Since the mid 1970s, there is a growing body of evidence indicating that volatile anesthetics protect the myocardium against ischemic injury. The early findings were eclipsed by the so called “Isoflurane-induced coronary steal” phenomenon described in the late 1980s, referring to the possibility of isoflurane induced myocardial ischemia in patients with “steal-prone” coronary anatomy.

Subsequent animal and human studies in the early 1990s have dismissed the isoflurane coronary steal hypothesis. Conversely, such studies have indicated that volatile anesthetics protect the heart against ischemia and reperfusion injury. The studies involved halothane, enflurane, isoflurane, and later sevoflurane and desflurane. Exposure to volatile agents resulted in improved functional recovery of contractile function of stunned myocardium, reduction of myocardial damage after cardioplegic arrest and reduction of myocardial infarct size. Some studies showed that the beneficial effects persisted even after discontinuation of the volatile agent before coronary artery occlusion. This short-term memory phenomenon, which is similar to observations with ischemic preconditioning, was termed anesthetic-induced preconditioning, and was observed with several animal species in a dose-dependent efficacy, both in vitro and in vivo.

The exact mechanism of cardioprotection against ischemic injury by volatile anesthetics is still not fully defined despite extensive research. However, the signal transduction pathways are similar to those involved in ischemic preconditioning (IPC), the central mechanism being opening of the mitochondrial Adenosine Triphosphate-sensitive potassium channel (mito KATP). This central mechanism is activated via several complex signal transduction pathways involving the Adenosine receptor, G protein-coupled receptors, activation of Protein Kinase C (PKC), Reactive Oxygen Species (ROS). In addition, reduction of the inflammatory response after ischemia-reperfusion, as measured by the levels of proinflammatory cytokines (e.g. TNF-α, IL-6) has been demonstrated for sevoflurane. Opioids induce anesthetic preconditioning via activation of δ1-receptor (only Morphine) both in-vitro and in-vivo.

The R (-) isomer of Ketamine, and sulphonylurea oral hypoglycemic drugs (glibenclamide) block the cardioprotection of IPC, probably by blocking mito KATP channels. It seems prudent to avoid racemic ketamine, and oral hypoglycemic drugs when ischemia-reperfusion is anticipated.