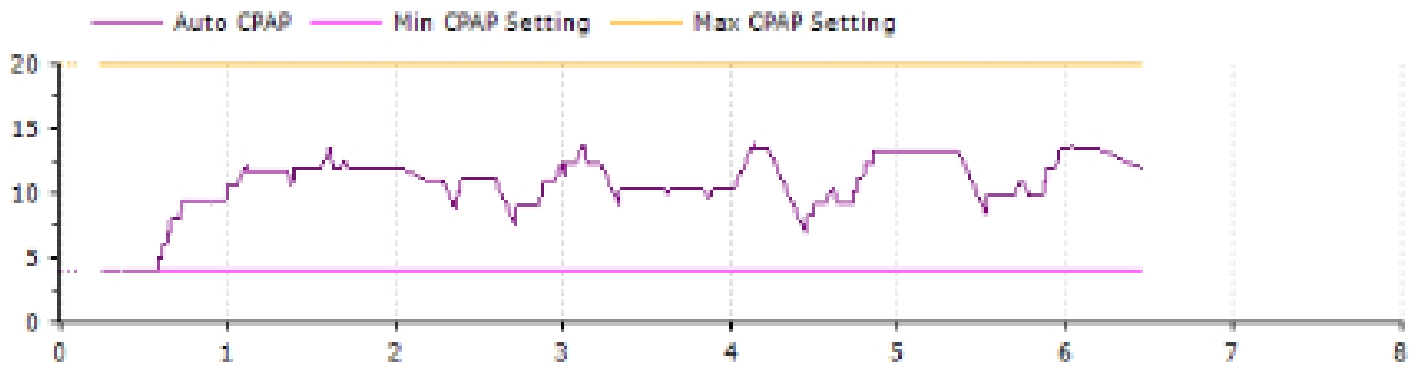
Device	Treatment Efficacy	Scoring Accuracy	Central Mechanism Detection	Snoring Detection	Patient Profile
D1	95%	67%	N	N	O
D2	81%	47%	N	Y	O, S
D3	100%	93%	N	N	O
D4	97%	N/A	N	N	O
D5	24%	99%	Y	Y	O, C, S
D6	94%	95%	N	N	O
D7*	84%	83%	Y	Y	O, C, S
D8	85%	91%	Y	Y	O, C, S
D9*	84%	94%	N	N	O
D10	96%	97%	N	N	O
D11*	57%	97%	Y	Y	O, C, S

