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Review

Bariatric surgery in adolescents with severe obesity: Review and state of the art in France☆

Chirurgie bariatrique chez l'adolescent en obésité sévère : revue de la littérature et situation en France

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Abstract

Severe obesity (body mass index > 120% of BMI IOTF-30 cut off) and morbid obesity (BMI > 140% of BMI IOTF-30 cut off) affect 5 to 10% of obese adolescents in France. Organic complications can be found in about 50% of these patients, and depressive symptoms in one-third of them. Finally, over 70% will suffer from adult morbid obesity associated with a marked increase in morbidity and mortality. However, the reversion of obesity strongly decreases, and may even cancels, these risks. In controlled randomized studies, lifestyle interventions have limited effectiveness on BMI in children (and none in adolescents). Bariatric surgery has been shown to have short-term effectiveness in adolescents with severe and morbid obesity: the average BMI loss after gastric banding was 11.6 kg/m^2 (95% confidence interval from 9.8 to 13.4), 16.6 kg/m^2 (95% confidence interval from 13.4 to 19.8) after bypass, and 14.1 kg/m^2 (95% confidence interval 10.8 to 17.5) after sleeve gastrectomy. The resolution of comorbidities was the main aim, as well as the improvement of quality of life. This is not a simple surgical intervention, and minor side effects have been reported in approximately 10–15% of teenagers who underwent surgery (more common with the gastric band), and severe side effects in nearly 1–5% (mainly with bypass). In France, recommendations regarding indications, the care pathway, multidisciplinary meetings, reference management structures and postoperative care have been published by the French National Health Authority (HAS) in 2016 to provide a framework for bariatric surgery in underage patients.

Keywords: Bariatric surgery; Adolescent; Obesity; Gastric banding; Roux-En-Y bypass; Sleeve gastrectomy; Morbid obesity; Severe obesity

Résumé

L'obésité sévère (indice de masse corporelle > 120 % du seuil d'IMC IOTF-30) et morbide (indice de masse corporelle > 140 % du seuil d'IMC IOTF-30) touche 5 à 10 % des adolescents obèses. Des complications organiques sont détectables chez près de 50 % des sujets et des symptômes dépressifs chez un tiers d'entre eux. De plus 70 % auront, à l'âge adulte, une obésité morbide et une augmentation franche de la morbi-mortalité. En revanche, la réversion de l'obésité décroît fortement, voire annule ces risques. La prise en charge nutritionnelle et physique a une efficacité modeste sur l'IMC, voire nulle chez les adolescents dans les études randomisées contrôlées. La chirurgie bariatrique a montré son efficacité à court terme chez l'adolescent avec une obésité sévère ou morbide. La perte d'IMC moyenne après anneau gastrique était de 11,6 kg/m^2 (intervalle de confiance à 95 % 9,8–13,4), après *by-pass* de 16,6 kg/m^2 (intervalle de confiance à 95 % 13,4–19,8) et après *sleeve* gastrectomie de 14,1 kg/m^2 (intervalle de confiance à 95 % 10,8–17,5). La résolution des comorbidités a été la règle, de même que l'amélioration de la qualité

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de vie. Il ne s'agit pas d'une chirurgie anodine et des effets secondaires mineurs ont été rapportés chez près de 10–15 % des adolescents opérés (plus fréquents avec l'anneau gastrique) et des effets secondaires sévères chez près de 1–5 % (principalement avec le *bypass*). En France, des recommandations concernant les indications, le parcours de soins, les réunions de concertation pluridisciplinaire, les structures de prise en charge et le suivi postopératoire ont été publiées par la HAS en 2016 pour encadrer la chirurgie bariatrique chez les sujets mineurs.

