RECOMMENDATIONS FOR BARIATRIC SURGERY IN ADOLESCENTS IN AUSTRALIA AND NEW ZEALAND

A position paper from the Australian and New Zealand Association of Paediatric Surgeons, the Obesity Surgery Society of Australia and New Zealand and the Paediatrics & Child Health Division of The Royal Australasian College of Physicians

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1. Introduction

The increasing prevalence of both obesity and obesity-associated complications in adolescents highlights the importance of primary prevention, as well as, effective treatment strategies. For those adolescents who are affected by obesity, the mainstay of treatment involves long-term behaviour change, dietary modification, increased physical activity, decreased sedentary behaviour and support for whole-of-family lifestyle change. As with any chronic disease, there is a spectrum of severity with obesity. For those who have moderate to severe obesity, treatment by a coordinated, multidisciplinary team offers the greatest likelihood of successful outcomes. Such treatment may involve the assessment and management of associated co-morbidities and, for adolescents, the use of pharmacotherapy.

Notwithstanding these interventions, a small proportion of severely obese adolescents will require additional treatment. It is in this situation that consideration should be given to bariatric surgery, within the context of an ongoing and coordinated multidisciplinary approach.

While there are rising numbers of reports of bariatric surgery in adolescents, there are as yet no Australian or New Zealand recommendations available to guide decisions as to which adolescents should receive such surgery and how they should best be managed. This is the reason for the development of this position paper on bariatric surgery in adolescents by representatives from the Australian and New Zealand Association of Paediatric Surgeons, the Obesity Surgery Society of Australia and New Zealand, and the Paediatrics & Child Health Division of The Royal Australasian College of Physicians.

2. Recommendations

Surgical treatment

Patient criteria for selection for bariatric surgery

Patients for bariatric surgery should meet all of the following criteria:

- Age. The majority of the Working Party was of the view that the minimum age should be 15 years, although surgery may be considered in exceptional circumstances at age 14 years
- Attainment of Tanner stage 4 or 5 pubertal development
- Attainment of final or near-final adult height (i.e. bone age ≥13.5 in females and ≥15.5 in males)
- Severe obesity. The recommended threshold for bariatric surgical intervention is a body mass index (BMI) >40 kg/m^2, although it should be considered in adolescents with a BMI >35 kg/m^2 in the presence of severe obesity-associated complications
- The presence of an associated severe co-morbidity, such as type 2 diabetes, hypertension, non-alcoholic steatohepatitis, benign intracranial hypertension or obstructive sleep apnoea
- Persistence of the level of obesity despite involvement in a formal multidisciplinary and supervised program of lifestyle modification and pharmacotherapy. The majority of the Working Party was of the view that a minimum 6 months of supervised multidisciplinary therapy should be provided prior to bariatric surgery being performed
- The adolescent and family understand, and are motivated to participate in, the on-going treatment, lifestyle change and review following surgery
- The adolescent is able to provide informed consent for the surgery (see below).

We recommend against bariatric surgery for:

- Adolescents under the age of 14 years
- Pregnant or breast-feeding adolescents
- Patients with significant cognitive disabilities
- Patients with an untreated or untreatable psychiatric or psychological disorder
- Patients with Prader-Willi syndrome and other similar hyperphagic conditions.

Informed consent

The adolescent should give written informed consent to the procedure. The capacity to give consent should be assessed by a consulting child and adolescent psychiatrist or adolescent physician who ideally would be part of the multidisciplinary weight management team. In addition, consent for surgery would involve:

- Full consent from the parent or legal guardian
- Complete understanding of treatment options, treatment outcomes, [the expected outcome], and the short and long term complications of the procedure and subsequent management
- Knowledge of post-operative management and monitoring.

Surgical expertise and facilities

If surgery is proposed, then referral should be to an experienced bariatric surgeon. The surgeon would be affiliated with a team experienced in the assessment and long-term follow-up of the metabolic and psychosocial needs of the adolescent bariatric patient and family. The institution where the surgery is to be undertaken should be either participating in a study of the outcomes of bariatric surgery, or sharing such data in a proposed national registry of bariatric surgery and patient outcomes.

In practice, surgeons performing bariatric surgery on adolescents should be credentialed for bariatric surgery. This is important due to the higher rates of complications in adolescents undergoing bariatric surgery. Such surgeons should ideally have experience in the management of patients in the adolescent age group.