療效　　準確性

Daily Details

23/11/2014 0:34

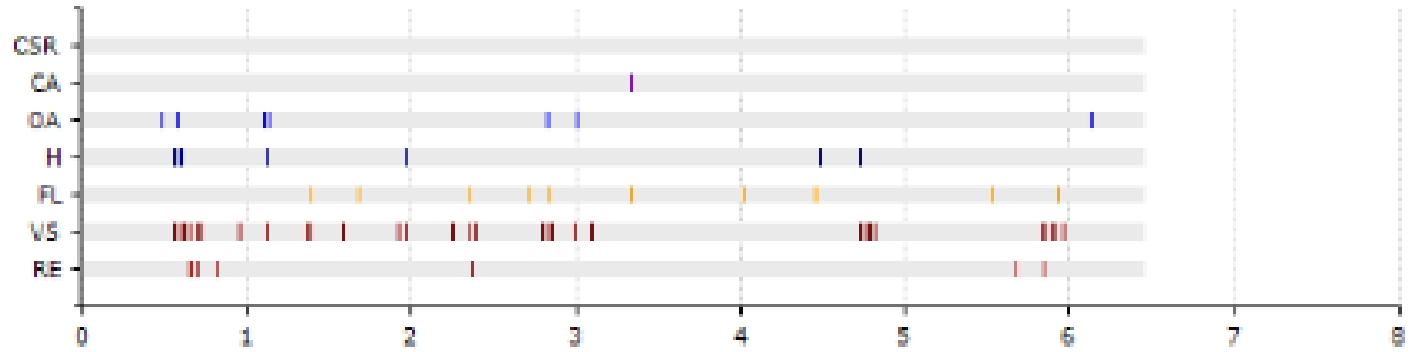
Pressure (cmH2O) **Mode: Auto CPAP**



90% Pressure
12.7

Average CPAP Pressure
10.8

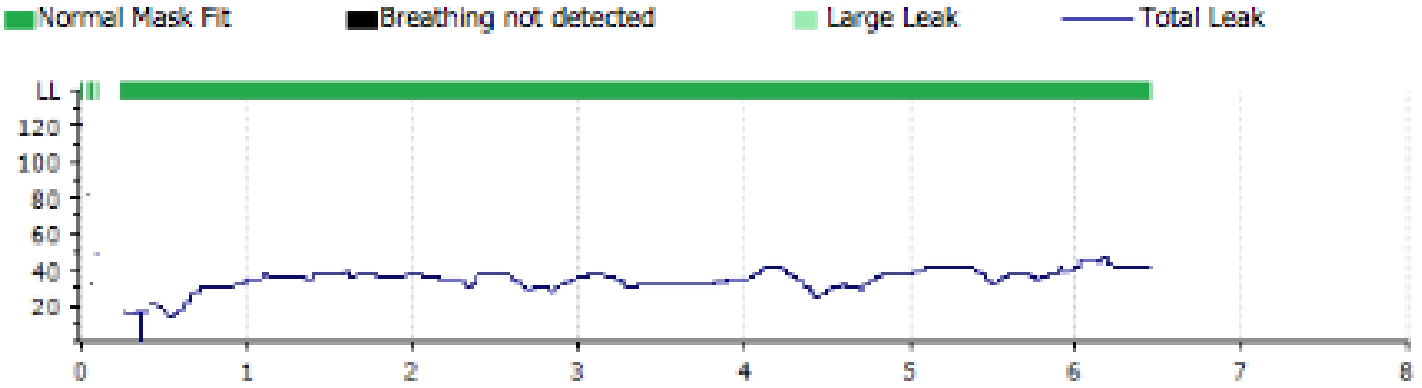
