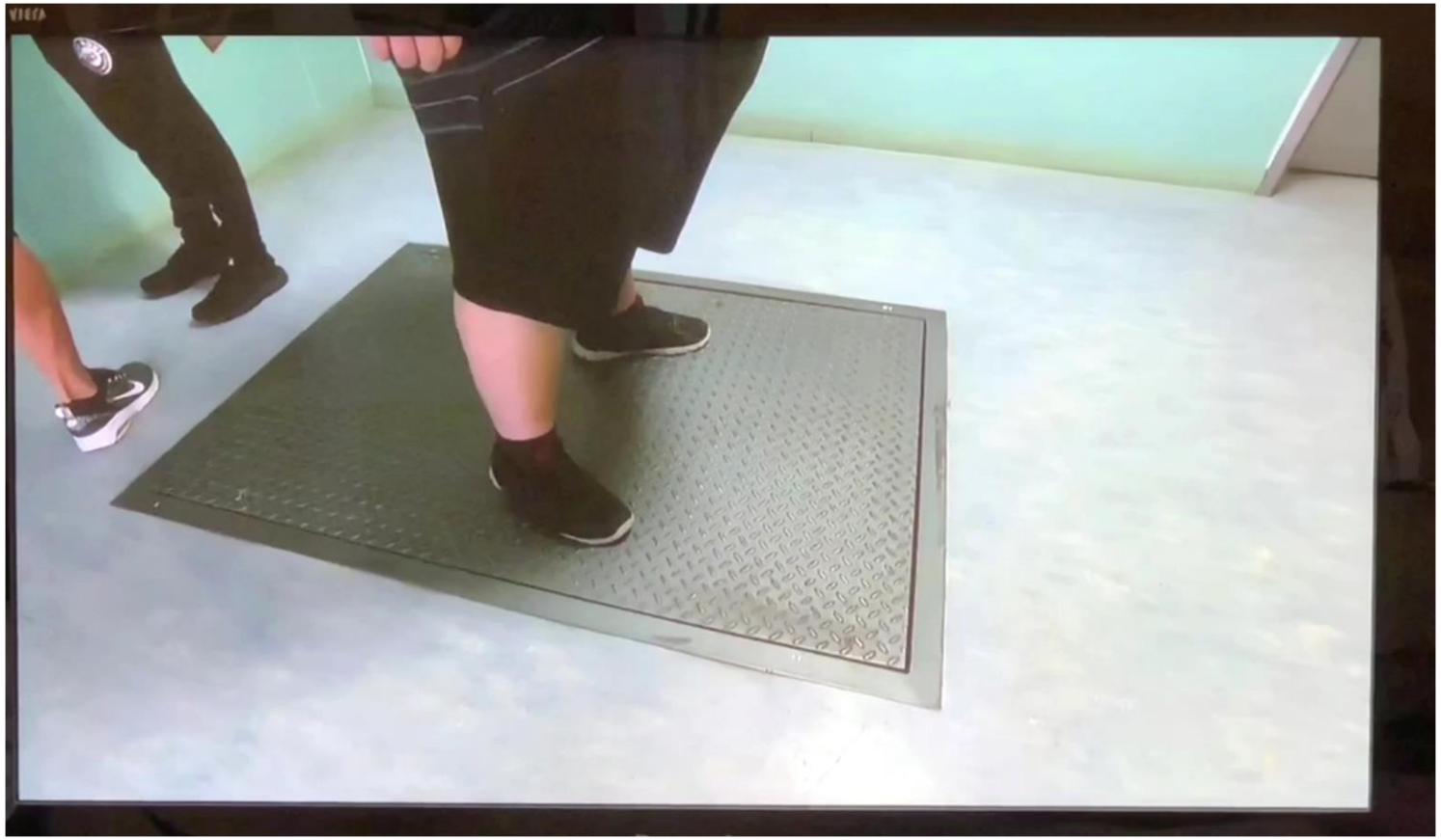


Anaesthetic challenges in the Morbidly Obese

- **Dr.S.Radhakrishna**
- **Consultant Anaesthetist,**
- **UHCW,**
- **Coventry**

World Health Organization

Obesity and overweight Factsheet

16 February 2018

Key facts

- Worldwide obesity has nearly tripled since 1975.
- In 2016, more than 1.9 billion adults, 18 years and older, were overweight. Of these over 650 million were obese.
- 39% of adults aged 18 years and over were overweight in 2016, and 13% were obese.
- Most of the world's population live in countries where overweight and obesity kills more people than underweight.
- 41 million children under the age of 5 were overweight or obese in 2016.
- Over 340 million children and adolescents aged 5-19 were overweight or obese in 2016.
- Obesity is preventable.

UK among worst in western Europe for level of overweight and obese people

Only Iceland and Malta have higher proportion of people who are overweight or obese, study finds

Epidemiology of Obesity in the UK

Public Health England report

62.15 of adults above the age of 16 were obese

Men (67.1%)

Women 57.2%

There has been a 24.9% increase in obesity in England in 10 years from 1993 to 2013.

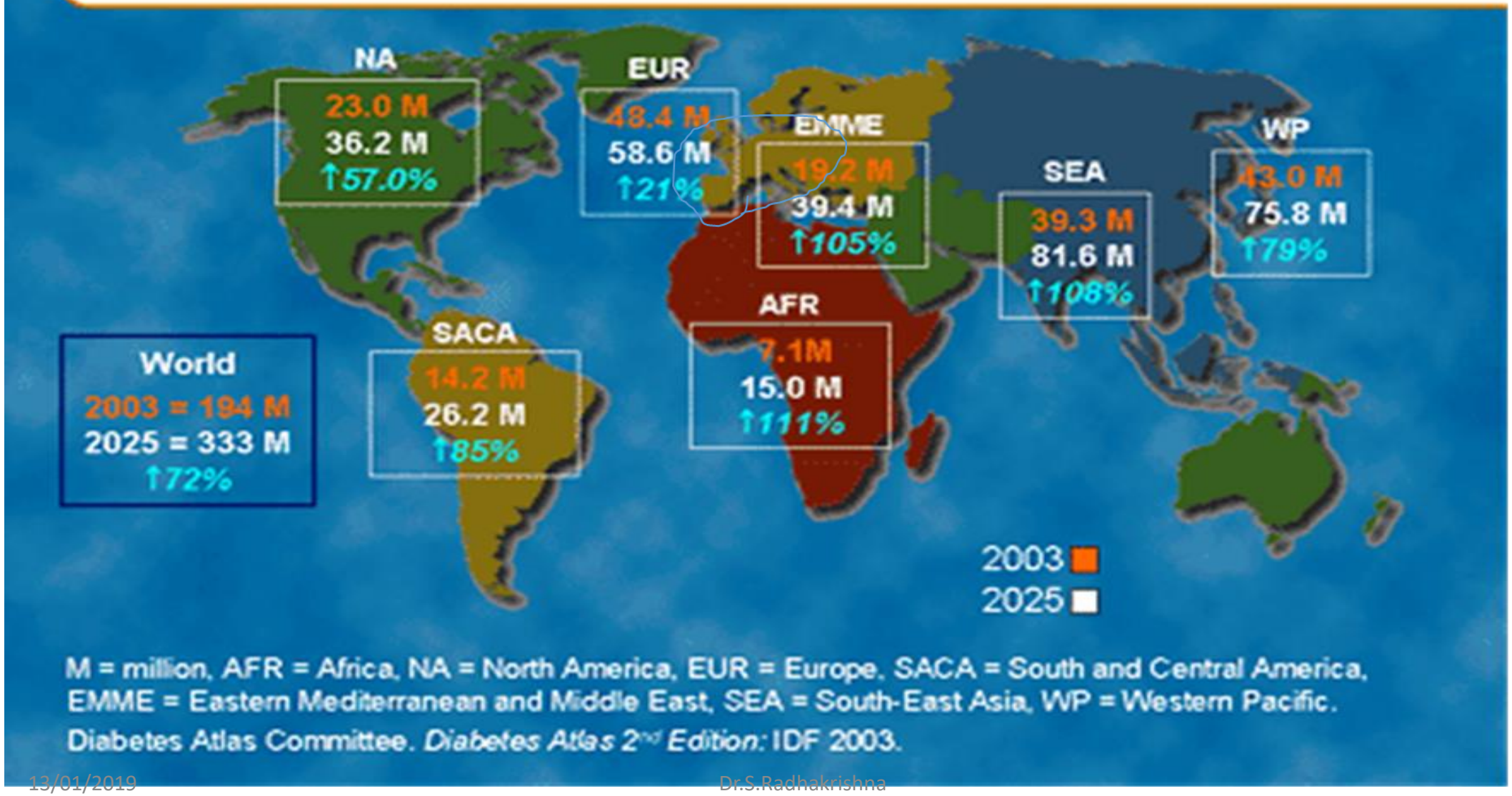
A BMI of 30 to 35 BMI reduces **life expectancy** by 3 years

A BMI >40 and above reduces **life expectancy** by 10 years


New
HARVEY'S
STUFFED
CHEESEBURGER
6 OZ. BURGER
Smoke's POUTINERiE
CLOGGING ARTERIES SINCE 2008.
Smoké's Poutinerie
@poutinerie
smokespoutinerie.com
DUDE! WE NOW HAVE A LOCAL FACEBOOK PAGE!
942
Pull


BREATHING PROBLEMS
Carrying around excess weight is hard on the lungs, which may lead to huffing and puffing.
SKIN AND HAIRCOAT PROBLEMS
Obesity leaves your dog more prone to skin infection, dermatitis and other skin and hair conditions.
ARTHRITIS
The added strain on joints and ligaments can worsen pain and make it harder for your dog to move around.
HEART DISEASE
Being overweight takes a toll on your dog's heart, making it work harder.
REDUCED ACTIVITY
Your dog's get-up-and-go just isn't there with all that extra weight making it harder to get around!

