Renal Function in Obese who Underwent Bariatric Surgery

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Key Points

- Impairment of renal function can occur in obese individuals with different metabolic body composition status and varies with gender, age and ethnic groups.
- The mechanism of chronic obesity contributing to Chronic Kidney Disease (CKD) remains elusive, multiple mechanisms had been proposed and include glomerular hyper filtration, development of micro albuminuria/proteinuria, increased glomerular capillary wall tension, and podocyte stress; these are followed by hypo filtration, decreased Glomerular Filtration Rate (GFR), and CKD progression.
- Medical or surgical loss of weight may be associated with improvement of renal function, however the subject is controversial.

Question Mark: Is bariatric surgery a good approach for the management of decreased renal function in obese patient?

Definitions

Obesity

WHO conceptualizes obesity as abnormal or excessive fat accumulation that may impair health. It is most commonly assessed using Body Mass Index (BMI), a simple and quick anthropometric tool that has a low cost. BMI ≥30 kg/m² is considered obesity. However, several researchers and professional associations consider the use of BMI as the primary clinical index of obesity insufficient. They have called for a new definition that fully accounts for the complexity of the disease relating to the quantity, distribution and secretory function of adipose tissue. Thus, other anthropometric markers are used for the purpose of better assessing obesity [1,2].

Renal Function/Obesity

The kidneys remove waste and extra water from the blood (as urine) and help keep ions (such as sodium, potassium, and calcium) balanced in the body. They also make hormones that help control blood pressure and stimulate bone marrow to make red blood cells. Kidney function is usually tested by measuring serum creatinine, and screening for glomerular disease is undertaken by measuring urine albumin or protein concentrations [3].

Obesity is associated with increasing prevalence of several diseases such as systemic arterial hypertension, diabetes and cardiovascular conditions, which can impair renal function. A general explanation is based on the micro vascular networks that are closely adapted to specific functions of nutrition and removal of waste in every organ. Damage of the small vessels in several tissues and organs has been reported in obesity and may increase cardio-renal risk. However, the mechanisms by which obesity and its attendant cardiovascular and metabolic consequences interact to cause renal micro vascular injury and chronic kidney disease are still unclear [4].

Epidemiology

Obesity is a global epidemic, affecting all age, race and ethnic groups. Nowadays, overweight and obesity represent over one third of the planet population. According to the WHO, in 2016 more than 650 million adults worldwide were obese. Obesity increases the risk for many chronic diseases, such as diabetes mellitus, cardiovascular diseases and cancers, and is possibly associated with mental health disorders. Thus, it is widespread in the world and can be a predictive factor for Chronic Kidney Disease (CKD), which may impair renal function. Additionally, it can lead to structural and inflammatory changes. These diseases are causing an enormous burden to human health and society [5-15].
Etiology

There is evidence suggesting that several factors play a role at different levels for the obese onset, including genetics, biology, human behavior, social interaction and broad environment at large [16-20]. Regarding to biological process, it includes sensibility to leptin and individual metabolism [21].

Individual behaviors include food intake choices and physical activities, while social interaction comprise family and friends connection that can influence life style. Regarding to environment it includes green spaces and suburb safety. Social forces are related to economy, politics, education self-perception of health and culture. All of these factors are direct or indirect associated with obesity [22] (Figure 1).

Obesity and Renal Dysfunction: Physiopathology

The mechanisms of renal dysfunction in obese patients are not well clear (elusive). The studies in experimental animals offer mechanical insights on the changes over cardiovascular and renal systems. It has been observed expansion of extracellular fluid in obese, which in turn increases the renal blood flow [23]. Inflamations, oxidative stress and hyper activation of renin/angiotensin/aldosterone system, besides leptin and adipocin may play an important role in the physiopathology of renal dysfunction in obese patients [24-26]. One can observe increase renal sodium reabsorption, besides the recruitment of functional reserve with glomerular hyper filtration, Obesity can also promotes hypofiltration, increasing the risk for Chronic Kidney Disease (CKD) [24-33] (Figure 2).

Figure 1: Illustration of how multiple factors acting across a range of scales can contribute to obesity.

Figure 2: Mechanisms of obesity-induced hypertension, renal injury and cardiovascular disease.

Obesity Treatment Strategies - Bariatric Surgery

Aiming to reduce the risk of obesity and its morbidities, as well as improving life quality of these individuals several clinical and surgical approach have been used including change in life style, drugs and surgical interventions. Bariatric surgery has become the main operative way of controlling the associated morbidities, and an effective method for achieving sustained weight loss, improves blood pressure, reducing hyperglycemia, and even inducing diabetes remission [34-37] (Figure 3).
whether there is improvement of renal function in obese patients undergoing bariatric surgery. Further prospective studies are required for providing better answer to the question. Some studies sustain that there is a decrease in albuminuria after bariatric surgery due to a decrease in the intra-abdominal pressure, which in turn reduces the stress on the glomerular capillary wall preventing the onset of CKD [38-43]. Additionally, regarding renal function there is evidence that after bariatric surgery there improvement in the hypo filtration [44-50] or reduction of hyperfiltration [51,52]. On the other hand, there are studies that support no evidence of improvement of renal function after obese patient undergoing bariatric surgery, including worsening of renal function [53-55].

The use of more accurate biological markers, such as cystatin C, and more precise equations for estimating renal function in obese patients undergoing bariatric surgery can improve more reliable assessment of renal function and its relationship of this surgical procedure in these patients [56,57]. Further prospective cohorts are required for providing better answer to the question whether there is improvement of renal function in obese patients undergoing bariatric surgery.

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