Sleep Therapy Flags



Indices
0.0 % of Night in CSR

CA: 0.2
OA: 1.1
H: 1.6
FL: 1.6
VS: 20.1
RE: 1.1
AHI: 2.9

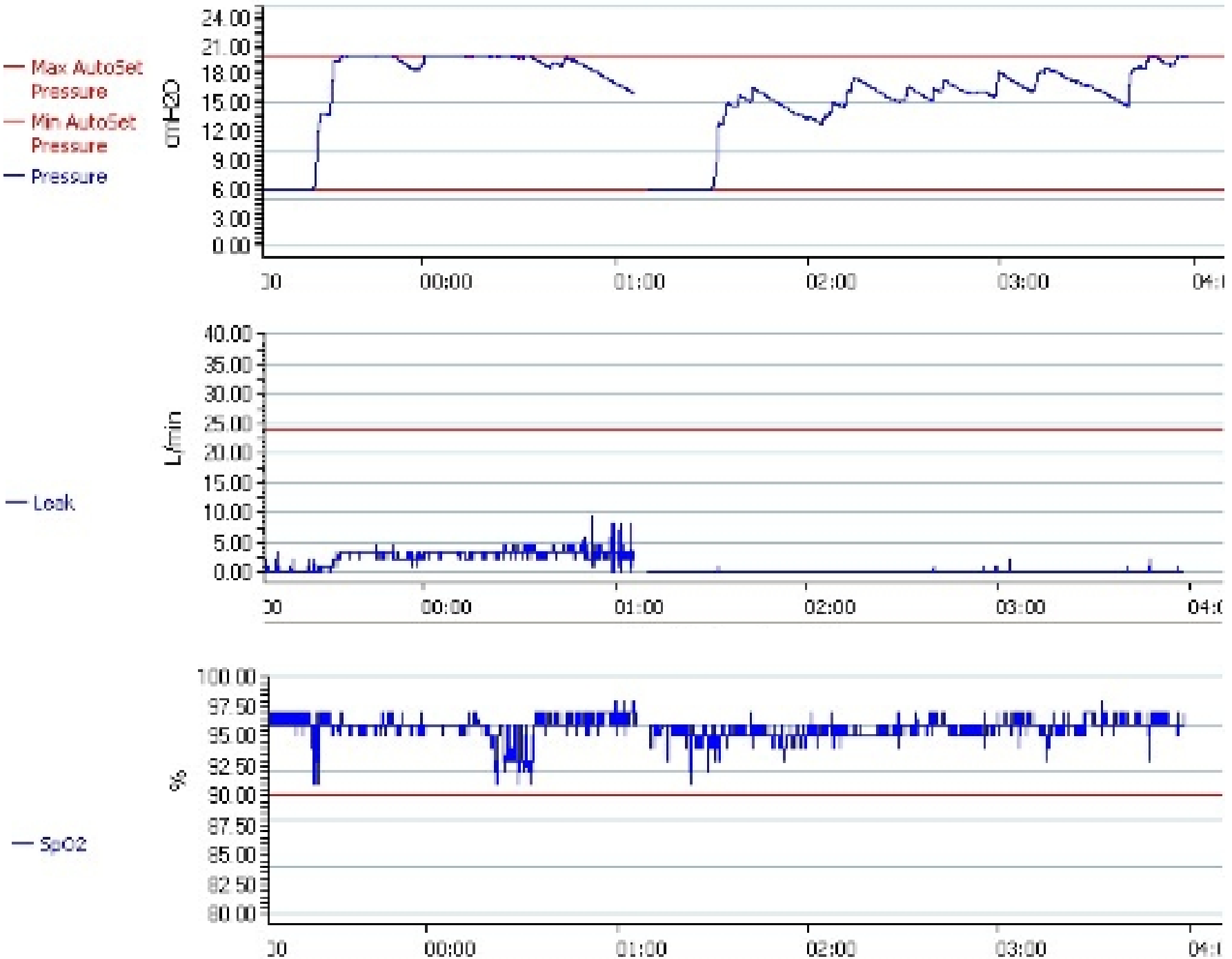
Total Leak (LPM)