Global Projections for the Diabetes Epidemic: 2003-2025



M = million, AFR = Africa, NA = North America, EUR = Europe, SACA = South and Central America, EMME = Eastern Mediterranean and Middle East, SEA = South-East Asia, WP = Western Pacific.

Diabetes Atlas Committee. *Diabetes Atlas 2nd Edition:* IDF 2003.

BMI Health survey for England 2007

BMI range (kg/m2)

a) **Underweight Under 18.5**
b) **Normal 18.5 to less than 25**
c) **Overweight 25 to less than 30**
d) **Obese 30 to less than 40**
e) **Morbidly obese 40 and over**

Obesity > 30 BMI

Class I	30 – 35
Class II	35- 40
Class III	>40
Super Obese	>50

Please note: BMI does not tell the full story!!

Anthropometric indices

BMI

PI = weight (kg)/height^3 (m); Ponderal index (More accurate because we are 3 dimensional = normal adult values 11 – 15)

WHR = Waist Circumference (cm)/Hip Circumference (cm);

WHtR = WC (cm)/height (cm); waist height ratio (Index of Central obesity)

BAI =; Body adiposity index HC (cm)/height$^{1.5}$ (m) – 18

CI = Conical Index $\frac{\text{WC (m)}}{(0.109 \times \text{weight (kg)/height (cm)})}$

Journal List › Cardiovasc J Afr › v.28(2); Mar-Apr 2017 › PMC5488060

CVJ AFRICA Cardiovascular Journal of Africa

ABOUT CVJA SUBMIT A MANUSCRIPT E-ALERTS CONTACT JOURNAL

Cardiovasc J Afr. 2017 Mar-Apr; 28(2): 92–99. PMCID: PMC5488060

doi: 10.5830/CVJA-2016-061 PMID: 27701484

Comparative analysis of anthropometric indices of obesity as correlates and potential predictors of risk for hypertension and prehypertension in a population in Nigeria

Chimaobi James Ononamadu, PhD, Godwin Okwudiri Ihegboro, PhD, Chinwe Nonyelum Ezekwesili, PhD, Onyemaechi Faith Onyeukwu, MSc, Uchenna Francis Umeoguaju,, MSc, and Obiajulu Christian Ezeigwe, PhD

Author information ▶ Article notes ▶ Copyright and License information ▶ Disclaimer

Summary Go to:

Background: Go to:

Obesity is a well-established independent risk factor for hypertension and other cardiometabolic disorders. However, the best anthropometric index of obesity that predicts or associates strongly with hypertension and related conditions remains controversial and inconclusive.

Waist circumference

1993	23% of Adults
2007	37% of Adults
Women	41%
Men	33%

Gender	Increased Risk	High/Very High Risk
Men	=>94cms	=>102 cms
Women	=>80cms	=>88cms

Health Risk and waist circumference

Men

19% increased risk

13% high risk

21% very High Risk

Women

15% increased risk

16% high risk

23% very high risk

Central obesity

central obesity, is excessive abdominal fat

There is a strong correlation between central obesity and cardiovascular disease.

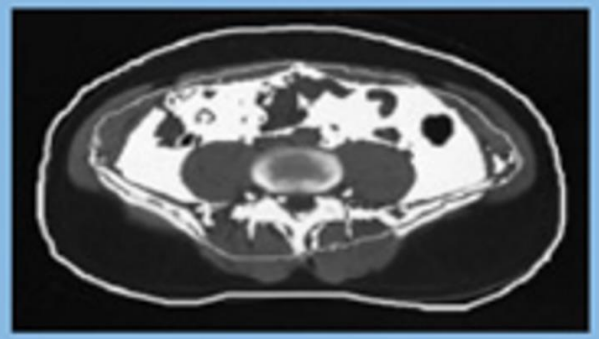
Abdominal obesity has been linked to Alzheimer's disease as well as other metabolic and vascular diseases

Was recently in the BBC news- Central obesity linked to Prostatic cancer

Men matched for BMI and total body fat: Differing "adiposity phenotypes"

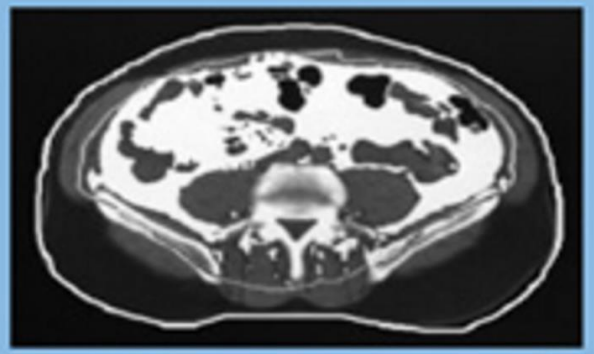
Subcutaneous obesity

Fat mass: 19.8 kg
VFA: 96 cm^2



Visceral obesity

Fat mass: 19.8 kg
VFA: 155 cm^2



Després J-P. *Eur Heart J Suppl.* 2006;8(suppl B):B4-12.

Metabolic Syndrome

24% prevalence comparable to Hypertension, deleterious effects on health such as MI, Stroke Diabetes

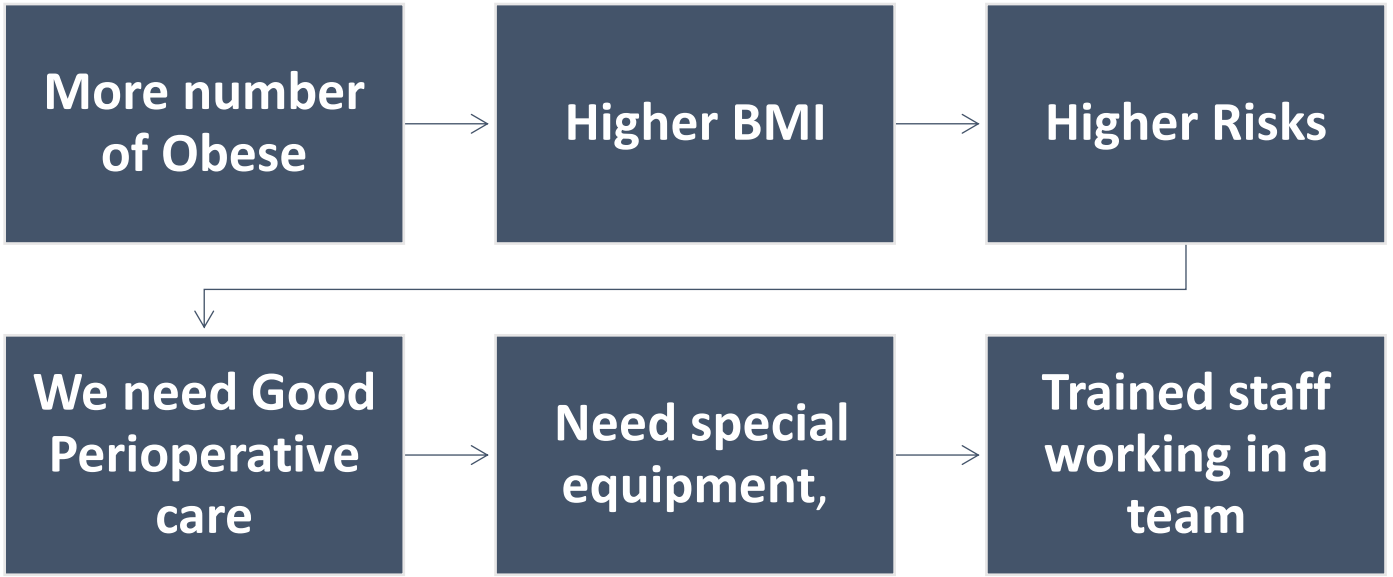
a. **Type 2 diabetes,**
b. **Impaired glucose tolerance or Normal glucose tolerance with insulin resistance**

1. **Elevated BP**
2. **Abdominal obesity &/or BMI >30 kg/m^2**
3. **Low HDL Cholesterol**
4. **High Triglycerides**
5. **Microalbuminuria**

<u>Metabolic syndrome if 3/5</u>

<u>ICO (Index of central obesity)</u>
<u>Waist circumference/ht in cms</u>
<u>ICO > 0.5 should alert the clinician</u>

What we are faced with is



Surgery for obesity

- **According to the NHS, the number of people in England having a stomach bypass to combat obesity has soared by almost 2,000% over a decade, from 242 in 2003-04 to 4,074 in 2012-13.**

Why is Anaesthesia a challenge?

- **The main issue is not intubation but sustained effective Oxygenation!**
- **Obese patients have increased fat content within their bone cages that reduce the volume of the organs**
- **Lungs – reduced FRC – 1800 to 2000 (normal about 2400ml) (19 ,970 cases studied > 20% FRC reduction**
- **Closing volume of the lung close to the Tidal volume- tendency to atelectasis and collapse**
- **Trachea, Bronchi relatively narrowed with a tendency to collapse requiring greater pressure to keep them open!**
- **At the same time their Oxygen consumption is much higher calculated at 3 ml per Kg (at 125 kgs 375 mls compared to a normal of 210 in a 70 KG man.**

Anaesthesia – what should we consider?

1. **Plan- Risk evaluation for GA**
2. **Prediction of Difficult Airway - can we predict difficult intubation?**
3. **Positioning**
4. **Pre-oxygenation – extremely important to have CPAP**
    1. **Mask ventilation almost always difficult**
    2. **Intubation in the majority easy and can often be overcome with video-laryngoscopy**
    3. **Ventilation a challenge**
5. **Pharmacology**
6. **Extubation**
7. **Post op care**
8. **Physio and Mobilisation**

Plan

- **Is Surgery needed?**
- **“Stop bang” questionnaire or sleep study will detect/diagnose patients with obstructive sleep apnoea (OSA).**
- **Should bring their home CPAP, if prescribed to the hospital.**
- **Prepare an OSA safe anaesthetic (regional or opioid free) or give postoperative CPAP**
- **Should have a medium (or intensive) care bed available**

Pre-Assessment

- **Pre assessment**
- **Height _____ inches/cm Weight _____ lb/kg**
- **Age _____**
- **Male/Female**
- **BMI _____**
- **Collar size of shirt: S, M, L, XL, or _____ inches/cm**
-
- **Neck circumference* _____ cm Waist circumference**
- **Lean Body Weight Quick Calculation = (1/3 of Wt. in Kg+ 1/3 of Ht. in cms) - 30**

STOP BANG Questionnaire

1. ***S*noring**

Do you *s*nore loudly (louder than talking or loud enough to be heard through closed doors)?