Mots clés : Chirurgie bariatrique ; Adolescent ; Obésité ; Anneau gastrique ; *Bypass* ; *Sleeve* gastrectomie ; Obésité morbide ; Obésité sévère

1. Definition and epidemiology of severe obesity in children and adolescents

In both adults and children, overweight and obesity are defined according to the body mass index (BMI) and calculated as BMI = weight/height^2, with weight expressed in kilograms and height in meters, the index reflecting the percentage of body fat. Child and adolescent obesity cannot be defined by a BMI threshold, unlike that of adults, because the standards for weight and height are dependent on age and gender; as a result, so are BMI standards. Overweight and obesity are defined as a corpulence index above the 97th percentile for age, based on curves established by M.F. Rolland-Cachera [1]. This 97th percentile of the French curves is slightly higher than the threshold set by the International obesity task force (IOTF), above which an increase in adult mortality has been observed (this IOTF-25 cut off corresponds to the 95th percentile of the French curves) [2]. Obesity is considered severe above a curve > 120% of BMI IOTF-30, and morbid above a curve > 140% of IOTF-30 [3,4]. These thresholds are consistent (more or less) with BMI_{35} and BMI_{40} at 18 years old respectively, and have been established based on prospective monitoring of child obesity [3,4].

The frequency of severe and morbid obesity in adolescents in France has not been clearly determined. The OBEPI studies in 2012 showed that the frequency between 18 and 24 years was 0.5% of the population [5]. It is likely that the frequency in adolescents between 13 and 18 years old is between 0.3 and 0.5% (i.e. 5 to 10% of obese adolescents), because most cases of severe and morbid obesity in young adults developed in childhood and adolescence. Almost all these patients experienced early adiposity rebound [6].

An adolescent has a 70% risk of developing morbid obesity as an adult (BMI > 40) when severely obese (BMI > 120% of BMI IOTF-30), a 44% risk when obese (BMI IOTF-30 < BMI < 120% BMI IOTF-30), and an 11% risk when overweight (BMI IOTF-25 < BMI < BMI IOTF-30) [7].

2. The consequences of severe and morbid obesity in adolescents

For a long time, it was thought that complications linked to obesity affected only severely obese adults. However, metabolic abnormalities, whether isolated or grouped within the nosological entity of the metabolic syndrome, already exist in many obese children and young adolescents [8].

Organic pathologies that are known to complicate obesity in adults can already be found in adolescents: high blood pressure, which could affect up to 50% of obese adolescents if the measurement is ambulatory [9,10], and which predicts the risk of metabolic syndrome in adulthood [11]; dyslipidemia (increase of triglycerides and of LDL cholesterol, decrease of HDL cholesterol), which affects almost 50% of obese children, depending on the degree of central adiposity [12]; obstructive sleep apnea and hypoventilation (8 to 17% of obese adolescents) [13,14]; fatty liver disease, which affects 9 to 38% of obese adolescents [15–17]; type 2 diabetes, however, remains rare in young obese Europeans (less than 1% in France, less than 2% in Germany) [18,19].

Finally, a third of obese adolescents presented with clinically significant symptoms of depression and a quality of life deemed below average [20]. Such circumstances often lead to abandoning formal education and to social alienation.

Patients who develop extreme obesity from childhood are exposed to overweight for a long time, with a major risk of morbidity and mortality in adulthood. Several studies have now linked cardiovascular morbidity and mortality in adulthood with obesity in childhood and adolescence [21–25]. However, reversion of obesity in adulthood (obesity in childhood, normal BMI in adulthood) appears to sharply decrease [24] or even cancel these risks [24,25]. More precisely, the risk of diabetes disappears if the patient is no longer obese in adulthood, while the cardiovascular risk decreases (but does not disappear). This can probably be linked to the early formation, from adolescence, of atheromatous lesions in patients who present risk factors [26]. Ultimately, this highlights the importance of early treatment, which is the only way to decrease the risk of organic pathologies in adult life.

3. Effectiveness of lifestyle interventions in adolescents with severe and morbid obesity

Generally speaking, randomized studies have shown the short-term (statistical) effectiveness of life style changes (so-called *lifestyle intervention*, including both changes in nutrition and physical activity) on BMI and risk factors in obese children and adolescents [27,28]. However, the effectiveness of this treatment was only modest (BMI loss of 1.25 kg/m^2 after 3 months at 2 years of treatment), and not significant in adolescents (Fig. 1).

4. Bariatric surgery in adolescents

The feasibility of bariatric surgery in adolescents has been clearly demonstrated [29,30]. The three techniques most often used are gastric band (Fig. 2), gastric bypass (Fig. 3) and