Min in Large Leak
0.0 mins.

% of Night in Large Leak
0 % of Night

Average Leak
35.5


Max AutoSet Pressure
Min AutoSet Pressure
Pressure
cmH2O
24.00
21.00
18.00
15.00
12.00
9.00
6.00
3.00
0.00
00:00
01:00
02:00
03:00
Leak
L/min
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
SpO2
%
100.00
97.50
95.00
92.50
90.00
87.50
85.00
82.50
80.00

11/13/2014 - 11/13/2014

Device Settings

Therapy Mode: AutoSet	EPR: Off	EPR Level: 2.0 cmH2O
Minimum Pressure: 6.0 cmH2O	Maximum Pressure: 20.0 cmH2O	

Pressure - cmH2O

Median: 16.7	95th Percentile: 19.9	Maximum: 19.9

Leak - L/min

Median: 0.0	95th Percentile: 3.6	Maximum: 152.4

AHI & AI - events/hr

Apnea Index: 0.4	AHI: 0.4	Obstructive: 0.4
Central: 0.0	Unknown: 0.0	Hypopnea Index: 0.0

Usage

Used Days >= 4 hrs : 1	Used Days < 4 hrs : 0	% Used Days >= 4 hrs : 100
Days not used: 0	Total days: 1	Median daily usage: 4:48
Total hours used: 4:48	Average daily usage: 4:48	