Yes No

2. ***T*ired**

Do you often feel *t*ired, fatigued, or sleepy during daytime?

Yes No

3. ***O*bserved**

Has anyone *o*bserved you stop breathing during your sleep?

Yes No

4. ***P*ressure (Blood Pressure)**

Do you have or are you being treated for high blood *p*ressure?

Yes No

5. ***B*MI**

*B*MI more than 35 kg/m2?

Yes No

6. ***A*ge**

*A*ge over 50 yr old?

Yes No

7. ***N*eck circumference**

*N*eck circumference greater than 40 cm?

Yes No

8. ***G*ender**

*G*ender male?

Yes No

***High risk of OSA:* answering yes to three or more items**

***Low risk of OSA:* answering yes to less than three items**

Adapted from:

STOP Questionnaire

A Tool to Screen Patients for Obstructive Sleep Apnea

Frances Chung, F.R.C.P.C., Balaji Yegneswaran, M.B.B.S.,† Pu Liao, M.D.,‡ Sharon A. Chung, Ph.D.,*
Santhira Vairavanathan, M.B.B.S.,_ Sazzadul Islam, M.Sc.,_ Ali Khajehdehi, M.D.,† Colin M. Shapiro,

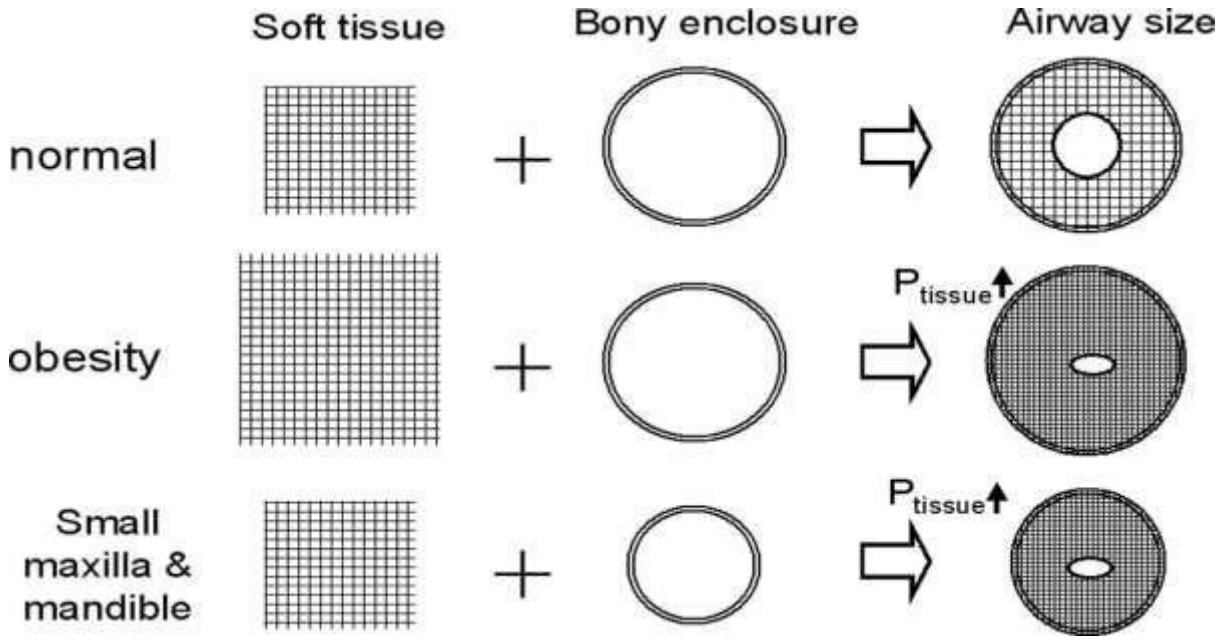
Anesthesiology 2008; 108:812–21

Obstructive Sleep Apnoea (OSA)

Definition: A patient has OSA if he suffers from Apnoeic-Hypopneic index (AHI) of 5 or more per hour of sleep in the context of excessive day time sleepiness and snoring (Polysomnography)

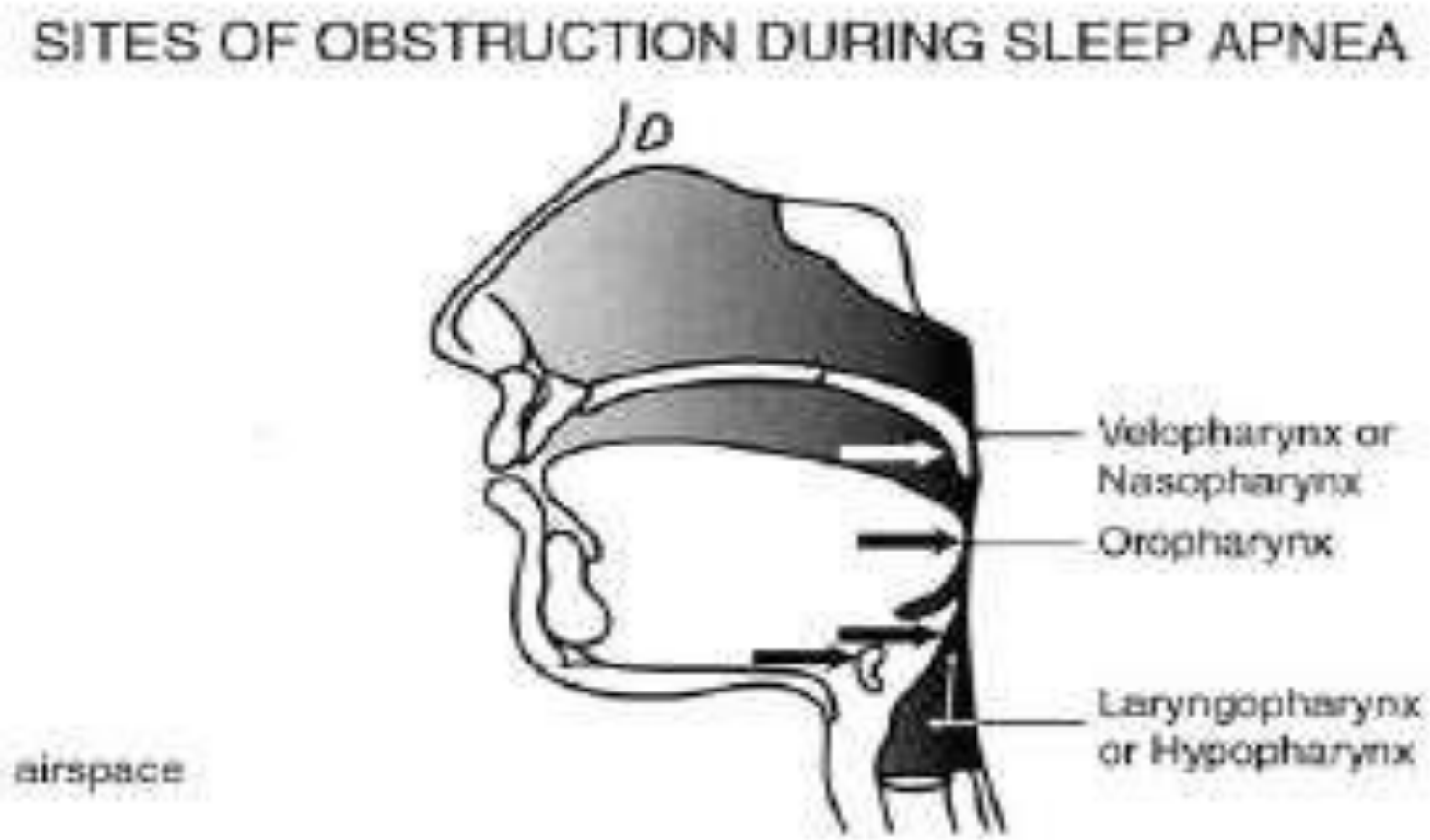
- Mild 5-10 episodes of AHI/hr of sleep
- Moderate 10-15 AHI/hr of sleep
- Severe more than 15 AHI/hr of sleep

Airway in OSA



Schematic explanations for interaction between soft tissue surrounding the pharyngeal airway and craniofacial bony enclosure. The airway size is determined by the balance between amount of soft tissue and bony enclosure size. Ptissue tissue pressure. From Watanabe *et al*

Airway in OSA



Pulmonary Circulation

Pulm Circ. 2015 Jun; 5(2): 220–227.
doi: 10.1086/679995

PMCID: PMC4449234
PMID: 26064448

Pulmonary hypertension in obstructive sleep apnea: is it clinically significant? A critical analysis of the association and pathophysiology

