Tier 4 service – Future of Adolescent Bariatric Surgery

Mr Ashish Desai
Paediatric Bariatric Surgeon
King’s College Hospital, London
FUTURE
PRESENT
PAST
Can’t plan for the future if we don’t know the present
PRESENT:
- Types of surgeries
- Rationale for surgery
- King’s experience
- Current status

Future directions
EXCEPTIONAL CIRCUMSTANCES

- BMI of 40 (kg/m²) or more - OR
- BMI >35 + other significant disease
- All non-surgical measures have failed for at least 6 months
- Receiving intensive management in a specialist service
- Generally fit for anaesthesia and surgery
- Commitment to long-term follow-up
- Physiological and psychological maturity
Absolute Contraindications

- A medically correctable cause of obesity
- A medical, psychiatric or cognitive disability that impairs ability for adherence
- Current pregnancy or breastfeeding, including planned pregnancy within the first year after surgery
- Inability or unwillingness of the patient or parents to understand the procedure or consequences, esp. the need for long term supplementation
- Active substance abuse problem
Current Surgical Options for Adolescents

- Lap. Band
- Lap. Sleeve Gastrectomy

Roux-en-Y Gastric Bypass

- Esophagus
- Bypassed Portion of Stomach
- Proximal Pouch of Stomach
- “Short” Intestinal Roux Limb
- Duodenum
- Pylorus

Lap. Sleeve Gastrectomy
What procedure?

- **Gastric Band – Initial Chosen Procedure**
- **Sleeve Gastrectomy**
- **Roux en Y Bypass**
LAGB – Mechanism of action

- Upper small pouch size of “an orange”
- Slows the flow of food from upper to lower pouch
- Distended upper pouch → Stretch receptors

- Early and lasting satiety.
  - 1-2 pounds of weight loss per week
LAGB – Post op Follow up

• Expectation of 10 visits (each 10 - 15 minutes) during the first year
  - Balloon Adjustments - with or without fluoroscopy

• Expect Regular visits per year (2-3) for the rest of life

• Watch for signs of complications
  - Success is dependent on complying with visits
### LAGB – Results

<table>
<thead>
<tr>
<th>Study</th>
<th>n</th>
<th>Mean Age</th>
<th>Start BMI</th>
<th>Follow-up</th>
<th>Postop BMI</th>
<th>Δ BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>O’Brien 2010</td>
<td>25</td>
<td>16.5 y</td>
<td>45</td>
<td>24-mo</td>
<td>32.6</td>
<td>-28%</td>
</tr>
<tr>
<td>Nadler 2009</td>
<td>41</td>
<td>16.1 y</td>
<td>48</td>
<td>24-mo</td>
<td>35.8</td>
<td>-25%</td>
</tr>
</tbody>
</table>
Do Bands Work?

BMI Change

Pre op  13 months  21 months  24 months  27 months

- 148
- 140.4
- 138.3

18 F  17 F  17 M
Psychometrics

Beck Anxiety inventory

Quality of life (IWQOL)

Minor complications – Nausea
## Bands v/s Lifestyle changes

- **Age, Gender, Ethnicity matched Controls**

<table>
<thead>
<tr>
<th></th>
<th>A (n=2)</th>
<th>AC (n=3)</th>
<th>B</th>
<th>BC (n=5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight change @ 1 yr (Kg)</td>
<td><strong>-22.25 (9.2 - 35.3)</strong></td>
<td><strong>+ 3.55 (17.8 to -16.4)</strong></td>
<td><strong>-8</strong></td>
<td><strong>+3.22 (-0.2 to 13)</strong></td>
</tr>
<tr>
<td>BMI change @ 1 yr (kg/m²)</td>
<td><strong>- 7.3 (3.4 - 11.2)</strong></td>
<td><strong>+1.06 ( -5.5 to 7.6)</strong></td>
<td><strong>-2.7</strong></td>
<td><strong>+0.6 (-1.6 to 4)</strong></td>
</tr>
</tbody>
</table>
Bypass & Sleeve

Roux-en-Y Gastric Bypass

- Esophagus
- Bypassed Portion of Stomach
- Proximal Pouch of Stomach
- "Short" Intestinal Roux Limb
- Pylorus
- Duodenum

Gastric "Sleeve"

- Pylorus
- Excised Stomach
Sleeve Gastrectomy
Sleeve v/s Band

**ADVANTAGES OVER BANDS**

- Wt loss rapid (similar to bypass)
- NO compliance with adjustment issues
- NO device complications

**DISADVANTAGES**

- Potential leaks (less than Bypass)
- Not reversible
- Long term results pending
Sleeve v/s Bypass

- No anastomosis
- No mesenteric defect
- Low risk of peptic ulcer
- G.I. tract accessible to endoscopy
- Vitamin and mineral absorption not altered
- Ability to convert procedure to two other operations