Given the increasing prevalence of obesity and related co-morbidities in adolescents and adults, and the potentially large financial pressures that the resultant burden of disease will place upon not just the health system but the economy as a whole, it is strongly recommended that publicly funded bariatric surgery be made available to those in need.

Pre-operative assessment

Pre-operative assessment of the patient and family may involve the following:

- Assessment of the adolescent's general health and developmental status
- Evaluation of the patient and family's motivation, expectations, and adherence

- Evaluation of the patient and family's knowledge of the procedure and postoperative requirements
- Evaluation of the patient and family's capacity for self care
- Independent psychological or psychiatric evaluation confirming the stability and competence of the family unit
- Evaluation of obesity-related co-morbidities.

Ideally, such assessment should be undertaken by a multidisciplinary team of health professionals including an accredited practising dietitian.

Pre-operative education

The patient and family should receive education about the following:

- The procedure and postoperative requirements, including the need for ongoing dietary modification and supervision
- Outcomes of surgery, and possible problems/complications
- Consequences of not undergoing treatment.

Type of surgical procedure

The majority of the Working Party was of the view that the primary bariatric surgical procedure of choice for adolescents in Australia and New Zealand is laparoscopic adjustable gastric banding as it has good weight based outcomes, has a low complication rate and is potentially reversible.

Anaesthetic considerations

All patients should be managed by an anaesthetist experienced with bariatric surgery. Patients should receive a careful pre-operative anaesthetic assessment and be informed about potential anaesthetic complications.

Post-operative management

Patients should be managed in the immediate post-operative period by a surgeon and bariatric surgical team with experience in adolescent care. Availability of a high dependency unit or intensive care unit may be required, particularly where complications such as sleep apnoea are present.

Follow-up

Although all bariatric patients require regular follow-up, especially early post procedure, adolescent patients are likely to require more frequent follow-up than is needed for adult patients. Follow-up of the adolescent patient should be on a 4–6 weekly basis. Early post-surgery involvement of the multi-disciplinary team is important for ongoing patient engagement in the treatment plan. Follow-up needs to be done by a team skilled both in gastric band management and the recognition of its complications, as well as those experienced in adolescent health. Importantly, issues such as improved fertility following weight loss, and hence the need for contraception, need to be considered.

The long term follow-up for any intervention in paediatrics, including bariatric surgery, needs to extend beyond 10 years, and ideally for the whole of life. In addition, appropriate after-care and long-term follow-up are critical for bariatric surgery outcome success.

Patients require long-term support for behavioural change in relation to nutrition and eating behaviours, physical activity and sedentary behaviour. Follow-up should be by a multi-disciplinary team which includes an experienced dietitian and psychologist.

Appropriate transition from adolescent services to adult services for on-going follow-up should be anticipated and effectively managed.

Guidelines for the thorough recording and collection of a range of physiological and behavioural parameters for audit and research purposes should be developed, including agreement as to prescribed times for data collection (e.g. 3, 6 and 12 months, and thereafter annually). A national database for outcome and long term monitoring of bariatric surgery in adolescents should be established and funded.

Given the poor level of evidence on long term outcomes, it is recommended that all adolescents undergoing bariatric surgery in New Zealand and Australia are enrolled in a properly designed clinical trial. Funding for the trial should come through the funding service (District Health Boards, States etc) with liaison with the Health Research Council of New Zealand and its Australian counterpart the National Health and Medical Research Council. An existing model

such as that used in childhood cancer, which has had considerable success in the identification of successful treatment programmes, could be adopted for use in bariatric surgery. For example, the comparative group could initially be adolescents undergoing non-surgical treatment, but over time alternative comparative groups including different surgical techniques could be incorporated.

3. The problem of obesity and its consequences

Adult obesity

The prevalence of obesity in both adult and paediatric populations has shown a steady increase over the past decades. Globally, World Health Organization (WHO) projections indicate that, by 2015, 2.3 billion adults will be overweight and 700 million will be obese[1]. In Australia, the 2008 Access Economics Report showed a prevalence of 23.5% for obesity in the adult Australian population and predicted that there will be 7.5 million obese Australians by 2028[2]. In four population-based surveys undertaken in Auckland, New Zealand, the prevalence of combined overweight and obesity in adult males has increased from 52.8% in 1982 to 70.9% in 2002/3[3].