Cyrus Kholdani,[✉] Wassim H. Fares, and Vahid Mohsenin

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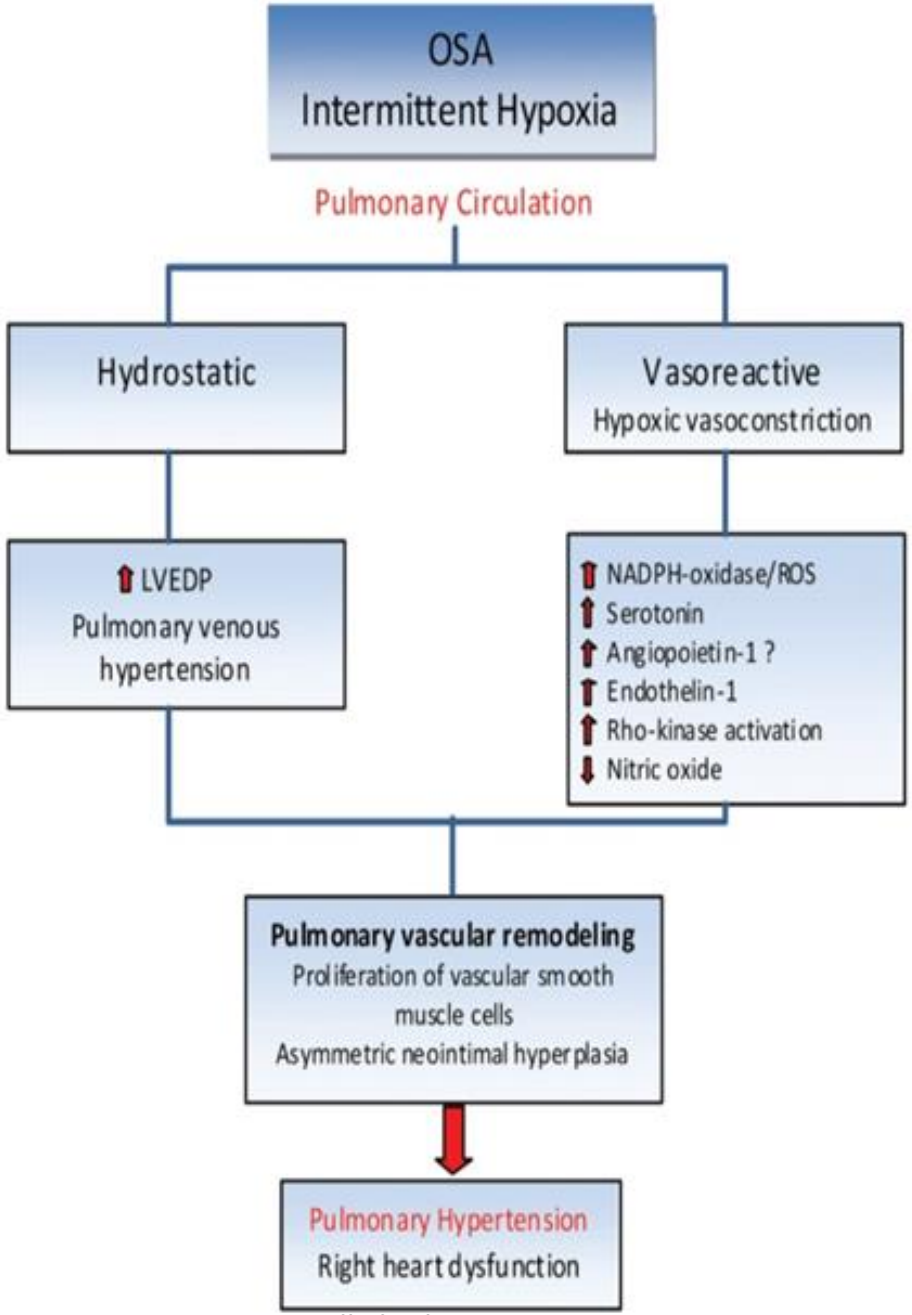
Abstract

Go to:

The development of pulmonary hypertension is a poor prognostic sign in patients with obstructive sleep apnea (OSA) and affects both mortality and quality of life. Although pulmonary hypertension in OSA is traditionally viewed as a result of apneas and intermittent hypoxia during sleep, recent studies indicate that neither of these factors correlates very well with pulmonary artery pressure. Human data show that


OSA
Intermittent Hypoxia
Pulmonary Circulation
Hydrostatic
Vasoreactive
Hypoxic vasoconstriction
LVEDP
Pulmonary venous hypertension
NADPH-oxidase/ROS
Serotonin
Angiopoietin-1 ?
Endothelin-1
Rho-kinase activation
Nitric oxide
Pulmonary vascular remodeling
Proliferation of vascular smooth muscle cells
Asymmetric neointimal hyperplasia
Pulmonary Hypertension
Right heart dysfunction

OSA and PH (mean Pap >20) and CPAP

- Pulmonary Hypertension can exist on its own are associated with LVF or lung disease
- 27% to 30% of patients with OSA have PH without impaired LVF or lung disease.
- Obesity Hypoventilation syndrome nearly 50% have PH
- Transthoracic echo helpful
- PH improves with treatment of OSA with CPAP
- Worse the problem better the response
- But CPAP does not completely resolve PH because of changes at cellular level.

17 out of the 21 patients with an average BMI of 45 had pulmonary hypertension

Respir Med. 2013 Dec;107(12):2061-70. doi: 10.1016/j.rmed.2013.09.017. Epub 2013 Sep 28.

Pulmonary hypertension in obesity-hypoventilation syndrome.

Kauppert CA[1], Dvorak I, Kollert F, Heinemann F, Jörres RA, Pfeifer M, Budweiser S.

Author information

Abstract

BACKGROUND: Pulmonary hypertension (PH) is considered a clinically important feature of Obesity-Hypoventilation Syndrome (OHS). We aimed to determine prevalence, characteristics and severity of PH including associations with clinical outcomes after established non-invasive positive pressure ventilation (NPPV).

METHODS: In a prospective cross-sectional study, clinically stable OHS-patients (NPPV duration ≥ 3 months) were consecutively assessed using echocardiography, serum markers and right-heart catheterization (RHC). NPPV use was quantified via ventilator counters. Blood gases, lung function, Epworth-Sleepiness Scale (ESS), sleep-quality, WHO-functional class (WHO-FC), 6-min walk distance, and health-related quality of life (HRQL) via Severe Respiratory Insufficiency (SRI) questionnaire were assessed.

RESULTS: Of 177 patients considered, 64 fulfilled inclusion criteria. Among these, 21 patients (10 female/11 male; BMI 45 [40; 53] kg/m(2), PaCO2 39.6 [37.8; 45.5] mmHg (median [quartiles])) gave consent for RHC. Four patients (19%) had normal mean pulmonary artery pressure (mPAP < 20 mmHg), 8 (38.1%) mPAP 20-24 mmHg and 9 (42.9%) manifest PH (mPAP ≥ 25 mmHg), 3 of them with combined pre- and/or postcapillary PH. mPAP was negatively correlated to NPPV use, vital capacity and lung diffusing capacity ($p < 0.01$ each), and positively to BMI ($p < 0.05$). NPPV use and vital capacity independently predicted mPAP. In patients with PH, ESS, WHO-FC, and some SRI-items were worse ($p < 0.05$ each) compared to patients without PH. Multivariate analyses revealed mPAP as the only independent predictor of the SRI-physical functioning domain.

CONCLUSIONS: Mild to moderate PH is frequent in patients with OHS despite NPPV, mPAP being inversely related to NPPV adherence. PH is associated with impairments in daytime-sleepiness, WHO-FC, HRQL and physical functioning.

OSA leads to

- **Atrial Fibrillation and other arrhythmias**
- **Pulmonary hypertension**
- **Cardiac failure**
- **Poor quality of sleep resulting in day time somnolence**

- **Use of CPAP leads to reduction of 42% relative risk of cardiac problems**
- **Reverses pulmonary hypertension and hypertension**
- **10% sustained weight loss reduces risk of cardiac disease**

Mask Ventilation in the Morbidly obese

- Always difficult, two hand technique, inadequate tidal volumes,
- SAD devices particularly iGEL very good 2005 Jun;102(6):1106-9; discussion 5A.
- **Intubating laryngeal mask airway in morbidly obese and lean patients: a comparative study.**
- Combes X[1], Sauvat S, Leroux B, Dumerat M, Sherrer E, Motamed C, Brain A, D'Honneur G.
- 100 patients (50 morbid obese + 50 control) effectively ventilated and intubated

What Predicts Difficult Intubation in the Obese?

Anesth Analg. 2002 Mar;94(3):732-6; table of contents.

Morbid obesity and tracheal intubation.

Brodsky JB[1], Lemmens HJ, Brock-Utne JG, Vierra M, Saidman LJ.

Author information

Abstract

The tracheas of obese patients may be more difficult to intubate than those of normal-weight patients. We studied 100 morbidly obese patients (body mass index >40 kg/m(2)) to identify which factors complicate direct laryngoscopy and tracheal intubation. Preoperative measurements (height, weight, neck circumference, width of mouth opening, sternomental distance, and thyromental distance) and Mallampati score were recorded. The view during direct laryngoscopy was graded, and the number of attempts at tracheal intubation was recorded. Neither absolute obesity nor body mass index was associated with intubation difficulties. Large neck circumference and high Mallampati score were the only predictors of potential intubation problems. Because in all but one patient the trachea was intubated successfully by direct laryngoscopy, the neck circumference that requires an intervention such as fiberoptic bronchoscopy to establish an airway remains unknown. We conclude that obesity alone is not predictive of tracheal intubation difficulties.

IMPLICATIONS: In 100 morbidly obese patients, neither obesity nor body mass index predicted problems with tracheal intubation. However, a hig Mallampati score (greater-than-or-equal to 3) and large neck circumference may increase the potential for difficult laryngoscopy and intubation.

Comment in

Intubation in morbidly obese patients. [Anesth Analg. 2003]
Positioning for intubation in morbidly obese patients. [Anesth Analg. 2006]

PMID: 11867407 [PubMed - indexed for MEDLINE]

Does neck circumference predict difficult laryngoscopy in morbidly obese patients?: 19AP2-5

Abrahams, H.; Bygrave, C.; Doyle, C.; Kendall, A.; Margarson, M.