DISADVANTAGES

- GORD
- Not reversible
## Data on Sleeve in children

<table>
<thead>
<tr>
<th>Study</th>
<th>n</th>
<th>Mean Age</th>
<th>Start BMI</th>
<th>Follow-up</th>
<th>Postop BMI</th>
<th>∆ BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inge 2015</td>
<td>67</td>
<td>17 +/- 1.7</td>
<td>50</td>
<td>3 years</td>
<td>37</td>
<td>-26%</td>
</tr>
<tr>
<td>Al-Qahtani 2012</td>
<td>108</td>
<td>13.9 y</td>
<td>49.6</td>
<td>12-mo</td>
<td>32.4</td>
<td>-35%</td>
</tr>
<tr>
<td>Boza 2012</td>
<td>51</td>
<td>18 y</td>
<td>38.5</td>
<td>12-mo</td>
<td>25.2</td>
<td>-35%</td>
</tr>
<tr>
<td>Boza 2012 (40)</td>
<td>51</td>
<td>18 y</td>
<td>38.5</td>
<td>24-mo</td>
<td>26.3</td>
<td>-32%</td>
</tr>
<tr>
<td>Boza 2012 (34)</td>
<td>51</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1\textsuperscript{st} Sleeve

- Type 3 Osteogenic imperfecta
- Wheelchair bound
- Approx 100 fractures
Post Operative

**BMI on 1st visit – 44 – 44 Kg**

- **Vit D**  
  - 13 to 53

- **Hepatic changes**  
  - Fatty changes resolved on biopsy within 1 year

- **Mobility**
How are you doing?
Roux-en-Y Gastric Bypass
Teen LABS – Complications – 30 days

No deaths reported 30 days post-surgery
Mechanism of Action

- Restrictive - Band, Sleeve
- Malabsorptive – Bilio Pancreatic Bypass
- Combined – Bypass
Gut Hormones & Appetite Control

Stimulators:
- Ghrelin – Stomach – Increased expression of NPY (Neuropeptide Y)
- CCK

Suppressors
- Leptin
- Peptide YY (Distal GIT)
- Glucagon like Peptide 1 (GLP – 1)
Metabolic Surgery?

Improves Glucose Homeostasis

Smaller meals

Fat Mass

Preservation of lean mass

Lipid response to a meal

Improves Glucose Homeostasis
Post Bariatric Surgery Changes

• RYGB – Increased PYY, GLP-1,
  – Early & Exaggerated Insulin Response

• Change In Brain Signaling To Food Stimulus

- P campos Sala et al., Diabetology & Metabolic Surgery 2014
Mechanism of Action

**Previous Thinking**
- Restrictive
- Malabsorptive
- Combined

**Changing Concept**
- Change in Brain Signaling
- Change in Hormonal Response
Surgery is risky

What about Obesity?
Mortality Risk of Teen Obesity

- Long term morbidity & mortality of Overweight Adolescents
- Harward – 1922 – 1935
- 1988 – Reviewed
- Increased mortality risk in Men. Hazard ratio 1.8
  - Must et al 1992
• 227,000 Norwegian Adolescents
  – 1963-75

  – Follow Up – 9650 Deaths

  – Relative Risk From Endocrine, Metabolic Causes
    ▪ Ischaemic Heart – 2.9 (M) And 3.7 (F)
    ▪ Respiratory, Sudden unexplained deaths = 2
### Comorbidities

<table>
<thead>
<tr>
<th>Comorbidities</th>
<th>No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dyslipidaemia</td>
<td>180 (74.4)</td>
</tr>
<tr>
<td>Sleep Apnea</td>
<td>137 (56.6)</td>
</tr>
<tr>
<td>Joint pain</td>
<td>110 (45.6)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>109 (45.0)</td>
</tr>
<tr>
<td>Back pain</td>
<td>109 (45.2)</td>
</tr>
<tr>
<td>Fatty liver disease</td>
<td>89/224 (36.9)</td>
</tr>
<tr>
<td>PCOS Females</td>
<td>38 (20.9)</td>
</tr>
<tr>
<td>Chronic Kidney disease</td>
<td>43 (19.2)</td>
</tr>
<tr>
<td>Diabetes Mellitus</td>
<td>33 (13.6)</td>
</tr>
<tr>
<td>Blout Disease</td>
<td>9 (3.7)</td>
</tr>
<tr>
<td>Psuedotumor Cerebri</td>
<td>6 (2.5)</td>
</tr>
</tbody>
</table>
CV risks

![Graph showing CV risks with BMI categories and conditions]

