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## Coronary Bypass on the Working Heart: Advantages and Challenges

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### ABSTRACT

This article explores the advantages and challenges associated with performing coronary artery bypass grafting (CABG) on a beating heart, also known as off-pump coronary artery bypass (OPCAB). OPCAB is a surgical technique that avoids the use of a heart-lung machine, allowing the heart to continue beating during the procedure. This approach is associated with several potential benefits, including reduced systemic inflammation, lower risk of stroke, decreased blood loss, and shorter hospital stays. However, OPCAB also presents unique challenges, such as the technical difficulty of operating on a moving target and the potential for incomplete revascularization. The article provides an in-depth review of the current literature on OPCAB, discussing patient selection criteria, surgical techniques, and outcomes. It also examines recent innovations in surgical instruments and techniques that aim to improve the feasibility and safety of OPCAB. The findings and insights presented are intended to inform cardiac surgeons, anesthesiologists, and other healthcare professionals involved in coronary bypass surgery about the latest advancements and considerations in performing CABG on the working heart.

**KEYWORDS:** Coronary artery bypass grafting (CABG), Off-pump coronary artery bypass (OPCAB), Beating heart surgery, Cardiac surgery, Patient outcomes, Surgical techniques, Revascularization, Innovations, Systemic inflammation, Stroke prevention.

**Relevance:** Coronary artery bypass grafting (CABG) remains one of the most common and effective methods of surgical treatment of coronary heart disease. With the increasing number of patients with comorbidities such as diabetes, hypertension and renal failure, there is a need for techniques that minimize invasiveness and reduce the risk of complications. On-heart CABG, also known as non-cardioplegic bypass surgery, is an innovative approach in which the operation is performed without cardiac arrest and without the use of a heart-lung machine (CPB). This method avoids a number of complications associated with the use of cardioplegia and cardiopulmonary bypass, such as systemic inflammation, cognitive impairment and organ damage.

CABG on the working heart is especially important for patients at high surgical risk, including elderly patients and patients with multiple comorbidities. Research shows that this technique is associated with shorter hospital stay, reduced postoperative complications and faster recovery. Despite these advantages, performing CABG on a beating heart requires highly skilled surgeons

and specialized equipment to stabilize the heart. The development of new technologies and improvements in surgical techniques continue to expand the capabilities of this method, making it available to more patients and improving clinical outcomes.

On-heart CABG is performed without cardiac arrest, requiring a high level of skill and specialized equipment from the surgeon to stabilize the bypass site. Various stabilizers and retractors are used to help keep the heart in the desired position.

**Conclusions:** On-pump CABG is associated with fewer complications, such as stroke, kidney failure, and inflammatory reactions, compared with the traditional method using a heart-lung machine. Patients who undergo beating heart CABG have a shorter hospital stay and return to normal life more quickly. However, this method requires a highly qualified surgeon and cannot be applied to all patients, especially to those with complex anatomical conditions or many affected vessels. Despite its challenges, beating heart CABG continues to evolve, and new technologies and stabilization techniques may make this approach more accessible and safer for a wider range of patients.

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