European Journal of Anaesthesiology:
12 June 2010 - Volume 27 - Issue 47 - p 248–249
Airway Management

836 Morbidly Obese patients (149 with BMI >60 kg/m^2) underwent Roux-en-Y Gastric Bypass or Gastric Banding at a Bariatric Unit

Conclusion(s): There is a clear and stepwise correlation between difficult laryngoscopy and neck circumference in these patients. The overall incidence of difficult laryngoscopy is not high, but a neck circumference ≥50cm does appear to be a strong predictor

Does Body Shape predict difficulty?

$$\text{Body Shape Index} = \frac{\text{Waist Circumference}}{\text{Body Mass Index}^{2/3} \times \text{height}^{1/2}}$$

802 patients
Waist Circumference, Height & Weight
Cormack & Lehane Grade of Laryngoscopy
(A Whelan, ESA 2015)

Krakauer *PLOS One* 2012: A Body Shape Index

Does Body Shape predict difficulty?

ABSI	Easy Laryngoscopy	Difficult Laryngoscopy
Quartiles 1-3 "Pears"	565	35 (5.8%)
Quartile 4 "Apples"	183	19 (9.4%)

Chi squared
P=0.102

- Underpowered..: a 90% probability that a difference exists..

Krakauer *PLOS One* 2012: A Body Shape Index

Other predictors in order of importance

- Range of Neck movement
- Malampatti
- Sternomental distance/ Thyromental distance

The Following co-relate best with difficult intubation in the Obese!

- BMI greater than 35,
- Male sex,
- MP 3,4,
- ? OSA,
- ? Presence of Beard,

Premeditations

Proton pump inhibitors if from night before or

Ranitidine in the morning

High incidence of hiatus hernia, reflux in these patients.

A starved patient from midnight may have a gastric juice volume of >100mls with a pH of ≤ 4

For serious aspiration one needs only 20 mls at a pH of 2.

? 0.3 molar Sodium Citrate

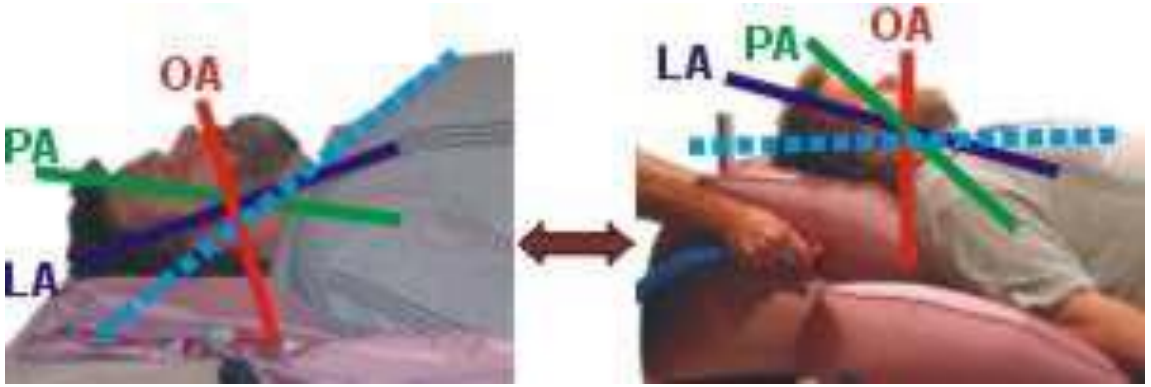
Positioning

- **The ramped position to bring the tragus in line with the sternal notch**
- **Gives optimum position for intubation and ventilation**
- **Various specialised pillows**
- **Adjustable operating table method**
- **Blanket Ramp method**
- **Rapid airway management positioner (RAMP)**
- **Position at a 30 degree recline with the Hip and Knees slightly flexed**
- **Known to reduce intra-abdominal pressure as shown by Jan Mullier, Brugge, on several morbidly obese patients undergoing laparascopic surgery**

Obese surgery 2010 Oct;20(10):1436-41. doi: 10.1007/s11695-009-9885-8. Epub 2009 Jun 24.

An evaluation of the rapid airway management positioner in obese patients undergoing gastric bypass or laparoscopic gastric banding surgery.

Cattano D[1], Melnikov V, Khalil Y, Sridhar S, Hagberg CA.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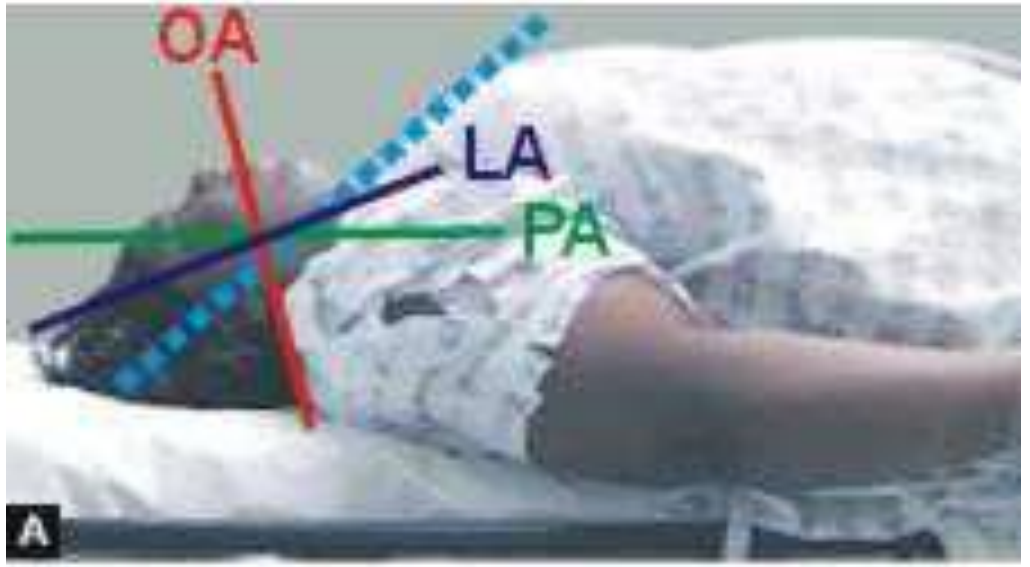
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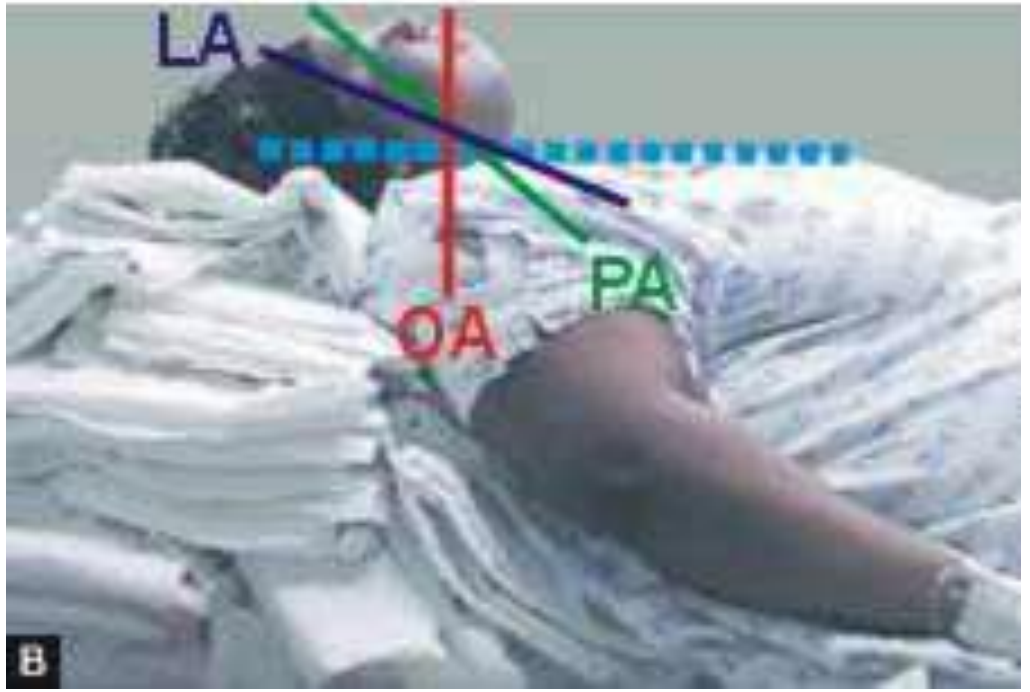
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OA
B


XL
THIGH

1. The Fundamental Problem in the Obese..

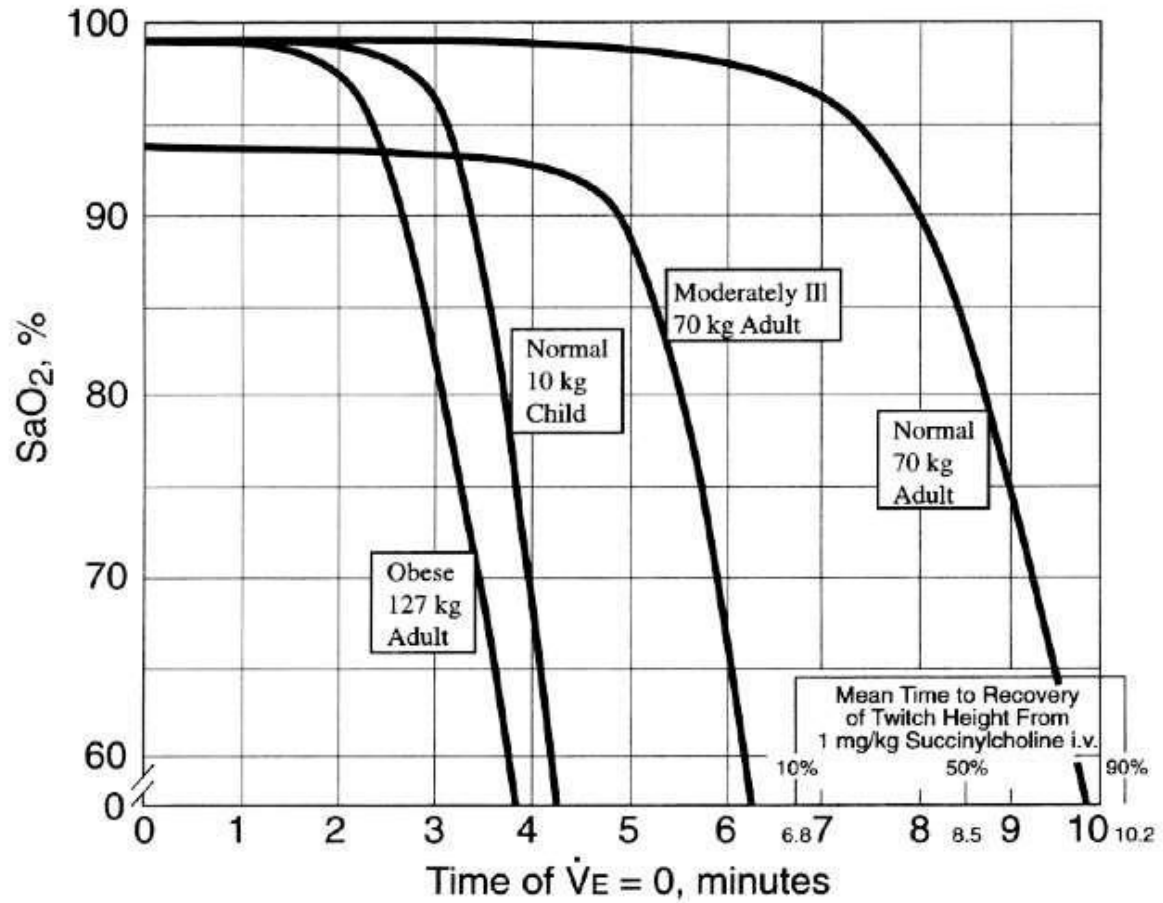
- High Oxygen Consumption
- Low Oxygen reserves