- Elevated Blood Pressure
- Impaired Fasting Glucose Level

Categories:
- BMI < 50
- BMI ≥ 50-<60
- BMI ≥ 60
## Incidence of comorbidities

<table>
<thead>
<tr>
<th></th>
<th>BMI &gt; 40</th>
<th>35 – 40</th>
<th>&lt; 35</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over all (%)</td>
<td>93</td>
<td>100</td>
<td>77</td>
</tr>
<tr>
<td>Hypertension</td>
<td>64</td>
<td>53</td>
<td>41</td>
</tr>
<tr>
<td>Insulin resistance</td>
<td>91</td>
<td>86</td>
<td>65</td>
</tr>
<tr>
<td>Vit D deficiency</td>
<td>55</td>
<td>27</td>
<td>22</td>
</tr>
<tr>
<td>Fatty Liver on US</td>
<td>59</td>
<td>33</td>
<td>60</td>
</tr>
</tbody>
</table>

*King’s College Data - Unpublished*
Does Surgery Help?
## Remission of Comorbidity

<table>
<thead>
<tr>
<th>Condition</th>
<th>Counts</th>
<th>Modeled Remission</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n / N</td>
<td>% (95% CI)</td>
</tr>
<tr>
<td>Type 2 Diabetes</td>
<td>19 / 20</td>
<td>90% (65-98)</td>
</tr>
<tr>
<td>Pre-Diabetes</td>
<td>13 / 17</td>
<td>77% (48-92)</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>84 / 128</td>
<td>66% (56-74)</td>
</tr>
<tr>
<td>Elevated Blood Pressure</td>
<td>56 / 76</td>
<td>73% (60-83)</td>
</tr>
<tr>
<td>Abnormal Kidney Function</td>
<td>19 / 22</td>
<td>86% (63-90)</td>
</tr>
</tbody>
</table>

## Comorbidity resolution

### 108 pediatric patients

<table>
<thead>
<tr>
<th>Condition</th>
<th>No available</th>
<th>Resolved, no (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSAS</td>
<td>22</td>
<td>20 (90.9)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>16</td>
<td>15 (93.8)</td>
</tr>
<tr>
<td>Pre-hypertension</td>
<td>18</td>
<td>15 (83.3)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>36</td>
<td>27 (75.0)</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>30</td>
<td>21 (70.0)</td>
</tr>
</tbody>
</table>

# Systematic Review and Meta-Analysis of Bariatric Surgery for Pediatric Obesity

*Jonathan R. Treadwell, PhD, Fang Sun, MD, PhD, and Karen Schoelles, MD, SM*

<table>
<thead>
<tr>
<th>18 Studies (163 citations)</th>
<th>Nutrition-Related Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Age 16.8 years (9 - 21)</td>
<td></td>
</tr>
<tr>
<td>8 LAGB (352 pts.) Mean BMI 45.8</td>
<td>• Protein-calorie malnutrition</td>
</tr>
<tr>
<td>6 RYGB (131 pts.) Mean BMI 51.8)</td>
<td>• Mirco-nutrient deficiency</td>
</tr>
<tr>
<td>5 “Other” (158 pts.) Mean BMI 48.8</td>
<td>• Peripheral neuropathy</td>
</tr>
<tr>
<td></td>
<td>• Beriberi</td>
</tr>
<tr>
<td></td>
<td>• Severe malnutrition</td>
</tr>
<tr>
<td></td>
<td>• Hair loss</td>
</tr>
<tr>
<td></td>
<td>• Iron deficiency</td>
</tr>
<tr>
<td></td>
<td>• Hypoglycemia</td>
</tr>
<tr>
<td></td>
<td>• Dumping Syndrome</td>
</tr>
</tbody>
</table>
Current status
Obesity Related Admissions in England

JD Jones Neilson et al. PLOS one
June 2013
UK Experience

- 6 Patients < 16
- Average BMI – 62.7 kg/m$^2$
- At least 3 Comorbidities

Arch Dis Child 2014
What is happening

- Increasing awareness

- NHS Commissioning Clinical reference Group for Morbid Obesity (Children)
  - Set Standards for services & Follow up
  - Standard for assessment
  - Selection of patients
Future

- Prevention
- Increasing acceptance of surgery
- Larger multi centric studies in UK
- Newer treatment modalities – Endobarrier / Balloons / Medical management
Newer techniques in children

Figure demonstrating concept of the Endobarrier:

**ANCHOR** attaches to duodenum

**LINER** extends 60cm along duodenum and jejunum

**FOOD** passing through endobarrier without touching intestinal wall
Intra gastric balloons
Future drugs?

- Combinations
- Phentermine – Appetite suppressant +
- Topiramate – Anticonvulsant with Effect
- Bupropion – Antidepressant +
- Naltrexone – Opioid antagonist
- GLP – 1 analogues
...I understand

...and we'll get there...together.