The economic impact of overweight and obesity on the Australian economy is estimated to be in excess of $56 billion. Colagiuri et al have estimated the total annual direct cost of overweight and obesity in Australia to be $21 billion in 2005[2]. The direct cost of obesity was estimated at $14.5 billion, while the direct cost of overweight was estimated at $6.5 billion. An additional $35.6 billion in government subsidies was received by overweight and obese individuals. These costs do not include the cost of obesity and overweight in human terms such as the cost of lost wellbeing.

Adolescent obesity

The prevalence of overweight and obesity in adolescents in the developed world is also increasing. Within Europe, it is estimated that 38% of children and adolescents will be overweight by 2010, the number of overweight and obese children increasing by approximately 1.3 million per year[4, 5]. In the USA, data from the 2003–2006 National Health and Nutrition Examination Surveys showed that 16.3% of children and adolescents were obese[6]. In Australia, the 2004 New South Wales Schools Physical Activity and Nutrition Survey found that 25% of school-aged boys and 23.3% of school-aged girls were overweight or obese[7]. In 2002 in New Zealand, 31% of school-aged children and adolescents were overweight or obese[8].

The complications of obesity in adolescents are multiple and affect both physical and psychosocial wellbeing. Obesity in particular can lead to cardiovascular, renal, gastrointestinal, respiratory, musculoskeletal, endocrine and neurological complications[9, 10] some of which may ultimately be life threatening. Depression, social isolation and poor self-esteem are just some of the psychosocial problems associated with obesity that may undermine the chances of a quality and productive life[9, 10].

Both treatment and prevention solutions of obesity are needed

In order to address the problem of obesity there is a need for a comprehensive approach - one that encompasses both prevention and treatment. The WHO in its report on obesity in the Pacific called for a three pronged approach which creates supportive environments, promotes positive behaviours and mounts a clinical response[11]. Similar objectives are outlined by the Australian National Chronic Disease Strategy which has a theme of "strengthening the activity across the continuum of chronic disease prevention and care"[12]. This current report focuses upon aspects of clinical care of adolescents affected by obesity, but acknowledges the vital importance of prevention approaches in tackling the obesity epidemic.

4. Access to treatment services for adolescent obesity

Principles of treatment of adult obesity

Obesity is a chronic disease and its treatment should be provided over the long term. Treatment typically requires an initial intensive treatment phase (weeks to months) and then continuing follow-up and treatment (years). Without persisting life-style changes, there is a natural tendency for weight regain over years, and hence further intervention and treatment should be introduced when this occurs[12, 13].

All obesity treatment programs involve support for lifestyle change, focussing upon aspects of diet, physical activity, psychology and behaviour. Pharmacotherapy is usually considered in adults with a body mass index (BMI) over 30 kg/m^2, or in those with failure to lose weight on conventional lifestyle change programs. The management of obesity-associated co-morbidities must be part of any treatment program. For adults with more severe obesity (BMI >40 kg/m^2, or BMI >35 kg/m^2 with significant co-morbidities), bariatric surgery should be considered[12, 13]. Obesity related co-morbidities are often addressed by bariatric surgery.

Principles of treatment of adolescent obesity

The broad principles of the conventional treatment of adolescent obesity include family involvement, a developmentally appropriate approach, long-term behaviour modification, dietary change leading to a reduced energy intake, increased physical activity and decreased sedentary behaviour[9, 14, 15]. The 2009 Cochrane Review of the treatment of child and adolescent obesity concluded that combined behavioural lifestyle interventions can produce a significant and clinically meaningful reduction in overweight in children and adolescents when compared to standard care or self-help[14]. Pharmacotherapy studies were also included in the Review and the authors concluded that consideration should be given to the use of either orlistat or sibutramine, as an adjunct to lifestyle interventions in the treatment of more severe obesity in adolescents, although such an approach needs to be weighed up against the potential for adverse events[14]. The role of bariatric surgery in the treatment of adolescent obesity is considered further below.

Availability of treatment services for adolescents in Australia & New Zealand

A recently published audit of tertiary care paediatric obesity services in Australia showed that only three states had any form of multidisciplinary tertiary level weight management services[16] and that they were generally poorly resourced and had long waiting lists. In an analysis of an on-going,

large-scale audit of general practice in Australia, the BEACH Survey, a high prevalence of overweight or obesity (29.6%) was seen in 2-17 year olds presenting to their general practitioner (GP)[17]. However, only 1.7% of these overweight or obese patients were managed for this specific problem.