- Time pressure when breathing stops!
- Panic when the saturations start to fall!

Critical Hemoglobin Desaturation Will Occur before Return to an Unparalyzed State following 1 mg/kg Intravenous Succinylcholine

Jonathan L. Benumof, M.D., Rachel Dagg, M.S.,† Reuben Benumof, Ph.D.‡*

TIME TO HEMOGLOBIN DESATURATION WITH INITIAL F_AO_2 = 0.87



How to increase FRC, and prevent atelectasis?

Pre-oxygenation with FIO2 0.8 ??

Pre-oxygenation in 30° reverse trendlenburg

Pre-oxygenation with CPAP (5 min) and PCV (< 20 cm H2O) with PEEP (5min) via a face mask during induction

Before extubation: vital capacity manoeuvre & avoiding FIO2 of 1.0?

PEEP during surgery but always with recruitment manoeuvre!

post-op: sitting position

NIV- CPAP or BIPAP(Boussignac masker)


Tracheal stenosis
00:00:00
00:10:09

Intubation

- **96% of cases achieved with a Macintosh blade. Burp and Bougie**
- **Most studies achieved near 100% intubation**
- **Strongly recommend Videolaryngoscopes with Macintosh like blade**
- **In cases with high probability of difficulty, BMI>40, Neck circumference> 50 cms,Limited neck movement consider AFOI**

- **Important to have a Plan and a strategy and to work as a team.**
- **Quick surgical airway- have a surgeon to help, keep equipment ready**

BMC Anesthesiol. 2014 Dec 18;14:125. doi: 10.1186/1471-2253-14-125. eCollection 2014.

Anesthetic management of patients undergoing bariatric surgery: two year experience in a single institution in Switzerland.

Lindauer B[1], Steurer MP[2], Müller MK[3], Dullenkopf A[1].

Author information

Abstract

BACKGROUND: In the field of anesthesia for bariatric surgery, a wide variety of recommendations exist, but a general consensus on the perioperative management of such patients is missing. We outline the perioperative experiences that we gained in the first two years after introducing a bariatric program.

METHODS: The perioperative approach was established together with all relevant disciplines. Pertinent topics for the anesthesiologists were; successful airway management, indications for more invasive monitoring, and the planning of the postoperative period and deposition. This retrospective analysis was approved by the local ethics committee. Data are mean [SD].

RESULTS: 182 bariatric surgical procedures were performed (147 gastric bypass procedures (GBP; 146 (99.3%) performed laparascopically). GBP patients were 43 [10] years old, 78% female, BMI 45 [7] kg/m(2), 73% ASA physical status of 2. 42 patients (28.6%) presented with obstructive sleep apnea syndrome. 117 GBP (79.6%) patients were intubated conventionally by direct laryngoscopy (one converted to fiber-optic intubation, one aspiration of gastric contents). 32 patients (21.8%) required an arterial line, 10 patients (6.8%) a central venous line. Induction lasted 25 [16] min, the procedure itself 138 [42] min. No blood products were required. Two patients (1.4%) presented with hypothermia (<35 °C) at the end of their case. The emergence period lasted 17 [9] min. Postoperatively, 32 patients (21.8%) were transferred to the ICU (one ventilated). The other patients spent 4.1 [0.7] h in the post anesthesia care unit. 15 patients (10.2%) required take backs for surgical revision (two laparotomies).

CONCLUSIONS: The physiology and anatomy of bariatric patients demand a tailored approach from both the anesthesiologist and the perioperative team. The interaction of a multi-disciplinary team is key to achieving good outcomes and a low rate of complications.

TRIAL REGISTRATION: DRKS00005437 (date of registration 16(th) December 2013).

Results

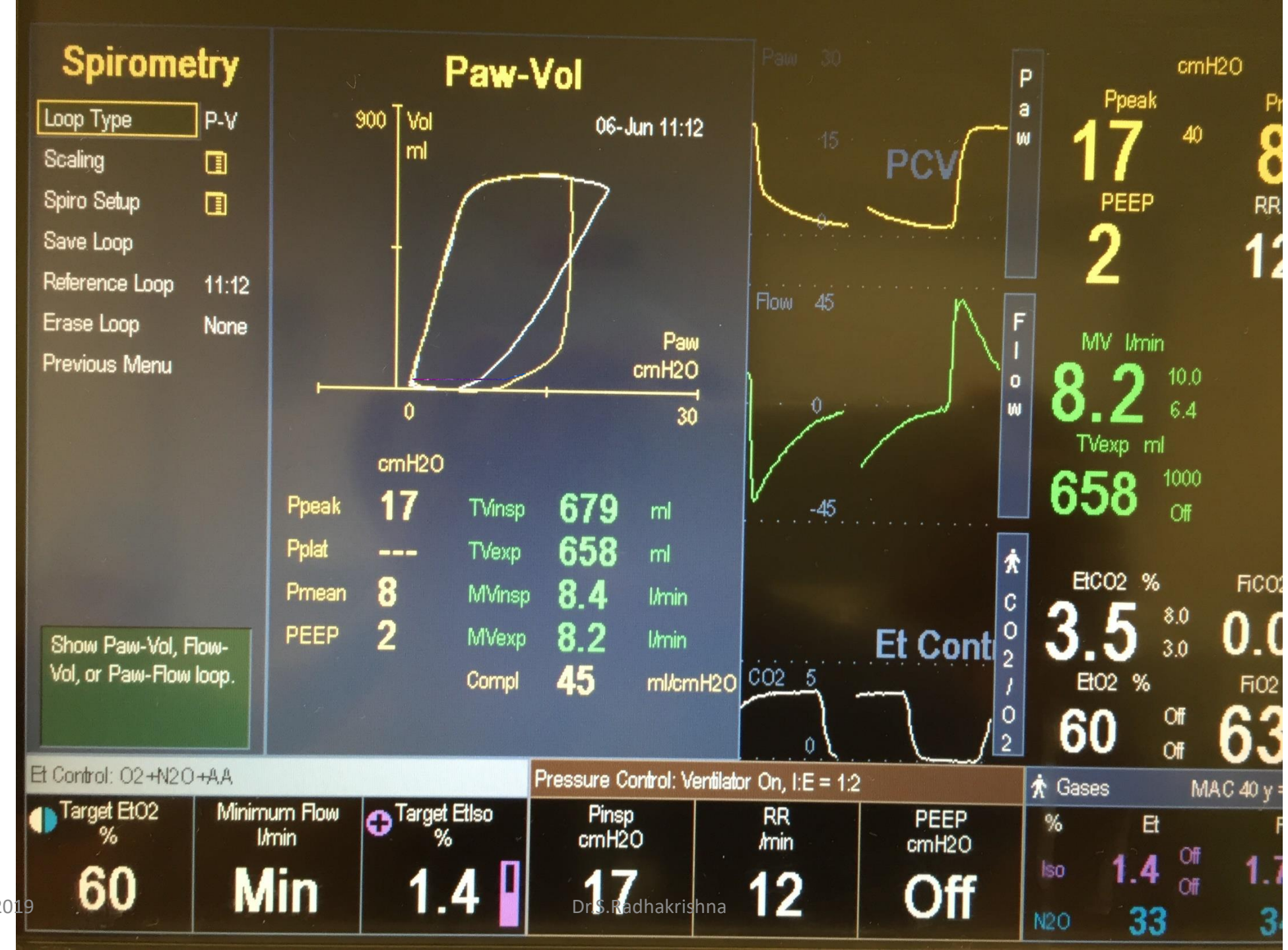
- **146 gastric by pass under GA**
- **BMI 45+, 28.6% OSA, age 43+, F:M ratio 6:4, ASA 2 (73%)**
- **117 intubated easily with DL (103 RSI)**
- **87.4% grade 1, 8.1% grade 2, 3.7% grade 3 and**
- **one failed DL leading to asleep FOI emergency)**
- **29 FOI (23 AFOI)**
- **1 aspiration**
- **Post op 32 went to HDU/ICU**
- **Rest spent an average of 4.1 hr in PACU**

Intra-operative Ventilation

- No Convincing Evidence that for operative anaesthesia you should use Pressure Control instead of Volume Control ?
- From ICU world
  - Pressure controlled mode causes less ‘damage’
  - Appropriate PEEP reduces inflammatory hit
- Big patients certainly develop atelectasis
  - PROVHILO showed no difference (**Protective Ventilation with High and Low pressures during abdominal surgery**)
  - PROBESE is Recruiting since 2015 ESA

