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REVIEW

## Evaluation of risk factors for complications after bariatric surgery

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### KEYWORDS

Postoperative complications;  
Bariatric surgery;  
Obesity surgery;  
Risk factors;  
Gastric bypass;  
Sleeve gastrectomy

**Summary** The decision to perform a bariatric surgical procedure, the conclusion of a clinical pathway in which management is individually adapted to each patient, is taken after multidisciplinary consultation. Paradoxically, the patients who would most benefit from surgery are also those who have the highest operative risk. In practice, predictive factors of mortality and severe postoperative complications (Clavien-Dindo > III) must be used to evaluate the benefit/risk ratio most objectively. The main risk factors are age, male gender, body mass index, obstructive sleep apnea syndrome, insulin resistance and diabetes, tobacco abuse, cardiovascular disease, ability to lose weight before surgery, hypoalbuminemia and functional disability. Routine preoperative evaluation of high perioperative risk patients provides the attending physician with information to: (1) correct several of these risk factors before surgery and thereby limit the operative risk; (2) orient the patient to a less risky surgical procedure and/or to a facility with a more adapted technical capacity, as necessary; (3) contra-indicate the operation if the risks exceed the expected benefits. All in all, this preoperative evaluation combined with management of comorbidities contributes to decrease the risk of postoperative complications and to improve the overall management of obese patients.

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### Introduction

The decision to perform a bariatric surgical procedure is taken after multidisciplinary consultation, the final step of a clinical pathway and management plan, specifically adapted to each patient [1–3]. One of the key issues during the multi-

disciplinary consultation is to evaluate the risk/benefit ratio (RBR) for a given patient. Several prospective studies, and in particular the Swedish Obese Subjects (SOS) study [4], have convinced medical physicians and surgeons of the value of bariatric surgery by showing that surgery improves life expectancy and comorbidities, leading to rapid expansion of bariatric surgery worldwide. Nonetheless, the question of the RBR remains important, particularly for patients with a high operative risk. Preoperative identification of the subgroup of patients at high risk or those patients who will most benefit from surgery, according to their demographic characteristics or comorbidities, is difficult, essentially because there are practically no studies concerning these specific

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subgroups today. Paradoxically, the patients who would most benefit from surgery are precisely those with the most severe disease, those who have the highest operative risk. Routine evaluation before surgery of patients at high perioperative risk has several strong points of interest and allows the attending physician to:

- correct the optimizable risk factors before surgery to limit the operative risk;
- orient the patient to a less risky surgical procedure and/or direct the patient to a facility with a more adapted technical capacity;
- contra-indicate the operation if the risks are greater than the expected benefits.

The goal of this update was to preoperatively identify the risk factors for severe postoperative complications in order to evaluate the risk of bariatric surgery for each individual patient.

## Risk/benefit ratio (RBR)

### The RBR from the attending medical physician's and surgeon's point of view

The team in charge of a potential candidate for bariatric surgery must balance the beneficial and negative effects of the operation for the patient. The main questions are: "Is the risk of surgery acceptable, taking into account the natural history of the disease to be treated?" and "Are the undesirable effects greater than the benefits?" Even though based on numerical data, the evaluation of the RBR is not a simple point that can be placed on a continuous line because the benefits and risk are not always of the same nature and therefore they are difficult to compare. For example, restrictive surgery is responsible for vomiting that may lead to hypokalemia, dehydration or the Gayet–Wernicke syndrome. But because restrictive surgery is associated with better weight loss, it also improves or eliminates certain comorbidities and improves life expectancy. Thus, one must pose the question of the balance between improvement of quality of life, life expectancy and functional handicap versus social disruptions linked to changes in eating habits or the frustration of not being able to satisfy the sensation of hunger. In this case, the nuisance induced by surgery can sometimes be considered as equivalent to the expected benefits.

Obviously, this appreciation can vary according to the physician's or above all the patient's evaluation and personal experience. The RBR is therefore difficult to quantify in practical terms. Finally, the only objective way to evaluate the RBR is to look at severe postoperative complications. This is the essential criterion that can potentially lead to justification or rejection of surgery as a solution for obesity. In practice, this evaluation should only be based on major postoperative complications (Clavien-Dindo > III). However, such analysis is only possible when there are case-controlled studies that permit calculation of the number of events that could have been avoided. For example, surgical treatment of  $n$  patients should allow avoidance of  $x$  deaths at 10 years, but may lead to  $y$  postoperative deaths. Overall, the RBR translates into a reduction of  $x-y=z$  deaths. One can consider that the RBR is unfavorable when the severity or the frequency of undesirable event leads to a risk that is disproportionate to the severity of the disease or the expected benefit [1–3].

### The RBR from the patient's point of view

The view of the patient differs greatly from that of the attending physician or surgeon. For the medical team, the nature of the benefit is related to epidemiological criteria and therefore the risk is a probability. By contrast, the patient wants to lose weight rapidly with neither frustration nor restriction, and without disturbing his or her social life; the benefit is measured in terms of quality of life, improvement of the functional nuisance of obesity and/or body image. For the patient, the medical motivations are often relegated to second position. The dangers of the operation are seen by the patient as a personal danger; the risk is not a statistical notion but directly concerns the individual who is obese and wants the operation. The risk is perceived by the patient as a danger that is intolerable, by definition. The medical team must therefore consider the difference in perception of risks and benefits.

### The risk/benefit ratio is related to the baseline risk

This notion is fundamental to analysis of the RBR for a given patient. Mathematically, the absolute benefit provided by the treatment is greater when the reference risk (or the natural history of the disease) is high. Thus, patients at high risk for severe postoperative complications and death are potentially those who would derive the most benefit from surgery [1–5].

### How to evaluate the absolute risk of death for the obese patient?

Obesity increases the risk of death mainly by increasing the relative risk of cardiovascular disease and cancer, the two main causes of death. A recent study has shown that it is the maximal weight observed during the period of obesity, rather than the weight at the moment of consultation, that counts most [5]. The risk of cardiovascular mortality at 5 or at 10 years can be evaluated by several equations. The Framingham 2008-body mass index (BMI) equation allows evaluation of the risk specifically related to obesity. The PROCAM (Münster Heart Study) model has the advantage of including lipidic parameters that are not in the Framingham equation [6]. The European Systematic Coronary Risk Evaluation (SCORE) model evaluates the risk of cardiovascular mortality at 10 years in individuals between 40 and 65 years taking into account total cholesterol, tobacco abuse and systolic blood pressure [7]. The main value of the SCORE model is that it has been calibrated for Europe according to the geographical area. France, however, is classed in the low cardiovascular risk range. Consequently, the SCORE and Framingham equations overestimate the risks in France and adjustments are necessary. These are available on line (<http://www.heartscore.org> or <http://www.riskscore.org.uk>) [8,9].

It is more difficult to evaluate the increased risk of death from cancer. Obesity is associated with an increased prevalence of cancer in both women and men [10–16]. For every 5-point increment in BMI, the relative risk of cancer increases as follows: endometrial cancer [RR 1.60 (1.52–1.68)], gallbladder cancer in women [RR 1.59 (1.02–2.47)] and esophageal adenocarcinoma (RR 1.52 in men and RR 1.51 in women). Other cancers have also been observed with lower relative risks: kidney, colon, leukemia,

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