Overall there are few tertiary level services for obese adolescents in Australia, and, anecdotally at least, in New Zealand. In Australia such patients and families are unlikely to be offered treatment when seen in primary care. As yet, neither country has a coordinated model of care for the treatment of child and adolescent obesity.

5. Bariatric surgery in adults

Overview

As noted above, obesity in adults, adolescents and children has increased dramatically in recent decades. Where conventional therapies have not achieved the desired outcomes attention has increasingly turned toward bariatric surgical alternatives, with a seventeen-fold increase in procedures from 10,000 in the USA in 1995 to approximately 170,000 in 2005[18]. In Australia the use of laparoscopic gastric banding has increased from a little over 1000 procedures per annum in 1998 to over 13,500 procedures performed in 2008[19].

Types of bariatric surgery

The three most common procedures undertaken are laparoscopic adjustable gastric banding [LAGB], Roux-en-Y gastric bypass [RYGB], and biliopancreatic diversion with duodenal switch [BPD/DS][18, 21]. More recently, gastric sleeve resection has been used, although as yet the medium and long-term results are unknown.

The popularity of LAGB is based on its relative simplicity for both patient and surgeon. It is the only procedure that is adjustable (e.g. in pregnancy) and reversible. An adjustable, inflatable silicone band is placed around the very upper portion of the stomach just below the gastro-oesophageal junction. The band is connected to a subcutaneous port providing access for size adjustments using saline injections. Regular adjustments are required. LAGB involves no removal or stapling of organs. Bowel handling is minimal. However, unlike RYGB, food passes via the distal stomach into the bowel. It is theorised that LAGB improves weight control through the neuro-humoural control of appetite and satiety. Compliance with prescribed eating habits is of importance after LAGB. Complications tend to result from technical problems with the band (e.g. slippage, erosion). LAGB is the most commonly performed bariatric procedure in Australia[19].

In the RYGB procedure a small (5-30ml) gastric pouch based on the lesser curve of the stomach is formed and then anastomosed to a Roux Y limb of jejunum. Originally thought to only limit intake and decrease transit time for the food into the jejunum, it is now known to alter gastrointestinal physiology, satiety, and metabolic processes. Complications vary depending on the surgical approach. Anastomotic leaks, stenosis, stomal ulceration, internal hernia and bowel obstruction can occur, together with a range of nutritional complications including iron, vitamin B12 and calcium

deficiencies[20]. Wound infections and incisional hernias are more commonly seen after open surgery[21 , 22 , 23].

The BPD/DS is primarily a malabsorptive procedure but has a modest restrictive component. A sleeve gastrectomy is performed, the first part of the duodenum is divided, the distal end closed, and the proximal end is anastomosed to a long Roux loop of jejunum and is then anastomosed some 50-100cm proximal to the ileo-caecal valve. The operation leads to major protein-calorie malabsorption, which can lead to protein-calorie malnutrition and micronutrient deficiencies. Life-long follow-up is of crucial importance to prevent major metabolic and nutritional problems. Peri-operative complications include anastomotic leaks, bowel obstruction, wound infections and incisional hernias. As with the RYGB the specific complications vary with the manner in which the operation is performed (i.e. laparoscopic or open)[21 , 24].

Open versus laparoscopic bariatric surgery

LAGB is now virtually exclusively performed laparoscopically. There has also been a shift toward laparoscopic RYGB and BPD/DS. Approximately 75% of bariatric surgery procedures in the USA in 2005 were performed laparoscopically[25]. Compared with open procedures the laparoscopic approach is associated with a shorter hospital stay, fewer wound problems, less post-operative pain, and shorter recovery time[25 , 26].

Improved weight profile and co-morbidities after bariatric surgery

There is very good evidence from both meta-analyses and systematic reviews that bariatric surgery in selected adults with morbid obesity has good efficacy in terms of medium and long-term weight loss and improvement or resolution of many co-morbidities[18 , 21 - 24, 26]. It is estimated that 75% to 90% of morbidly obese patients have resolution of their medical co-morbidities[27]. Weight loss in a large [n=4047, mean BMI 41] non-randomised Swedish study comparing bariatric surgery with conventional therapy at 10 years demonstrated weight loss of 16.1 % in the surgical patients compared to a 1.6% gain in the non-surgical patients[28].