SpO2 - %

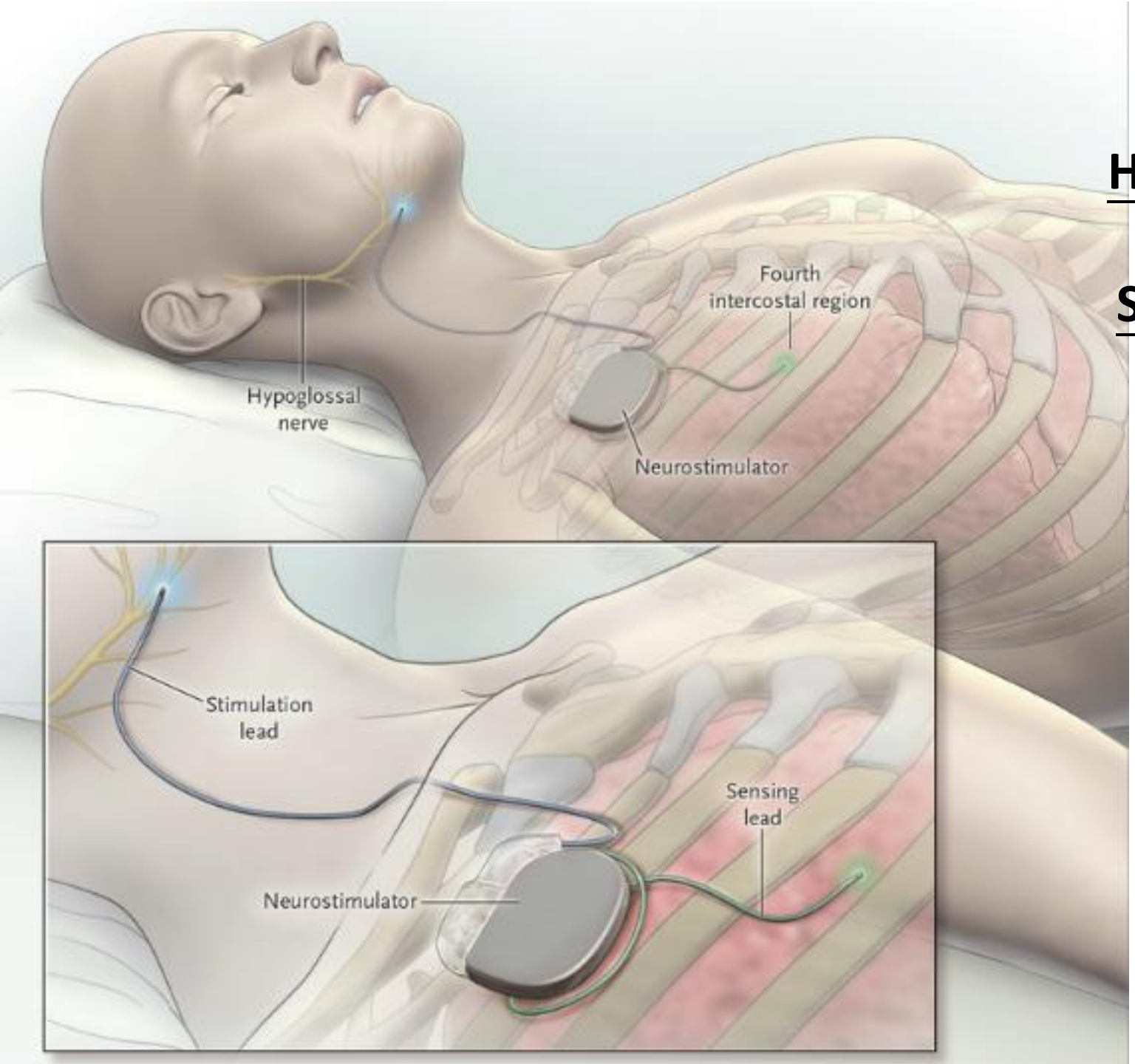
Minimum: 78	Median: 96	Maximum: 98
SpO2 was less than 90%: 00:00:11	SpO2 was less than 80%: 00:00:01	SpO2 was less than 70%: 00:00:00

