Obesity – Implications for the Anaesthetist

Dr Martina Bieker
Consultant Anaesthetist
Overview

- Background
- Surgery
- Preoperative Assessment
- Practical aspects of anaesthesia
OBESITY: The percentage of the population older than 15 with a body-mass index greater than 30.

<table>
<thead>
<tr>
<th>Country</th>
<th>USA</th>
<th>Mexico</th>
<th>UK</th>
<th>Slovak Republic</th>
<th>Greece</th>
<th>Australia</th>
<th>New Zealand</th>
<th>Hungary</th>
<th>Czech Republic</th>
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<tbody>
<tr>
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<td>24%</td>
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<td>21%</td>
<td>19%</td>
<td>15%</td>
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<th>Spain</th>
<th>Ireland</th>
<th>Germany</th>
<th>Portugal</th>
<th>Finland</th>
<th>Turkey</th>
<th>Belgium</th>
<th>Poland</th>
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<th>Netherlands</th>
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<th>Denmark</th>
<th>France</th>
<th>Austria</th>
<th>Italy</th>
<th>Norway</th>
<th>Japan</th>
<th>Korea</th>
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Why surgery?

- **Economical and Personal benefit**
  
  - Cost of obesity to NHS = £3.5 billion/yr
  - 30 000 deaths, 18 million days off work/yr
  - Bariatric procedure – cost £7000 or €12000
  - Takes about 4 years to recoup costs of medication
  - Bariatric surgery reduces all cause mortality
  - Diabetes remission rate – 73%
  - Remission of obstructive sleep apnoea, hypertension, cardiac failure
Heartlands experience

- April 2003 – December 2007
- 1335 patients – gastric bands
- Mean age – 42.5 years (18 – 72)
- Mean preop weight 121.5 kg (73 – 268)
- Mean preop BMI – 44.1 (35- 99)
- No hospital mortality
- Average stay – 1.02 days
# Comparison

<table>
<thead>
<tr>
<th>Procedure</th>
<th>30d mortality</th>
<th>Side effects</th>
<th>Weight loss (Average excess)</th>
<th>Patient compliance required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastric band</td>
<td>0.05%</td>
<td>11.3%</td>
<td>41-54%</td>
<td>High</td>
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<tr>
<td>Sleeve gastrectomy</td>
<td>?</td>
<td>?</td>
<td>30-50%</td>
<td>Medium</td>
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<tr>
<td>Roux-en-Y</td>
<td>0.5%</td>
<td>23.6%</td>
<td>57-67%</td>
<td>Medium</td>
</tr>
<tr>
<td>Duodenal switch</td>
<td>1.1%</td>
<td>15%</td>
<td>66-74%</td>
<td>High</td>
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</table>
Adverse events

- Operative (10%)
  - Thrombo-embolic
  - Bleeding
  - Pneumonia
  - Ulcers
  - Infection/ peritonitis

- Long term (20-30%)
  - Iron deficiency
  - Calcium
  - Vitamin B12
  - Vitamin B1
  - Protein deficiency
  - Gall stones
  - Weight gain
Preassessment

- Cardiovascular system
- Respiratory system
- Airway
- Metabolic disorders
Apples and Pears
Android fat distribution

- Android fat distribution
- Greater significance
- Central obesity and cardiovascular disease
- Fat in neck and around airways
- Difficult surgery

Waist-to-hip ratio:
- For men >1
- For women >0.8
Gynaecoid fat distribution

- Arms, legs and buttocks
- Less severe
- Not always clear cut
Assessment

- May be difficult to assess fitness
- Technical difficulties with Echocardiograms
- May not be able to exercise
- Number of “Fat years” significant
- Vague symptoms may have serious underlying pathology
Cardiovascular Pathology

Obesity
- Increased circulation blood volume
  - Increased stroke volume
    - Increased cardiac output
      - LV enlargement
        - Increased LV wall stress
          - Eccentric LV hypertrophy
            - Hypertension
              - LV systolic dysfunction
                - LV diastolic dysfunction
                  - Ischaemic heart disease
        - LV failure
          - Pulmonary venous hypertension
            - Pulmonary arterial hypertension
              - RV enlargement & hypertrophy
                - Hypoxia/hypercapnia
                  - Obstructive sleep apnoea, obesity hypoventilation
Cardiomyopathy of Obesity

- ? Separate entity
- 30 asymptomatic patients (BMI 49.2)
- Mean age 37.8 years
- 83% hypertensive

- Left ventricular hypertrophy 82%

Cardiomyopathy

- Diagnosis: weight gain, dyspnoea, orthopnoea, oedema, ascites
- LV hypertrophy with increased wall thickness and LV cavity size

Echocardiograms for all?