Improved survival after bariatric surgery

Bariatric surgery has been shown to reduce mortality in comparison to non-surgical weight management interventions in adult populations. There is limited published control data on risk of mortality[29]; however a large [n=11,903] epidemiological study [open - 67%, laparoscopic - 28.5%]

showed a survival advantage over non-surgical patients was apparent within 6 to 11 months[29]. The mortality rate at 2 years post procedure in those under 65 years was 4.5 % for the operative group and 8.6% for the non-operative cohort [P<0.001]. For those > 65 yrs it was 8.0% in the operative group and 12.2% in the non-operative cohort [P<0.001][29]. In the long-term prospective controlled Swedish Obese Subjects study, in which one-half of the 4047 obese adults received bariatric surgery and the remainder received conventional weight loss therapy, there was a statistically significant reduction in mortality at a mean of 10.9 years follow-up, favouring the surgical group (Hazard Ratio adjusted for sex, age and risk factors 0.71 [p=0.01])[30]. Adams et al in a retrospective cohort study (gastric bypass n=7925 v control n=7925 – age, sex and BMI matched, mean follow-up 7.1yrs) found statistically significant reductions in long-term death rates for diabetes, heart disease and cancer in the gastric bypass group. The death rates in this group for other causes were higher than the controls but the differences were not statistically significant[31]. A number of other studies[32 , 33] have shown statistically significant survival advantage for patients receiving surgical intervention for obesity when compared to age, sex and BMI matched control groups.

A study of data from an Italian national registry of 13,871 morbidly obese adults who underwent bariatric surgery between 1996 and 2006[34] demonstrated that the type of procedure significantly influenced mortality risk. The risk ranged from 0.1% [96.8% laparoscopic] for adjustable gastric banding to 0.8% [14% laparoscopic] for biliopancreatic diversions. Furthermore, a 2002 systematic review of LAGB undertaken by the Australian Safety and Efficacy Register of New Interventional Procedures-Surgical[35] found "no evidence to suggest that LAGB is more fatal in the short term that its comparator surgical procedures".

Guidelines on the use of bariatric surgery in adults

The 1992 US National Institutes of Health guidelines indicate bariatric surgery as an effective treatment for morbid obesity and appropriate for adults with a BMI ≥ 40 kg/m^2, or with a BMI ≥ 35 kg/m^2 and a significant co-morbidity where weight loss has not been achieved by non-surgical means[36]. Safer and more reliable surgical management has seen a relaxation of the criteria. Many surgeons would now offer bariatric surgery to individuals in the BMI range 30-35, particularly when co-morbidities such as diabetes exist.

6. Bariatric surgery in adolescents

Overview

The impetus to consider bariatric surgery in adolescents has been fostered by increasing levels of adolescent obesity, the search for more successful therapies, the success of laparoscopic procedures in morbidly obese adults and a desire to overcome the obesity-associated co-morbidities[26 - 29 , 37 , 38 , 39].

Evidence for effectiveness of bariatric surgery

The first and only systematic review of bariatric surgery for adolescent obesity was published in 2008[40]. It incorporated studies from the English language literature that reported outcome data for a minimum of three subjects under the age of 21 years, representing ≥ 50% of paediatric subjects enrolled at the centre, who had outcome data at 12 months [or longer] including weight and BMI. Nineteen papers were included, including eight studies of LAGB on 352 patients [mean BMI 45.8], six studies of Roux-en-Y gastric bypass [RYGB] on 131 patients [mean BMI 51.8] and five other studies of other surgical procedures on 158 patients [mean BMI 48.8]. The average age of the patients studied was 16.8 years with a range of 9 to 21 years.

Laparoscopic adjustable gastric banding [LAGB] results

A total of eight studies have reported results for adolescents for bariatric surgery. The mean age of the subjects included ranged from 15.6 years to 18 years, with an overall range of 9-20 years. The studies are summarised in Table 1.

Of the eight studies, outcome variables were reported in twelve papers[41 , 42 , 43 , 44 , 45 , 46 ,47 , 48 , 49 , 50 , 51 , 52]. Two studies did not meet preset outcome data for reduction in BMI. The remaining six studies reported BMI data for a period of 1-3 years and suggested a 95% confidence interval for weight loss during this period following LAGB of -13.7 to -10.6 BMI units. This compares favourably with the average loss over the same time-period with non-surgical intervention programs[2].