Pulse Rate - bpm

Minimum: 24	Median: 89	Maximum: 111

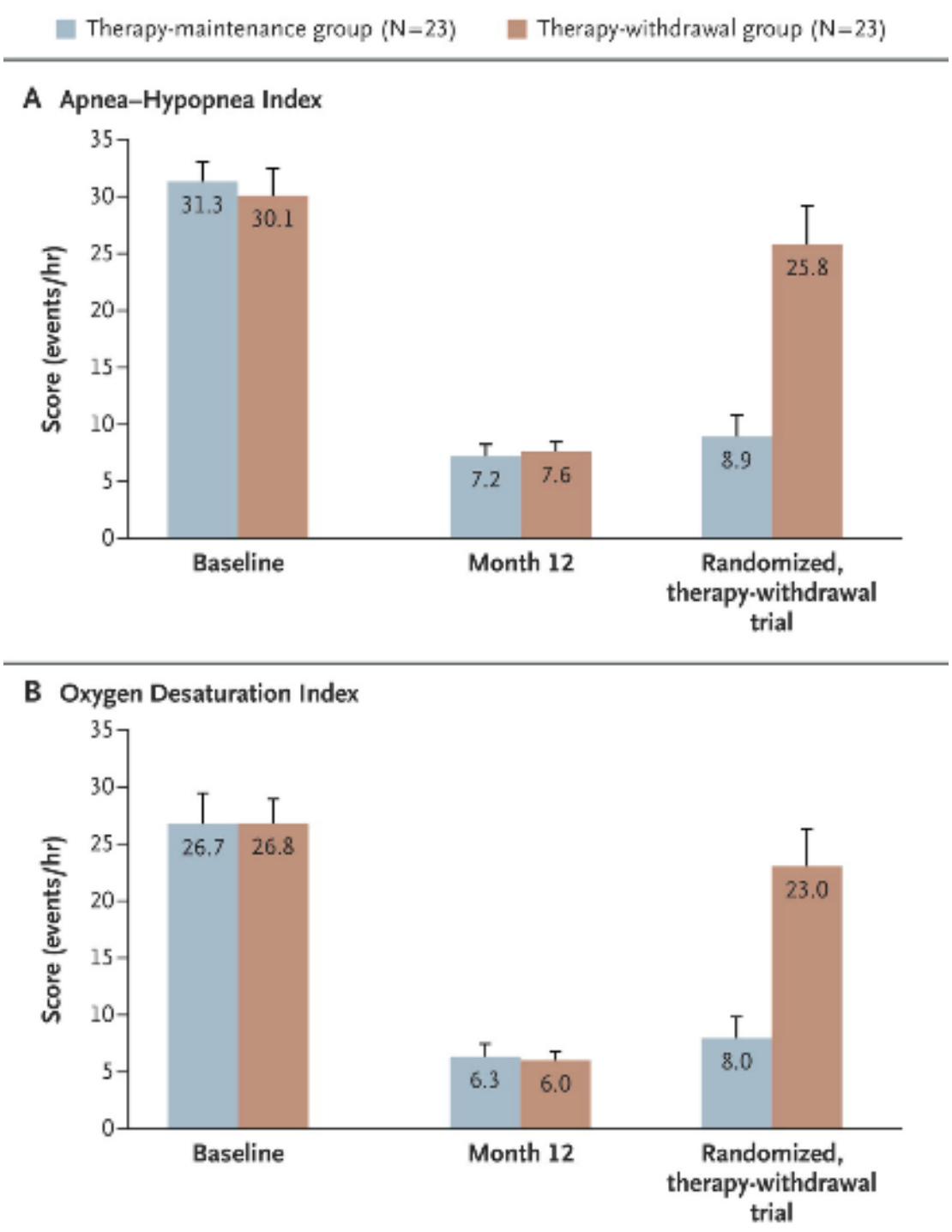
ODI

ODI for the session: 2



HypoGlossal Nerve Stimulation (HGNS)
舌下神經起搏器

Strollo, 2014



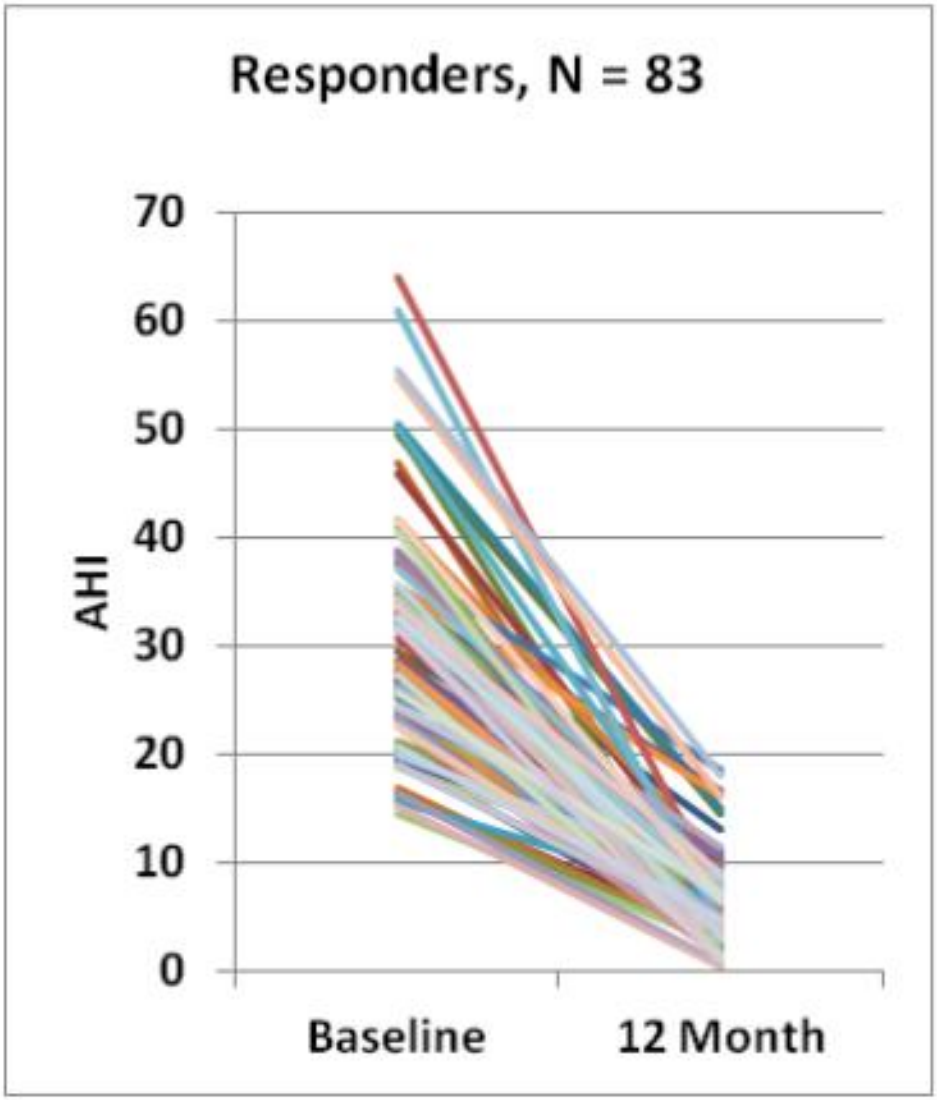
At the 12-month visit, 83 (66%) of 126 participants met the criteria for the coprimary outcome of a reduction of at least 50% in the AHI score from baseline and an AHI < 20 /h)