Owan and Litwin (2007) Current Heart Failure Reports 4: 221-817
ECG abnormalities

- Low voltage due to chest wall
- LV hypertrophy or strain
- Prolonged QT interval
- Inferolateral T wave abnormality
- Right axis deviation or RBBB – showing right heart strain
Respiratory pathophysiology

- Excess metabolic activity of adipose tissue
- Therefore increased oxygen demand and CO₂ production
- Excess work of breathing due to reduced compliance and increased resistance
- FRC <1 litre if BMI >40
Respiratory physiology
Obstructive Sleep Apnoea

- Incidence of 3%
- History of snoring, daytime sleepiness, mood swings, poor concentration
- Association with hypertension and obesity
- May not be able to lie flat – may sleep upright or prone – may desaturate or obstruct airway
- Diagnosed with polysomnography (sleep laboratory)
- Treatment: CPAP at night
- May need awake intubation in sitting position

Hypoventilation of obesity

- Pickwickian syndrome
- Sustained hypoventilation during sleep
- Excessive hypersomnolance, morning headaches
- Maybe breathless at rest, unable to speak in full sentences, snore when awake
- Daytime hypoxia, raised Pa CO₂ (> 5.9 kPa) and polycythemia
- In up to 31% of hospitalised morbidly obese – increases with increased BMI

Leads to right heart failure and mortality
Perioperatively at risk of respiratory depression
Diagnosis: Absence of other causes
BMI > 30
Raised Pa CO$_2$
OSA in 85%

Treat with elective CPAP or NIV
Only cure is weight loss
Epworth score

Score of sleepiness

- More than 10 – sleepy
- More than 18 – very sleepy – seek advice

0 – never doze/sleep
1 – slight chance
2 – moderate chance
3 – high chance

1. Sitting and reading __
2. Watching TV __
3. Sitting inactive in public place __
4. Passenger in vehicle for hour or more __
5. Lying down in afternoon __
6. Sitting and talking to someone __
7. Sitting quietly after lunch (no alcohol) __
8. Stopped in traffic for few minutes while driving __
Airway

- Difficulty predicted by **male sex** and **neck circumference** (>17.5 inches)
- Associated with history of OSA
- Difficult intubation is 6.4-9% in non-obese population vs. 13-24% in obese
- Due to fat pad behind neck and increased fat in soft tissues of soft palate and pharynx
- Positioning important
- Desaturate extremely quickly after induction even with prolonged preoxygenation
- Need for awake fibreoptic intubation?

Ezri et al. Anaesthesia: (2003) **58**:1101-8
Diabetes – 67% of type II are overweight and 50% obese

- Metformin
- High doses of insulin
- Hypothyroid
- Up to 90% of patients still have gastric volume of > 25 ml with pH < 2.5 after fasting – risk of aspiration
- Hiatus hernia with reflux
Risk scoring

Obesity Mortality Score

- 1 point each for:
  - Male
  - Age above 45
  - Hypertension
  - BMI equal or greater than 50
  - Increased risk for thrombo-embolic disease

- Score:
  - 0-1 = lowest risk = mortality 0.2%
  - 2-3 = intermediate = mortality 1.1%
  - 4-5 = high risk = mortality 2.4%

Tests

- FBC, u+e, LFT and blood glucose
- ECG mandatory – rhythm abnormality and cor pulmonale – guide for further tests
- Blood gas if suspect OSA or hypoventilation – useful guide to weaning from ventilation
- Echo and CXR – assess cardiac function/cardiac failure
- Exercise – formal or walk/ stair climb
National Obesity Survey

- Prof Bellamy (Leeds) – presented at meeting of Society of Bariatric Anaesthetist (Chichester: September 2008)
- Carried out end of 2007 in UK
- Not published yet, but:
  - Routine tests: FBC, u+e, ECG: 100%
  - LFTs: 84%
  - TFTs: 45%
- Glucose: 90%
- Pulmonary function tests: 24%
- Routine specific tests - Blood gas: 10%
- Epworth score: 45%
- Echocardiogram: 10%
- Cardiopulmonary exercise test: none
Practical considerations

- TEAM WORK
- Transport
- Special equipment (including large gowns)
- Positioning
- Monitoring
- Venous access
- Intubation
- Thrombo-prophylaxis (size of TEDs)
Equipment
Positioning

“Ramping”
Practical considerations

- TEAM WORK
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- Monitoring
- Venous access
- Intubation
- Thrombo-prophylaxis
Waking up
PERI-OPERATIVE MANAGEMENT OF
THE MORBIDLY OBESE PATIENT

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www.aagbi.org
June 2007
Key Recommendations

1. All trained anaesthetists should be competent in management of MO
2. All patients should have their height and weight recorded
3. BMI is not ideal measure of risk - is most useful
4. Named anaesthetist and theatre staff member
5. Protocols and availability of specialist equipment
6. Manual handling courses
7. Preoperative assessment is mandatory
8. Communication!
Where next?

- Revision surgery
- Day surgery: ASA 1 and 2 and BMI< 50
- Bariatric patients in other surgical disciplines notably obstetrics and orthopaedic surgery
- Emergency surgery
- Paediatric- BMJ 25th of October
Acknowledgment

Thank you to Dr B. Prasad for the use of some of the photos
The future?