Four of the eight studies reported co-morbidity outcome data with a follow-up period of 1.3 to 2.9 years. Two studies for diabetes found a resolution rate of 100% [7/7 subjects][43] and 80% [4/5 subjects][46]. Hypertension was assessed in three studies with resolution rates of 50% [6/12][43], 100% [6/6][45] and 100% [3/3][46].

The complications of LAGB were reported in all eight studies. No in-hospital or post-operative deaths were reported[40]. Re-operations were performed in 8% of subjects [28/352] most commonly for band slippage. Eight subjects suffered iron deficiency and five from hair loss. No studies reported on growth or development following surgery[40]. These complication rates are from published historical data; with subsequent improvements in devices and surgical techniques, complication rates may have improved.

In essence, the mildly decreased overall effectiveness of LAGB is offset by the lower morbidity and mortality rates of LAGB compared to other procedures. A systematic review found LAGB has been associated with a mortality rate of 0.05% compared to 0.5% for RYGB[35]. Prolapse and band slippage rates are quoted as 4.4-5.8% and erosion at 0.4%[53 , 54]. Problems with tubing breaks have decreased. Overall, revisional surgery for LAGB takes place in up to 10% of cases[55] but the majority of these surgeries can be performed laparoscopically, unlike initially open procedures. Moreover, given the concerns of possible long term physiologic surgical sequelae, particularly with diversionary procedures, the fact that the band can be removed is appealing for the adolescent population and suggests that LAGB should be considered the treatment of choice in adolescent patients.

Roux-en-Y gastric bypass results

Four suitable studies were identified from the meta-analysis[56 , 57 , 58 , 59 , 60 , 61 , 62 , 63 , 64 , 65 , 66]. Substantial weight loss was achieved with the 95% confidence interval of the random-effects summary statistic ranging from -17.8 to -22.3 BMI units. Resolution of co-morbidities ranged from 50% to 100% for hypertension[56 , 64 , 65]. Two studies reported resolution of obstructive sleep apnoea at 100% for six and ten subjects[57 , 65]. There were no early deaths, but four deaths were reported (9 months - 6 years) after surgery[58 – 60 , 63 , 64]. The most frequently reported complications relate to protein-calorie malnutrition and micro-nutrient deficiency[22]; these should be able to be avoided with appropriate preventive nutritional counselling and supplementation. Rare complications included shock, pulmonary embolism, and severe malnutrition[40].

Conclusions of the meta-analysis[40]

The strength of evidence for the efficacy of LAGB and RYGB to reduce BMI at 1 year is rated as moderate and weak at the longest follow-up. Both LAGB and RYGB compare very favourably to non-surgical interventions in morbidly obese adolescents. It is important to note, however, that, to date, no randomised controlled trial or controlled clinical trial has yet been published on adolescent

bariatric surgery. The Working Group is aware that two randomised controlled trials are underway in Melbourne and the USA, although at the time of writing results are yet to be published.*

The three central issues for considering bariatric surgery in adolescent patients relate to (1) informed consent, (2) interference with physical growth and maturation, and (3) compliance with post-surgical diets. There remains little data about long term co-morbidities, quality of life assessments and potentially improved survival.

Existing guidelines for bariatric surgery in adults and young people

For adults, the US standard recommendations for bariatric surgery include patients with a BMI ≥40 kg/m^2 or BMI ≥35 kg/m^2 with one or more medical co-morbidities[67, 68, 69]. More stringent criteria for the adolescent population have been suggested with a BMI ≥50 kg/m^2 or BMI ≥40 kg/m^2 with one or more medical co-morbidities[70, 71, 72, 73]. Such recommendations have arisen in an environment in the USA where RYGB is a much more commonly available form of surgery and LAGB is essentially "off-label" for adolescents. Other authors have suggested that the same criteria in adults should be applied to paediatric patients[74, 75, 76]. The over-riding concerns, as suggested by Inge, are to consider the adolescent's attainment of physical maturity, decisional capacity and the presence of a supportive family environment[77].