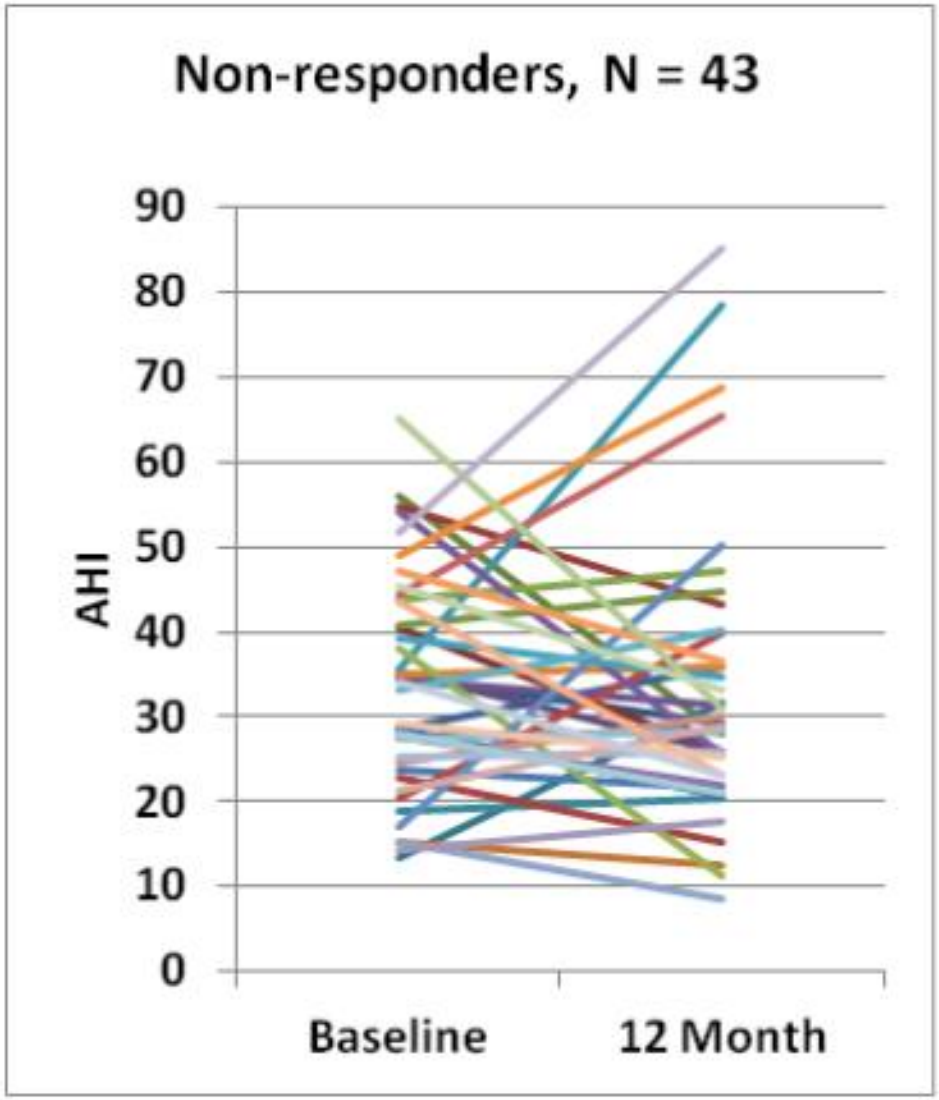
The first 46 consecutive participants who met the criterion of having a response to therapy were randomly assigned, in a 1:1 ratio, to the therapy -maintenance group or the therapy-withdrawal group. This design filtered out persons who had not had a response to therapy

The therapy-withdrawal group had the device turned off for 7 days

Strollo, 2014

Figure S3. AHI Changes in Responders and Non-responders





Strollo, 2014

Table S1. Summary of Adverse Events		
Adverse Events	**No. of events**	**Number of Participants with event (%)**
Serious adverse event	35	27 (21%)
Device-revision	2	2 (2%)
Death, unrelated[¥]	2	2 (2%)
Other unrelated*	31	23 (18%)
Procedure-related non-serious adverse event	169	72 (57%)
Post-op discomfort related to incisions	46	33 (26%)
Post-op discomfort not-related to incision	39	31 (25%)
Temporary tongue weakness	35	23 (18%)
Intubation effects	18	15 (12%)
Headache	8	8 (6%)
Other post-op symptoms	22	14 (11%)
Mild infection	1	1 (1%)
Device-related non-serious adverse event	190	85 (67%)
Discomfort due to electrical stimulation	80	50 (40%)
Tongue abrasion	33	26 (21%)
Dry mouth	13	13 (10%)
Mechanical pain associated with device presence	8	8 (6%)
Temporary internal device functionality compliant	14	12 (10%)
Temporary external device usability or functionality complaint	8	7 (6%)
Other acute symptoms	25	19 (15%)
Mild or moderate infection**	1	1 (1%)

Strollo, 2014

外科手術

- **鼻腔**手術
- **扁桃腺**手術Tonsillectomy
- 激光懸雍垂**軟顎**整形手術 (LAUP)
- 懸雍垂顎咽成形手術（UPPP)
- 臉臚骨**整形**手術 (Genioglossal advancement hyoid myomectomy & Maxillo-madibular osteotomy)
- 聚能刀 (Radio-frequency ablation)

Distraction osteogenesis
牽張成骨

- Widens the mandible and maxilla
- Rapid palatal expansion in adolescents can have a beneficial effect on the nasorespiratory pattern
- Maxillary transverse distraction osteogenesis widens both maxillary dentoalveolus & **floor of nose**

Conley RS, Legan HL, Am J Orthod Dentofacial Orthop 2006

Two-month postsurgical progress photos





RDI < 10/h

Conley RS, Legan HL, Am J Orthod Dentofacial Orthop 2006

謝謝