

The effects of bariatric surgery on the heart

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Obesity is associated with an increased cardiovascular mortality rate, and an even greater risk is associated when the body mass index (BMI) exceeds 35 kg/m².¹ As obesity is now a global problem affecting virtually all ages and socioeconomic groups, it has become a major contributor to the global burden of cardiovascular disease. Structural and functional changes in the cardiovascular system occur in response to obesity including; ventricular

hypertrophy, diastolic dysfunction, reduced myocardial energetics,² and aortic stiffness,³ all of which are associated with adverse cardiovascular risk.⁴⁻⁷ In addition to these structural changes, obesity is associated with the metabolic syndrome, hypertension, insulin resistance,⁸ chronic subacute inflammation⁹ and activation of the renin-angiotensin system¹⁰ resulting in a proatherosclerotic environment, further increasing cardiovascular risk (Figure 1).

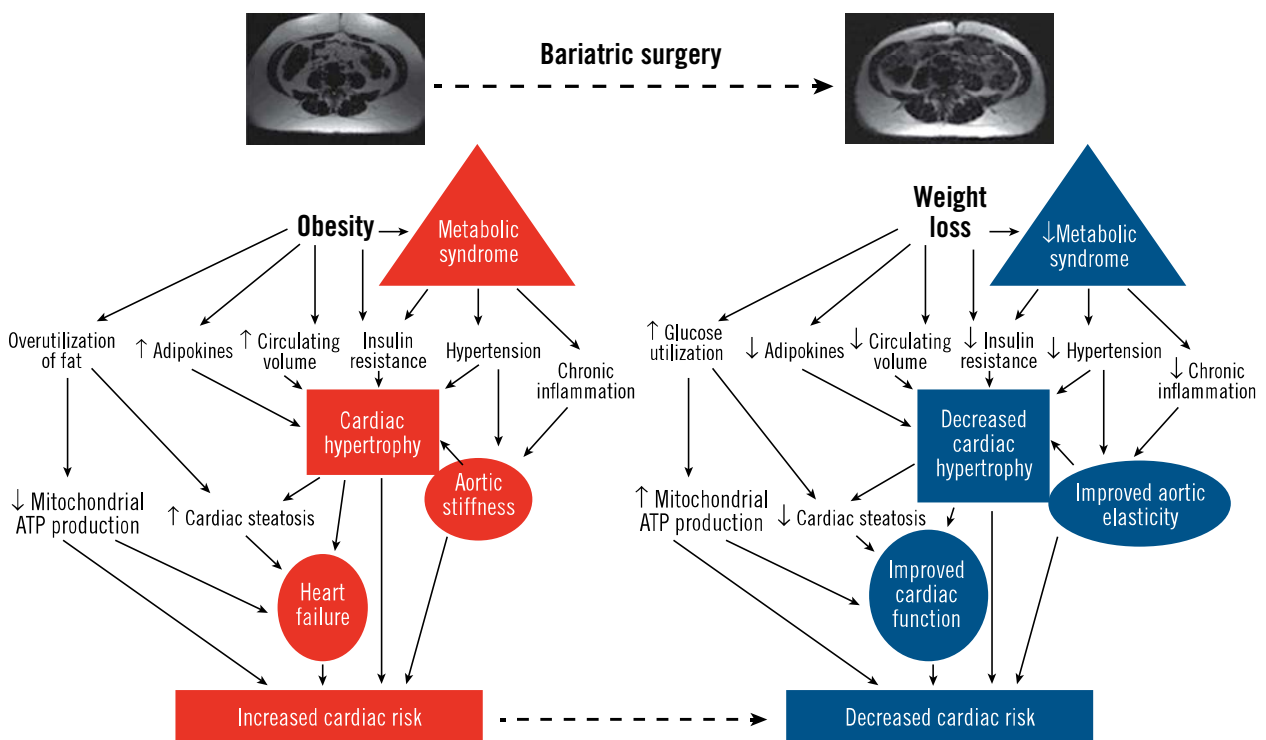


Fig. 1 The effects of obesity and bariatric surgical weight loss on the cardiovascular system.

The effects of bariatric surgery

Although successful in the short-term,¹¹ the traditional treatments to achieve weight loss such as diet, lifestyle, and behavioral therapy have proven relatively ineffective in the long-term to achieve either sustained weight loss or improvement in the cardiovascular risk factor profile, and are especially ineffective in morbidly obese patients (BMI >40 kg/m²). This led to the development of specific surgical treatments (ie, bariatric surgery) to treat morbid obesity and its comorbidities.

Surgical weight loss has been shown to have beneficial effects on cardiac geometry with reduced ventricular mass and cavity size as early as 3 months following bariatric surgery,¹² with additional improvements in aortic elastic function¹³ and cardiac high-energy phosphate metabolism accompanying sustained reduction in fat mass.¹⁴ In addition to the positive effects on cardiovascular structure and function, both exercise capacity and clinical symptoms also improve after bariatric surgery. In addition, over a 3-year period, bariatric surgery has been shown to be superior to intensive medical therapy for the treatment of diabetes.¹⁵ Evidence now suggests bariatric surgery improves subclinical cardiac dysfunction and, as a result, has the potential to reverse obesity-related cardiomyopathy. The mechanisms by which bariatric surgery achieves improved cardiovascular physiology are likely to include reduced circulating volume, decreased inflammation, and modification of adipokines and gut hormones (*Figure 1*). The ability of bariatric surgery to reverse the components that comprise the metabolic syndrome is illustrated in the case report by Rahul Mukherjee in this issue.

The obesity paradox

Although obesity is a major risk factor for the development of congestive heart failure, obesity itself is associated with better survival in patients with manifest cardiac failure.¹⁶ The reasons for this “obesity paradox” are not well understood, but are extremely important given the high prevalence of both obesity and heart failure in the general population. Given the survival advantage that obesity confers to heart failure, there is now a genuine question as to whether bariatric surgery in this setting would be beneficial or remove the survival advantage conferred by obesity. While positive reverse cardiovascular remodeling and improved survival in the general population occurs with bariatric surgery,¹⁷ whether or not these

beneficial effects can be achieved in a heart failure patient remains unknown. Given the current lack of guidelines on weight management in heart failure, answering this question is of great clinical importance and further studies are needed.

Conclusion

There is now clear evidence that bariatric surgery confers beneficial effects to the cardiovascular system. However, these benefits need to be weighed against the possible increase in operative risk in obese subjects and especially in patients with overt obesity cardiomyopathy, despite the fact that this population is likely to gain the most benefit from weight loss. Although it is likely that bariatric surgery will have long-term benefits in preventing and treating obesity-related cardiovascular disease, to date, no randomized studies have assessed the effects of bariatric surgery in either reducing the incidence of heart failure and myocardial infarction or reducing mortality in patients with established heart failure. ■

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