Consideration of Binge Eating Disorder

Binge Eating Disorder is a relatively common problem associated with obesity in adolescents. It is found in approximately 15% of obese adolescents. Adolescents diagnosed with binge eating disorder commonly have other co-morbidities such as depression and dissatisfaction with their body image that is associated with their obesity. Given the incidence of this disorder it needs to be considered when assessing obese adolescents. Binge Eating Disorder is not a contraindication to either RYGB or LAGB surgery but to ensure acceptable outcomes a concurrent (surgical and psychological intervention) rather than a sequential treatment approach should be adopted. These patients must be flagged to ensure that they receive appropriate post-operative psychological

* Since preparation of the report, the Melbourne study has been published [78]. This was a randomised controlled trial of 50 adolescents aged 14 to 18 years with a BMI >35 kg/m^2 who were randomly assigned to receive either laparoscopic adjustable banding or a supervised lifestyle intervention. At follow-up 2 years from baseline, 84% of the surgical group and 12% in the lifestyle group lost more than 50% excess weight (mean BMI reduction of 12.7 units in the surgical group versus 1.3 units in the lifestyle group). There were more significant improvements in cardiometabolic status and quality of life measures in the surgical group, but 8 operations (33%) were required in 7 patients for revisional procedures.

support. There is no difference in weight loss in this group of patients compared to those without the disorder and similar outcomes are achieved with either RYGB or the LAGB.

7. Assessing the ability to give informed consent for surgery - Gillick competence

The traditional position with respect to consent is that adolescents do not have the capacity to consent to treatments or surgery until 18 years of age. It is recognised that decisional capacity does not follow chronological age but most agree that children aged ≤ 13 yrs do not have the capacity to consent to serious interventions. It is also recognised that there is limited capacity between ages 13 – 16 yrs. This capacity varies with individuals. Responsibility to determine capacity will fall on health professionals and caregivers. Specific legislation regarding the capacity of children to consent to medical procedures exists in New South Wales (14 years of age), South Australia (16 years of age) and New Zealand (16 years of age).

The legal position with respect to a "mature minor" is that "*A minor is capable of giving informed consent when he or she "achieves a sufficient understanding and intelligence to enable him or her to understand fully what is proposed"*[77]. This is usually called "Gillick competence."

The issues of "sufficient understanding and intelligence" in minors remain undefined. In the case of *Re R (a minor)* (1991) an English court held that in order to be competent to give consent a child must understand:

- The nature of the proposed treatment; and
- The consequences of treatment (including side-effects) and of not undergoing treatment

In practice this would mean that "Gillick competence" or the capacity to consent to a treatment such as bariatric surgery must be determined on an individual basis in the adolescent age group. In practice such competence is usually assessed by a consulting child and adolescent psychiatrist or adolescent physician, who ideally would be part of the multidisciplinary weight management team.

Table 1. Studies of adjustable gastric banding in adolescents [adapted from Treadwell et al. 2008] [2]

Study [ref]	Years	Details	No.	Mean age yrs [Range]	%Female	Mean BMI [Range]	Follow-up [Range]
Dillard et al [41]	2001-2006	Lap-Band	24	18 [14-20]	75%	49 [38-81]	Mean 1.0 yr [0-4]
Al-Qahtani et al. [43]	2003-2005	Lap-band	51	16.8 [9-19]	53%	49.9 [38-63]	Mean 1.3 yrs [0.5-2.8]
Nadler et al [44]	2001-2006	Lap-Band	53	15.9 [13-17]	77%	47.6 [N/A]	Range 0.5-2 yrs
Yitzak et al. [45]	2000-2006	Swedish adjustable GB [SAGB]	60	16 [9-18]	70%	43 [35-61]	Mean 3.3 yrs [0.3-7.2]
Silberhumer et al. [46]	1998-2004	Lap-Band 13/50; SAGB 37/50	50	17.1 [9-19]	62%	45.2 [32.5-76.6]	Mean 2.9 yrs [0.3-7.2]
Angrisani et al. [47]	1996-2003	Lap-Band	58	18.0 [15-19]	81%	46.1 [34.9-69.3]	Range 0-7 yrs
Fielding et al. [49]	1998-2003	Lap-Band	41	15.6 [12-19]	73%	42.4 [31-71]	Mean 2.8 yrs [0.1-5.8]
Abu-Abeid et al. [52]	N/A	Lap-Band	11	15.7 [11-17]	73%	46.6 [38-56.6]	Mean 1.9 yr [0.5-3 yrs]

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