Clinical Tips: PEEP and Ventilation

- **Watch your tidal volumes: 6-8ml/kg Ideal Body**
- **Aim for normal $EtCO_2$**
- **Shorten I:E ratios and expect rate 12-18/min**
- **Sufficient PEEP – need 10-15 to prevent atelectasis**
  - **Recruitment maneuverer - but watch the cardiac output**
  - **Preload with 500-750ml & have Pressors.**
  - **Bad hearts – accept lower PEEP and degree of collapse?**


Spirometry
Loop Type P-V
Scaling
Spiro Setup
Save Loop
Reference Loop 11:12
Erase Loop None
Previous Menu
Show Paw-Vol, Flow-Vol, or Paw-Flow loop.
Paw-Vol
900 Vol ml
06-Jun 11:12
Paw cmH2O
0
30
cmH2O
Ppeak 17
Pplat ---
Pmean 8
PEEP 2
TVinsp 679 ml
TVexp 658 ml
MVinsp 8.4 l/min
MVexp 8.2 l/min
Compl 45 ml/cmH2O
Paw 30
15
PCV
0
Flow 45
0
-45
CO2 5
0
Et Cont
Paw
Flow
CO2/O2
cmH2O
Ppeak
17
40
PEEP
2
MV l/min
8.2
10.0
6.4
TVexp ml
658
1000
Off
EtCO2 %
3.5
8.0
3.0
EtO2 %
60
Off
Off
FiO2
63
Et Control: O2+N2O+A,A
Target EtO2 %
60
Minimum Flow l/min
Min
Target EtIso %
1.4
Pressure Control: Ventilator On, I:E = 1:2
Pinsp cmH2O
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RR /min
12
PEEP cmH2O
Off
Gases
MAC 40 y
% Et
Iso 1.4 Off Off
N2O 33

Noninvasive Monitoring of Lung Recruitment Maneuvers in Morbidly Obese Patients: The Role of Pulse Oximetry and Volumetric Capnography

Gerardo Tusman, MD,* Iván Groisman, MD,* Felipe E. Fiolo, MD, FACS,† Adriana Scandurra, PhD,‡ Jorge Martinez Arca,‡ Gustavo Krumrick, MD,* Stephan H. Bohm, MD,§ and Fernando Suarez Sipmann, MD, PhD‖¶

- Levels of PEEP and atelectatic collapse
- 20 patients
- Mean BMI 43
- Complex Protocol…

- RESULTS: The lungs' opening pressures were detected at 44 (4) cm H_2O (median and interquartile range) and
- the closing pressure at 14 (2) cm H_2O.
- Therefore, the level of PEEP that kept the lungs without collapse was found to be 16 (3) cm H_2O
- CONCLUSIONS: Lung recruitment in morbidly obese patients could be effectively monitored by combining noninvasive pulse oximetry and VCap. SpO_2, the elimination of CO_2, and Bohr's dead space detected the individual's opening and closing pressures.

Extubation

- Extubation : Planned, always fully awake
- If high risk, consider AEC, postpone extubation, Surgical airway

Drugs

- **Muscle relaxant ideally Rocuronium with Sugammadex on standby**
- **Desflurane – wakeup better**
- **Avoid Morphine and long acting Opioids**
- **Use regional blocks and other analgesics**

- **Must monitor in all morbidly obese patients TO4 (T1/T4 ratio of > 90% at extubation**

DOSING

Dosing of common anaesthetic drugs in the obese

DRUG	RECOMMENDED DOSING
Propofol	Induction: LBW
	Maintenance: TBW
Fentanyl	Induction: LBW
	Corrected weight = IBW + (0.4 × excess weight)
Thiopental	Induction: 7.5 mg kg^{-1} IBW
	Maintenance: TBW
Midazolam	Induction: TBW for initial dose
	IBW for continuous dose
Vecuronium	Induction: IBW
Atracurium	Induction: TBW
	Initial dose 0.15 mg/kg–2.3 mg/10 kg >70 kg. Supplemental dose 0.15 mg/kg–0.7 mg/10 kg >70 kg
Cisatracurium	Induction: TBW
Rocuronium	IBW (“because Roc is the ideal drug for RSI!”)
Suxamethonium	TBW
Mivacurium	Induction: TBW. Divided dosing 0.15 mg/kg + after 30 s 0.15 mg/kg
Neostigmine	Induction: TBW
Alfentanil	Induction: IBW or corrected weight
Sufentanil	Induction: TBW corrected
Morphine	Induction: IBW
Paracetamol	Induction: IBW

References and Links

Lifeinthefastlane.com

- CCC — Obesity

Journal articles and textbooks

- De Baerdemaeker LEC, Mortier EP, Struys MMRF. Pharmacokinetics in obese patients Contin Educ Anaesth Crit Care Pain 2004; 4 (5): 152-155. doi: 10.1093/bjaceaccp/mkh042 [Free Full Text]

Post Anaesthetic Care

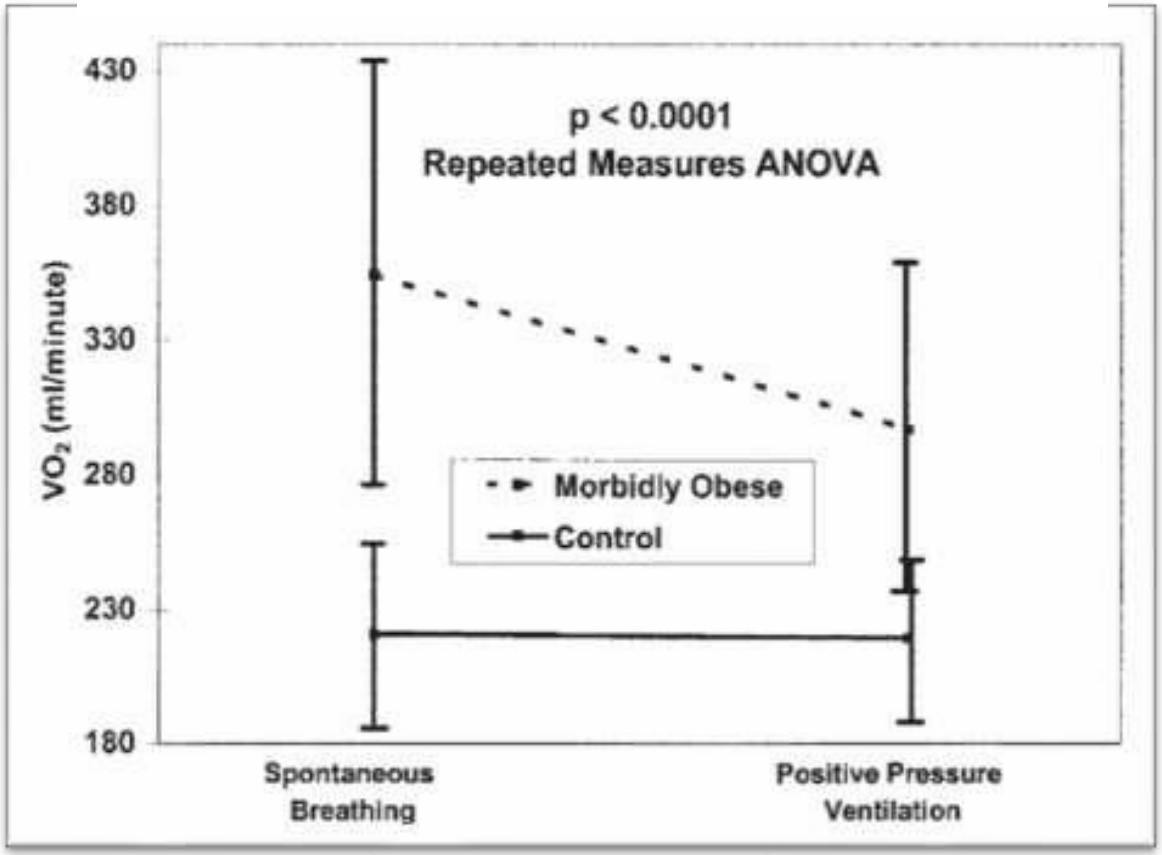
- Recovery
- PACU
- HDU/ITU

Time Pressure: Apnoeic Desaturation

The Impact of Morbid Obesity on Oxygen Cost of Breathing ($\dot{V}O_{2RESP}$) at Rest

JOHN P. KRESS, ANNE S. POHLMAN, JOHN ALVERDY, and JESSE B. HALL

Department of Medicine, University of Chicago, Chicago, Illinois



The Effects of Body Mass on Lung Volumes, Respiratory Mechanics, and Gas Exchange During General Anesthesia

Paolo Pelosi, MD, Massimo Croci, MD, Irene Ravagnan, MD, Stefano Tredici, MD, Alessia Pedoto, MD, Alfredo Lissoni, MD, and Luciano Gattinoni, MD

ANESTH ANALG
1998;87:654–60

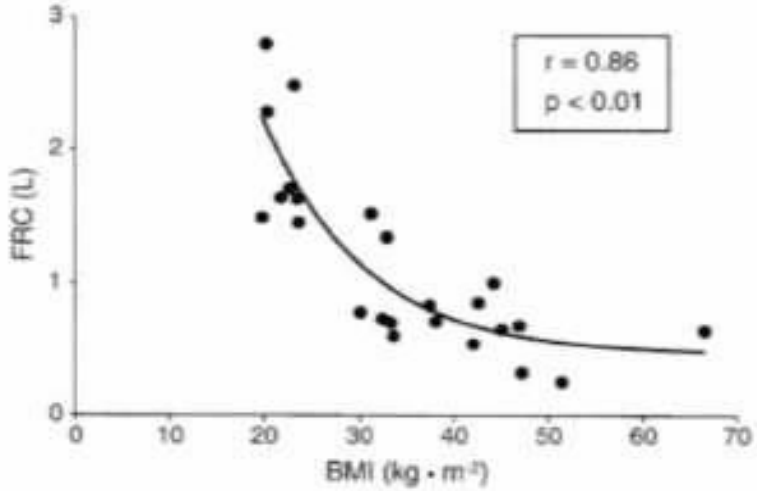
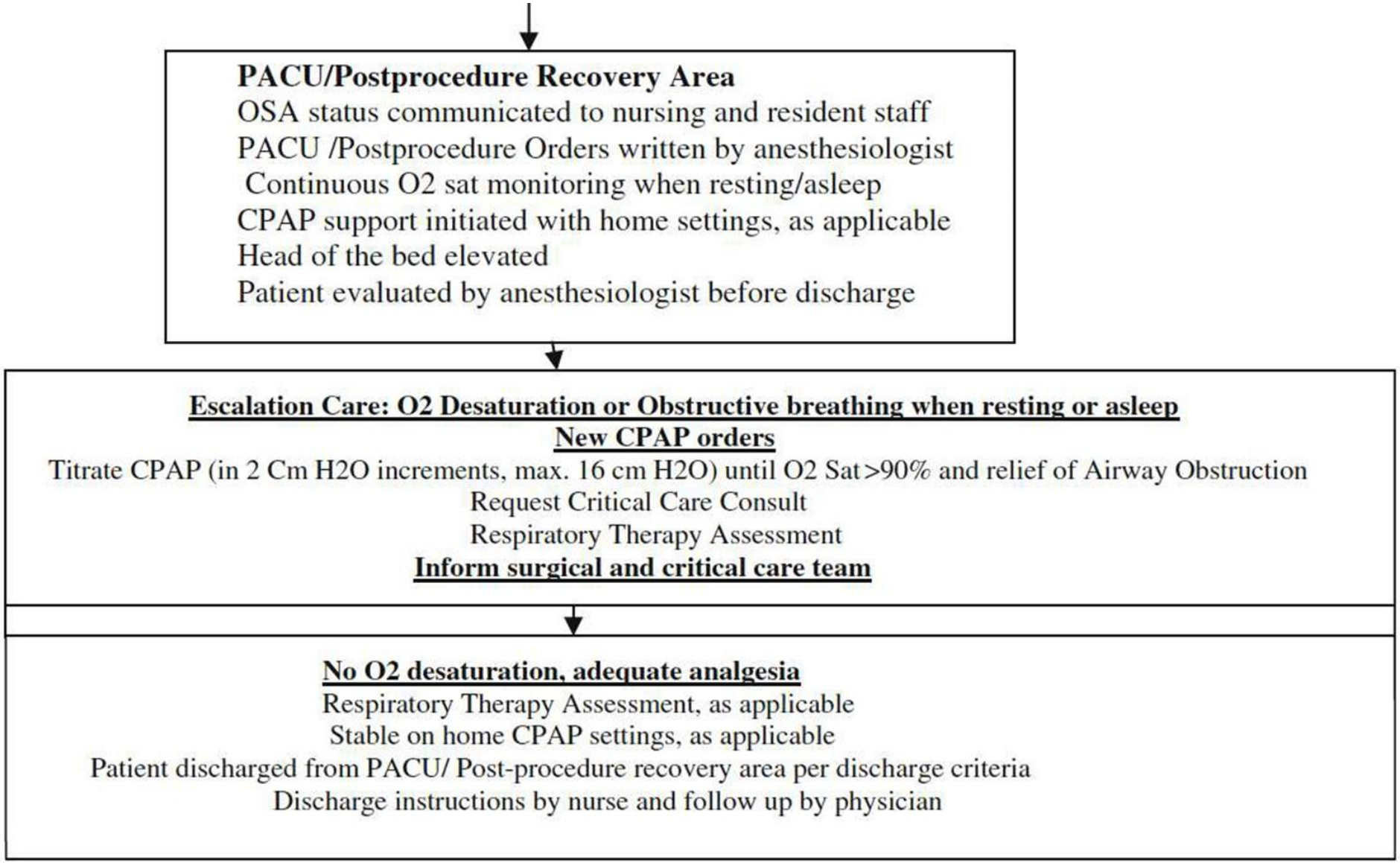


Figure 1. Relationship between functional residual capacity (FRC) and body mass index (BMI).

Management of Surgical patients with OSA



Jahan Porhomayon et al. Lung 2011;189:359-67

Key points for postoperative care

- Sitting position and continue with CPAP mask if used before surgery.
- Sufficient pain and postoperative nausea and vomiting treatment
- Promote deep breathing with chest physiotherapy and
- incentive spirometry
- Promote early mobilization and provide
- thromboprophylaxis
- Look for ominous patterns of SpO_2 desaturations and hypercarbia suggestive for obstructive breathing with arousal failure or carbonarcosis

Summary Before the operation

slide 1/3

- Pre-assess (neck circumference,BMI,OSA, Co-morbidities)
- A 10% reduction in weight helps cardiac status, postpone if weight reduction possible
- Prepare Team
- Equipment and Set up
- Bariatric anesthesia comes with its unique challenges, but when approached in a thoughtful and interdisciplinary fashion it becomes safely manageable

Summary Anaesthesia

slide 2/3

- Ramped position
- Pre-oxygenation with a CPAP of >5cms, a very vital part of your anaesthetic, With atelectasis prevention better than cure
- Once induced insert an Igel 4/5 and continue ventilation through the iGel
- Mask ventilation is difficult and often adds to stress
- Give the relaxant and monitor NMBA through out
- Intubate using a Videolaryngoscope (C-Mac, Glidescope,McGrath etc)
- If difficult you can put the Igel back & ventilate – intubate through igel

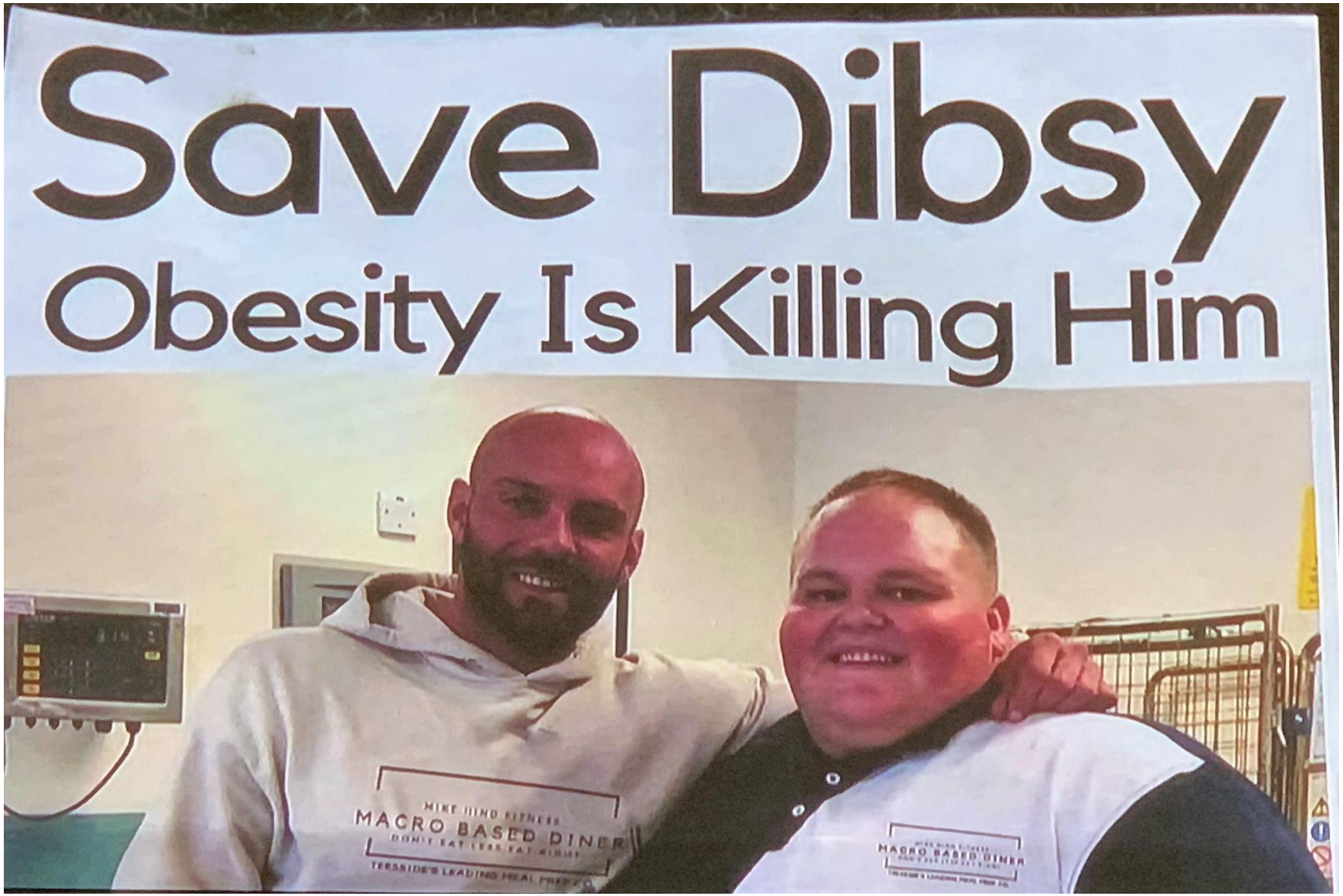
Summary Recovery and Post op

slide 3/3

- use drugs that are reversible or easily eliminated by the body
- For calculating dosage use lean body mass
- PCV or VCV?
- Avoid Morphine particularly in OSA cases.
- Guard against Hypothermia
- Extubate awake (consider CPAP, SIMV, PSV)
- Plan post care (HDU,ICU)
- Physiotherapy and early mobility

Questions?

Thank You!!


Save Dibsy
Obesity Is Killing Him
MACRO BASED DINER
MACRO BASED DINER